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PRACTICE WITH SCIENCE

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1883.

> 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.*

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CONTENTS OF PART I., VOLUME XIX.

Second Series.

APPENDIX.

DIRECTIONS TO THE BINDER.

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

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

Wheat Tables for the years 1865 to 1882 to follow page 208.

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

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

METEOROLOGY.—1882.

First Quarter (January, February, March).—The mean reading of the barometer during the quarter was 30·03 inches, and was more than a quarter of an inch above the mean reading for the corresponding period of 40 years.

The weather in January was remarkable for very high readings of the barometer and high mean atmospheric pressure for the month; total absence of snow, the very few nights on which the temperature on the grass was below 32°, and consequently very few and slight frosts, and almost total absence of north and north-east winds. It was a mild pleasant month, being very warm during the first fortnight, and the last 5 days with a rainfall below the average; at the end of the month all agriculture was a month in advance, and many flowers were in blossom in addition to the usual January flowers.

The weather in February was mild and pleasant, with a high barometer continuing till near the end of the month, and a high temperature from the 11th day; vegetation was very forward at the end of the month.

The weather in March was singularly mild and pleasant, being exceptionally warm during the first 20 days, and quite genial; on the 21st and 22nd, a little snow was general over the country, and the temperature on the 21st, 22nd, and 23rd was slightly below the average, but it became warm again on the 24th. The weather from November to this time was most favourable for farming work, and at the end of the quarter vegetation was very forward.

The *mean temperature* of the air for the quarter was 42°·7, and exceeded by 4° the average for the corresponding period in 111 years.

The *rainfall* measured at Greenwich during the quarter was 3·63 inches, and was nearly an inch and a half below the average amount in the corresponding periods of 66 years. The recorded amount showed a deficiency of about half an inch in each of the three months of the quarter. Rain was measured at Greenwich on 10 days in January, 8 in February, and 11 in March; in all, on 29 of the 90 days of the quarter. At 42 stations of observation the recorded rainfall of the quarter ranged from 2·96 inches at Bournemouth, to 12·13 inches and 12·83 inches respectively, at Cockermouth and Stonyhurst.

The number of hours of bright sunshine recorded at Greenwich during the quarter was 179·7, against 172·0, the average amount recorded in the corresponding quarters of the four years 1878–81.

Second Quarter (April, May, June).—The mean reading of the barometer during the quarter was 29·737 inches, and was 0·046 below the mean reading for the corresponding period of 40 years; the mean showed an excess in May, but was below the average in April and June.

The weather in April was generally warm till towards the end of the month, with frequent rain, the total being in excess of the average, but not more than was needed, the three preceding months having been drier than usual. The atmospheric pressure was in excess of the average till the 10th, and generally in defect afterwards. The prevailing winds were from the S., S.W., and W.

On the 28th there were violent gales of wind and squalls passing over Jersey and Guernsey, and on the 29th a severe gale passed over the South of Wales and the South of England, which proved to be very injurious to fruit trees, and the foliage of trees throughout its course. This gale was thought to be in some places as severe as that of October 14th, 1881. The observer at Osborne says, twelve large trees were overturned; the observer at Southbourne says, houses were unroofed. At all places the leaves of trees on the S.W. or windward side were spoken of as blackened, as if by frost, or as if scorched by fire; this effect was attributed by several observers to saline matter carried by the wind. The gale entirely changed the appearance of the country over which it passed, but it did not extend far north. At Cambridge there was a gale after 3 P.M.; at Oxford a storm from 5 P.M. to 9 P.M.; at Lowestoft a gale after 4 P.M.; at Hull the day was fine with showers; at Bradford the day was fine throughout; at Stonyhurst there was a snowstorm, and snow fell at Liverpool and Bolton. The instances of rain exceeding an inch in one day, were on the 1st at Plymouth, on the 12th at Totnes, on the 13th at Stonyhurst, on the 25th at Caterham and London, on the 29th at Wrottesley, Bolton, and Bradford, and on the 30th at Halifax.

The weather in May, with the exception of about a week in the beginning of the month, was warm and genial. The fall of rain at most places was less than the average. The atmospheric pressure, except from the 20th to the 26th, was generally above the average. The month was favourable to all growing crops, grass abundant; there was no instance at any of the stations of a fall of rain to the depth of an inch on one day during the month.

The weather in June was cold and unseasonable throughout, the temperature, with the exception of 2 or 3 days at the beginning of the month, was below its average. The atmospheric pressure was below its average from the 3rd to the 14th, and from the 18th to the 24th; the weather was variable; the fall of rain was in excess of the average, it was a wet, ungenial month, and bad for hay-making, and proved to be the coldest June since 1871.

The *mean temperature* of the air for the quarter was 53°·0, and exceeded the average for the corresponding period of 111 years by 0°·7.

The *amount of rain* measured at Greenwich during the quarter was 6·13 inches, and was about the third of an inch below the average amount in the corresponding periods of 66 years. The amount in May was 0·71 of an inch below the average, whereas an excess of 0·65 and 0·36 of an inch respectively was recorded in April and June. Rain was measured at Greenwich on 13 days in April, 11 in May, and 19 in June; in all, on 43 of the 91 days in the quarter.

The number of hours of bright sunshine recorded at Greenwich during the quarter was 510·6, showing an excess of 48·7 hours upon the average amount recorded in the corresponding quarters of the five years 1877–81.

Third Quarter (*July*, *August*, *September*).—The mean reading of the barometer was 29·709 inches, and was 0·086 below the mean reading for the corresponding periods of 40 years; the mean reading for each month was below the average.

With the exception of the first three days, which were fine and warm, the month of July was cold; the maximum temperature in the month, at many stations south of latitude 52°, did not rise above 73° or 74°, and it exceeded 78° at a very few places indeed over the country; it was in this respect a great contrast to July

1881, in which month the temperature exceeded 90° on two days, and was above 80° on many days. The atmospheric pressure was generally below its average, and rain fell in showers on 17 to 20 days at stations situated in the south of England, the number gradually increasing to 25, and to 29 at northern stations. The wind was mostly from the S.W., frequently blowing strongly, and there was almost a total absence of wind from the east. The month was cold, wet, and ungenial—a bad month for haymaking, and many fields remained uncut at the end of the month.

The month of August was moderately fine at the beginning, but cold and showery from the 14th; the maximum temperatures in this month were low, at many stations not reaching 80° during the whole month, and the stations at which it exceeded 80° were few in number. The fall of rain was generally less than the average. The atmospheric pressure was above its average till the 11th, and was, with the exception of the 17th, constantly below it during the remainder of the month.

The weather in the month of September, during the first week was moderately fine, but from the 7th was cold and unsettled; the highest temperature reached in the month was less than 70° at several stations, but exceeded 70° generally; the mean temperature of the month was lower than of any other September back to 1863, excepting that of 1877; the atmospheric pressure was constantly below its average from the 10th to the 29th; rain was generally less than the average, but was above at a few stations. The month on the whole was cold, and the air more humid than usual, particularly in the Midland Counties, and in the early afternoon hours, causing harvest operations to be slow.

Upon the whole the unsettled weather which began in June continued till the end of this quarter; the number of days within these four months which could be described as summer-like have been very few.

The *mean temperature* of the air in the quarter was 58°·1, and was 1°·6 below the average for the corresponding period in 111 years.

The *amount of rain* measured at Greenwich during the quarter was 6·01 inches, and was nearly an inch and a half below the average amount in the corresponding periods of 66 years. The deficiency of rainfall was 1·29 inches in August, and the fall was slightly below the average in each of the other months of the quarter. Rain was measured at Greenwich on 19 days in July, 15 in August, and 14 in September; in all, on 48 of the 92 days in the quarter. At 39 stations of observation the recorded rainfall of the quarter ranged from 4·73 inches at Royston, to 15·55 inches at Barnstaple, and 16·34 inches at Stonyhurst.

The number of hours of bright sunshine recorded at Greenwich during the quarter was 420·4, and was identical with the number in the corresponding period of last year; the average amount in the third or summer quarters of the five years 1877–81 was 412·6 hours.

Fourth Quarter (*October, November, December*).—The mean reading of the barometer during the quarter was 29·560 inches, and was 0·191 below the mean reading for the corresponding periods in 41 years; the mean reading for each month was below the average, the largest deficiency occurring in December.

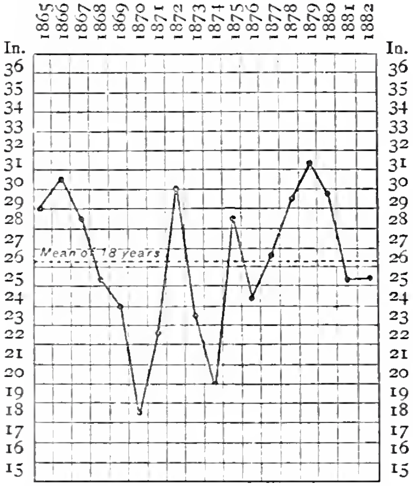
The first half of the month of October was warm, and the second half cold. The atmospheric pressure was above its average for the first 10 days, and below it afterwards. Rain fell at most stations in the Southern and Midland Counties to more than double the average; lowlands were flooded; there was a gale of wind on the 24th, with snow at many places; the fall of rain on this day was heavy, and exceeded 1 inch in depth at several stations. The month of November was warm during the first 10 days, cold from the 11th to the 21st; then warm and cold alternately. Throughout this month the atmospheric pressure was low; the weather was unsettled and changeable, and farm work was almost at a standstill, owing to the wetness of the land. December.—Till the 15th day the weather was foggy and very cold, at times severely so, snow falling frequently; it was warm from the 16th to the end of the month, remarkably so from the 26th. The atmospheric pressure was almost continuously below the average.

The *mean temperature* of the air in the quarter was 44°·8, and was 1°·2 above the average for the corresponding period in 111 years.

The *rainfall* measured at Greenwich during the quarter was 9·39 inches, and was two and a quarter inches above the average amount in the corresponding periods of 66 years. The rainfall in October was equal to 5·42 inches, and 2·62 above the average; whereas the amounts measured in November and in December were both slightly below the average. Rain was measured at Greenwich on 23 days in October, 19 in November, and 17 in December; in all, on 59 of the 92 days in the quarter.

The number of hours of bright sunshine recorded at Greenwich during the quarter was 134·3, and was 24·6 below the average number recorded in the five preceding corresponding periods.

Diagram representing the Annual Rainfall at Greenwich during each Year for Eighteen Years, from January 1, 1865, to December 31, 1882—in continuation of Diagram II. in vol. ii. of this Journal (Second Series), Part I. p. 70.



The mean rainfall at Greenwich for the period (1865-82) was 26·2 inches. The largest rainfall was in the year 1879, and amounted to 31·3 inches. The lowest was 18·5 inches, and occurred in 1870. The extreme amount of range was, therefore, 12·8 inches.

Fall of Rain in Inches at Greenwich.

1865	1866	1867	1868	1869	1870	1871	1872	1873	1874	1875	1876	1877	1878	1879	1880	1881	1882
29·0	30·7	28·4	25·2	24·0	18·5	22·3	30·0	23·4	20·0	28·2	24·2	26·9	29·2	31·3	29·8	25·2	25·2

With reference to the rainfall in 1872, Mr. Glaisher reports that the fall in January was large, being as much as 1·7 in. in excess, but in February less rain than the average fall was measured to the extent of 0·8 in. In March the amount again exceeded its average, but only to the amount of 0·5 in.; and in the next three months the falls were slightly in defect in April and June, but in excess to almost the same amount in May. In July the amount was nearly the same as its average, in August slightly in excess, but in September as much as 1·0 in. in defect. The rainfall, however, in these months was much heavier in the Northern than in the Southern Counties, and harvesting was frequently interrupted both in August and September by heavy rains and frequent thunderstorms, so that by the end of September very little progress had been made either in the north of Ireland or in Scotland, where operations were still further checked by sleet and snow. In the next three months the frequency of rain was a most remarkable feature. During this period it fell on no fewer than 67 days, a larger number than had been previously experienced at Greenwich since the year 1815. The total amount was large, amounting to 11·32 inches, a quantity no less than 4·2 inches in excess of the average. In 58 years this fall has but once been exceeded in the corresponding three months, viz., in 1821, when it was 11·47 inches, or 0·15 in. greater; and back to 1815 there is only one other year in which a greater quantity than 11 inches was recorded, viz., in 1852, 11·13 inches.

This unusual frequency of rain was general over the country. At Stonyhurst, rain fell on 89 days, and at Guernsey on 80 days, whilst the general average over the country was 67 days. The amount at Guernsey was very remarkable, being as much as 25¼ inches.

The mean amount from all the stations was 13·97 inches, being more than double the fall in the corresponding period of 1871, which was 6·09 inches.

The total rainfalls for the year 1872 ranged from 65·4 inches at Allenheads, to 28·5 inches at Royston, and the number of rainy days from 319 at Stonyhurst, to 156 at Holkham.

In the year 1879 there was an excess of rain in every month excepting March, and the last three months of the year; this excess being particularly great in the months, May to August. The greatest total fall in the year was 56·77 inches at Sharples near Bolton, the next in order being 47·71 inches at Helston, 42·4 inches at Stonyhurst, and the least was 26·19 inches at Carlisle; the next in order being 27·10 inches at North Shields, and 27·41 inches at Lowestoft. The greatest number of days on which rain fell was 240 at Bradford, 225 at Bywell, 223 at Stonyhurst, and 215 at Truro.

TABLE I.—METEOROLOGICAL OBSERVATIONS RECORDED AT THE ROYAL OBSERVATORY, GREENWICH, IN THE FIRST SIX MONTHS OF THE YEAR 1882.

1882. MONTHS.	Temperature of										Elastic Force of Vapour.		Weight of Vapour in a Cubic Foot of Air.	
	Air.			Evaporation.		Dew Point.		Air—Daily Range.		Water of the Thames.				
	Mean.	Diff. from average of 111 years.	Diff. from average of 41 years.	Mean.	Diff. from average of 41 years.	Mean.	Diff. from average of 41 years.	Mean.	Diff. from average of 41 years.		Mean.	Diff. from average of 41 years.	Mean.	Diff. from average of 41 years.
	°	°	°	°	°	°	°	°	°	°	in.	in.	grs.	grs.
January ..	40·4	+3·9	+2·1	39·0	+2·2	37·2	+2·5	9·1	−0·5	..	0·222	+0·024	2·6	+0·3
February ..	41·8	+3·1	+2·4	40·5	+2·8	38·8	+3·1	11·5	+0·4	..	0·238	+0·031	2·8	+0·5
March ..	46·0	+4·9	+4·3	43·5	+4·2	40·7	+4·6	17·5	+2·9	..	0·256	+0·041	3·0	+0·5
Means ..	42·7	+4·0	+2·9	41·0	+3·1	38·9	+3·4	12·7	+0·9	..	0·239	+0·032	2·0	+0·4
	°	°	°	°	°	°	°	°	°	°	in.	in.	grs.	grs.
April	47·9	+1·8	+0·8	45·3	+1·4	42·4	+1·9	17·8	−0·6	..	0·271	+0·018	3·1	+0·2
May	54·5	+2·0	+1·9	50·5	+1·7	46·6	+1·6	22·0	+1·6	..	0·318	+0·020	3·6	+0·1
June	56·5	−1·7	−2·4	53·3	−1·2	50·4	−0·2	17 4	−3·7	..	0·366	+0·004	4·1	0·0
Means ..	53·0	+0·7	+0·1	49·7	+0·6	46·5	+1·1	19·1	−0·9	..	0·328	+0·014	3·6	+0·1

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

TABLE II.—METEOROLOGICAL OBSERVATIONS RECORDED AT THE ROYAL OBSERVATORY, GREENWICH, IN THE LAST SIX MONTHS OF THE YEAR 1882.

1882. MONTHS.	Temperature of										Elastic Force of Vapour.		Weight of Vapour in a Cubic Foot of Air.	
	Air.			Evaporation.		Dew Point.		Air—Daily Range.		Water of the Thames.				
	Mean.	Diff. from average of 111 years.	Diff. from average of 41 years.	Mean.	Diff. from average of 41 years.	Mean.	Diff. from average of 41 years.	Mean.	Diff. from average of 41 years.		Mean.	Diff. from average of 41 years.	Mean.	Diff. from average of 41 years.
	°	°	°	°	°	°	°	°	°	°	in.	in.	grs.	grs.
July	60·4	−1·2	−1·8	56·6	−1·2	53·2	−0·8	18·6	−2·4	..	0·406	−0·013	4·5	−0·3
August ..	59·6	−1·3	−1·9	56·3	−1·2	53·4	−0·6	18·8	−0·9	..	0·409	−0·011	4·6	−0·1
September	54·3	−2·2	−2·8	52·0	−2·0	49·8	−1·3	17·4	−0·9	..	0·358	−0·022	4·0	−0·4
Means ..	58·1	−1·6	−2·2	55·0	−1·5	52·1	−0·9	18·3	−1·4	..	0·391	−0·019	4·4	−0·3
	°	°	°	°	°	°	°	°	°	°	in.	in.	grs.	grs.
October ..	50·8	+1·3	+0·8	49·2	+1·2	47·5	+1·6	12·9	− 1·8	..	0·330	+0·019	3·8	+0·1
November ..	43·5	+1·2	0·0	41·2	−0·1	38·6	−0·8	10·3	− 1·2	..	0·234	−0·012	2·7	−0·1
December ..	40·1	+1·0	+0·2	39·0	+0·5	37·6	+1·0	8·4	− 1·0	..	0·225	+0·006	2·6	0·0
Means ..	44·8	+1·2	+0·3	43·1	+0·5	41·2	+0·5	10·5	− 1·3	..	0·263	+0·004	3·0	0·0

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

TABLE III.—METEOROLOGICAL OBSERVATIONS RECORDED AT THE ROYAL OBSERVATORY, GREENWICH, IN THE FIRST SIX MONTHS OF THE YEAR 1882.

1882. 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 41 years.	Mean.	Diff. from average of 41 years.	Mean.	Diff. from average of 41 years.	Amount.	Diff. from average of 66 years.		At or below 30°.	Between 30° and 40°.	Above 40°.		
			in.	in.	grs.	grs.	in.	in.	Miles.				°	°
January ..	89	+ 2	30·185	+0·419	559	+ 5	1·35	−0·55	265	11	20	0	18·3	37·4
February ..	90	+ 5	30·051	+0·268	555	+ 2	1·14	−0·43	292	15	10	3	16·3	43·5
March ..	83	+ 1	29·843	+0·097	547	− 3	1·14	−0·43	349	16	10	5	19·0	46·6
							Sum	Sum	Mean	Sum	Sum	Sum	Lowest	Highest
Means ..	87	+ 3	30·026	+0·261	554	+ 1	3·63	−1·41	302	42	40	8	16·3	46·6
			in.	in.	grs.	grs.	in.	in.	Miles.				°	°
April ..	83	+ 5	29·602	−0·152	540	− 3	2·40	+0·65	354	11	16	3	24·1	41·5
May	75	0	29·875	+0·086	538	− 3	1·37	−0·71	267	7	12	12	23·7	47·2
June ..	80	+ 6	29·735	−0·071	533	+ 1	2·36	+0·36	325	0	5	25	33·0	53·2
							Sum	Sum	Mean	Sum	Sum	Sum	Lowest	Highest
Means ..	79	+ 4	29·737	−0·046	537	− 2	6·13	+0·30	315	18	33	40	23·7	53·2

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

TABLE IV.—METEOROLOGICAL OBSERVATIONS RECORDED AT THE ROYAL OBSERVATORY, GREENWICH, IN THE LAST SIX MONTHS OF THE YEAR 1882.

1882. 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 41 years.	Mean.	Diff. from average of 41 years.	Mean.	Diff. from average of 41 years.	Amount.	Diff. from average of 66 years.		At or below 30°.	Between 30° and 40°.	Above 40°.		
			In.	In.	grs.	grs.	In.	In.	Miles.				°	°
July	78	+ 3	29·700	—0·099	528	0	2·45	—0·11	293	0	1	30	36·9	54·9
August ..	80	+ 3	29·740	—0·042	529	+ 1	1·16	—1·29	303	0	7	24	33·0	55·8
September	85	+ 4	29·687	—0·117	534	+ 1	2·40	—0·01	228	1	21	8	29·0	52·1
							Sum	Sum	Mean	Sum	Sum	Sum	Lowest	Highest
Means ..	81	+ 3	29·709	—0·086	530	+ 1	6·01	—1·41	275	1	29	62	29·0	55·8
			In.	In.	grs.	grs.	In.	In.	Miles.				°	°
October ..	88	+ 2	29·656	—0·053	538	— 2	5·42	+2·62	269	3	14	14	27·0	54·2
November	86	— 2	29·532	—0·217	544	— 4	2·19	—0·15	449	13	10	7	18·2	47·1
December	91	+ 3	29·493	—0·302	547	— 5	1·78	—0·22	288	14	10	7	20·3	48·1
							Sum	Sum	Mean	Sum	Sum	Sum	Lowest	Highest
Means ..	88	+ 1	29·560	—0·191	543	— 4	9·39	+2·25	335	30	34	28	18·2	54·2

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

The following Report on the Hay-harvest forecasts of 1882 has been received from the Meteorological Office:—

"Sir,

"I beg to submit herewith a Report on the Hay Harvest Forecasts for 1882.

"The issue of these forecasts commenced with those for 'England N.E., E., Midland Counties, England S. and S.W.' on the 12th of June; as the season advanced, those for the other districts were added, and the issue terminated generally on August 12th with 'Scotland N.' Most of the districts received the telegrams daily (except on Sundays) for a space of about five weeks, but in the case of 'England S.W.' they were continued for an additional fortnight by a special request of the observers. In the neighbourhood of Knutsford the forecasts were so fully appreciated that they were continued at the expense of the Hon. P. Egerton for an additional period of four weeks.

"The result of the checking shows that the total percentage of success (87) is much larger than in either of the preceding years during which the hay-harvest forecasts have been issued, and also that the proportion of *completely* successful forecasts is decidedly greater than it has hitherto been. The largest total percentages of success were reached in 'England N.W.' and 'Ireland S.,' for which districts the value was 92, while the smallest proportion (80) was in 'England E.' and 'Ireland N.'

"The following is a brief *résumé* of the larger table on pp. XIV. and XV.

“ Summary of Results.

Districts.	Names of Stations.	Percentages.				Total Percentage of Success.
		Complete Success.	Partial Success.	Partial Failure.	Total Failure.	
Scotland, N. ..	Golspie and Drynie ..	48	35	15	2	83
Scotland, E. ..	Glamis and Longniddry ..	57	31	10	2	88
England, N.E. ..	Morpeth and Ulceby ..	40	46	12	2	86
England, E. ..	Thorpe and Rothamsted	56	24	18	2	80
Midland Counties	Cirencester and Gerrard's Cross	45	45	8	2	90
England, S. ..	Maidstone and Downton	53	35	9	3	88
Scotland, W. ..	Islay and Drymen	41	49	6	4	90
England, N.W. ..	Leyburn, Prescot, and Knutsford	51	41	8	..	92
England, S.W. ..	Bridgend (Glamorgan), Falfield. Clifton, and Glastonbury	47	41	10	2	88
Ireland, N... ..	Antrim, Hollymount, and Moynalty	47	33	14	6	80
Ireland, S.	Moneygall, New Ross, and Ardfert Abbey	63	29	8	..	92
	Mean for all districts, 1882	50	37	11	2	87
	” ” 1881	29	47	21	3	76

“ The remarks made by Mr. Smith (for the Hon. P. Egerton) and by Mr. Mitchell, of Drynie, Inverness, are worthy of note (see remarks on detailed table).

“ I am, &c.,

“ (Signed) Fredc. Gaster.

“ *To* R. H. Scott, Esq.,

“ *Secretary, Meteorological Council.*”

HAY HARVEST

RETURN SHOWING THE NUMBER OF FORECASTS SENT TO EACH OTHERWISE OF

Districts.	To whom sent.	Addresses.
0. Scotland, N. ..	— Melville, for the Rev. Dr. Joass ..	Dunrobin Gardens, Golspie
	J. R. Mitchell	Drynie, Inverness .. .. ..
1. Scotland, E. ..	W. S. Macdonald ..	Craigielaw, Longniddry ..
	G. Johnstoue	Glamis, by Forfar .. .. ..
2. England, N.E. ..	J. Wilson	Woodhorn Manor, Morpeth ..
	J. Turner	The Grange, Ulceby .. ..
3. England, E. ..	W. Birkbeck	Thorpe, Norwich .. .. ..
	Sir J. B. Lawes, Bart.	Rothamsted, Harpenden ..
4. Midland Counties	Professor Ohm	Royal Agricultural College, Cirencester .. ..
	Charles King, for the Duke of Somerset ..	Gerrard's Cross, Bucks ..
5. England, S. ..	C. Whitehead	Barming House, Maidstone ..
	E. P. Squarey	The Moot, Downton, Wilts ..
6. Scotland, W. ..	J. S. R. Ballingal ..	Eallabus, Bridgend, Islay ..
	C. H. H. Wilsone, of Dalnair (the late) ..	Endrick Bank, Drymen ..
7. England, N.W. ..	G. W. Wray	Leyburn, Yorkshire .. ..
	F. Harrison, for the Earl of Derby ..	Knowsley Gardens, Prescot ..
	J. F. Smith, for the Hon. P. Egerton ..	Tatton Park, Knutsford ..
8. England, S.W. ..	R. Neville	Butleigh Court, Glastonbury
	J. Harle, for the Earl of Ducie	Whitfield, Falfield, R.S.O. ..
	T. Dyke	Loug Ashton, Clifton, Bristol
	Colonel J. P. Turbervill	Ewenny Priory, Bridgend, Glamorgan .. ..
9. Ireland, N. ..	W. M. Kirk, per J. Hanson	The Bush, Antrim .. ..
	Rev. A. Brown	The Manse, Hollymount, Co. Mayo .. ..
	C. C. Hamilton	Cherrymount, Moynalty, Co. Meath .. ..
10. Ireland, S.	W. Bradshaw, for T. Crosbie	Ardfert, Co. Kerry .. ..
	D. A. M'Cready ..	Larchvale, Moneygall, King's Co. .. ..
	D. A. Milward	Kilkenny .. ..

FORECASTS, 1882.

OF THE UNDERMENTIONED PERSONS, WITH THE SUCCESS OR THE FORECASTS.

No. of Forecasts sent.	No. of Forecasts checked.	Percentages.				Remarks.
		Complete Success.	Partial Success.	Partial Failure.	Total Failure.	
30	30	36·7	43·3	16·7	3·3	
30	29	58·6	27·6	13·8	..	Mr. Mitchell says: "Reports very correct on the whole, except that thunder-storms are not foretold."
30	29	55·2	31·0	10·3	3·5	
30	29	58·6	31·0	10·4	..	
30	29	34·5	51·7	10·3	3·5	
30	29	44·8	41·4	13·8	..	
30	29	51·7	31·0	13·8	3·5	
30	23	60·8	17·4	21·8	..	
30	29	58·6	34·5	6·9	..	
30	23	30·4	56·5	8·7	4·4	
30	29	55·2	31·0	6·9	6·9	
30	29	51·7	38·0	10·3	..	
30	22	40·9	45·5	9·1	4·5	
30	29	41·3	51·7	3·5	3·5	
30	29	51·7	34·5	13·8	..	
30	29	55·1	38·0	6·9	..	
58	29	44·8	51·7	3·5	..	Mr. Smith says that the forecasts were looked for by all the residents, and that they have been a great boon to the farmers.
42	30	53·3	40·0	6·7	..	
42	41	51·2	36·6	9·8	2·4	
42	41	36·6	41·5	19·5	2·4	
42	41	46·3	48·9	4·8	..	
30	29	31·0	44·8	20·7	3·5	
30	29	55·1	20·7	13·8	10·4	
30	29	55·1	34·5	6·9	3·5	
30	29	75·9	13·8	10·3	..	
30	29	62·0	38·0	..	..	
30	30	50·0	36·7	13·3	..	

CORN: IMPORTATIONS, SALES, AND PRICES.

TABLE V.—QUANTITIES of WHEAT, WHEATMEAL, and FLOUR, BARLEY, OATS, PEAS and BEANS, IMPORTED into the UNITED KINGDOM in the YEAR 1882.

1882.	Wheat.	Wheatmeal and Flour.	Barley.	Oats.	Peas.	Beans.
	cwts.	cwts.	cwts.	cwts.	cwts.	cwts.
January ..	4,612,057	738,599	1,280,293	726,230	44,232	145,203
February	4,625,345	814,563	959,485	459,494	72,417	190,051
March ..	4,874,488	1,082,243	1,068,500	697,128	112,912	96,997
April ..	4,841,876	955,075	1,066,124	627,200	233,233	117,274
May ..	4,118,270	1,005,224	1,048,493	1,329,426	211,771	211,293
June ..	4,546,257	962,475	925,955	1,280,628	339,643	232,201
In first Six Months	27,618,293	5,558,179	6,348,850	5,120,106	1,014,208	993,019
July	5,569,960	1,046,392	810,543	1,589,246	249,750	301,884
August ..	7,462,798	1,138,926	816,284	1,668,953	76,459	140,577
September	8,071,886	1,175,216	826,956	1,247,625	63,827	59,391
October ..	6,761,008	1,261,493	1,737,017	986,226	74,811	105,298
November	4,132,113	1,292,616	2,358,466	1,172,898	311,272	1,608,858
December	4,555,964	1,555,883	2,621,734	1,861,097	309,870	313,266
In last Six Months	36,553,329	7,470,526	9,171,000	8,526,045	1,085,989	1,081,274
Year ..	64,171,622	13,028,705	15,519,850	13,646,151	2,100,197	2,074,293

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, $485\frac{1}{3}$ lbs., or $4\frac{1}{3}$ cwts.; for barley, 400 lbs., or $3\frac{4}{7}$ cwts.; for oats, 308 lbs., or $2\frac{3}{4}$ cwts. Corn has been entered by *weight* instead of *measure* since September, 1864. No duty has been charged since 1st June, 1869.

TABLE VI.—COMPUTED REAL VALUE of CORN IMPORTED into the UNITED KINGDOM in each of the SEVEN YEARS, 1876-82.

	1876.	1877.	1878.	1879.	1880.	1881.	1882.
	£.	£.	£.	£.	£.	£.	£.
Wheat ..	23,140,766	33,820,084	27,397,487	31,329,500	30,604,285	31,466,804	34,237,0
Barley ..	3,745,420	5,396,791	5,545,802	4,798,923	4,998,442	4,069,402	5,541,4
Oats ..	4,619,427	4,998,864	4,553,946	4,500,760	4,946,440	3,781,013	4,603,9
Maize ..	12,744,432	9,851,236	12,589,422	9,802,249	11,141,642	10,392,460	6,522,0
Other kinds	2,555,397	2,321,922	1,463,433	1,634,064	1,920,787	1,617,820	1,637,2
Wheat Flour	4,729,206	6,803,327	6,790,320	8,505,308	8,721,269	9,205,807	10,631,9
Other kinds of Flour	15,474	17,284	32,214	25,585	36,845	24,007	21,9
Total of Corn ..	51,550,122	63,209,508	58,372,624	60,596,389	62,369,710	60,557,313	63,195,

TABLE VII.—QUANTITIES of BRITISH WHEAT SOLD in the Towns from which Returns are received under the Act of the 27th & 28th VICTORIA, cap. 87, and their AVERAGE PRICES, in each of the TWELVE MONTHS of the YEARS 1876–82.

	QUANTITIES IN QUARTERS.						
	1876.	1877.	1878.	1879.	1880.	1881.	1882.
	quarters.	quarters.	quarters.	quarters.	quarters.	quarters.	quarters.
First month ..	154,367	152,557	146,848	183,223	124,422	122,533	181,182
Second month	188,539	173,729	164,387	237,861	142,857	119,219	175,829
Third month (five weeks)	208,367	213,718	174,025	234,469	136,613	164,942	169,155
Fourth month	160,868	150,012	146,933	197,918	106,170	120,177	142,321
Fifth month ..	174,153	132,231	166,909	227,295	104,125	130,235	143,861
Sixth month (five weeks)	188,611	122,390	137,981	229,307	127,132	113,386	112,818
Seventh month	90,626	77,674	82,597	105,139	71,622	57,333	51,130
Eighth month	88,030	89,759	119,611	71,525	54,641	49,329	42,363
Ninth month (five weeks)	314,327	225,659	272,699	75,374	153,752	197,351	229,765
Tenth month	216,393	217,046	329,564	96,261	197,757	231,960	217,416
Eleventh month	192,440	175,262	216,187	156,218	172,153	194,080	192,704
Twelfth month (five weeks)	225,254	212,627	276,943	207,511	218,641	215,547	245,290

	AVERAGE PRICES PER QUARTER.													
	1876.		1877.		1878.		1879.		1880.		1881.		1882.	
	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
First month ..	44	11	51	7	51	11	39	3	46	2	42	7	45	8
Second month	43	4	51	8	51	5	38	0	44	0	41	10	46	0
Third month (five weeks)	43	1	51	1	49	8	39	7	56	5	42	11	44	9
Fourth month	44	11	53	4	51	3	41	0	48	2	44	8	46	2
Fifth month ..	45	0	65	10	51	11	40	10	45	4	44	6	47	4
Sixth month (five weeks)	47	0	64	6	48	0	41	8	45	1	44	9	47	4
Seventh month	48	6	62	9	44	11	44	6	43	9	46	8	48	10
Eighth month	46	4	64	11	44	7	49	4	44	0	48	7	50	0
Ninth month (five weeks)	46	8	59	1	44	1	47	7	41	9	51	4	44	0
Tenth month ..	46	7	53	7	39	7	48	10	41	4	47	0	39	8
Eleventh month	48	0	52	3	40	1	49	4	43	7	45	11	40	10
Twelfth month (five weeks)	49	9	51	6	40	8	46	7	44	2	44	7	41	5

Table VIII.—Average Prices of British Corn per Quarter (Imperial measure) as received from the Inspectors and Officers of Excise according to the Act of 27th & 28th Victoria, cap. 87, in each of the Fifty-two Weeks of the Year 1882.

Week ending	Wheat.		Barley.		Oats.		Week ending	Wheat.		Barley.		Oats.	
	s.	d.	s.	d.	s.	d.		s.	d.	s.	d.	s.	d.
January 7..	44	9	31	10	20	3	July 8..	47	7	27	4	24	6
January 14..	45	5	32	9	20	3	July 15..	48	5	26	5	25	3
January 21..	46	1	33	2	20	11	July 22..	49	2	27	8	24	6
January 28..	46	3	33	4	20	4	July 29..	50	0	27	1	25	9
February 4..	46	1	33	2	20	9	August 5..	51	3	29	1	25	3
February 11..	46	5	32	5	20	8	August 12..	50	6	26	7	22	11
February 18..	46	0	31	10	21	1	August 19..	50	5	26	1	24	5
February 25..	45	7	31	4	20	7	August 26..	47	10	30	4	24	9
March 4..	44	9	30	8	21	8	September 2	47	3	36	2	23	6
March 11..	44	9	30	5	21	1	September 9	45	9	36	0	22	9
March 18..	44	7	30	0	21	0	September 16	44	5	36	11	22	0
March 25..	44	5	30	1	21	1	September 23	42	1	36	1	21	4
April 1..	45	1	30	11	21	6	September 30	40	4	34	10	20	2
Average of Winter Quarter	45	5	31	9	20	11	Average of Summer Quarter	46	9	28	7	22	6
April 8..	45	5	30	0	21	3	October 7..	39	6	34	4	19	10
April 15..	45	11	28	7	21	7	October 14..	39	2	34	0	19	1
April 22..	46	3	28	9	22	3	October 21..	39	7	34	5	19	9
May 29..	46	11	30	7	22	5	October 28..	40	3	34	4	19	10
May 6..	47	2	28	5	22	8	November 4	40	11	34	5	20	2
May 13..	46	11	28	9	21	8	November 11	40	11	34	1	20	7
May 20..	47	0	27	11	23	0	November 18	40	8	34	4	20	6
May 27..	48	1	28	4	22	7	November 25	40	11	34	4	20	4
June 3..	47	7	28	4	23	3	December 2	41	5	34	6	20	7
June 10..	47	9	27	5	23	9	December 9	41	8	34	5	20	9
June 17..	47	5	26	6	23	2	December 16	41	6	33	8	20	9
June 24..	46	11	27	6	23	7	December 23	41	6	33	1	22	0
July 1..	46	11	25	10	23	11	December 30	40	11	32	8	20	5
Average of Spring Quarter	47	3	30	6	23	7	Average of Autumn Quarter	40	8	34	0	20	4

Table IX.—Quantities of Wheat, Barley, Oats, Peas, Beans, Indian Corn or Maize, Wheatmeal, and Flour, Imported in the Five Years 1878–82; also the Countries from which the Wheat, Wheatmeal, and Flour were obtained.

	1878.	1879.	1880.	1881.	1882.
Wheat from—	cwts.	cwts.	cwts.	cwts.	cwts.
Russia	9,032,930	7,975,144	2,880,108	4,018,895	9,571,021
Denmark	*	*	*	*	*
Germany	5,118,135	3,616,419	1,608,275	1,361,724	3,083,921
France	11,200	17,793	1,446	6,693	7,379
Turkey and Roumania ..	240,105	170,354	127,140	248,387	721,030
Egypt	217,498	2,064,397	1,590,957	1,070,488	174,862
United States	28,963,901	35,976,805	36,089,869	36,038,074	35,059,623
Chili	50,573	1,372,461	1,343,860	1,091,803	1,656,361
British India	1,819,304	887,256	3,247,242	7,308,842	8,477,479
Australia	1,459,850	2,245,657	4,267,743	2,978,130	2,475,127
British North America ..	2,603,586	4,676,686	3,893,544	2,860,854	2,684,828
Other countries	294,561	365,168	147,120	58,779	259,991
Total Wheat ..	49,811,643	59,368,140	55,197,304	57,042,669	64,171,622
Barley	14,162,028	11,541,098	11,685,527	9,811,051	15,519,850
Oats	12,765,789	13,482,607	13,862,430	10,336,795	13,646,151
Peas	1,804,733	1,916,777	2,141,438	1,972,724	2,100,197
Beans	1,870,508	2,310,101	2,574,759	2,070,199	2,074,293
ndian Corn, or Maize ..	41,631,348	36,078,586	37,153,658	33,429,722	18,255,285
Wheatmeal and Flour from—					
Germany	1,118,761	914,483	977,756	1,388,218	1,990,403
France	696,059	355,229	279,435	203,296	220,269
United States	3,635,200	6,863,172	6,908,352	7,696,415	7,777,262
British North America ..	294,448	460,435	521,702	260,342	339,305
Other countries	2,079,531	2,137,239	1,903,337	1,812,139	2,701,466
Total Wheatmeal and Flour	7,823,999	10,730,558	10,590,582	11,360,410	13,028,705
ndian Corn Meal	41,679	37,080	55,379	25,137	16,422

* Included under "Other Coutries."

TABLE X.—AVERAGE PRICES of Consols, of Wheat, and of Meat; also the AVERAGE NUMBER of PAUPERS relieved on the *last day* of each Week; and the MEAN TEMPERATURE, in each of the Twelve Quarters ending December 31st, 1882.

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 the Metropolitan Meat Market (by the Carcass).		Quarterly Average of the Number of Paupers relieved on the *last day* of each week.		
				Beef.	Mutton.	In-door.	Out-door.	
	£.		*s.* *d.*					°
1880 Mar. 31	98	3·00	45 1	4*d.*—$7\frac{5}{8}$*d.* Mean $5\frac{7}{8}$*d.*	$4\frac{4}{8}$*d.*—$8\frac{2}{8}$*d.* Mean $6\frac{3}{8}$*d.*	182,836	595,908	39·8
June 30	$98\frac{7}{8}$	2·93	46 1	$4\frac{2}{8}$*d.*—$8\frac{1}{8}$*d.* Mean $6\frac{2}{8}$*d.*	5*d.*—$9\frac{3}{8}$*d.* Mean $7\frac{2}{8}$*d.*	168,661	555,196	52·4
Sept. 30	98	2·50	43 0	$4\frac{2}{8}$*d.*—$7\frac{6}{8}$*d.* Mean 6*d.*	$4\frac{6}{8}$*d.*—$8\frac{6}{8}$*d.* Mean $6\frac{6}{8}$*d.*	162,879	539,670	61·4
Dec. 31	$99\frac{2}{8}$	2·62	43 1	$4\frac{7}{8}$*d.*—$7\frac{6}{8}$*d.* Mean $6\frac{3}{8}$*d.*	$5\frac{2}{8}$*d.*—$8\frac{6}{8}$*d.* Mean 7*d.*	177,441	543,242	44·0
1881 Mar. 31	$99\frac{1}{8}$	3·19	42 3	$4\frac{6}{8}$*d.*—$7\frac{2}{8}$*d.* Mean 6*d.*	5*d.*—9*d.* Mean $7\frac{1}{8}$*d.*	191,578	591,071	37·3
June 30	$101\frac{5}{8}$	2·65	44 6	$4\frac{2}{8}$*d.*—7*d.* Mean $5\frac{5}{8}$*d.*	5*d.*—$9\frac{2}{8}$*d.* Mean $7\frac{1}{8}$*d.*	173,074	558,941	52·9
Sept. 30	$100\frac{2}{8}$	3·14	48 10	$4\frac{4}{8}$*d.*—$7\frac{2}{8}$*d.* Mean $5\frac{7}{8}$*d.*	$5\frac{2}{8}$*d.*—9*d.* Mean $7\frac{1}{8}$*d.*	164,567	538,057	60·0
Dec. 31	$99\frac{5}{8}$	4·93	45 10	$4\frac{4}{8}$*d.*—$7\frac{4}{8}$*d.* Mean 6*d.*	5*d.*—$8\frac{7}{8}$*d.* Mean 7*d.*	178,058	539,515	44·6
1882 Mar. 31	$100\frac{3}{8}$	4·93	45 5	$4\frac{4}{8}$*d.*—$7\frac{4}{8}$*d.* Mean 6*d.*	$5\frac{4}{8}$*d.*—$9\frac{2}{8}$*d.* Mean $7\frac{4}{8}$*d.*	187,202	560,513	42·7
June 30	$101\frac{7}{8}$	3·00	46 9	5*d.*—8*d.* Mean $6\frac{4}{8}$*d.*	$5\frac{4}{8}$*d.*—$9\frac{4}{8}$*d.* Mean $7\frac{4}{8}$*d.*	170,546	542,134	53·0
Sept. 30	$99\frac{7}{8}$	3·67	47 3	5*d.*—$8\frac{2}{8}$*d.* Mean $6\frac{4}{8}$*d.*	$5\frac{3}{8}$*d.*—$9\frac{5}{8}$*d.* Mean $7\frac{4}{8}$*d.*	165,280	529,921	58·1
Dec. 31	$101\frac{5}{8}$	5·00	40 8	$4\frac{5}{8}$*d.*—$8\frac{1}{8}$*d.* Mean $6\frac{3}{8}$*d.*	$5\frac{3}{8}$*d.*—$9\frac{6}{8}$*d.* Mean $7\frac{5}{8}$*d.*	180,228	534,387	44·8

TABLE XI.—NUMBER of BEASTS exhibited and the PRICES realised for them at the CHRISTMAS MARKETS since 1843.

Year.	Beasts.	Prices.				Year.	Beasts.	Prices.			
		s.	d.	s.	d.			s.	d.	s.	d.
1843	4,510	4	0—	4	4	1863	10,372	3	6—	5	2
1844	5,713	4	0—	4	6	1864	7,130	3	8—	5	8
1845	5,326	3	6—	4	8	1865	7,530	3	4—	5	4
1846	4,570	4	0—	5	8	1866	7,340	3	8—	5	6
1847	4,282	3	4—	4	8	1867	8,110	3	4—	5	0
1848	5,942	3	4—	4	8	1868	5,320	3	4—	5	8
1849	5,765	3	4—	4	0	1869	6,728	3	6—	6	2
1850	6,341	3	0—	3	10	1870	6,425	3	6—	6	2
1851	6,103	2	8—	4	2	1871	6,320	3	10—	6	2
1852	6,271	2	8—	4	0	1872	7,560	4	6—	6	0
1853	7,037	3	2—	4	10	1873	6,170	4	4—	6	6
1854	6,181	3	6—	5	4	1874	6,570	4	4—	6	8
1855	7,000	3	8—	4	2	1875	7,660	4	6—	6	6
1856	6,748	3	4—	5	0	1876	7,020	4	4—	6	4
1857	6,856	3	4—	4	8	1877	7,510	4	6—	6	0
1858	6,424	3	4—	5	0	1878	6,830	4	6—	6	0
1859	7,560	3	6—	5	4	1879	5,620	4	0—	6	4
1860	7,860	3	4—	5	6	1880	7,660	4	0—	6	0
1861	8,840	3	4—	5	0	1881	8,150	4	0—	6	2
1862	8,430	3	4—	5	0	1882	7,370	4	8—	6	4

TABLE XII.—AVERAGE PRICES of BRITISH WHEAT, BARLEY, and OATS, per IMPERIAL QUARTER, in each of the TWENTY YEARS 1863–82.

Year.	Wheat.		Barley.		Oats.		Year.	Wheat.		Barley.		Oats.	
	s.	d.	s.	d.	s.	d.		s.	d.	s.	d.	s.	d.
1863	44	9	33	11	21	2	1873	58	8	40	5	25	5
1864	40	2	29	11	20	1	1874	55	9	44	11	28	10
1865	41	10	29	9	21	10	1875	45	2	38	5	28	8
1866	49	11	37	5	24	7	1876	46	2	35	2	26	3
1867	64	6	40	0	26	1	1877	56	9	39	8	25	11
1868	63	9	43	0	28	1	1878	46	5	40	2	24	4
1869	48	2	39	5	26	0	1879	43	10	34	0	21	9
1870	46	10	34	7	22	10	1880	44	4	33	1	23	1
1871	56	10	36	2	25	2	1881	45	4	35	11	21	9
1872	57	0	37	4	23	2	1882	45	1	31	2	21	10

TABLE XIII.—ACREAGE under each Description of CROP, FALLOW, and IRELAND,

DESCRIPTION of CROPS and LIVE STOCK.	GREAT BRITAIN.		
	1880.	1881.	1882.
CORN CROPS :—	Acres.	Acres.	Acres.
Wheat	2,909,438	2,805,809	3,003,960
Barley or Bere	2,467,441	2,442,334	2,255,269
Oats	2,796,905	2,901,275	2,833,865
Rye	40,781	41,567	56,553
Beans	426,667	440,201	436,882
Peas	234,470	216,790	246,851
TOTAL CORN CROPS	8,875,702	8,847,976	8,833,380
GREEN CROPS :—			
Potatoes	550,932	579,334	541,064
Turnips and Swedes	2,024,207	2,035,642	2,024,326
Mangold and Beetroot	343,116	348,872	333,645
Carrots and Parsnips	17,082	15,519	13,442
Cabbage, Kohl-rabi, and Rape	161,575	143,128	149,941
Vetches, Lucerne, and any other crop (except clover or grass)	379,741	388,073	413,242
TOTAL GREEN CROPS	3,476,653	3,510,568	3,475,660
OTHER CROPS, GRASS, &c. :—			
Flax	8,985	6,534	5,220
Hops	66,705	64,943	65,619
Bare fallow or uncropped arable land	812,566	795,809	784,425
Clover and artificial and other grasses under rotation	4,434,339	4,342,285	4,327,392
Permanent pasture, meadow, or grass not broken up in rotation (exclusive of heath or mountain land)	14,426,959	14,643,397	14,821,675
LIVE STOCK :—	No.	No.	No.
Cattle	5,912,046	5,911,642	5,807,491
Sheep	26,619,050	24,581,053	24,319,768
Pigs	2,000,842	2,048,090	2,510,402
Total number of horses used for agriculture, unbroken horses, and mares kept solely for breeding	1,421,180	1,424,938	1,413,578
Acreage of orchard, or of arable or grass-land, used also for fruit-trees	..	..	..
Acreage of woods, coppices, and plantations	..	..	..

and Grass, and Number of Cattle, Sheep, and Pigs, in Great Britain in 1880-82.

Ireland.			United Kingdom, including the Islands.		
1880.	1881.	1882.	1880.	1881.	1882.
Acres.	Acres.	Acres.	Acres.	Acres.	Acres.
148,636	154,009	152,720	3,065,895	2,967,059	3,163,899
218,579	211,150	187,805	2,695,000	2,662,927	2,452,077
1,381,943	1,392,365	1,397,304	4,191,716	4,306,391	4,244,639
7,108	7,459	7,772	47,937	49,084	64,382
9,564	10,904	10,058	436,361	451,310	447,115
594	990	1,160	235,177	217,926	248,084
1,766,424	1,776,877	1,756,819	10,672,086	10,654,697	10,620,196
820,728	854,294	837,919	1,380,578	1,443,434	1,388,307
302,768	295,235	293,978	2,336,499	2,341,045	2,328,880
41,510	44,862	36,306	385,348	394,651	370,974
3,799	4,072	3,394	21,402	20,012	17,271
42,350	34,340	42,605	204,016	177,560	192,638
36,204	36,194	34,752	418,450	426,509	450,187
1,247,359	1,268,997	1,248,954	4,746,293	4.803,211	4,748,257
157,534	147,085	113,502	166,521	153,624	118,722
..	..	..	66,705	64,943	65,619
15,366	21,186	21,263	828,778	817,698	806,167
1,909,907	1,998,402	1,961,773	6,389,225	6,384,172	6,333,064
10,261,266	10,091,688	10,110,079	24,717,092	24,767,767	24,963,205
No.	No.	No.	No.	No.	No.
3,921,026	3,954,479	3,986,847	9,871,153	9,905,013	9,832,417
3,561,361	3,258,583	3,071,493	30,239,620	27,896,273	27,448,220
849,046	1,088,041	1,429,930	2,863,488	3,149,173	3,956,495
499,284	489,458	482,469	1,929,680	1,923,619	1,905,317
..	..	..	..	..	..
..	..	..	..	..	..

TABLE XIV.—CERTAIN ARTICLES of FOREIGN and COLONIAL PRODUCTION IMPORTED in the YEARS 1879–82; and their QUANTITIES.

	1879.	1880.	1881.	1882.
ANIMALS, Living:				
Oxen, Bulls, and Cows, number	208,720	350,950	282,691	309,360
Calves .. .. ,,	39,172	38,999	36,683	34,340
Sheep .. .. ,, Lambs .. .. ,,	944,869	940,991	935,244	1,124,391
Swine and Hogs .. .. .. ,,	52,267	51,030	24,273	15,670
Bones (burnt or not, or as animal charcoal) .. .. tons	65,067	79,740	65,007	54,401
Cotton, Raw .. .. .. cwts.	13,171,043	14,547,283	14,952,724	15,794,566
Flax .. .. ,,	1,694,051	1,896,249	1,781,762	1,966,969
Guano .. .. ,,	76,945	78,965	50,072	45,095
Hemp .. .. ,,	1,204,036	1,320,731	1,475,421	1,354,407
Hops .. .. ,,	262,616	196,688	146,710	315,377
Hides untanned: Dry .. ,,	545,373	660,198	554,134	576,451
,, ,, Wet .. ,,	463,086	584,693	457,295	613,593
				gallons.
Petroleum .. .. tuns	170,831	152,672	234,968	59,135,384
Oilseed Cakes .. .. .. tons	216,002	243,998	220,790	190,252
Potatoes .. .. cwts.	9,352,236	9,420,623	4,034,577	2,997,514
Butter .. .. ,,	2,045,606	2,319,802	2,046,421	2,167,428
Cheese .. .. ,,	1,789,168	1,773,503	1,834,480	1,692,495
Eggs .. .. .. great hundreds	6,388,838	6,228,437	6,306,645	6,757,234
Lard .. .. cwts.	838,897	929,616	855,792	665,885
Bacon .. .. ,,	3,996,922	4,370,860	3,858,855	2,348,060
Hams .. .. ,,	906,121	938,269	747,009	548,507
Salt Beef .. .. ,,	242,864	289,422	248,698	227,748
Salt Pork .. .. ,,	400,591	384,057	349,709	266,259
Clover Seeds .. .. ,,	345,206	271,609	279,925	354,869
Flax-seed and Linseed .. qrs.	1,665,333	1,712,576	1,829,838	2,437,918
Rape .. .. ,,	365,340	400,694	373,028	547,679
Sheep and Lambs' Wool .. lbs.	411,106,627	460,337,412	447,044,809	483,954,318

TABLE XV.—QUANTITY and VALUE of MEAT IMPORTED in the 6 YEARS, 1877–82.

QUANTITIES.

	1877.	1878.	1879.	1880.	1881.	1882.
	Cwts.	Cwts.	Cwts.	Cwts.	Cwts.	Cwts.
Beef, Salted or Fresh ..	678,505	723,558	806,462	1,008,089	1,061,467	688,407
Meat, ,, ,, ..	130,178	145,493	151,505	148,788	177,931	13,016
Total	808,683	869,051	957,967	1,156,877	1,239,398	701,423
Meat, Preserved otherwise than by salting	469,003	438,903	566,758	655,600	575,929	559,812
Total Meat ..	1,277,686	1,307,954	1,524,725	1,812,477	1,815,327	1,261,235

VALUES.

	1877.	1878.	1879.	1880.	1881.	1882.
	£.	£.	£.	£.	£.	£.
Beef, Salted or Fresh ..	1,686,392	1,753,066	1,919,922	2,399,324	2,644,165	1,773,537
Meat, ,, ,, ..	388,933	426,864	436,317	428,285	515,812	39,981
Total	2,075,325	2,179,930	2,356,239	2,827,609	3,159,977	1,813,518
Meat, preserved otherwise than by salting	1,434,234	1,313,541	1,688,321	1,903,036	1,638,938	1,692,772
Total Meat ..	3,509,559	3,493,471	4,044,560	4,730,645	4,798,915	3,506,290

The quantity of meat imported in 1879 was 1,524,725 cwts., being an increase over that of the previous year of 216,771 cwts.; in 1881 the quantity had still further increased to 1,815,327 cwts.; in 1882, however, it was no more than 1,261,235 cwts., or 554,092 cwts. less than in 1881, and was about the same as the quantity imported in 1877, from which there had been a steady rise.

In 1882 there was an increase, compared with the previous year, in the number of oxen, bulls, and cows of 26,669, and there was a decrease in swine and hogs of 8603; the number of sheep had increased by 189,147, and the number of calves had decreased by 2343.

In 1880 the average price of beef per lb. was 6⅛*d.*, of mutton per lb. 6⅞*d.*, showing an increase over the previous year of 9 per cent. and 4 per cent. respectively. In 1881 the average price of beef per lb. was 5⅞*d.*; of mutton per lb. 7⅛*d.*, showing a decrease in the price of the former—as compared with the year 1880—of 4 per cent., and an increase in the price of the latter of 4 per cent.; in 1882 the average price of beef rose to 6⅜*d.*, and that of mutton to 7⁴⁄₈*d.*, which prices showed percentages of increase of 4 and 9 respectively, compared with the prices in 1880.

STATISTICS OF DAIRY PRODUCE.

The following remarks relating to Butter and Cheese are extracted from 'The Grocer':—

CORK BUTTER MARKET.—The actual working of this market was very uneventful during the past year, compared with some former years. During the month of January, as stocks ran down, prices ran up, and *seconds*, which were quoted 124*s.* on January 2nd, were 144*s.* on the 31st of same month. *Thirds* advanced from 104*s.* to 121*s.*, and *fourths* from 72*s.* to 99*s.* In February, *seconds* went to 150*s.*, and *thirds* to 130*s.*; and in March *seconds* touched 157*s.*, and *thirds* 135*s.*, *fourths* going as high as 109*s.* In April, when supplies began to increase, *firsts* fell from 156*s.* to 109*s.*, and *seconds* from 150*s.* to 102*s.* The lowest point for the year was touched by *firsts*, at 101*s.*, on May 23rd. *Seconds* were at their lowest on May 16th, when price quoted was 92*s.*; and on August 7th, *thirds* touched their lowest price for the year, which was 87*s.* The prices of "superfine mild" were quoted during the year at a steady figure over the values of *firsts*, but "fines" and "milds" very often caused a loss to producers by being quoted at less money than their relative qualities in salt butters. The tendency of demand is becoming stronger each year in favour of mild-cured butters, and if the standard of the mild-cured brands of Cork were raised, and inspection more even, there is no reason why Cork mild-cured butters should not obtain the same high prices as French or Danish.

Contrary to general expectation, Cork prices remained stationary all through the past summer. From May until September the fluctuations did not exceed 5*s.* per cwt. on any quality. It was only in October that the price of *firsts* advanced, and the advance in *seconds* did not take place till the month of December. In the months of November and December the supplies collapsed most suddenly and unexpectedly—so much so, that before it was understood that supplies were exhausted, merchants had let their stocks run out, believing they could replace them later on. This they were unable to do, and the end of the year left the trade of Cork with a smaller stock to meet their winter demands than has been known for many years past. As it is with the Cork merchants, so also is it with very many of their customers, who in former years held heavy stocks at Christmas, and who now have to face three months of extreme scarcity with empty cellars. So far as we can ascertain, all the other Irish markets are equally bare of fine butters, and therefore we shall be very much surprised if we do not see extreme prices quoted for Cork butters this winter.

Irish Butter.—The quantities of Clonmels and Carlows on offer in the early part of the year 1882 were small from the first week in January to the end of April; quotations were from 116*s.* to 128*s.*, according to repute of brands. The new season's butter began in May with prices at 106*s.* to 112*s.*, and only varied from 2*s.* to 4*s.* to the end of August, being then 116*s.* The highest price in October was 128*s.*; November, 132*s.*; December, 140*s.*; the demand far from active. The year began without any *first* Corks on offer; *seconds*, the first week in January, 127*s.*; the first week in February, 130*s.* to 148*s.*; *thirds*, the first week in January, 127*s.*; the first week in February, 110*s.* to 128*s.* The new season began in May with *firsts*, 114*s.*; *seconds*, 104*s.*; *thirds*, 97*s.*; at the end of the month *firsts* were 107*s.*; *seconds*, 100*s.*; *thirds*, 95*s.*; then to the first week in September they had varied little. In the middle of October *firsts* were 10*s.* higher; *seconds*, 7*s.*; *thirds* scarcely altered. At the end of December *firsts* were nominally 148*s.*; *seconds*, 120*s.* to 133*s.*; with *thirds* a moderate extent of business was transacted at 106*s.* to 110*s.*

Foreign Butter.—The demand throughout the year has rested upon finest qualities. Best Danish, the first fortnight in January, 135*s.* to 170*s.*; the first week in February, 135*s.* to 160*s.*; early in

March, 148*s.* to 168*s.* In April, best varied from 150*s.* downwards to 136*s.*; in May, 125*s.* to 112*s.*; then to the middle of August the top quotations were 114*s.* to 118*s.* In the beginning of September the highest prices were 130*s.* to 134*s.*; at the end of October, 4*s.* to 6*s.* higher; at the end of November they had steadily advanced to 152*s.*, and continued at about that price to the third week in December, with only a small quantity on offer. In the beginning of the year best Normandys were 144*s.* to 150*s.*, and continued at about those prices to the middle of March; at the end of April, with increased supplies, they were 115*s.* to 123*s.*; at the end of June, with an increased supply of first English, the top quotations were 110*s.* to 114*s.*; the lowest points were 100*s.* to 106*s.* in the middle of July. In August they had advanced 6*s.*; in September the month began with the highest price for best, 116*s.*; at the end of the month, it was 128*s.*; in October, 2*s.* more. In November, best had advanced to 140*s.*; the middle of December, 150*s.* Inferior qualities throughout dull sale. Dutch, as usual, very fluctuating market. In January, the top price, 150*s.*; in February, 160*s.*; in March it varied from 142*s.* to 156*s.* April began with 140*s.* for best; in May it had descended to 100*s.*, and varied little to the third week in September, when the price had advanced to 122*s.*, and then to the third week in December prices varied from 130*s.* to 140*s.* The weather from May to September was very favourable for vegetation, and the result was an increase in the quantity of fresh English offered for sale; after that a continuation of wet weather materially lessened the autumn make. The supplies of butter from America have throughout the season been unusually small.

CHEESE.—Has varied very little in price. Best Cheddar and Cheshire, early in the year, 76*s.* to 78*s.*; from July to the end of the year, Cheddar, according to quality, from 64*s.* to 80*s.*; and Cheshire, for the chief part of that time, from 70*s.* to 80*s.* Best American cheese, from the beginning of the year to early in May, from 64*s.* to 68*s.*; second qualities chiefly, from 30*s.* to 60*s.*; the new season's make then began to arrive, and prices may be quoted generally from 58*s.* to 60*s.* for best, and from 30*s.* to 54*s.* for lower qualities; then for the September make prices gradually advanced from 64*s.* to 72*s.* Inferior qualities still pressed for sale at from 20*s.* to 60*s.*

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

TABLE XVI.—AVERAGE and CURRENT PRICES of BUTTER and CHEESE on 1st SATURDAY in JANUARY of each YEAR, from the latest actual MARKET SALES.

	Average Annual Price in the 5 years, 1875–79.	Current Price, 1st January, 1880.	Current Price, 1st January, 1881.	Current Price, 1st January, 1882.	Current Price, 6th January, 1883.
	Per cwt. s. s.	Per cwt. s. s.	Per cwt. s. s.	Per cwt. s. s.	Per cwt. s. s.
Butter:					
Carlow, finest, F.O.B	131 to 144	126 to 140	120 to 140	112 to 138	120 to 140
,, Landed ..	138 ,, 148	.. ..	.. ..	.. ..	.. ..
Cork, 1sts..	143 ,, 148	145 ,, ..	141 ,, ..	136 ,, 140	.. ..
,, 2nds	133 ,, 137	143 ,, ..	132 ,, 135	129 ,, 131	120 ,, 136
,, 3rds, new ..	108 ,, 109	115 ,, ..	105 ,, ..	131 ,, 113	120 ,, ..
,, 4ths	90 ,, 91	96 ,, ..	78 ,, ..	82 ,, ..	91 ,, 92
Limerick	124 ,, 129	.. ..	.. ..	.. ..	.. ..
Foreign:					
Friesland	132 ,, 137	128 ,, 134	120 ,, 130	125 ,, 144	125 ,, 136
Jersey, &c.	94 ,, 134	125 ,, 136	110 ,, 125	110 ,, 140	110 ,, 134
Kiel	135 ,, 164	.. ..	.. ..	.. ..	.. ..
Normandy	92 ,, 151	120 ,, 146	108 ,, 140	.. ..	.. ..
American	81 ,, 121	90 ,, 135	95 ,, 125	60 ,, 122	.. ..
Bosch	.. ..	65 ,, 95	65 ,, 84	50 ,, 85	60 ,, 90
Cheese:					
English Cheddar, fine, new	72 ,, 90	72 ,, 86	76 ,, 90	76 ,, 82	68 ,, 82
,, good, new	.. ..	.. ..	.. ..	.. ..	.. ..
Red Somerset Loaf..	77 ,, 87	74 ,, ..	76 ,, 82	74 ,, 78	74 ,, 76
White or yellow Cheddar Loaf ..	78 ,, 87	.. ..	.. ..	.. ..	.. ..
Scotch Cheddar ..	164 ,, 189	.. ..	.. ..	.. ..	.. ..
Cheshire, new.. ..	78 ,, 86	64 ,, 86	74 .. 88	72 ,, 82	68 ,, 80
,, good ditto	53 ,, 71	.. ..	.. ..	.. ..	.. ..
Wiltshire, new ..	70 ,, 79	62 ,, 76	70 ,, 80	64 ,, 74	62 ,, 72
,, good ditto	60 ,, 68	.. ..	.. ..	.. ..	.. ..
North Wilts Loaf, new	72 ,, 81	.. ..	72 ,, 82	76 ,, 84	74 ,, 76
Derby ,, ,,	74 ,, 64	70 ,, 74	76 ,, 84	60 ,, 74	72 ,, 76
Foreign:					
American, fine ..	63 ,, 67	64 ,, 68	68 ,, 72	60 ,, 68	62 ,, 70
,, good ..	41 ,, 59	56 ,, 60	56 ,, 66	42 ,, 60	46 ,, 58
Gouda	52 ,, 61	56 ,, 62	60 ,, 66	56 ,, 62	54 ,, 62
Edam, new	56 ,, 65	56 ,, 64	62 ,, 68	57 ,, 64	56 ,, 64
Gruyère, new	76 ,, 85	71 ,, 78	62 ,, 82	72 ,, 75	72 ,, 75

TABLE XVII.— QUANTITY and VALUE of BUTTER IMPORTED from DENMARK, 1865–81.

Years.	Quantities.	Computed Real Value.	Years.	Quantities.	Computed Real Value.
	Cwts.	£.		Cwts.	£.
1865	65,555	362,440	1874	226,053	1,363,433
1866	67,305	319,528	1875	206,171	1,275,870
1867	80,589	422,479	1876	205,195	1,311,234
1868	79,437	471,262	1877	210,322	1,347,791
1869	103,613	574,981	1878	242,427	1,517,467
1870	127,013	767,190	1879	281,740	1,673,452
1871	140,851	803,226	1880	300,157	1,777,176
1872	173,574	1,009,322	1881	279,625	1,691,894
1873	201,558	1,203,459			

TABLE XVIII.—QUANTITY and VALUE of BUTTER Imported from the UNITED STATES, BELGIUM, FRANCE and HOLLAND; and of CHEESE Imported from the UNITED STATES and HOLLAND, 1867–81.

Years.	UNITED STATES.			
	BUTTER.		CHEESE.	
	Quantities.	Computed Real Value.	Quantities.	Computed Real Value.
	Cwts.	£.	Cwts.	£.
1867	39,035	113,290	526,740	1,470,017
1868	7,117	37,279	489,117	1,439,380
1869	17,203	84,603	487,870	1,612,325
1870	16,915	80,928	555,385	1,861,263
1871	83,775	394,359	731,326	2,014,805
1872	45,765	199,679	598,198	1,701,435
1873	43,406	199,639	790,238	2,353,181
1874	36,307	188,769	849,933	2,589,776
1875	40,331	205,900	958,978	2,786,027
1876	118,131	593,122	936,203	2,564,977
1877	188,491	920,561	1,082,844	3,129,829
1878	219,794	998,766	1,345,745	3,306,612
1879	301,054	1,243,075	1,214,959	2,467,651
1880	277,790	1,343,967	1,171,498	3,411,625
1881	174,246	845,125	1,244,419	3,555,702

Years.	BELGIUM.—BUTTER.		FRANCE.—BUTTER.	
	Cwts.	£.	Cwts.	£.
1867	80,754	470,464	450,693	2,265,147
1868	70,456	405,987	393,578	2,156,824
1869	85,789	481,609	407,432	2,231,450
1870	84,408	516,643	289,692	1,672,899
1871	94,539	523,460	304,683	1,636,006
1872	74,191	409,555	355,089	1,916,795
1873	76,610	439,501	446,550	2,409,861
1874	76,723	465,517	713,251	3,944,233
1875	79,950	499,028	567,560	3,387,219
1876	65,309	419,209	622,488	3,732,405
1877	58,200	378,435	606,762	3,654,488
1878	80,073	499,889	555,272	3,179,326
1879	63,032	391,166	438,725	2,264,591
1880	53,259	302,993	531,649	2,826,586
1881	50,118	285,606	496,724	2,720,831

Years.	HOLLAND.			
	BUTTER.		CHEESE.	
	Cwts.	£.	Cwts.	£.
1867	326,217	1,733,459	332,628	961,245
1868	343,322	1,992,414	329,565	959,547
1869	415,176	2,253,420	426,913	1,262,101
1870	406,795	2,388,459	422,553	1,204,830
1871	390,616	1,986,708	348,148	954,236
1872	269,091	1,358,579	329,535	942,537
1873	279,004	1,453,875	336,654	1,013,233
1874	351,605	1,877,755	398,888	1,164,921
1875	357,106	1,917,910	370,123	1,078,594
1876	402,984	2,252,909	330,435	949,413
1877	372,134	2,084,686	341,980	984,855
1878	460,601	2,494,903	355,159	1,018,669
1879	655,377	3,331,149	275,039	743,107
1880	810,509	4,076,399	288,666	810,590
1881	745,536	3,745,885	264,626	747,052

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ROYAL AGRICULTURAL SOCIETY

OF ENGLAND.

I.—*Half-bred Horses for Field or Road: their Breeding and Management.* By EARL CATHCART.

GENERAL INTRODUCTION.

FROM an agricultural point of view that thoroughly English production, a sound and shapely thoroughbred horse, is not a mere galloping dice-box, but he is one of God's precious gifts to the nation; a noble animal, certain, in great measure, to beget in his own similitude admirable creatures, to be thankfully used in our service—for our comfort and pleasure in peace, for our credit and advantage in commerce, and for our individual efficiency, and it may be for the national safeguard in war. Horses, as old Fuller says, are men's wings. I have, in short, the good fortune to treat on a subject that comes home to the bosom and business of almost every Englishman.

It is only with a view to scientific accuracy that it is necessary to define the term Half-bred—which is not rendered literally. In the language of horsemen that term implies only some stain in the traceable pedigree hardly to be detected: in appearance and qualities a horse may be, to all intents and purposes, thoroughbred, yet, from some slight stain in the pedigree, unqualified for entry in the Stud-book.

I am not the parent of this Paper, I am not its sponsor, not even the literary accoucheur. I may be likened to a connoisseur, who takes pleasure in ticketing and in duly arranging the valuable contributions which, by the favour of many friends, he has acquired for his collection.

It came to pass in the routine business of the Journal Committee that on this subject a Paper was wanted; and in the harmonious division of labour it fell to my lot to seek for a suitable writer to entrust with a difficult and important, perhaps too long-neglected, subject. I soon found it was almost impossible to get any one practical writer—for practical arts must be chiefly taught by men having practical experience—to undertake the wide subject in its completeness; but, without hesitation, most of my friends expressed a willingness to contribute. I reported to my colleagues accordingly, and by their desire it was that I undertook to do my best in this matter. I do not now appear, and I wish this to be fully understood, in the character of a volunteer.

I have said that a paper is wanted. Nearly twenty years have elapsed since Mr. Dickenson's,* Mr. Gamgee's, and Mr. Spooner's valuable contributions appeared in this 'Journal.' About the same time, and at my request, Mr. Wilkinson, principal Veterinary Surgeon of the Army, wrote on Cavalry Remounts. Since then, namely the years 1863–5, the 'Journal of the Royal Agricultural Society' has contained no special Paper on the present subject. The feeling out of doors may be gathered from a typical letter now before me, dated January 12th last, and addressed to the Secretary. The letter, in the ordinary course of the Society's business, covered a subscription from a practical man: and it is just one of those little bits of reality that in few words brings home conviction:—

"The Council should publish some good papers on breeding nag-horses, special reference being had to best strains in Yorkshire and Norfolk. Horses seem ignored. A wider scope in the half-yearly Papers would be welcome." Two authorities are mentioned by name, either of whom, it is said, could write a splendid article on Breeding Hunters. "What a delightful article could be written on the hunting stallions of Yorkshire, exemplifying the bad as well as the good points: a similar article on roadster stallions! You would be doing a decided service to the members of the Royal Agricultural Society if you could in any way further the profitable breeding of hunters and roadsters."

The retrospect for a period of twenty years—1863–83—of the Reports of the Royal Agricultural Society's Stewards and Judges on superior horses is exceedingly unsatisfactory. Undoubtedly the weakest part of our organisation is to be found in the various classes of horses claiming blood. At Newcastle: "Riding in the Ring was a novelty that gave great satisfaction." In 1868, at Leicester, in a fox-hunting country: "Stallions were

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* 'On the Breeding of Horses; a Letter addressed to the Right Hon. J. E. Denison, by W. Dickenson.' Journal Roy. Agri. Soc., vol. xxiv., 1863.

'The Breeding of Hunters and Roadsters.' By J. Gamgee, sen. *Ibid.*

'Supply of Horses adapted to the requirements of the English Army, with Notes on the Remount System in the French Army.' By J. Williamson. *Ibid.*

'On Cross-Breeding in Horses.' By W. C. Spooner. Journal Roy. Agri. Soc., vol. i., New Series, 1865.

a moderate lot, Hunters especially disappointing." The next year, at Manchester: "above average;" "good action, no breeding; good breeding, no action." Distressing! The thoroughbred horses exhibited are not like the bulls we admire, of faultless type. Reference is made to a letter on the subject of Half-bred Horses for Road and Field, which, dated June 1, appeared in the 'Times,' and was addressed by the Speaker Denison to Lord Zetland. In 1870, at Oxford: "inferiority generally prevails." Wolverhampton, the next year, was cheerful, as compared with "Motley's" walk-over at Plymouth. "The Show at Hull in 1873 was not grand for Yorkshire." At Taunton, in 1875, it was said that in Somersetshire the thoroughbred horse was almost as unknown as the Dodo: as a feature two jackasses competed for a 50*l.* prize! At Birmingham, in 1876, the weight-carrying hunters were a good class. Bristol, 1878, appears to have been fairly satisfactory. The great Exhibition at Kilburn in 1879 was specially reported upon by Mr. Francis Lawley: the Judges said it was the best exhibition of horses ever held in England. In 1881, Mr. Whitehead, the Senior Steward, reported on the show of horses at Derby: now, if there is one man more than another who, in the best sense of the phrase, could "make bricks without straw," it is my very able friend last named. One thousand pounds was offered in prizes, yet all that could be reported is that influenza kept horses away: 256 were entered, 192 only appeared: thoroughbreds—never a strong class at a Royal Show—were now a very bad lot; and the stallions for getting hunters were few in number, and inferior in quality: a week, the Steward observed, is a long time in which to expose valuable horses to risk, variable weather, and draughty boxes. The most noteworthy feature was the sensational antics of the hackney and pony stallions, and their leaders.

By way of culmination, a high authority, Mr. Hutchinson, of Manor House, Catterick, a Judge at Reading last year, 1882, is admirably outspoken:—"Mr. Grout's hackney, 'Fashion'* was generally admired: otherwise the number of exhibits was limited, and the quality below expectation. The hunter stallions were a moderate lot, calculated to do more harm than good. Unless the Royal Agricultural Society can attract better hunting sires, prizes should be abandoned." The causes of failure, as suggested, are threefold:—(1) unworthy prizes; (2) long detention; and (3) expenses. Foreigners come with high expectations, they are naturally disappointed—consequently as a horse-breeding nation our prestige is lowered.

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* For 'Fashion,' see *post*, p. 27.

Let us return for a moment to Mr. Francis Lawley and his special report on Kilburn in 1879.

Mr. Francis Lawley * is a Yorkshireman of great natural ability and high cultivation. He has great and varied experience in this and other countries; and by birth, inheritance, education and taste, he is, in the largest sense of the word, a consummate horseman. As I understand him, in writing of the "equine aristocracy" he implies that many notable breeders are opposed to exhibition. Costly shows must be arranged to attract the "splendid shilling": horses are always popular, and attract not an agricultural public only, but everybody. Our American cousins, who have beaten us in trotters, run us hard with thoroughbreds: query, should the Society not encourage and cultivate trotting qualities? London carriage-horses are now foreigners. The Royal Society should formulate points, and not leave all to the Judges: a standard is wanted; and, moreover, the tendencies of various strains should be studied. Reference is then made to the revival of coaching; but coaching stallions are no longer of the Cleveland type. More, Mr. Lawley thinks, might be done by the Royal Agricultural Society to teach farmers how to utilise their half-bred mares. The really practical question is, how to raise hunters worth at 4 years old from 100*l.* to 150*l.*, the consideration being the cost, the market, and the ruinous fees charged for service. Enduring hacks of the old sort are now only to be found in very few hands—wheels being everywhere preferred: very different from the good old time when men rode and did not rail! The fancy type in an equine prize list should be excluded in favour of a valuable coaching or, rather, omnibus type of horse. The crying evil is, professional exhibitors going the rounds with veteran champions—stallions that never get a hunter, or hunters that were never hunted.

The Royal Agricultural Society has just received from the French Ministry of Agriculture the Annual Report of the Management of the French National Studs.† Few people really grasp the idea, but steam and railways have had an extraordinary effect in breaking down the barriers of ages, and in promoting free association, all tending to the almost sudden geographical

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* "Report upon the Exhibition of Horses at Kilburn." By the Honourable Francis Lawley. Journal Roy. Agri. Soc., vol. xv., New Series, 1879. The reader should consult the text, of which the above is only an unworthy *précis.* I should mention the Highland Society has had a recent paper on "Breeding and Rearing Horses for Farm, Road, or Field." By W. T. Paterson. Trans. Highland and Agricultural Soc., Fourth Series, vol. xiv., 1882. It is only a short paper of 7 or 8 pages. Hunter-breeding in Scotland rather deprecated. Mentions Mr. Wilson, of Kendal, as breeding from the thoroughbred mare and Norfolk horse.—C.

† 'Ministère de l'Agriculture, Direction des Haras, Bulletin.' Paris, 1882, which see.

distribution of the thoroughbred and other English horses. In Prussia, I am told, every horse must have a Government certificate of soundness, otherwise he may serve no mares other than his owner's. This official publication is noteworthy in many respects, especially as showing the great importance attached by Continental nations to the breeding and improvement of superior half-bred horses. It consists of nearly 200 imperial octavo pages, and embraces exhaustive official reports on the stud institutions and establishments of Austria and Hungary; four pages of admirably engraved illustrations of the brands or marks for horses which distinguish the various studs in Austria and Hungary. There are also three large folded sheets, a plan of a stud farm, showing the position of the various studs, and coloured maps of Austria and Hungary. The French system is founded on the Law (in regard to studs) of the 29th May, 1874. Glancing rapidly over the pages of the Report, I observe the Inspector-General of Military Remounts refers to a fact well within our own experience, that, as compared with those which remain at home, travelling stallions have far greater powers of procreation. The French average appears to be for thoroughbred horses under fifty mares each. He greatly favours the proposition that army remounts should be purchased at three years old, thus anticipating the equine demands for trade and commerce which now sweep the markets of everything desirable; thus to the exclusion of the middleman, promoting advantageous direct trade between the Government and the breeder. By purchasing remounts at three years of age, foreign purchases, it is argued, may be avoided. The Inspector-General would select a proportion of army mares suitable for breeding, and amongst breeders distribute them in districts where improvement is most necessary. Of thoroughbred stallions, 218 were English, 187 Arab, and 63 Anglo-Arab. Thirteen horses during the year were purchased in England: two thoroughbred, eight Norfolk, one American trotter, two Welsh trotters. The Welsh horses are highly spoken of, as bred on both sides from trotters, as hardy, and of good shapes and paces. Reference also is made to the effect on French markets of horses imported from America viâ Antwerp and England. There is a disturbing export trade in valuable horses, Boulonnais and Percherons, from France to America. Only carthorses that can trot are officially encouraged, and even the artillery require in addition a dash of blood. It requires years for English and Eastern horses and mares imported into France to acclimatise.* In round

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* Acclimatisation as tending to variation or to sterility. Exhaustive inquiry should be made as to effects in every part of the world where English thoroughbred is established.—Art. "Acclimatisation," Current Ed., Encycl. Brit. Read art. "Charmoise Sheep," Jour. R. A. S. E. vol. xiv. 1853, p. 214.—C.

numbers the State stallions served 129,000 mares, and got 77,000 foals. Trotting races, it is observed, offer an important means of testing half-bred horses; trotting races afford the breeder a standard and an aim, and they direct attention to trotting sires. The mission to Austria and Hungary was in 1881. The Report, like everything of the sort that is French, is admirably complete and admirably clear. In Austria proper English thoroughbreds multiply more and more, to the exclusion of the Oriental races. Many famous English names appear in the lists of stallions with the note "born in England!" Of 1881 State stallions, 69 were English thoroughbreds, 749 English half-bred, 145 Norfolk, 382 Arab half-bred. In Hungary proper, of 1620 stallions, 73 were English thoroughbreds, 571 English half-bred, 54 Norfolk, and 439 Arab half-bred. The Hungarians have a stud-book. They have a great society for the import and sale of English horses and mares: it encourages racing and trotting races; fox-hunting has been introduced; and last, but not least, at Buda-Pesth the Hungarians have created a great centre and focus for their horse trade, and the Magyar language containing no word expressive enough, or sufficiently confidence-inspiring, they have named it "Tattersall's."[*]

Concerning science, there are more things than are dreamt of in our philosophy. Nature and the horse-breeder are no doubt sometimes at cross-purposes; all-bountiful Nature ordains for the general good of the world-spread equine race; men strive for their own narrow interests. There is amongst us no man, however experienced, however practical, who, thinking, presumes to say to the flowing tide of modern science, "hitherto shalt thou come, but no further"! The all-containing Book of Nature is open spread out before every one of us; let us reverentially search its ample endless pages, and according to our several lights read, mark, learn, and inwardly digest. I cannot cite chapter and verse; I cannot expound the laws of Nature; I cannot preach to evolve truths from Nature's teeming pregnant texts—would that I could! Charles Darwin, that "Gamaliel" at whose feet I would have sat, could only spell out and exactly decipher here a word and there a line. But as the gathered wisdom of many gleanings, I, though ignorant, think I may venture to suggest one word that certainly will not be found in that law-containing Book of Nature, it is—in the sense of accident, haphazard, or fluke—the misguiding word chance.

"It is interesting," says the Philosopher,[†] "to contemplate a tangled bank, clothed with many plants of many kinds, with

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[*] "Ce Tattersall (on le nomme ainsi) est le centre du commerce hippique de la Hongrie."

[†] Charles Darwin; 'Origin of Species;' the Conclusion.

birds singing on the bushes, with various insects flitting about, and with worms crawling through the damp earth, and to reflect that these elaborately constructed forms, so different from each other, and dependent upon each other in so complex a manner, have all been produced by laws acting around us. These laws, taken in the largest sense, being Growth with Reproduction; Inheritance which is almost implied by reproduction; Variability from the indirect and direct action of the conditions of life, and from use and disuse; a Ratio of Increase so high as to lead to a struggle for Life, and as a consequence to Natural Selection, entailing Divergence of Character and the Extinction of less-improved forms. Thus, from the war of nature, from famine and death, the most exalted object which we are capable of conceiving, namely, the production of the higher animals, directly follows. There is grandeur in this view of life, with its several powers, having been originally breathed by the Creator into a few forms or into one; and that, whilst this planet has gone cycling on according to the fixed law of gravity, from so simple a beginning endless forms most beautiful and most wonderful have been, and are being evolved."

And now, courteous reader, in regard to what the elder D'Israeli might have called these curiosities of equine literature, I have taken you fully into my innermost confidence. I have only further to premise that, except Messrs. Tattersall, no one writer has seen the other's work; all have written freely and independently.—You will, I am sure, readily credit me when I say that it delights me to step aside to present to you my very able and most practical friends.

MR. LUMLEY HODGSON.

Should a stranger ask me, Who is Mr. Lumley Hodgson of Highthorne? the idea would instantly flash across my mind—this person who so inquires is not a Yorkshireman. Mr. Lumley Hodgson is a Yorkshire squire born and bred; a noted sportsman; one who has had a long lifetime's practical experience as a successful breeder of horses. The 'Report of the Royal Commission on Agriculture of 1881'* describes him in highly complimentary terms:—" Mr. Lumley Hodgson of Highthorne is a close observer, and a shrewd practical man; he has been a landlord for sixty years, during forty of which years he has also been, as he is at present, a large tenant-farmer." I am personally indebted to this kindly gentleman, who immediately,

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* Report of Mr. Coleman, Assistant Commissioner, p. 160.

and in the most friendly and neighbourly manner, met my request, and favoured me with a characteristic letter, together with a large parcel of papers—printed and MS.—from which, with his correction and approval, I have prepared the following Paper:—

"HIGHTHORNE, *May* 30, 1882.

"DEAR LORD CATHCART,

"I enclose you my evidence,[*] and that of many of the most experienced men both of the old and present time. You will see that all who, like myself, have had experience in knowing what the stallions, mares, hunters, hacks, harness-horses, soldiers' horses, and racehorses of forty, fifty, and sixty years ago were, before railways and foreigners—the one taking away the best and soundest mares and stallions, the other making people think there would be no demand for inferior horses—prevented people breeding, and those who continued, after selling their best mares, found it an unprofitable business, are all of one opinion, that horses are neither so good in quality, nor so good to find as formerly. Young people who never saw the old class of horse, say they are superior, and much improved. I have no hesitation in saying there were formerly better horses travelling the country and that would serve half-bred mares than you can now find at the fashionable studs. See the comparison of those named in my letters. My memory has become treacherous, and you will get more information from the evidence before the Lords' Committee and the different letters enclosed in the parcel [†] I send your Lordship than anything I can write now, even if I had time. When Phillips,[‡] the most experienced man I know, was going to be examined before the Lords' Committee, he wrote to ask me to give him my opinion, and it was in consequence of his showing my letter to Lord Rosebery that I was much surprised by being suddenly called upon to give evidence: I was the only man who recommended the dealer's licence to be taken off, and the tax to be taken off farmers' young horses; people were annoyed at being called upon for 12*l.* 10*s.* by the tax-

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[*] Report, Lord's Committee on Horses, Session 1873, known as Lord Rosebery's Committee.

[†] "The old Sportsman" of 'Sporting Gazette,' March 24, 1877 [*pencil*—"I don't think I could ever write your Lordship so good a letter as this"]. Other letters and papers in print and MS. Correspondence, local Yorkshire papers, private letters. Letter to Phillips, 1873. 'Sporting Gazette,' March 22, prefaced, "the letter of an eminent authority."

[‡] Mr. Henry Richard Phillips, of Wildsden Paddocks, formerly a dealer in horses and army contractor, a man of great experience both in the home and export trade; experienced, as he told the Lords' Committee in 1873, in every capacity connected with horses of every class, from troopers to hunters. It is said that the greater part of the unrivalled English stud of Napoleon III. was selected by Mr. Phillips.

collector when they sold horses, and by having to pay a duty upon young horses, as soon as they were broken: these things seriously discouraged the breeding and grazing of horses.

"You will not have patience to wade through all the papers and letters I received and had to write when the subject was first agitated; but the evidence before the Lords' Committee will be sufficient to convince any one old enough to recollect the old style of horse, that Phillips and myself were right in saying that really good sound horses were more plentiful and much easier to find formerly than now. I shall be glad if you find any useful information for the purpose desired. Keep the papers and letters as long as you like, and make any use of them you please.

"Yours faithfully,

"LUMLEY HODGSON."

The following is Mr. Lumley Hodgson's contribution:

The foundation of all improvement is judgment in selection: if I liked my horse and mare, I have rarely been disappointed; like breeds like in all animals. Good horses, no doubt, are scarce; it is because we have useless brutes to breed from. Such stallions as now travel the county would ruin any man: on the other hand, a good wide short-legged thoroughbred horse will improve any breed. The best way, in my opinion, to keep an unsound stallion off the road would be this—supply a better! People, however, are too apt to blame even a good stallion for the faults of their badly-bred curby-hocked mares. It is when carthorses are down in the market that the farmer takes to blood and to breeding superior horses. Breeding is one thing, management another. A man may be successful as a breeder, yet fail as a manager; that is, in breaking and making handy—manners; as in man, manners vastly go to make the horse, it is commonly said a quarter of the value of a riding-horse depends on his manners.* There was the famous Yorkshire Parson on his horse "Calamity," spilt in the streets of York, when the Parson said it would delight the Dissenters. Since I can recollect, a really good horse has always fetched a good price; yet, speaking generally, no essentially valuable animals have had in their breeding so little pains bestowed upon them. Experience teaches me that, if properly carried out, horses may be bred with almost as much certainty as other

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* Mr. Milward, a late friend of mine—famous for his ponies—told me he attributed much of his success to having an old groom with two sons; all three had *hands!* The best ponies, he said, were from Shropshire and Cheshire. The Norfolk ponies had not first-rate shoulders. The ponies were picked up for him here and there by a dealer. He said, "I hate the term Cob; under 14·2 is a pony, over that a hack."—C.

kind of stock—not by haphazard, but on system. One really good horse will leave more money than a whole field full of cattle; but I am sure of this, nothing will bring a farmer to a stone-heap sooner than stocking his farm with a lot of worthless horses.

I remember, as a boy, old Kirby of York buying such horses of my father to go to Russia as you rarely see now, as compared to the modern thoroughbred—wider, different shoulders, and better limbed. The retrospect of nearly fifty years teaches me that foreigners have purchased our best mares and best stallions: foreigners will have none other than well-shaped, well-legged, and well-actioned horses. There is now-a-days a scarcity of really good horses in hands that will sell them. There are more thoroughbred hunters now, but they are not so good as those I remember when ridden by the Duke of Portland, Lord Fitzwilliam, Lord Scarborough, my father, the Duke of Grafton, Lord Lonsdale, and many others. These horses were wider, shorter legged, firmer, and better than the steeple-chasers of the present day. Formerly, second horses in the hunting-field were unusual, and not wanted. When I was a boy, there were perhaps only two or three places in a fence you could get through: modern hunting, with its trimmed and jumpable fences, is more like steeple-chasing. Improvement in my time has brought much undrained land into cultivation, and fitted it for sheep, where previously horses and cattle only were bred: Dickenson, the job-master,* used to say that in Yorkshire the sheep have eaten the horse! On many small holdings now consolidated, small farmers worked useful mares, and bred valuable foals. Influenza has had a discouraging effect. It came with the potato-disease and the foot-and-mouth disease in 1845, and has been more or less prevalent ever since, causing in horses many roarers. I never had a roarer before,† and have never been without one since. In 1861–2 influenza broke out amongst 28 such horses of mine as now you rarely see. Formerly in the every-day business of life much more was expected of a horse in the way of condition, endurance, and stamina. If in the present

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* Mr. Dickenson, I knew—he was a remarkable man, because he was an exact man; in his own hand he kept a record of every horse of the thousands he must have owned during his long and successful career. "Breeders of cattle and sheep," he said, "keep their best females, but as regards horses only the unsaleable remain. Select your mares at two years old; make up your mind what you want—in breeding have an aim. The best hacks are by a thoroughbred out of a pony mare." Dickenson held the horse that walks well can trot and gallop.—C.

† This statement is noteworthy. "Roaring" is a disease decidedly on the increase, particularly among thoroughbred horses. Colts "roar" before they are backed; the disease is said to prevail more in Yorkshire than elsewhere. Horses are more subject than mares. I quote from a recent work, the latest I have, 'The Horse-owners Safeguard.' Heatley. Blackwood & Son, London, 1882.—C.

day a man has 20 miles to ride, he thinks it a hardship: I thought nothing of riding 200 miles, and in my college days I always rode up and down to Cambridge. My father's old mare "Priscilla" ran three heats of 4 miles, and came out to win another, only to please an old tailor, who on the mare had staked his all. I remember old John Maynard of Eryholme, then seventy years old, rode his hack, "Black Tom," from Eryholme to Newcastle and back, 80 miles, in a day, only baiting at Newcastle; and, finding the Tees at Neasham in flood, he went in at the high ford and swam across, landing at the low ford, 500 yards down-stream.

Thoroughbred horses have not so much bone as formerly; go and look at the Doncaster yearlings. In consequence of handicaps, and the practice of racing-men who breed from fashion, thoroughbred stallions have not the good legs they had; the stallions for general purposes are leggy, with "Blair Athol's" ankles and feet. There are no stallions travelling in these days like those of all classes fifty years ago; thoroughbreds were 15 hands 2 to 3 inches high, looking several inches lower, gaining their underneath length by their sloping shoulders; not as the modern fox-hunter describes his long, low horse, getting length by the shoulder run into the neck, and a long weak back and lady-like waist. Undoubtedly a vast number of travelling stallions are unsound. In my opinion, a man who says that prizes for entire horses at Agricultural Shows are of no use, must be a man of small experience.

The old class of thoroughbred horse that served half-bred mares, such as—"Screventon," "Woldsman," the two "Presidents," "MacOrville," "Perion," "Record," "Sancho," the "Waltons," "Sir Harry Dimsdale," "Sheet Anchor," "Lanercost," "Tramp," &c.—and I have had horses by nearly all of these—were certainly superior to the three crack hunting prize-horses of the present day—"Citadel," "Laughing Stock," "Angelus." I should not like to ride any one of the three; nearly all the old horses would have carried me pleasantly on the road or in the field. As to the superiority of the old race-horses *—any of the old trainers, John Scott did in the very last conversation I had with him, would bear me out—contrast, "Lottery," "Lanercost," "Reveller," "Blacklock," "Catton," "Woodman," "Bennington," "Sweep," "Sheet-Anchor," "Walton," "Whisker," "Voltaire," "Priam," "Sir Hercules," "Filho da Puta," "Sir Peter," "Inheritor," "Physician," "The Colonel," "Velocipede," "Camillus," "Sir Solomon," "Cockfighter,"

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* A number of thoroughbred pedigrees, provocative of study, are clearly and exhaustively given in a comparatively inexpensive book,—'Brit. Rural Sports,' by Stonehenge. London: Warne & Co., 12th ed.—C.

"Smolensko," "Emancipation," "Crucifix," "Alice Hawthorn," "Beeswing," "Bessy," "Bedlam," "Dr. Syntax"—contrast these with such heavy shoulders and action as "Stockwell," "Rataplan," "General Peel," &c., or such legs as "Blair Athol" and "Gladiateur," as well as most of the "improved" breed of 16 to 17-hand horses.

"Kingcraft" is, or was, the most like the horses of forty or fifty years ago; I would rather give 25 guineas to him, than use many of the fashionable stallions for nothing: it is not height, but shape and action that carries weight safely.

Where are the nags? the old short-legged horses, the roadsters, all, almost all, gone! Railways and wheels, and lazy people too idle to ride! Roadsters have become very scarce; try and buy a nice hack, and you will see. The Norfolks, our East Riding hacks, the Clevelands, our East Yorkshire coaching mares, all, nearly all, gone abroad. "Old Champion" and "Phenomenon"[*] were brought from Norfolk by old Robert, or rather "Bob," Ramsden, of Market Weighton, perhaps about the year 1830. The Suffolk Punch has deteriorated; no sinews under knee; larger, but not so compact and useful. The old useful short-legged Punch we have lost could ride, drive, plough, cart, or breed a hunter. Mares by a trotting stallion, put to a short-legged, wide, thoroughbred horse, produced valuable hack-hunters, and single-harness horses. The old roadsters had beautiful heads. Lord Charlemont, in his evidence before the Lords' Committee on Horses, says: "I have seen some of the very best hunters in Ireland got by a Norfolk horse out of a thoroughbred mare, a 15 hands 3 inches horse, that looked like a carthorse, only no hair on his legs; action very superior, and temper perfect." At my recommendation, old John Foxton entered "Bay President" when twenty-three years old, for the Nag prize at the Yorkshire Show at Malton, which prize the old horse won, much to the disgust of the many owners of heavy-shouldered so-called nag stallions. "President," as already a winner, could not then compete as a hunting sire. I won the corresponding Nag prize at the Yorkshire Show at Hull with his son "President Junior." I gave John Foxton this reason for my advice, namely, that two of the Judges out of three at Malton were men used to ride 60 or 70 miles a day, and they would certainly prefer a blood hack to a high-

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[*] The trotting "Phenomenon" approaching you with all his four legs tucked up close to his body appeared like a flying barrel, on which had been stuck a head and neck. Science has again stepped in to upset old theories in philosophy and in art. See 'Animal Mechanics, the Theory of Quadrupedal Locomotion, founded on Anatomy and the Revelations of the Camera.' Twenty-four were used working to the five-thousandth of a second. Stillmann (J. D. P.) 'The Horse in Motion; Views by Instantaneous Photography:' Boston, U.S.A., Oct. 1881. Royal 4to. Price 2*l.* 5*s.*—C.

stepping, heavy-shouldered trotter, all action and no go, dragging his hind-legs after him instead of pushing them along; one of those animals that, with nothing to be proud of, are very proud.

Concerning mares generally; we breed from the refuse, the worn-out and worthless. Yet by putting even inferior mares to good sound horses the breed gradually improves. Foreigners prefer to purchase mares, formerly, when not so much in favour, they were kept and worked on the farms and bred from. Yes, mares fit for the hunting-field. Forty years ago Harris, a well-known dealer largely employed in the purchase of army remounts, used to buy better mares * for the cavalry than you can find now in many hunting-stables. A thoroughbred horse can get a valuable general-purpose horse from an active cleanly cart-mare: or you may reverse the order: in breeding from a cart-mare you must have one with quality, a good game head, silky mane, good sloping shoulders, good action: in short, one that you can ride if by accident you should throw your leg over her. There is a great difference in the produce of the same mare in different years—a breeding back to a weedy ancestor. But, do bear this in mind, you must have game and mettle in the mare: a sluggish, coarse, heavy mare will assuredly breed a slug—to any horse a sluggish mare will breed a slug.

The old-fashioned and, unhappily, virtually extinct Cleveland could ride, hunt, plough, and, to a short-legged thoroughbred horse, breed the best of hunters. A pure-bred Cleveland was usually, if not invariably, a bay with black legs. The old-fashioned Cleveland stallion often got admirable hunters out of thoroughbred mares. To a thoroughbred horse the Cleveland mares were the very best of breeders: there was nothing better than Cleveland mares before they were crossed; it was a saying they gained a cross of blood about every 50 miles they went towards London or Malton. These famous Yorkshire horses were ruined by the fashion that prevailed about the year 1820 for big flashy 16·2 to 17-hand London carriage-horses;' they crossed the old-fashioned Clevelands with all sorts of leggy, useless brutes. I knew a Cleveland mare that carried a man 70 miles a day for a week together. Tommy Miles of Harlsey, near Northallerton, rode his Cleveland mare to York for a week together, to have his name called over in Court as a juryman: he was in York by 9 o'clock every morning (35 miles), and slept in his own bed at Harlsey (35 miles) every night.

I now have to offer as the result of my experience a few practical suggestions. The causes of the decline in breeding superior horses I attributed in my letter to Phillips, (1) to

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* "The cavalry are, or were, 1873, chiefly mounted on mares."—*Phillips.*

railways; (2) foreigners and export; (3) cavalry remount-regulations; (4) drainage and improved land, more cattle and sheep; (5) the unreasonable return of horses sold on warranty; (6) influenza; (7) the annoyances of the tax-collector, and the unjust claims under the head of horse-dealer's licence. Influenza, and using long, tall, leggy, half-bred stallions, produce roarers. Long-backed, long-legged horses more frequently become roarers than those that are near the ground and compact: variability of climate, clipping, singeing, and chill, all predispose—but nothing predisposes to roaring so much as influenza. Farmers will not send mares any distance; they grudge the fee; the expenses of travelling a horse are considerable; and in addition there are all risks—constant change of stable, standing about, cold, influenza, roaring, inflammation, not to speak of the difficulty in finding a sober leader: all these considerations often lead to a sale rather than to travelling. Travelling a stallion costs from 5*l.* to 11*l.* a week. Farmers grumble at two guineas; down comes a foreigner, and away goes a good horse! General Peel says in his evidence before the Lords' Committee:—"To encourage and improve, don't cover at a low fee; cover half-bred mares at 5*l.* 5*s.*; good mares at half-price, first-rate mares gratis; then good mares would be found; if you covered all sorts gratis, some people would breed from a donkey!" If you take care of a horse, he is all the better for travelling, say, 30 miles a day. I had a stallion travelled till 26 years old; "Old President" and "Young President" travelled after that age. I have had horses cover over 100 mares, with scarcely one geld; "Perion" served 250 mares in one season. In one case I know, 192 mares were covered by the same horse, 22 only geld.[*] Breeding cannot be carried on profitably on a large scale; the land gets foiled[†] with horses: the best horses are bred, not in great studs, but on small private farms. It used not to be the custom to give colts corn after the first winter. A young horse, without shelter in summer, costs 10*l.* a year to keep up to 4 years old; Phillips and East both gave 15*l.* between 3 and 4 years. To breed a thoroughbred yearling costs at least 100*l.*; dam and sire, say 20 guineas; risks, barren mares, &c., and 40*l.* a year, to keep, say 15*s.* a week. Infirmities and false shapes of horses have increased with their size: as I have observed, large horses are more apt to be roarers than small ones, because they have not girth in proportion to size.

The curse of our day is breeding *from fashion.* Racing-men regard fashion more *than utility.* Stud-owners purchase or

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[*] William Shaw, a Yorkshire stallion-leader for thirty-six years, gave curious evidence on these and other points.—*Report, Lords' Committee,* which see, p. 96.

[†] Old English—to beat down with feet; to trample; foul'd. French—*fouler.*

hire a fashionable stallion, and put all mares to him, whether the cross is suitable or not: breeders should select and individually fit the horse to the mare, blending together slightly opposing but almost invisible deviations. I commenced by saying the foundation of all improvement is judgment in selection: racing-men, however, breed from fashion and blood, without regard to legs and action; forgetting that *own brothers*, without identity of shape, are *different animals*. The shape as well as the blood are the considerations which should constitute the value. We too often have length in the top, not underneath; light legs, bad ankles, shoulders into the neck, instead of sloping into the back, light girths, bad feet, perhaps curb, spavin, and ringbone. What we want in a horse is this: length underneath from the shoulders, sloping well into the back; strong below the knee, bone and sinew; the knee to bend, and the shoulder as well to move. For any and every purpose we want horses with heads set on rightly, four good legs, and with their shoulders sloping well into their backs.

Mr. Lumley Hodgson having concluded his paper, I may perhaps be allowed, by way of example, to mention one horse of which he is the successful breeder and fortunate owner, got by "Camerino," dam by "Sir Tatton Sykes," winner of the Leger, grandam, "Betsy Bird," by "Voltaire." The produce * of this famous horse in question have won endless premiums. He is thus described by "Blinkhoolie" in the 'Sporting Times,' Jan. 30, 1875: and for a novice, the mere description is a polite education: "'Highthorne,' a brown, with fine clean black legs, a good expressive head, beautifully placed shoulders, with back, loins, and quarters; a model of symmetry and power. He is very well ribbed-up, and the muscles on his forearms and thighs are excellent. His soundness, wind and limb, undoubted; his temper all that can be desired, and his action simply perfection."

MR. MAYNARD.

Mr. Maynard,† who has completed a ten years' Mastership of the North Durham Foxhounds, has favoured me with the following very interesting letter: I begged for the sort of open-

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* Namely, amongst others, "Topthorn," a great winner, "Cyprian," "Flower Girl"—at 3 years first at Yorkshire, at 4 years first at Royal at Carlisle—"Chancellor," "Robin Hood," &c. "Highthorne's" produce in 1878 won between 30 and 40 prizes; in 1879, 31 prizes; in 1880, 52 prizes at the Royal, Yorkshire and all great Shows; in 1881, between 90 and 100 prizes; at the Yorkshire Meeting held at Hull 8 Highthornes were shown, they won 6 prizes; they are again winning largely this year—1882.

† Anthony Lax Maynard, Esq., Newton Hall, Durham.

air sermon he would naturally preach from out of his saddle; and his nice crisp facts are a pleasant and friendly response. Everywhere in demand as a judge of horses, few men have had greater experience. Mr. Maynard, moreover, inherits the talents and sporting tastes of a name inseparably connected with the perfection of animal form. Old Mr. John Maynard, of Harlsey Castle, in his day bred and bought as many famous hunters as any man. In the days of old, when hardy Shorthorns industriously sought for scanty provender by the banks of the Tees, and as often as not calved naturally in the open field, Charles and Robert Collins created pedigree Shorthorns by means of a bull bought out of a lane, "Hubback,"* and a heifer bought from old John Maynard, whose father called out, as the heifer was being led away for delivery,—"John! we have plenty better left at home!" The distinguished brothers John and Anthony, with the latter of whom I have ridden many a mile, always said that their father possessed better Shorthorns than they had ever seen since. "And what," it may be said, "has this interesting fact about Shorthorns to do with half-bred horses?" I answer, much. It goes to point a moral, and to adorn a tale. So called flukey breeding—regarding form not record, from the skilful selection of the best individual animals, may be made, by specially applied talent, to approach something very like the certainty of science. It is the great effect, says Darwin, produced by the accumulation in one direction during successive generations, of differences to an uneducated eye absolutely inappreciable. Not one man in a thousand has accuracy of eye and judgment sufficient to become an eminent breeder. If gifted with these qualities, and he studies his subject for years, and with indomitable perseverance devotes a lifetime to it, he will succeed, and may make great improvements; if deficient in any of these qualities, assuredly he will fail.

"Newton Hall, Durham,
Jan. 27.

"Dear Lord Cathcart,

"In reply to yours, I write to say that my experience in hunters, and the breeding of them, is that the best I have had and known have been animals got by a thoroughbred horse—as a rule a short-legged stallion with good action, sound wind and limb, for like will beget like. Particularly avoid an unsound stallion in wind.† I may mention a few of the best thoroughbred stallions in my time for getting hunters. 'Sir Peter,' 'Oberon,' 'Woldsman,' 'Sir Harry Dimsdale,' 'Kite,' 'President,' 'MacOrville,' 'Perion,' 'Piccador;' and at the present

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* See Herdbook, "Hubback."

† The terrible strength of inheritance so often exhibited in a wrong direction; endless diseases, even habits such as Cribbing. See also Finlay Dun, "Hereditary Diseases of Horses," 'Jour. R. A. S. E.,' vol. xiv. p. 106.—C.

time I have a great fancy for 'Uncas,' * now located at Neasham Stud Farm. These horses I have mentioned got hunters, and the very best, out of half-bred mares, mares that you found working on the land, with quick action, good constitutions, and on short legs, and what I may term roomy mares; not heavy-legged cart-mares, but such as were formerly used in Cleveland.

"I remember, as a boy, riding a horse by 'President,' out of a butcher's hack, and this horse my father sold for a very long price into Leicestershire, and for many years he could not be beaten with fourteen stone on his back. Another instance; my father bought a 3-years'-old colt by 'President' from a really good Cleveland mare, which turned out well; he rode the horse himself with his own hounds and with Mr. Millbanke's for two years, then sold him to the late Sir Harry Gooderick for 400 guineas. At the end of the hunting season Sir H. wrote to my father, stating that 'The Primate,' as the horse was called, was, out of fifty-two, the best in his stable. He also sold a famous horse to the Earl of Darlington, afterwards the Duke of Cleveland, for 400 guineas, by 'Woldsman,' out of a plough-mare: this horse could not be beaten with fifteen stone on his back across any country with hounds. Another beautiful weight-carrying hunter my father sold to the late Sheldon Cradock for 400 guineas; he was by 'Petronius,' out of a Cleveland mare. I may mention that the Cleveland mares in those days were clean-legged, good steppers, and full of pluck. I saw a farmer one day, when we were hunting with the late Ralph Lambton, take his mare from the plough, jump on to her bare back, with winker-bridle, and collar round her neck, and go for about five miles across country, take every fence before him, and was there when we killed our fox; this very mare afterwards bred some famous hunters crossed with old 'MacOrville.'

"I have had myself many first-rate hunters by old 'President,' 'MacOrville,' and 'Perion;' one horse, by 'President,' bred by Mr. Rigg of Yafforth, out of a plough-mare. The late Mr. John Booth of Killerby bought this horse for me, rising 4 years old; I called him 'Jim Crow,' and in the great Hurworth runs, when Frank Coates was huntsman, Mr. Cookson on 'Old Roderick,' by 'Bob Logic;' Rev. H. Dyke, of Long Newton, on his famous 'President' mare with one cross, and myself on 'Jim Crow,' were always in a good position over all kinds of country. Another fine mare, by 'MacOrville,' dam a Cleveland mare, I bought from Mr. John Parrington; no day was too long for her, and no country too stiff. I sold her to the Hon. Henry Willoughby, afterwards Lord Middleton; his huntsman, Morgan, told me she

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* "'Uncas,' 30 public mares at 30 guineas and 1 guinea the groom."—*Advertisement*, 'York Herald,' February 17th, 1883.

was the very best hunter he ever crossed. I also sold a horse, by 'Perion,' similarly bred, to Mr. Willoughby, which proved a grand hunter. John Payne, of Market Harborough, bought many hunters from me by 'President' and 'Perion' out of Cleveland mares, and they always gave great satisfaction.

"I must confess now that I rarely see a mare that I am much in love with to breed hunters from—only one now and again; and there is no doubt that most of our best hunters now come from Ireland. Our North country farmers find that the heavier kind of farm horses pay them the most money; consequently these animals are not adapted for breeding hunters from; they are worked on the land from 3 years old until about 6 or 7 years old, then sold for town, Dray, or Rulley horses at prices from 50 to 100 guineas each. In my experience I have only known a very few quite thoroughbred hunters good across our plough and heavy country; they may do for steeplechasing, but don't bear the wear and tear, up and down hills, that the half-bred hunter does.

"When I mention a half-bred hunter I must have him well-bred, well-made, good action, shoulders in the right place; I don't object to a strong shoulder, but it must be well-placed, with a muscular neck, deep back-ribs, well-developed hocks, and the height about 15·3. Then with a good pack of hounds, a good fox, fine scenting day—such an animal, with a good man on his back, will always be in a good place, and bring you comfortably home at night. All hunters should be good hacks.

"Big horses are apt to go roarers. I don't like a hunter, as a rule, above sixteen hands.

"As to hackneys and roadsters, I myself prefer an animal with a cross or two of blood; one that walks really well; and in this case, as with hunters, the shapes must be good, with sound well-formed feet.

"I used to prefer making my own hunters, buying them young, riding them myself, always using them well, and exercising a great deal of patience; still being firm, but never lose your temper with a horse. More is done by kindness than by rough treatment—as an old huntsman once said to me, more flies are caught with honey than vinegar; this was after he had been using civil words to a cross farmer—who afterwards became his friend.

"I have written you a few lines: I don't know that they will be of any use to you, but if so, it will afford me pleasure, and I remain,

"Yours very truly,

"A. L. Maynard."

MR. GEO. LASCELLES.

The following paper is justly entitled to carry weight. My friend and neighbour, Mr. George Lascelles,* who for the Royal Agricultural Society has repeatedly acted as a judge of horses, kindly interested himself in my undertaking. A keen sportsman, an able man of business, a practical farmer, a successful breeder of horses, Mr. Lascelles inherits the sporting traditions of several generations of the House of Harewood :—

The subject of breeding useful saleable half-bred horses is one which interests all classes of the community, and is of especial importance to the farmer, whose precarious income may be considerably increased by annually turning out one or two good-looking hunting or coaching colts. The apparent uncertainty of breeding half-bred horses has deterred many from entering on this business, and frequent disappointment has driven others out of this branch of industry. As an old farmer once remarked, "You see, Sir, what we want is a big brown colt, and what we mostly get is a little chestnut filly." Now, though I do not propose to give any patent way for breeding big brown colts to a certainty, yet I shall attempt to show how, by keeping the right sort of mare and using the most suitable stallion, a farmer may reasonably expect to breed a sound saleable horse, with substance and action, for which there is and always will be a steady demand.

In vol. xxiv. of the Society's 'Journal,' by Mr. W. Dickenson, there is a letter addressed to the Right Honourable John Evelyn Denison, which treats very fully of the business of breeding horses of all breeds. It is full of valuable information on the subject, and is well worth studying by any one interested in the subject. In the same volume is another article on the "Breeding of Hunters and Roadsters," by Mr. J. Gamgee,† senior, a very valuable and exhaustive treatise, to which it is difficult to add any useful information as a guide to the breeder;

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* Hon. George Lascelles, Sion Hill, Thirsk.

† Mr. Gamgee tells us that the object of cross-breeding is to gain desirable qualities in the offspring which neither parent possessed,—the mule an extreme example. Great changes, he observes, writing in 1863, have, as regards breeding, taken place in fifty years. Breeders change their system as they do their clothes; non-scientific; listening to the suggestions of horse-dealers and considering only the capricious demand of fashion. To get hunters depends on the judicious crossing of breeds and the blending of the individual parents. In the half-bred mare form must be more regarded than pedigree: half-bred pedigrees are unreliable. No care or skill will enable the breeder of hunters to reach the highest aim with more than a fair proportion. The average horse must pay expenses. But the weight-carrying hunter should be the type or model; the misfit hunters are valuable for most purposes.—C.

and I would certainly advise all horse-breeders to read those articles carefully.

With all the knowledge that study and experience can give us, breeding half-bred horses will always be more or less a speculation: the most likely mares fail to produce anything so good as themselves; and one not nearly so good-looking, or even so good an animal, may annually breed a really good and valuable foal. But still there are certain rules which must not be disregarded, and there is a road to success, if we steadily stick to it. One comfort to the hunter-breeder is, that men of all weights and sizes join in the sport, and so a sale is obtained for the small fry and failures, as well as for the plums; and, fortunately, some men are not critical judges of shape and form, and so long as they are carried safely across country, are not perhaps aware what an inferior animal they are riding. And indeed I have heard an old sportsman affirm that no young man under thirty should be allowed to ride behind perfect shoulders, which should be a luxury reserved for mature age and failing nerve. The great misfortune of the present day is the system of showing. The farmer who has a good-looking three-year old, instead of knocking him across country, and improving both himself and his horse, now fattens him up, and will hardly jump him over a stack bar, for fear of hurting him, or perhaps throwing out a curb, the horror of dealers, but in reality of no consequence, and almost inevitable with a keen young horse who handles his hind-legs in proper form. The horse is run the round of the shows, and perhaps sold to some admirer for a long price as a hunter. The purchaser is surprised, on riding him with the hounds, at his high-priced hunter putting his fore-feet into the first blind ditch and giving him an ugly fall, and he then finds out he has bought a perfectly unmade horse, which he will have to teach the rudiments of his business, and which may or may not turn out a hunter.

I fear it is beyond dispute that hunter-breeding has been much neglected in the last few years, even in the most horsey counties, many of the most likely young horses on the lands of farmers having been bought of Irish dealers; and indeed the mares are not in the country to produce hunters. A man may travel a long way now without seeing a mare calculated to breed a hunter, and our principal Shows fail to bring out the class of animals required in any quantity. The fact of horses being imported into England from Hungary, Canada, &c., speaks to the scarcity of good-looking half-bred horses in our own land.

In looking for the cause of this disinclination on the part of farmers to undertake the business of breeding hunters, we must first inquire as to the chances of profit or loss; and I fear, if we take the cost of the mare's keep and the cost of the foal's maintenance until it is marketable, and take into consideration the failures to breed, that there is not much encouragement to breeders of blood-stock, and the breeding of carthorses is a much more certain and remunerative business. I have had some experience and the opportunity of watching the result of breeding from good well-bred hunting mares, with at least three crosses of pure blood, and I must admit that the number of valuable horses, up to say 14 stone, bred in this way is very limited over a considerable number of years. I attribute this failure to the attempt to get size from the sires used. A big thoroughbred horse and a well-bred half-bred mare, may produce a tall leggy horse, but seldom a short-legged strong one.

Some of our best weight-carriers have doubtless been first cross from the thoroughbred horse and a cart-mare, and I consider that it is indispensable that the mare should have the size and substance, and from these sorts of mares it has been found that medium-sized and even small short-legged thoroughbred horses, with good sound feet, good legs and action, have proved the most successful sires. We all in Yorkshire look back to horses got by "Old President," "MacOrville," "Perion,"—all small horses; but they were mated with what were called Chapman and Cleveland mares, which did the farm-work in our northern dales, and produced the best hunters and carriage-horses of the times.

These mares were got by half-bred sires out of the cart-mares of the country, the sires generally having a cross of thoroughbred blood. They were kept as much as possible to a good bay colour with black legs, and the colts were always saleable either for hunting or harness. The fillies were kept on the farms, and bred from again. This, I am inclined to think, is the only way that horse-breeding can pay the farmer. These mares are now very scarce, and have been almost all bought up by the foreigners, who will never pass a good strong bay mare if they can induce the owner to sell her. Hence the importation of horses into England bred from our own mares and got by our own stallions. If when the farmer has got a promising three-year-old, he would ride him after the hounds for half a day a week during the hunting season, he would find that a more healthful and profitable business than gadding about to the Shows all summer-time (when he ought to be at home looking after his business), learning to drink and bounce, and spending a fiver to get a 50*s.* prize, the achievement of which triumph so turns his head, that he claps on such a price on his prize-taker that no one in their senses will look at him. He spends a couple of summers at this game, till, when his horse is examined, what with fat and exposure in showyards, his horse is found to be a roarer, and has to be sold at screw price; and the farmer is naturally disgusted at what he calls breeding hunters, and will have no more of it.

But I feel sure that with the exercise of good judgment in selecting mares to work on the farm, crossing them with thick, short-legged, thoroughbred sires, that many of our light-land farmers and dalesmen could still find breeding half-bred horses a fairly remunerative business, with perhaps more plums in the pudding, than breeding pure cart-horses.

COLONEL LUTTRELL.

Being anxious that all my correspondence should not be dated from Yorkshire and the North, I wrote to Colonel Luttrell; he has favoured me with the following letter, for which I sincerely thank him. Of the Colonel, I need on the present occasion write no more in this 'Journal;' he is to us all so well known and so much appreciated as an undoubted authority, and as a most able, patient, and painstaking Judge.

"BADGWORTH COURT, AXBRIDGE, R.S.O.,
"SOMERSET, *July* 4, 1882.

"DEAR LORD CATHCART,

"It is not easy to say anything fresh about horse-breeding, but I gather from your letter that your paper is intended more for the practical information of farmers than anything else. Now farmers in this county are profoundly ignorant in the science of breeding light horses, the land being more adapted to carthorses, and the profit of breeding them quicker and more certain. My own experience in breeding nag horses shows me that the selection of the dam is of the utmost importance, for from her, as a rule, we have to look for size, constitution, temper, and endurance; above all things she should be free from any disease likely to be propagated in the progeny, such as curbs, spavins, ringbones, sidebones, sandcracks, and roaring. To breed hunters, she should have well-sprung ribs, like a sherry-cask; I have never seen a flat-sided one a good breeder: her shoulders should be long and clean, her quarters long and strong, in fact she should be a well-made, deep, long mare. Many people think that any defect in the mare can be easily rectified by the horse; this to a certain extent is true, but I have always found that if the mare is defective in any material point, it is certain sooner or later to show itself.

"In selecting a sire even for breeding weight-carriers, I should not look so much for great size and substance, as for one truly and evenly formed; a well-made level horse with good action and quality is much more likely to get, when put to a mare of substance, a big colt, than a great big horse, loosely made. For instance, take 'Citadel' and the 'Duc de Beaufort,' two Royal winners; the former a horse of great size, the latter comparatively small, but wonderfully level. I have never seen anything like a weight-carrier got by 'Citadel;' whereas the 'Duc de Beaufort' gets all his stock of good size and full of bone. To breed from, give me quality and action, for if you miss getting a hunter, a hack with good action is always saleable at the best price. I should never use anything but a blood-horse. You don't know where you are going with a cocktail, he may throw back to a brute. This is exemplified in sheep-breeding. If you use a ram from a well-selected and old-standing flock, you get all your lambs as level as dies; you may use an equally well-made sheep from a flock that has not been carefully bred, and your lambs will be all shapes and sizes. Another point I would refer to, viz. the character of the soil on which you intend to breed: your subsoil should be dry, not too light; and your upper surface rich in carbonate and phosphate of lime, in order to assist in the production of bone and muscle; wet heavy clay-lands are totally unfit for the purpose, and only lead to disappointment. I will only add that if a farmer wishes to be successful, he should remember that a foal, like a calf, should always be going; for it is well known that if an animal once loses its calf's flesh, it takes months to recover it. Give the mare the best of food, and if she is a bad nurse, don't spare the oats, it will teach the young one to feed. Boiled milk and oatmeal are good accessaries for a bad mother. Hoping this letter may be of some use to you,

"I remain, yours faithfully,
"H. A. T. LUTTRELL."

MR. BOOTH.

I have much to regret that I could not induce the ex-Master of the Bedale to contribute to our present object. The name of Mr. John Booth, of Killerby, is in agriculture a household word; he is most experienced, he is most successful, and he wields an admirably facile pen; in short, let it be an open secret, I and others wished Mr. Booth to occupy exclusively the whole ground of this Paper. But, in the common interest, I am sorry to say that friendly correspondence and pleasant conversation extending over twelve months have resulted only in the following communications :—

"KILLERBY, CATTERICK,
"*Jan.* 25, 1883.

"DEAR LORD CATHCART,—

"I have thought fully over the subject of breeding weight-carrying hunters, and the conclusion I have come to is, that it is impossible to lay down any rules on which to proceed, to obtain the animal named.

"It is not difficult to define the course to be pursued in breeding pure-bred animals, or even in breeding *crosses* from two strains of *pure-bred* animals; but, in my opinion, in crossing with *cross-bred* animals, which necessarily the brood mares for breeding half-bred horses must be, the results are of a very uncertain and fluky nature. I must beg, therefore, to be excused from attempting to teach others this road, which I feel I do not know myself, and which I think might lead them to disappointment and loss.

"Believe me, yours very truly,
"JOHN B. BOOTH."

In a previous letter,* March 3rd, 1882, Mr. Booth observes—and as stated from such relevant facts, mentally soaked, important principles sometimes may be evolved :—

"I had one mare which bred me seven foals; the first three, by one horse, made an average of over 200*l.* each at four years old. The other four, by another and equally good-looking horse, made about 30*l.* each at the same age, the first three being fine strong good animals, the last four perfect weeds.

"Another mare I had bred me five foals; the first I sold as a three-year-old for 200*l.*; the next, two years old, for 300*l.*, and the next two at good prices; but all the first four went roarers, at which I was so disgusted that I sold the mare with a filly foal at her foot for 20*l.*; that foal was brought up, and was one of the most celebrated hunters in the country, and kept perfectly sound all her life. These were from good mares, and got by the best sires I could find. Whilst such a horse as 'Golden Drop,' for instance, was out of a common cross-bred coaching mare you would not have given 10*l.* for by a horse travelling the country at 30*s.* a mare. These are instances—I could give scores of them—which will show, I think, that any one writing a paper on such a subject would, by giving advice, be apt to mislead other people. In my opinion the matter is best left to the *judgment* or *inclination* of those who like to try it."

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* Addressed to the Secretary and Editor.

In the conscientious discharge of my unsought-for task I am nothing daunted nor yet discouraged by the suggestion of difficulties which are well known and recognised by all men of action and all men of science. Tottering *inclination* often wants the support of stable *judgment*—the complaint appears to be that in our day inclination does not always walk hand in hand with judgment. From his own point of view, however, I fully understand and quite appreciate Mr. Booth's objections; yet proverbial wisdom teaches that by others' faults wise men correct their own. I replied, so far as I am concerned, all views are acceptable to me. My only object—my obvious duty—is to state the whole case to the best of my ability: fully, clearly, and honestly. In addition and supplementary to blood we must have substance from somewhere. Weight-carrying half-bred horses, chargers and hunters, and strong and nimble and enduring hacks, are, and will continue to be for ages to come, more and more in demand, and will and must be continually, perhaps increasingly, produced in their natural home—England—and that in the greatest possible perfection. And if in this affair we cannot attain to the absolute certainty of science, the convergence of many minds and many experiences towards one centre may result in the evolution of some recognised principles for our guidance in this, an important business of our every-day lives.* Science is no more than system—an aim as opposed to a random shot. Infant science seeks to give a desired, rapid, and more certain effect to the old old law of natural selection: as I have written in a former volume of this 'Journal,' such commendable and necessary attempts as this now in question may be well described as youthful Science pluckily endeavouring to gain some footing on a very slippery spot.

I just now observed that from relevant facts, mentally soaked, important principles may sometimes be evolved. Take for example, I fear an unworthy example: in 1875 I had occasion to think concerning many facts bearing upon a particular matter then in question, which thought resulted to my surprise in the evolution of a general principle that since I have myself applied usefully, and which may or may not be of general application—it is this:—the more artificial the condition the

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* See, for example, how Mr. James Howard, M.P., practically treats the physiology of breeding, "The Application of Natural Laws to the Breeding of Horses, Cattle, and Sheep." I always refer to these pages with pleasure. From his own reading and observation, and after the comparison of notes with Mr. McCombie and other breeders, Mr. Howard was enabled to come to the conclusion that certain cardinal points in the art of breeding have been fairly established. Such, for instance, as outward conformation being derived from the male parent, the internal organs chiefly from the female, and so on.—Jour. Roy. Agri. Soc., vol. xvii, 1881, p. 210. But a vast deal remains to be said on these as yet doubtful principles of prepotency of transmission.—C.

more desirable it is to couple nature with freedom, and to study the probable action of that combination with a view to the utmost practical conformity. How important the application of this or some other analogous but superior or better fitted principle, applied, scientifically and practically, to the elucidation of the phenomena connected with the recently established —in the sense of fully recognized—the disastrous, widely-extending, and now certainly hereditary disease in horses known as Roaring.* It was, I think, Archbishop Whately who finely observed, nothing is a trifle that can illustrate a general principle.

In that charming and clever work of fiction, 'Handley Cross,' the sporting hero, Mr. Jorrocks, recommends his attentive audience to "choose a mouse-coloured dun, for it has the peculiar advantage of looking equally well all the year round," and as an additional attraction Mr. Jorrocks mentions "a black list down the back." I had such a one by birth, a Tartar by trade, my brother-in-law's Crimean pack pony; an honest, pleasant, nimble pad. Now this cheerful quotation suggests one of the most remarkable theories connected with the philosophy of horse-breeding, illustrating the mysterious laws of unity of type, correlation, variation, and tendency to reversion. As we all know in England, spinal stripes occasionally appear in horses of all colours and of all breeds; bars on the legs are not unfrequent, more especially in duns, mouse-duns, and a wide range of colour between brown and cream. In one known case in a chestnut—a trace of shoulder stripe has been even seen in a bay. Two dun ponies, one Welsh and the other Devonshire, each had three parallel stripes on either shoulder. In India the Kattywar breed is generally striped, spine, legs and shoulders. Bars and zebra-stripes appear on the horses of all parts of the world, even, as Darwin observes, on the English thoroughbred, but oftener on the foal. Mules also are frequently striped and barred, one Indian mule appeared like a hybrid zebra. There is, scientifically speaking, no chance in all this; the theory is simple, it is law, or the action and reaction of laws such as those we have cited. The original stock, the common parents from whence our domestic horse, and indeed all horses are descended, were zebra-like—striped—all horses are descended from a striped progenitor.†

From the little dun horse of fiction and the striped horse of science we now turn to a little black brown, happily in the flesh, namely Mr. John Grout's much-admired hackney stallion "Fashion." The winner of endless prizes, "Fashion" is

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* Or in the vegetable kingdom to the disease in the cultivated potato.

† See Darwin's 'Animals and Plants under Domestication,' chap. ii.

honourably mentioned, as it will be remembered, by the Judges of the Royal Agricultural Society as the first prize-winner at Reading. He appears to me to be an interesting example of successful cross-breeding, and his pedigree as well worthy of an afternoon's study. That pedigree, with the due allowance to be made in all half-bred pedigrees, is a lecture on the English hackney.

"Fashion's" description and pedigree are as follows:—the fee, and this is an important consideration with many, three guineas. A black brown, rising 4 years old, 15·1 hands high, a grand goer, with good bone on very short legs.

He was bred by Mr. Robert Worsley, of Suffield Hall, Norfolk. "Fashion" is by "Confidence" out of an exceedingly well-bred roadster mare. "Confidence" is a black-brown horse, 15·2 hands high, bred by the late Mr. William Rose, of Dykebeck, Wymondham. His sire, Mr. Tice's "Prickwillow;" dam, a fast-trotting mare, by Mr. Jacob's "Highflyer;" this horse was sold for 1000 guineas; g. dam, a noted trotting mare, by the late Mr. J. Smith's "Norfolk Hero," which gained the first prize and silver medal at the Agricultural Show at Norwich, and was highly commended at the Royal Show at Cambridge. She trotted 2 miles in *six minutes*, and 15 miles in *fifty-five minutes*. "Hero" was by Mr. Wiggs' "Shales;" dam, by "Old Congress; g. g. dam, a bay mare by Mr. Dodd's "Shales," which trotted at Ipswich, 5 miles in *sixteen and a half minutes;* g.g.g. dam, by "Old Bellfounder," late the property of Mr. Clarke, of Carbrooke, Norfolk. The pedigree of "Confidence" thus comprises the best trotting action of the present day, and it is acknowledged that his sire left the largest number of horses and the finest goers of any in the world; whilst he himself is allowed by competent judges to be the finest goer in Norfolk.

Mr. Grout of Woodbridge is an old acquaintance, of whom I have pleasant recollections, but I did not apply to him; I inquired of a mutual and altogether disinterested friend, and gather from him that last year 1000*l.* was refused for "Fashion." But here is the really interesting and encouraging point as connected with the study of this pedigree; I understand that Mr. Grout has or had seven brothers by the same sire, and one or two of them promise to rival "Fashion."

Truly there are various and curious ways of farming; the late Mr. Sydney Smith used to say he liked to farm from his hall door with a spyglass and a speaking trumpet. My old friend the late Mr. Torr of Aylesby's plan of farming at a gallop, with relays of well-bred hacks, will more commend itself to many who have judgment, and hands, time, and inclination to put the good horse Pleasure to the safe mare Profit.

MR. T. PARRINGTON.

Naturally one of the first persons it occurred to me to apply to was Mr. Parrington. I relied on his friendly feeling—the colleague of years—nor was I disappointed. A famous sportsman, delighting in the noble animal the subject of his letter, his experience is life-long—and wide as continuous. Few men have known so much of horses and horsemen as the late self-unsparing and altogether typical Secretary of the Yorkshire Agricultural Society.

"MY LORD, "RAVENSWYKE, KIRBYMOORSIDE, *July* 15, 1882.

"You ask me to give you my opinion as to the best method of breeding and rearing half-bred horses of superior quality for riding and driving purposes. I will endeavour to comply with your Lordship's request in as concise a form as possible, first treating of the mare, then of the stallion, and lastly of the produce.

"There is no doubt in my mind that the pure Cleveland bay mare is the best animal from which to breed valuable half-bred horses; and it is much to be regretted that the foreigners have been buying them up for years, until it is now difficult to find such mares in the hands of farmers, and the *pure* breed is almost extinct. If the sort of mare I now speak of was put to an active, short-legged, thoroughbred stallion, the produce, if a colt, was sure to make a valuable carriage-horse; if a mare, and then crossed again with blood, the produce would probably be a most valuable hunter, for in all my experience I have always found the best and most enduring horses bred in this way—i.e. got by a thoroughbred horse, dam by a thoroughbred horse, grand-dam a pure Cleveland bay mare; in fact, I have known many excellent horses from Cleveland bay mares with only *one* cross of blood; and forty years ago, short-legged stallions of high quality, such as 'Perion,' 'MacOrville,' 'President,' and 'Theon,' not unfrequently got from such mares excellent hunters, that sold at from one to two hundred pounds each, a great price in those days.

"There is an old saying, 'it is bad to get butter out of a dog's throat,' and the foreigners having got our best mares, we shall never get them back again. Some people will say that the farmers should not have parted with them; but the temptation of a high price in times of depression is hard to resist.

"At the different Agricultural Shows now held all over England, how seldom we see a good Class of Brood Mares! Among the Hunting Mares all sorts of inferior creatures are found, with now and then a good animal, yet generally aged, and terribly worn, and such scarcely ever breed anything but weeds. It is the lusty young mare in the full vigour of life that produces the most healthy and enduring stock.

"The great difficulty, then, in the way of breeding superior half-bred horses is in possessing a mare suitable to breed from. Some are, no doubt, yet to be found, and it would be a great advantage to England if they were owned by breeders who would never part with them.

"With regard to the choice of a stallion for any particular mare, there is much to be said; the breeding of half-bred horses is a great lottery. I would strongly advise the use of such stallions *as are known to cross well with half-bred mares*, for however apparently suitable a thoroughbred horse may be to mate to half-bred mares, the produce may turn out most disappointing. In my experience I have always found stallions of high quality, standing about 15·2, or 15·3, on short flat legs, with free action, the best to use. Stallions that are roarers, or having spavins, or diseased feet, or suffering from any other hereditary infirmity, should be particularly avoided; on the other hand, good, strong, well-laid shoulders; deep fore-ribs, good back and quarters, sound legs and feet, should always be sought for in the selection of a sire.

"I am of opinion that there is no advantage in having half-bred mares to foal earlier than the 1st of April. The mare during the time of her pregnancy should be well housed and fed, then the chances are that the produce will be strong and healthy, with an abundant flow of milk for the foal, which should be constantly handled whilst sucking its dam, and taught to lead, and so avoid the dangerous practice of 'swinging' when grown up. Colts should be castrated when a year old, care being taken to keep them warm and dry for some days after the operation. I would recommend a partial breaking at two years old, to be resumed at three and completed at four years old, and let the breeder never lose sight of this fact—that nothing conduces to the value of young half-bred horses so much as the possessing of *good manners*, and that it almost entirely depends on the judgment, patience, and care exercised by the horse-breaker, whether this most desirable attribute is inherent in the horse or not.

"Trusting the few remarks I have strung together may be intelligible,

"I am, my Lord,
"Your Lordship's most obedient servant,
"THOMAS PARRINGTON."

I append a note of part of Mr. Parrington's interesting evidence, given before the Lords' Committee, 1873.

"I live," said Mr. Parrington, "in the Cleveland district. I have had thirty years' experience in farming, breeding, and riding horses to hounds. The Cleveland mare, now nearly extinct, was the best foundation to breed from that I ever knew. The foreigners have got them all. The discovery of the Cleveland ironstone has caused a great demand for heavy carthorses. Superior horses are hard to get—the demand, in fact, outruns the supply. I was part-owner of 'Perion,' by 'Whisker,' bred by Mr. Vansittart; 15 hands 1 in. high, of rare quality; got the most valuable half-bred horses we had; he could get a very good horse out of a very common mare. I have known him serve 250 mares in a season, and rarely any complaints of barren mares. As compared with horses, beef, mutton, and milk are in these days more profitable productions.

"We encourage coaching stallions,[*] because from them we get the mares; but not roadster stallions, for mares by them are worthless, the colts only are valuable. A stallion, however good, cannot establish himself in the country until people have seen his stock. In my opinion the best possible thing we could do is to try to induce breeders to keep the best mares in the country."

MR. WICKSTED.

A high authority suggested to me to push inquiry into Shropshire. My able colleague Mr. Bowen Jones, a Member of the Council of the Royal Agricultural Society, with characteristic energy and kindness interested himself in the matter and obtained for me a letter from Mr. Wicksted—a gentleman of that county, and the Master of the Ludlow Fox Hounds.[†] Relating to an immediately adjoining district, Mr. Bowen Jones also sent me from his own collection a Catalogue, 1826, of Montgomeryshire Hunters, a very suggestive and refreshingly quaint document full of tantalising information as to pedigree and performance. What suggestive curiosities of equine literature to my certain knowledge are stowed away and lost amongst piles of dusty MSS. in our charter-rooms and other private repositories!

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[*] I understand Mr. Grout of Woodbridge has now [Feb. 1883] thirty-three coaching-stallions in his stable, and sold as many within twelve months to go abroad.—C.

[†] Delabere Blaine says he knew near Ludlow a mare that carried one owner hunting eleven years, and afterwards produced 1000*l.* worth of horseflesh in seven years; the produce more than realised the fee-simple of the land that reared them.—'Ency. Rural Sports, 1840.'—C.

"LUDLOW, SHROPSHIRE, *February 19th*, 1883.

"DEAR MR. BOWEN JONES,

"There is no doubt that the breeding of horses in this neighbourhood is decidedly on the decline, and a very great pity it is that such should be the case, for this district is most suitable for breeding horses, and in former days was noted for the good hunters bred in it, famous for their capabilities as weight-carriers and for their powers of endurance. This is therefore a district to be encouraged by every possible means to renewed energy in the important art of breeding valuable horses for all purposes, as the subject is no novelty, and the farms very suitable for rearing young colts. The great cause of the decline is the want of a really good thoroughbred horse, that would cover at a low figure, and that would be approved of by the farmers. He must have great bone and substance, as the mares generally are small, but of good quality and hard constitutions. I have no doubt that there are plenty of good mares in this country, and that a good horse would be highly appreciated. The difficulty, however, is how and where to find, first the money, and secondly the horse, these bad times being the chief cause of the said difficulty. At this time an attempt is being made to form a company and procure a suitable horse; at present there is not a very cheerful prospect of success, but I have heard many farmers speak very hopefully. There is only one thoroughbred stallion that I know of in this immediate district, where only a few years ago there were five or six, that is 'Acton,' a very good-looking old horse, and well bred. There is also a cob stallion, 'Little Tommy,' by 'Stockinger.' I have no doubt that there will be some half-bred trotting or coaching stallions in the neighbourhood soon, but they are not the sort that are wanted at all, there being no certainty as to their produce having any heart to carry heavy weights over these hills, or even in more favoured hunting countries, even if they have good looks. A *really well-bred* powerful Norfolk trotter would be of great use in this country for getting hacks and very likely hunters for these hills, as many (of the right sort) have great endurance; but, for all purposes, and especially for the chance of procuring a good price for a four- or five-year-old colt, a big, powerful, compact, short-legged thoroughbred horse, that has not been over-worked or over-trained, and with stout blood in his veins, is what is required, and would not only be of the greatest service to the best class of men in Europe—the farmers around Ludlow—but to all lovers of a good horse. The horse must cover at a low fee, in order to prevent mares being put to cheap horses, of all sorts and kinds, to save a guinea or two, which unfortunately is often done, although the majority of breeders—and they are many—well know it is more profitable and cheaper in the end to rear a good-bred colt than a bad one. The time is advancing, and some measures must now be taken, and I hope I may be able to tell you of success. Any information as to hiring or buying would be most acceptable. I think if an individual or a company had the capital to buy or hire a good horse for this district a good investment could be made, and no money difficulties arise. The Cart-horse Society will do infinite good. Hoping you will find the expression of my opinions of some small use,

"I remain, yours very sincerely,
"C. W. WICKSTED."

The following is the instructive description of

THE TEN HORSES [formerly]
Used with the MONTGOMERYSHIRE FOX HOUNDS,
Sold by Auction On TUESDAY, the 31st. Day of JANUARY, 1826,
In the STABLE YARD at the OAK INN, WELSH-POOL,
(*From which place there are daily Coaches to Ludlow, Shrewsbury, & Chester*).

1. DUN GELDING 14½ hands high, 6 years old;—bred by Mr. Richard Owen, of Castle Caereinion, near Welsh-Pool, and got by *Underhill's Alexander*, Dam a thorough bred Daughter of old *Revenge*, (Son of *Marske* and *Figurante* by *Regulus*.) This Horse, tho' low and small in size, is of great value and surprising Game, having carried, and always in his place, old *Mr. Jones* of *Cwm-breeth*, (who rides at least 16 Stone) 3 days a week, in the last, and present Season, for several weeks successively, up and down the Welsh Hills, and in the last three days was up at the death of 4 Foxes, not one of which was killed without severe running for 1½ hour. [87 gns.]

2. BLACK MARE, 16 hands, 7 years old;—Bred by Mr. Whitfield, of Llansaintfraid, and got by *Melibœus*, Dam by *Old Glaucus* (Son of *Diomed* and *Grace* by *Snap*.) This Mare lived through the severe chase of Thursday, the 8th January 1824, and carried Mr. Whitfield home afterwards, without any refreshment though he rides 16 Stone. [63 gns.]

3. CHESNUT GELDING. 15½ hands, 6 years old;—bred by

Mr. Richard Bratton, of Burgedin, near Guilsfield out of a well bred Mare covered by *Mark Anthony*, and *Driver*. Has never been out when a Fox was found, but is active and of a good constitution, and goes well in a plain Snaffle. [60 gns.]

4. Grey Gelding, 15 hands, 7 years old;—Bred by Mr. Downes, of the Argoed, near Oswestry, and got by brother to *Stamford* (Son of *Sir Peter and Oratio* by *Eclipse*) Dam by *Vermin* (Son of *Highflyer* and *Rosebud* by *Snap*) Grandam by *Smoker* (Son of *Pilot* and *Heron*, by *Herod.*) This Horse goes, and can hold to a racing pace; and last Season carried Mr. Downes (about 17 stone) through the chace with *Sir B. Graham's hounds*, from near Halston over the Welsh Hills (when several good Horses were killed) and lived well through it, and carried Mr. Downes safe home though a free and straight forward rider. [60 gns.]

5. Brown Bay Horse, 16½ hands, 9 years old;—Bred by John Dodson, Esquire, of Crossage, and got by *Lutwyche*, Dam by *King Fergus*, Grandam by *Old Revenge*, great Grandam by *Snap*. This is a fine formed Horse, and last season carried the Whipper-in through a severe chace of 7 hours, having changed to 3 different Foxes, with only one short check, over the Montgomeryshire and Denbighshire Hills, and carried his rider home, (15 miles) afterwards, in good spirits and quite ready again in 3 days. [87 gns.]

6. Bay Mare, 15 hands, 10 years old, Bred by Robert Perrott, Esq. of Bronhyddan, and got by *old Tickle Toby*, Dam by *Old Revenge*, Grandam by *old Regulus*. This Mare has been out only once this season when game was found, which was in October, but she took several Brushes last year when the property of Thomas Pricard Esq.

7. Bay Mare, 15 hands, 6 year old, carries 16 Stone, stout and straight forward. Bought by Thomas Thornes Esq. of Alberbury.

8. Black Gelding, 16 hands, 7 years old;—Bred by Mr. Asterly, of Pentrcheylin, near Llanymynech; and got by a travelling *Yorkshire horse*, out of the *Vermin mare*, Dam of the late Hon. Mr. Trevor's *Lady Jane*. This horse is straight forward and tough, and when 4 years old lived through that severe chace, with the *Montgomeryshire hounds*, from Corndon hill almost to Knighton, and back to Clun, (where they killed their fox, and eventually one horse died and others much injured) and brought his Rider safe home (22 miles) after to Welsh-Pool. [65 gns.]

9. Brown Gelding, 16 hands, 9 years old; Bred by Mr. Powell of Bishops Castle, and got by *Candidate* (Son of *Sir Oliver*, and *Overtina*, by *Overton*) Dam an excellent Hunting

mare, out of a daughter of *old Snap.* This horse on Thursday the 8th January, 1824, before-mentioned, was mounted by the Whipper in at 4 o'clock in the morning, and ridden 14 miles to Covert, and carried him well, without one fall, through a chace of at least 60 miles, and home again 27 miles, by the turn-pike Road, by eleven that night, (full 100 miles in all) without receiving the least Refreshment, and was quite playful again in 3 days, and though he carried his owner on the preceding Monday the 5th through a chace of one continued Burst of at least 12 miles, and about 6 more of cold hunting. He is master of 17 Stone, the weight of Mr. Powell, (who bred him) who once rode him 18 hours and much of that time at full speed in driving the hill Ponies off Clun Forest for the Earl of Powis, and it was the next day that the present owner saw him looking quite fresh, and bought him. [200 gns.]

10. Grey Gelding, 16 hands, 9 years old;—Bred by Mr. Jones, the Saddler in Shrewsbury, and got by *Lutwyche;*—Dam by Acton Burnell *Regulus*, Grandam by *Minister*, Great-Grandam by *Snap.* This was the first horse his owner bought to follow Foxhounds, and for two years went through the harassing Service of breaking in young hounds, and was a chief mean of bringing the Montgomeryshire hounds to kill 54 foxes out of 63 found last Season.

11. Chesnut Gelding, 16 hands, 6 years old, got by old *Warwick.*—This a good tempered strong horse, but untried.

The history of the American roadster stallion, "Shepherd F. Knapp" is interesting and most suggestive. Major Stapylton, of Myton, brought this well-known horse into Yorkshire in 1869, at a cost of 500*l.*, and he was twenty-two years old when he died—or rather was killed—in September 1881. I had a conversation with my friend Major Stapylton, who referred me for exact particulars to his agent, an old acquaintance of mine, Mr. Munby, Estate Office, Myton, Helperby, York, who favoured me with an obliging communication. Other and altogether independent information has been sent me; I have also as a neighbour some personal knowledge, and have been often seen the horse trot in harness at the Yorkshire Shows. He was in Norfolk one season, where his stock are said to have turned out well.

"Shepherd F. Knapp," named after the gentleman who bred him, was foaled in America; his pedigree shows him to be nearly thoroughbred, being by "Eathan Allan" out of an Arab mare; "Eathan Allan," by "Morgan Black Hawk," by

"Sherman Morgan," out of the "Howard" mare, by a son of "Hambletonian"; his dam, said to be by "Messenger," a thoroughbred, the *Adam* of American trotters; he was by Lord Grosvenor's grey horse "Mambrino." It is said of "Messenger"—1786: "When that old grey came charging down the gang plank of the ship that brought him over, the value of not less than one hundred millions of dollars struck American soil." After a successful *début* in the States, "Shepherd" was brought over to Europe, and, whilst trotting at Aintree, caught the eye of Major Stapylton, who happened to be on the look-out for a stallion to improve the breed of harness-horses in this country, and particularly for the use of his tenantry. The result is well known in Yorkshire, for the horse set his mark upon all his produce, and young "Shepherds" have been sought after, and have commanded long prices. His extraordinary action will long be remembered; he had the merit, so uncommon in American trotters, of possessing legitimate all-round trotting action; indeed, his wonderful hock action was a chief feature. It is said, however, he hit himself in the elbows by reason of excessive knee action. "Shepherd F. Knapp" was never known to be beaten in this country, and I here append his public time:—Half a mile in 1 min. 10 secs.; 2 miles in 4 min. 55 secs.; 2½ miles in 6 min. 14 secs.; and 3 miles in 8 min. He could go 20 miles in the hour, and do the last mile in the same form as the first. The following extract from 'The Trotting Horse of America,' by Hiram Woodruff,* alludes thus, in a paragraph relating to the early training of trotters, to "Shepherd F. Knapp":—"'Shepherd F. Knapp' and 'Jessie' were another pair that were trained early, and with no ill effect, even though their race was one of uncommon severity. They were four years old, and trotted five heats, the best of which was 2 min. 40 secs. It was the second heat, and was won by the filly after she had previously won the first. Upon seeing the time of this heat, I concluded that the colt could beat her, and he won the three subsequent heats, the best of them being in 2 min. 41 secs." The public have lost in "Shepherd F. Knapp" the services of the most noted roadster that perhaps ever returned to the Old Country. The nearest English prototype I know, though without equal breeding, was the trotting "Marshland Shales," foaled in 1802, "the best in Mother England up to 20 stones, and styled in Norfolk "a thundering trotter."

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* London: Sampson, Low, & Co., 18th Ed., 1876. Hiram Woodruff appears to have been as clever a man as ever frequented the "trotting tracks," or "levelled a horse with a thicker shoe on the short side." A "three minute trotter" is said to be as scarce in England as a "two-thirty" horse is in America. Hiram was a wonderful man to "talk horse"!—C.

On a hard road he trotted with 12 st. 2 lbs. on his back 17 miles in the hour. "Shales" was the famous sire of a famous stock.*

"Shepherd F. Knapp" was a success, and, when mated with that all-important factor, a well-bred mare, his stock showed quality. The stock bred at Myton Stud Farm made good prices; the French Government bought one at 2 years old for 250*l*., and a yearling pony for 90*l*. One sold for 200*l*. at 3 years old, and it is said was subsequently sold for 600*l*. A gentleman writing to me from Croft, near Darlington, says: "I had a mare by 'Shepherd F. Knapp,' out of a well-bred mare by 'Post Captain:' my mare, a handsome brown, 16 hands, full of quality, was fast in her gallop as a hunter, with fine trotting action, and a bold big jumper; when 5 years old, I had bid for her by auction at York 260 guineas." My correspondent adds, "I have known similar instances." "Shepherds" are, however, chiefly harness-horses, and as such cannot well be surpassed. Certainly "Shepherd F. Knapp" did not make his mark in the Thirsk district where I live; his fee, 10 guineas, was comparatively high. "Highthorne," for example, covers half-bred mares at 3 guineas, and my neighbours preferred, for getting hunters, such undoubtedly successful thoroughbred horses as "Highthorne" and "Baron Cavendish." Speaking generally, it may be doubted whether as roadsters American trotters would cut a figure in our English Showyards; their slow paces, as a rule, would hardly reach our requirements—the easy trot and the essential walk. The American pacers and trotters, going off in a little pacing amble before they *square* away in the flying trot, are bred chiefly for speed and action; their deficiency, as regards slow paces, would, as everyday hacks, render them unsuitable and unpleasant. We can hardly realise the essentially American needs, conditions, and sandy "tracks": bearing them in view, take "Flora" as a type:—"'Flora' does not amble to begin, but in jogging off slow, she goes rolling and tumbling along, as if she had no gait at all, and was capable of none. But when she *squares away* and begins to deliver the real stroke, she has as fine and even trot as any horse in the world—her gait in the rushes of lightning speed, when she darts up the stretch, is *as square* as ever was seen."

As regards Army horses and Cavalry remounts, I have been favoured with the following interesting memorandum; the information it contains is of the latest date, and may be taken

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* There is a portrait and an account of "'Shales" in that excellent work, 'Sidney's Book of the Horse,' London: Cassell, which see.—C.

as absolutely authentic. The bearing of the memorandum upon the subject of this paper is obvious; frequent reference has been made to the Army requirements as connected with breeding weight-carrying hunters and other superior half-bred horses as a convenient source of demand for the farmer's possible hunting misfits.*

MEMORANDUM.

Our Cavalry regiments are mounted exclusively on Irish horses, excepting the Household Cavalry, who are mounted on horses from Yorkshire and Lincolnshire. The Royal Artillery stationed in England are horsed with English and Scotch horses. Those stationed in Ireland, with Irish horses. The Transport Service the same.

The price paid is for	Cavalry	40*l.*
	Artillery	45*l.*
	Transport . . .	45*l.*

Ages, 4 to 6 years.

The horses of the Household Cavalry cost more, about 60*l.* each.

A few years ago a large number of foreign horses were purchased for the Artillery and Transport, principally from France. Of late, however, English horses have been procurable for the service in sufficient numbers, at the above prices, and are much preferred, as they are sounder, stronger, and possess more endurance than the foreign horse, that is, for service at home. A considerable number of foreign horses are still imported from Germany, Denmark, &c.; but they are principally for saddle and carriage purposes, and do not find their way into the Army. About 10,000 horses were imported, to 6000 exported last year. In 1879, 350 Hungarian horses were purchased for a Hussar regiment. They cost, landed in England, 40*l.* each. They are not so strong or sound as the Irish trooper; but for a tropical, or semi-tropical, climate, and indifferent fare, they are more suited. The 7th Hussars took 50 of them to the Transvaal, and the 19th Hussars 100 to Egypt; on both occasions they were reported upon in the highest terms. For the year ending 31st of December last, the average strength of the Army at home in horses was 11,727. The number cast and sold was 1223, or 10·43 per cent. Of those cast and sold, 821, or 67·12 per cent., were cast for old age. Their average age was nearly 17 years, and service 13 years. They fetched at auction 10*l.* 12*s.* 7*d.* each. The average length of service of the whole of the cast horses was 9 years 9 months, and the average sum

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* Mr. Wimbush, the job master, said his best carriage-horses were fitted to have been hunters.—Trans. Highland Soc., *ante*, p. 4, *note*.

realised at auction was 10*l.* 19*s.* 10¾*d.* The average price paid for remounts, with incidental expenses, was 45*l.* 6*s.* 3*d.* Deducting the sum realised for cast horses, and allowing for deaths, each remount costs Government 38*l.* 3*s.* 9*d.* The number of deaths, died, and destroyed, was 301, or 2·57 per cent. Their average length of service was 5 years 6 months.

This country could not meet any sudden large demand for horses without seriously interfering with the traffic. Enhanced prices would bring a considerable number into the market, but there is no large floating surplus; horses are bred up to the requirements of the average demand. If we wanted 8000 to 10,000 horses—no unusual number for modern wars—we should have to go abroad for them, probably to America, Germany, Hungary, France, &c. Whilst for pack-saddle transport, we should have for our mules to depend entirely on foreign supply.

During the Canadian Rebellion in 1838, the late Sir George Cathcart mounted the heavy men of the King's Dragoon Guards on Canadian and American horses; his experience on that occasion has often been cited, but never before given in his own words. Subsequently the Canadian horses of one squadron of the regiment were brought to England.

"I had [July 1838] my veterinary surgeon and Mr. Hammersley in the Upper Province of Canada purchasing horses. We have also very good horses, bought in the United States. I put the Canadians and Americans into the ranks as soon as possible, taking care the best riders had the worst-broken mounts. Every morning, five to seven, we have Adjutants' drill, and I am always there. In three weeks we made the horses do everything essential for service. Yesterday I had my first field-day with officers out. My horses do not equal the English in power and vigour; but their appearance, their temper, and their action, is superior to the average English trooper. Their shoulders are beautiful, so well back and light, and a broken knee is not to be found. I think we are better mounted than any foreign cavalry I ever saw, except those who had Hungarian or the better sort of Polish horses. You and I [that is the old Lord, his father] have often seen, with a Murat at their head, much worse mounted cavalry do great things." *

MR. SAWREY-COOKSON.

My best acknowledgments are due to Mr. Sawrey-Cookson; † he heartily and promptly entered into my views. In 'Baily's

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* Memoir of General Sir George Cathcart in MS. Much on subject of Canadian Horses for Army purposes in Report, Lords' Committee.—C.

† Mr. James Sawrey-Cookson, Neasham Hall, Darlington. He judged horses for the Royal Agricultural Society of England at Newcastle, as long ago as 1864.

Magazine,'* my friend is thus and worthily described:—Mr. Sawrey-Cookson is a graduate of Trinity College, Cambridge [1839]: he has been, and is, keen to hounds, good with his gun, and a M.F.H. of long standing. Mr. Cookson has not only followed his own bent, but as well he has done the state good service: he is one of the few Englishmen who have made breeding their study, and, by bringing to bear on the subject a practical knowledge and judgment second to none, he has done much, no man perhaps more, to improve the breed of the English thoroughbred horse.

The list of winners in the famous Neasham Stud is indeed a lengthy one. "Mincemeat," the Oaks winner in 1854. "Kettledrum" and "Dundee" first and second for the Derby in 1861. "Formosa" and "Paul Jones," first and second for the St. Leger, the former also dividing the Two Thousand Guineas, winning the One Thousand Guineas and the Oaks. Among other numerous winners are "Regalia," winner of the Oaks, and second for the St. Leger to that great horse, "Gladiateur;" "Brigantine," winner of the Oaks and Ascot Cup; "Pilgrimage," of the Dewhurst Plate, Two Thousand Guineas and One Thousand Guineas, and second for the Oaks, on three legs; "Jenny Howlett," winner of the Oaks; and "St. Louis," of the Middle Park Plate, sold for 2200 guineas as a yearling. The sum of public money won reaches, if it does not exceed, 90,000*l.* The writer in 'Baily' adds: "There is no better-known man in the North of England, and very few so popular."

NEASHAM HALL STUD FARM, DARLINGTON,
August 1, 1882.

In dealing with the subject of breeding from country mares and a thoroughbred horse, I address myself in particular to the tenant-farmer, who expects that horse-breeding will help him to pay his rent. I do not say, if he does me the favour to read and to carry out in practice what I am putting on paper, that he will necessarily breed a hunter; but I hope to show him how he may breed one with more than the ordinary degree of certainty, or, at any rate, a short-legged horse with substance and symmetry enough to find a market.

That horses are bred a good deal by accident and in every sort of way, there can be no question, and it will always be so. At the same time it is the uncertainty attaching to this "every sort of way" which is too fluky for the farmer, and which must be very considerably discounted if horse-breeding is to do him any good. In regard, then, to the mare: if the tenant has the money

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* 'Baily's Magazine,' December 1882, which see.

to buy a really clever one with blood, action, and substance, the game is more than half played for him; yet, good as she is, he may spoil her if he won't take any trouble, and merely uses a thoroughbred horse because such happens to pass his door; but if, on the other hand, he can't afford to buy such a mare, let him take the best he has, though she be far from perfect in shape, *provided she have frame enough*, with some action, or my hint won't hold water at all.

Before, however, coming to the point, I make two observations. The first is, that in choosing a sire the breeder must place no reliance on blood producing action or symmetry in *defiance of shape in the same.* Consequently he is at a disadvantage with the breeder of thoroughbred stock, who has pure blood to deal with on both sides, and also the aid of crosses which have been for the last thirty years or more, and which continue to be, fairly successful, and to have done more during this period towards improving the breed of the thoroughbred horse than at any other of stud-book history.

My second observation is, that though what may be called the accidental part of breeding very often serves the breeder of thoroughbreds, it would be simply suicidal to the tenant-farmer. I shall be found to explain, as we proceed, my meaning in regard to the first observation; and in regard to the second, it is this. Many breeders of thoroughbred stock, irrespective of shape either in sire or dam, send their best mares to the most fashionable horses, trusting entirely to high-class blood on both sides to produce a race-horse. No doubt this plan frequently succeeds, and saves a deal of trouble, at the same time it ought to be no matter of wonder that so many good horses on the turf are far from perfect in shape. "Beeswing" had straight shoulders, so had "Touchstone." "Queen of Trumps" could neither walk nor trot; and to ride "Rataplan" on the road was a caution. That good horse "Newminster" was the result, we all know, of sending "Beeswing" to "Touchstone," though the owner of the mare had not seen "Touchstone." But good as "Newminster" was, he was not faultless in shape. The late Sir Tatton Sykes,[*]

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[*] The sale by Mr. Tattersall of the late Sir Tatton Sykes' blood stock at Sledmere, on the 10th of September, 1863, which, extending over three days, realised double the estimate, viz. 24.171 guineas, was a never-to-be-forgotten event in modern equine history. I was there; the late Lord Gallway, M.F.H., a good judge, was, I remember, of our party. Several of the mares 6 and 8 years old had never been broken, and cut pretty capers in the ring. Many went to Berlin, many to Australia. Foreign interests were largely represented. An analysis of the three days' selling shows the following surprising results. The brood mares, 111 in number, averaged over 81 guineas each, the highest price given being 450 guineas. The stallions averaged 400 guineas each; 31 three-year-old fillies averaged 62 guineas each, the highest price being 150 guineas; 27 two-year-old fillies averaged 55 guineas each, the highest price being 135 guineas; 51 year-

than whom there were few better judges of what was really true shape, having had him and "Daniel O'Rourke" offered to him each for 1000*l.*, preferred the latter, as being the better-turned horse of the two. And I am quite of opinion that if both horses had been kept exclusively for country purposes, "Daniel's" "Birdcatcher" blood (that of the day for hunting) and symmetry would have proved him the best of the two. Assuming the fact, then, that many good race-horses are not perfect in shape, and that heavy-shouldered and otherwise bad-shaped half-breds are neither hunters nor hacks, it follows that, though the breeder of the former is often successful with his animals bred in all shapes, the breeder of the latter is more heavily handicapped. He can't get a good price for a "three-cornered" horse, and consequently his success will depend on producing fairly true-shaped ones. Therefore his aim must be to use such a sire as will ensure symmetry, as far as is feasible, upon the fact that external organisation generally follows the sire, and the bare principle that the best-shaped horses are, in the long run, the best for any purpose, last the longest, and bring the most money. In order, therefore, to secure symmetry in the produce of his mare, I shall first show him how he will not do so, excepting by sheer luck. I shall take the negative line of proof founded on cases that have come constantly under my notice for years, the like of which will be reproduced if he commences in the manner so many do to their cost, and which is one of the phases of fluky breeding not worth trying. I have made it my theory, in which practice has long confirmed me, that the mare must be roomy and have some action, as it is next to hopeless to breed from a mare without some flippancy about her. The breeder, further to ensure size as likely to command a price, selects the big horse of the neighbourhood, advertised, as I have often observed, "standing nearly 16 hands 2 inches, with substance," not knowing, or overlooking, the fact that the more size, the more liability to all natural blemish.

In due course the foal makes its appearance (a colt, we will suppose), and being what is called "a great good one," the dam is sent to the same horse again. Every day, however, as the foal grows older it grows plainer; and though, as a yearling,

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lings averaged 60 guineas each, the highest price being 165 guineas; 2 fillies foaled in 1855 averaged 25 guineas each; 8 fillies foaled in 1856 averaged 52 guineas each; 6 fillies foaled in 1857 averaged 50 guineas each; 18 fillies foaled in 1858 averaged 101 guineas each, the highest price being 250 guineas; 23 fillies foaled in 1859 averaged 111 guineas each, the highest price being 260 guineas; 5 geldings foaled in 1861 averaged 105 guineas each; 10 other geldings averaged 72 guineas each; and 15 hunters averaged 94 guineas each, the highest price being 330 guineas. The interest evinced in this remarkable sale was gradually on the increase from the first.—C.

if it has been well kept, condition will hide faults, it is unmistakably growing the wrong way every day, and at four years old is fit only for some such job as slow London night work, which simply means dead loss to the man that bred him. In addition to his shapelessness, being by a big horse, he is pretty certain to be destitute of action, as it very rarely happens that a big horse, even if he can move a bit himself, has the power of putting that bit into his stock. In making this statement, I do not wish to be misunderstood, as I allude in the main to dealing with the country mare, though I am bound to say, that with the thoroughbred mare I arrive pretty much at the same conclusion, viz. that too big a horse is a mistake. Of course, there is the glorious exception of "Stockwell;" and even in his case, marvel as he was with thoroughbreds, I do not believe, from his great size, and long hind-legs bent to a fault, that he would, as a rule, have got a nice horse either for the field or road from the sort of mare I am recommending to the farmer.

Returning to the farmer's mare, and taking the produce to have been a filly, the usual practice is, in order "to save a year," as it is called, to put it at two or three years old *to a big horse*, with the idea of expanding the mare, and that "size with two crosses is sure to hunt," and so it may. But I can honestly say, if it turn out to be a safe and easy hack, without which qualification there can be no chance of it getting into the hands of any one who cares about comfort after a hard day in the saddle with hounds, I have no recollection of having seen a good hack bred in this way, though others may, as there is no royal road to horse-breeding. For myself, however, I have no faith in mixing the mongrel blood of the country mare with that of a *lumbering thoroughbred* horse. I would advise my friend the tenant-farmer, in order not to go on further at fault, to try and put all this unsymmetrical work straight, by mating the old mare and her daughter with a horse of another cut altogether, viz. with short back, rather arched loins with length underneath, good bone, short fore-legs set on well in front and on the outside of him, long sloping shoulders, deep middle, not too short a neck, freedom from all blemish (particularly that of curbs, which blemish, I may here remark, is handed on more than any other to which horseflesh is liable, and takes so much off the value of otherwise a good-looking youngster), with a blood-like head, which is very important when dealing with the vulgarity of so many country mares in this respect, and standing not more than 15 hands 2 inches, with good width to follow, and fair width to meet. I make a distinction in these last two requisites for this reason, that although the chest of a horse is his basis, which fact is too often overlooked by breeders of blood-stock, and although no narrow-chested horse ought ever to be used with the expectation of getting a stayer (though a mare with depth is best so made), a thoroughbred country sire ought not to be too wide in front, most farmers' mares having this tendency. But if, perchance, the horse selected catch the eye as a little faulty in this respect, if his feet, as he stands, are nearish together, there is no great objection to the horse with a broad chest. But if, as he stands, the feet are wide apart, with the toe possibly turned in, which is common with wide-chested horses, there cannot really be a worse fault; and as it is quite six to four on this fault reappearing, to avoid a horse with it, is my advice. It is curious, and I believe a much unobserved fact by breeders of thoroughbred stock, how many really good race-horses have failed at the stud from this fault alone. "Lanercost" was a good race-horse, but got a lot of his stock with their toes in like "Liverpool," his sire, and consequently failed. "The Provost" was a good horse, but he had a toe turned in, and mostly put it on all his stock, and failed. "Tomboy," and his son "Gameboy" (a wonderfully fine-bred horse), got most with both toes in, and were also failures; in short, it is a fault I have had my eye on ever since I gave any attention to the subject of horses; and I never knew a sire either with thoroughbred or country mares ever succeed who had it. And I should be very glad, as I am always willing to learn, if any breeder can direct me to a sire *who has this fault* that has not put it on his stock, or that has been a success at the stud.

To return, however, to the horse I have described as most suitable for the sort of mare found among farmers. I am quite prepared to hear that such horses are difficult to find, and so they may be. Nevertheless, the fact remains that this stamp of horse is *the only one* to correct glaring faults in big mares, and as there are in all breeding districts horses approaching this description, *if a farmer will go a little out of his way to find them*, I can only say, in spite of being considered somewhat erratic to attempt to lay down any fairly hard-and-fast rule by which a vast amount of uncertainty attending the breeding of horses may be avoided, that if the horse I have described be tried, though the breeder may not at first like his foals so much as those by the big horse, they will improve on him as they grow older, and sell when their time arrives. In this district little horses have always done the best. "Oberon" and "Agricola" were such, the former barely 15 hands 1 inch, but very wide, with big limbs. "Old President" and "Perion" were the same stamp, and have left indelible marks to this day. "Cain," sire of "Ion," one of the best racing strains of the day, was a beautiful horse, standing 15 hands 2 inches, with a thoroughly Arab head, which he put on his stock even from the commonest cart-mare. "Omen," by "Augur," son of "Birdcatcher," out of "Comfit," by "Sweetmeat," had bone enough, but no more; he was a little horse, so much so, that the farmer, as usual, condemned him. *But he left his mark*, with the few chances he had, and if alive now, would have had the best mares in the country; as his stock have the "Birdcatcher" type, which sells them, *and they are good hunters.* All these horses finished in the district where they began, as their stock had only to be seen to ensure good seasons for them; whereas the big horses, though often prize-takers at Agricultural Shows, had to pass from one county to another, leaving behind them too often a lot of incapable brutes, and showing in many cases unmistakable symptoms of being wrong in wind before leaving the breeder's hands.

In conclusion, therefore, *I would not begin with a mare requiring too big a horse;* for, to speak plainly, I hate the sight of a big horse, big hound, big bull, either for activity or stud purposes. But if a tenant-farmer has a mare which he considers requires a big horse, let me beg of him to pick a compact big one, and one comparatively much shorter in his back than the horse standing 15 hands 2 inches need be, *as a long-backed big one will spoil nine mares out of ten*, outline favouring the horse in most instances. "King Tom"—and I must say a word of him to the farmer, though I could not of his half-brother "Stockwell"—I consider was the precise type of the big horse I should recommend. And though he was not within the compass of the farmer, his sons are about the country, and all have, as far as I have seen, his peculiarity of short back, almost commencing from the withers. This has secured to them the power of putting it on their stock, which consequently are first-rate jumpers, as the old horse did on his stock, and which served them so well where the finish was up hill, Ascot to wit, over which course so many "King Toms" have won races, but never elsewhere ran up to that form again. "King Tom" also had the straight hind-leg, which for hunting purposes is the strongest; and in this respect his sons are like him, and ought to be used when accessible.

One word more and I have done. Do not put a thoroughbred mare, or one with a few crosses, to a coach-horse, trotter, or cart-horse; for though it may come off now and again, it is breeding upside down, and another phase of flukyness not worth a trial.

Mr. Pain.

My friend and colleague on the Council of the Royal Agricultural Society, Mr. Pain, ex-Master of the South Wilts Foxhounds, with inherent and helpful good-nature, not only spent part of a hunting morning in writing for me the following letter, but also very kindly interested his partner, Mr. Tattersall, in my undertaking. I hail with great satisfaction two additional and altogether undoubted authorities; and I have great pleasure in thanking both these well-known gentlemen for their valuable and welcome contributions.

"Audley's Wood, Basingstoke,
"*February* 22, 1883.

"Dear Lord Cathcart,

"The breeding of the thoroughbred and cart-horse is much more easy to write about than the half-bred, which includes every horse not in the Stud-book. The subject is one of difficulty, as it is almost impossible to lay down a principle by which you are certain to get a good half-bred horse, as in breeding these animals they so often 'throw back.' All I can do is to give an opinion as to the best course of proceeding to secure for general purposes a good sort of half-bred. The stallion should be a long, low, muscular horse, with *strong* shoulders, laying well back; short, flat legs, with plenty of true action; standing not over 15·2, but looking much higher, and always with a good countenance. We have then something to begin with. The mare should have as many crosses of *blood* as possible, provided she has size, plenty of bone, is very roomy, with good feet, and as big as possible, provided she is level made. No doubt the perfection of a brood mare was the old-fashioned 'Cleveland,' but she is as difficult to find now as a nugget of gold on Salisbury Plain. Forty years ago there were plenty to be found, but a great desire arose to obtain more action, and for this purpose many Hanoverian stallions were imported, and from that time the breed became deteriorated, the foreign stallion having imparted softness and entirely changed its character. The foreigners about this time begun purchasing all the good mares they could find. In Ireland* no man would part with

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* Ireland is the great nursery of hunters. The agricultural returns ('Whitaker's Almanack,' 1882, p. 386) shows an increase of horses in England and Wales of nearly 5000, a decrease in Scotland of 1000, and a decrease in Ireland of 10,000. The late Lord Charlemont, the largest breeder of half-bred horses in Ireland, told the Lords' Committee that tillage there was done by all sorts of horses, from the pony to the thoroughbred. The hunter got by a thoroughbred horse out of a cart-mare with a dash of blood in her. Clydesdales have been imported into Ireland, Meath, and co. Dublin; this is disadvantageous as regards the breeding of hunting horses. The 15·2 Irish cob horse, thick, short-legged, and well-shaped, is getting scarce. Ireland differs from England remarkably in this respect, much greater importance and interest is attached to pedigree: even as regards a half-bred horse there is always forthcoming an ample pedigree.—C.

his brood mare or one likely to prove one. I well remember a large dealer, being anxious to obtain a good huntress, tried every means without success until he put a hundred bright sovereigns on the table, the sight of which was too much for Pat. Many reasons can be given for the scarcity of good half-bred horses, but the thing to do is to endeavour to regain the position we have lost. We shall never succeed in doing much in England—in Yorkshire, parts of Worcestershire, Lincolnshire, and Shropshire—the latter, years ago, being the best county in England for hunters—owing to farmers turning their attention to the manufacture of beef and mutton, which comes to hand much quicker than horseflesh. We may do something in the West of England and South Wales, where there are small grass farms and a lighter cart-mare exists; but our horse-raising ground must be in Ireland, where every man, priest or peasant, is fond of the animal. Some years ago I judged horses and hounds at Cork: I think it was in 1861. The stallions were paraded, and, when I turned to my colleague with the remark, 'I shall not give one of these a prize,' he begged me, as I valued his life, to postpone judgment until he had gone. That night at the Society's dinner no one would hear me, as I had discarded a stallion that had won two prizes and wanted the third, and then would be called 'The Champion Sire of the South.' That horse was useless, unsound in every respect, but he had served at two guineas for years. There are now many good stallions in Ireland, but the fee is too high for every small man to use them. I would suggest that the Government should come forward and assist by locating in different districts in the south and west of Ireland some really good thoroughbred horses, which should travel the districts and serve *all* mares gratis, the owner of which could produce a certificate of hereditary soundness from a qualified veterinary surgeon, who should be liable to a penalty for giving a false one, and no mares except thoroughbred or cart should be exported from Great Britain or Ireland for three years. By these means I think we should partially regain our lost useful horse, and become more independent of foreign countries for our horse in times of peace or war.

"Your Lordship's faithful servant,
"T. PAIN."

MR. TATTERSALL.

"Albert Gate.

"MY LORD,

"I have read with great interest the exhaustive articles 'On Breeding Half-bred Horses for Field or Road,' written by my friends Mr. Lumley Hodgson, T. Parrington, and Colonel

Luttrell, and other gentlemen no doubt equally well up in the subject, and I think they have left very little more to be said on the point how to breed the hunter and hack. The question is, how and *where* to find the raw material—especially the roomy mares—which all the writers mention. For the last quarter of a century, and most likely for a much longer period, our breeders have been selling the "geese which laid the golden eggs," and the intelligent foreigner has been buying them. He would take none but the sound, the well-made, short-legged, active mares, and he has left us what Mr. Bright called 'the residuum,' and the result is that we have a short crop and many weeds.

"It hardly pays a farmer to breed a half-bred horse, except under particular circumstances, and it pays him better and with greater certainty to breed cart-horses, sheep, and cattle, and therefore we are obliged to depend largely upon foreign countries for our horses as well as our food, a thing our ancestors would not have believed, and which does not redound to our credit as Englishmen. Foreign countries are wiser in their generation. They do not leave the supply to chance or the caprice of individual breeders, who cannot be expected to go on breeding at a loss for the good of the country if the Government neglects its duty.

"In every other country in Europe there are large breeding-studs, conducted on a well-managed scheme for supplying every district with good, sound, useful stallions, bred for the purpose, and sent out with a proper certificate of soundness to serve the mares of the farmers and small breeders at a uniform and very cheap rate, and no stallion is allowed to serve mares unless he has a proper certificate of soundness, &c., &c.! This is the best and I think the only sound plan, to do away with the 'lame, the halt, and the blind' weeds, which are allowed to poison the few good farmers' mares left to breed from; and these horses must be sent to the farmer's door, or he will send to the nearest horse, or wait till some Cheap Jack calls as he passes. I know several noblemen and gentlemen who have kept good horses on purpose at a cheap fare, and have been so annoyed at the breeders not taking the trouble to send their mares a few miles, that they have given up keeping a good horse for people who did not use him! There ought to be a Government stud for stallions, at all events, and proper men to travel with the horses from a depôt in every county or district, and I think this would be beneficial and popular in Ireland, as there is a demand for useful stallions to breed hunters, and very few private gentlemen can or will keep them now for the good of the country. Such a system is carried out in Prussia, where they have 2000 stallions belonging to the Government stud, under the management of such first-rate judges as Count Lehndorff and other gentlemen, travelling the various districts, at a fee of from 7*s.* to 10*s.* or 12*s.* of our money; and I am informed by Count Munster that now the studs are well-established the cost to the country does not exceed 100,000*l.* a year—a fleabite for a rich nation. In Austria they have an equally large, or a larger number of stallions for the service of the country, under the management of first-rate judges; and Count Żaparey has lately purchased 'Craig Millar' and 'Ruperra' in England at large sums, and from these and similar horses they breed in their different studs the stallions which are sent through the country districts.

"The same thing, I am told, is done in Russia, on even a larger scale.

"The late Emperor of the French established studs all over France, and although they were dispersed after the Empire, the Republican Government has had the sense to re-establish them, and at the present moment I believe England is the only country whose Government takes no trouble to keep up the national supply of good horses. My friend, the late Mr. Cavaliero, used to tell me that England was very foolish, and was losing a large trade in horses, which she ought to have kept in her own hands; and there was no cleverer man or better judge ever sent over to this country to pick up and buy our best thoroughbred stock.

"Colonel de Butts, an Irishman by birth, but an Austrian cavalry officer, bought 'Buccaneer' and other good horses, and he told me that he had for many years bought, whenever he could get them, the best mares of the best old blood out of Ireland, as well as English half-bred mares.

"So that our best mares for years have been drained away from the country, and we are now obliged to buy from foreign countries, and largely from America—horses for harness more especially—instead of breeding them for ourselves, as we ought. For in spite of all disadvantages and under all difficulties there is no country in the world where such good horses are bred as in England, and this is proved by buyers coming here from all parts of the world to buy our best blood to breed from and to replenish their studs. There is a something soft in the foreign horse generally, and the English horse, like the Englishman, when it comes to the pinch, shows more 'real grit' than the horse of any other country.

"I quite agree with what one of the writers has said as to the Norfolk horse or mare for a cross with the thoroughbred. They have some real good blood in them. I remember some of the Norfolk stallions when I was a boy, and I have never seen such trotting-action since.

"I had an old 'Shales'* mare to ride in the holidays. She was a dark chestnut, with some white on her legs and a slight streak on her face, with a head like a pure Arab. She was warm in her temper, and could trot up to seventeen or eighteen miles an hour. I rode her hunting in the holidays, and one day, when the Royal Staghounds met at my father's farm at Dawley Hall, with Charles Davis, I think, on 'The Hermit,' I, then a boy in a jacket, asked the man on the deer-cart what deer he had. Upon which he said, 'Old Ripley,' so named because he always ran to or near to Ripley, in Surrey. A young officer laughed at my asking about the deer! I made a mental note of him! The deer went away straight to the Thames, about ten miles, swam it, and went away for Ripley. In the latter part of the run I passed my friend of the morning, and said, 'I am afraid you will not get to Ripley to-day, sir.' His horse was dead-beat then, and my old mare was going like a steam-engine. I saw the deer taken at Ripley; there were not many up. The mare trotted home the twenty-one miles as gay as a lark, and as only a real good bred one could have done. She ran away with me when she was 27, and died from an accident in the field when turned out. I often trotted her fifteen miles to London to breakfast, and home in the evening, in about an hour. She was a real good Norfolk hack. The great difficulty, no doubt, is to find the right sort of mares and encourage the farmers to breed from them; and anything that can be done to that effect will be a step in the right direction. We ought to give more money for our troop-horses. What farmer will breed a half-bred horse to get 40*l.* or 50*l.* for him at three or four years old, when he can get the same price for a cart-horse at two years, and work him into more money till he is four or five years old? We should get up our regiments to their full complement at once, and encourage the breeders by giving a better price for their young horses. Buying in the cheapest market is not always the best policy for a nation; and although upon a sudden emergency 2000 or 3000 horses *might* be bought from abroad and in the home market, they would not be cavalry horses, as it takes time to make and train them, as well as the men who ride them, and who deserve to be well mounted.

"There are a great many good hunters still bred in England and Ireland, and I feel sure that anything the Royal Agricultural Society can do to encourage the breed of good sound horses will entitle them to be thanked as benefactors to the

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* For "Marshland Shales" see *ante*, p. 36.

country; and there is one thing quite certain, that as we have lately seen here, a good horse, such as 'Isonomy,' will always remain a great attraction to the great body of Englishmen.

"E. TATTERSALL."

GENERAL CONCLUSION.

I am about to bring to a conclusion that which, thanks to my friends, the reader will, I hope, agree with me in thinking a useful and practical paper: indeed it must be a dry flower out of which the bee sucks no honey. We need not regret in the authorship any want of absolute unity, for all the best big things are the result of many lesser efforts. My several correspondents give the experience of their lives, preached in open-air sermons, as though from out their saddles or their stables. It is most remarkable that, without concert, they all should be so agreed. If my friends, or some of them, have been successful as breeders (every why has a wherefore), it is, I warrant you, because they are never-to-be-denied sort of men, who would have succeeded in anything they pleased to undertake. Special talent is only general talent specially applied. The man of reading and culture may perchance find in these pages at least some old truth in a new setting: there is matter I hope to attract even those who seldom partake of the dainties which are bred in a book.

Some qualified talent might with great advantage, I think, be specially applied in following up a true line of scientific inquiry: I should like to see a paper in the 'Journal' of the Royal Agricultural Society on the Philosophy of Horse Breeding. It would also, throughout the world, be of practical importance to trace the effects of acclimatisation * on the English thoroughbred horse. We know but little of the general laws that regulate creation, nor have we perhaps a great desire for that knowledge, it being so much easier to believe than to be scientifically instructed. A grand and almost untrodden field of inquiry is opened up to those who desire to think of things beyond their names. The laws of embryology; variation, and variation under domestication; correlation, descent with modification, unity of type, the tendency to reversion, and the law of extinction—all these laws, and many others, are in action, and of them we are profoundly ignorant. There is the fossil horse of America; † why on that vast continent were all horses killed off?—and until reintroduced by the Spaniards there were none. Again, in Yorkshire, Black Cattle gave place to Longhorns, they in their turn to Shorthorns—the Shorthorns that are

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* See *ante*, p. 5.

† For the geological history of the horse in the Old and New Worlds, consult 'Chapters on Evolution,' by Andrew Wilson, F.R.S.E. London: Chatto & Windus, 1883. At p. 94 are diagrams explanatory of the early horse, with three and four toes.

at this moment supplanting inferior breeds all over the world—old forms, under uniform laws, every day being supplanted by new types and modifications. I consulted Mr. Horace Darwin, and had from him an obliging reply: the study of these laws with a view to their practical application is not professed by him, but he was so good as to refer me to an article in the current edition of the 'Encyclopædia Britannica,' under the heading of "Breeds;" also to the work of his eminent father, 'The Variation of Animals and Plants under Domestication.' Pray bear in mind that analogous laws in many instances regulate alike the vegetable and animal kingdoms. True it is that Nature never sent her work for man to mend; but as all animals are under the dominion of man, so also is their modification within the necessary limits of Nature's laws—hence concrete interest in the study of Law. He who blindly worships chance can have no ground for a belief in seed-time and in harvest.

Turning from science to art, the Royal Academy might perhaps with advantage devote one of its empty rooms to a winter loan exhibition of the portraits of famous horses by excellent artists, of which pictures, say from 1700–1820, the country is replete. How popular, how instructive and encouraging such an exhibition would be; and how its arrangement would have delighted the late President of the Royal Academy, who delighted not only in the weapon of his art, but also in the more exciting brush of Reynard the fox! What a trotting out there might be of clever old horses, by such clever old artists as Alken, Chalon, George Morland, Stubbs, Sartorius, Ferneley, Herring, Ward, Landseer, and no doubt many others, who, if unrecalled by me, are yet well known to fame.*

Wisdom boiled to an essence is not in my opinion the best food for the robust mind. It may be expected, however, that, considered as a whole, I should sum up the results of the present inquiry. I have no wish unduly to obtrude any view of mine, but would rather cite the text that should, I often think, adorn every farmer's office or business parlour: "Prove all things; hold fast that which is good."

The question is, the breeding and management of half-bred horses?

Management I will dispose of in a few sentences, and thus reduce and simplify the essential question.

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* Messrs. Graves, of Pall Mall, have favoured me with a list, 1780–1820, ncluding twenty-seven names of animal painters. Illustrations for this paper should be furnished by the Print Room, British Museum. Mr. Walter Gilby, in London and in Essex, has a large and complete equine collection—paintings and prints; he mentions Lord Rosebery's splendid pictures at The Durdans, near Epsom. The famous 'Anatomy of the Horse,' by Geo. Stubbs, has recently been eft to the nation: Landseer Bequest.—C.

By management, I do not mean that cleverness which, for example, makes nine horses out of ten look better in a dealer's yard than anywhere else. By management, I would convey the sense of skilful treatment which, embracing manners, is comparatively well understood. The true horseman should have an instinctive and minute perception of all the circumstances which in the horse occasion progress or retrogression, pleasure or pain. Retrogression, we may hope, shall be exceptional; and progression should be after the admirably gradual manner of old Milo of Crete, who ultimately carried an ox, but prudently began with it, as soon as ever it was calved.

The question, then, as stripped stands thus: the breeding of half-bred horses? The information, the evidence bearing on it would, if digested in exact method, arrange itself for convenient consideration under the following subjects—the two essential factors, the horse and mare—their conjunction and its consequences, and therefrom arising a few general observations.[1]

The horse, the thoroughbred horse, generally available for half-bred mares, in point of shoulders, substance, and soundness, is not as good now as formerly. Yet it is generally acknowledged that blood should be on the side of the sire, and a desire is generally expressed for that quality which is the evidence of blood. Even a coach-horse it is said should be got by a thoroughbred out of a half-bred mare. There is a general and satisfactory agreement of opinion that some known and named thoroughbred horses have or had a remarkable power of getting and stamping uniformly good cross-bred stock,—such a horse, for example, as "Perion." Farmers should seek stallions *known* to cross well with half-bred mares—a sire with known power to stamp his own facsimile. A big overgrown horse we are particularly told should be studiously avoided. Such a one is apt to get roarers. A horse that travels is more prolific than one that remains to serve at home. The cost of service, often, too often, unduly considered, is a serious consideration. Fashion, which is slavery in disguise, has had a disastrous effect—any such influence should be ignored by the farmer. The horse must not only be good in himself, but he must be fitted to the mare to blend with her. Violent contrasts in breeding, as in art, are usually best avoided. There is, further, a disturbing influence of friendship. I soon discovered that in Yorkshire there was a law in action, unknown to science, which I was obliged to name for myself: I called it the wife's-cousin-principle; applied by the vulgar it would resolve itself into this expressive vernacular phrase—"sending the mare to the man, not to the horse."

The roomy mare—where is the universally wanted roomy mare? The worth of anything is best known by its want. It is suggested that the foreigner has taken away our mares as a man eats cherries out of a pottle, first picking the best, then eating up all. People forget the great and material influence of natural barriers, which steam and rail suddenly broke down ; the rapidity more than the mass is telling, and has led to the consequently wide and extraordinary geographical distribution of the thoroughbred and other English horses. Railways in England have dislocated or distracted, not lessened, the demand for horses, an illustration of a principle I laid down in a previous volume of this 'Journal':—"True it is that the creation of any one exceeding industrial momentum is certain to excite an endless parallel, and converging lines on unexpected, and often marvellously rapid progress."* Hence the general and profitable increase of the Clydesdale, the Shire, the Suffolk, and other heavy horses. In very many breeding districts sheep and cattle have eaten up the horse. Every one, without any exception, interested in half-bred horses, deplores the virtual extinction, consequent on the various causes stated, of the famous Cleveland breed, together with the old pack-horse and Chapman mares, with fine shoulders but drooping quarters, and the farmers' mare of all work—the general-purpose mare. The farmer who works his brood-mare has no doubt a pull over any mere stud establishment. The crying evil is, we constantly breed from refuse mares : the farmer, if he reflects, really knows better—it is like seeking to skim cream off blue-milk ! The only plan is to retain on farms likely fillies to breed from. The dam, the mother, is an all-important factor ; in addition to half the original germ, she solely nourishes the embryo. Above all things, aptitude and energy are elements of excellence in anything : it is essential the mare should have energy,—that is, mettle. That ancient Grecian sporting man understood the art of breeding who, when asked at the supreme moment if a certain horse would probably win the great Olympic Stakes, unhesitatingly replied, "You must ask the horse's dam."

He has made a good progress in a business who has thought well of it beforehand; yet, in the conjunction of horses, it appears men often act with no more consideration than their wives would give a hasty pudding. In this affair we should remember the stable-door is shut in Nature's face, for under domestication natural sexual selection cannot exist. No breeder of experience doubts the tendency to inheritance, though the exact laws are unknown : like produces like — the mingled qualities of parents — is the rule, with, especially in cross-breeding, numerous and most disheartening exceptions. All are agreed that in cross-breeding there must be, to produce a

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* Jour. Roy. Agri. Soc. vol. xi. Art. "Wool."

successful result, a previous distinct and defined object—an aim: on the barn-door of the mind chalk up a form perfect in itself, and work up to it. The unskilful or careless so badly pair as to neutralise good qualities, and increase defects. The instinctively able breeder, with such natural faculties as the penetrating vision that observes little things, the delicate touch to further discover and appreciate them, the fine sympathies which give insight into nature, all heightened by practice in every nicety of the art of breeding, so blend together almost invisible deviations as to correct minor defects in either parent by the other's complementary excellencies. The grand object and aim are to secure the begetting and propagating of excellencies.

The further general and explanatory observations shall be few. If you do breed half-bred horses the general opinion is that, other considerations fitting, you should aim high—a good horse eats no more than a bad one. If you do not get a valuable weight-carrying hunter, your hunting misfits may be valuable short-legged horses, with shapes and substance to command a market and pay expenses. The problem of our age is to save time, hence rail and wheels; "the grandfather's hack," like the saddle-bags and pillion, are things of the past. Yet the men of the present like a "blood-tit," and the gentleman's coach and the lady's carriage must be horsed with well-bred horses, with shape that would become a desirable hunter. One argument against breeding, as drawn from a neighbour's failures, should not be allowed to weigh: because one man has a sore nose, there is no reason we should all wear plasters.

When a prudent man embarks his capital, his first consideration is, may I reasonably expect it after many days to return to me? Will it pay to breed half-bred horses? That, as I gather from the evidence, depends on various individual circumstances—such as prices, markets, locality, opportunity, means, tastes, and pleasures; all these and many other considerations must be weighed and taken into account. In this matter, as in most, every tub must stand on its own bottom: regarding it I will cite further and in conclusion only one phrase more—it was begotten of Mother-wit by the great Lord Chatham—"in this and all the other affairs of life we should consult and be determined by the dictates of common sense."

The horse has followed man over the whole surface of the earth, from the Ganges to the Rio de la Plata; and from the sea-coast of Africa to the mountainous plain of Antisana, which lies higher than the Peak of Teneriffe. The northern birch in one region, the date-palm in the other, afford refreshing noon-day shade to the wearied horse—all are of the same species; and the same species of animal which contends in Eastern Europe with bears and wolves, is exposed in a different latitude to the attack of tigers and crocodiles.*

Considering the wonderful plasticity of the noble animal's nature; remembering the power that man has to mould it to his pleasure and to his purposes; remembering that in this respect the Englishman, above all men, is pre-eminent; that England is the birthplace, the cradle, the home of the thoroughbred, the universally undisputed aristocrat of the equine race, how can I doubt or question the future of the English horse? The English horse, moreover, is a part of the history of England:—

> "We are the sons of men
> Who conquered on Crécy's plain,
> And what our fathers did before
> Their sons will do again."

The English horse, of every race, is an integral part of that English literature which is the treasured possession, and one of the strongest of the many strong bonds which unite the vast world-spread Anglo-Saxon family. That noble Chaucer, in those former times, who first enriched our English with his rhymes; Shakspeare, the dear son of memory, that great heir of fame; Sir Roger de Coverley, whose hunting-horses were the finest and best-managed—his tenants are still full of the praises of a grey stone-horse that unhappily staked himself several years since and was buried with great solemnity in the orchard; the silent "Spectator," mounted by Sir Roger on his chaplain's easy pad—the silent "Spectator" who nearly lost them all their sport by forgetting to cry "Stole away!" but who later made amends by saying that hunting and horsemanship were the best kinds of physic for mending a bad constitution and for preserving a good one; until these things, all these things—History, Chaucer, Shakspeare, Sir Roger de Coverley, the "Spectator" —are all, all forgotten,—yes, I make bold to say, perhaps afterwards,—the half-bred horse will continue to be produced in England, and that in perfection.

II.—*Shorthorns in Scotland and Ireland.* By JAMES MACDONALD, Editor of 'The Farmers' Gazette,' Dublin.

IMPROVED Shorthorns, unlike prophets, have had no lack of honour in their own country. For a long period of time they have been freely accorded the first position amongst English races of cattle. To that distinction the numerical strength and high general character of the breed, coupled with remarkable

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* In South America the horse has to contend even against fishes. The electric eel, the *gymnotus*, six feet long, carries a battery strong enough to kill the largest animal at one discharge.—See Alex. von Humboldt, 'Views of Nature.'

influence in improving inferior varieties, have won for them an indisputable claim. Much, however, as Shorthorns have done in England, it may be questioned whether they have not in other countries even outstripped their home achievements. In foreign fields: America, the Continent of Europe, the British Colonies, and other far-away countries, the breed has established itself as a most effectual agent in the development of national resources. Then, nearer to its native land, it has on the well-tilled farms of Scotland and the green pastures of the Emerald Isle accomplished work of great magnitude and value. What the breed has done in Scotland and Ireland the following notes are intended mainly to indicate. They are offered as a humble contribution to the treatment of a vast subject which has not as yet received due attention from the live-stock historian.

The peculiar mission of the Improved Shorthorn would seem to be to remove or make up for the deficiencies of other breeds. Its own meat-producing powers are of the highest order, and, if it had been kept within itself and turned solely to this purpose, it would no doubt have attained a creditable position. The breed, however, possesses in an eminent degree another property, which has raised it far above the mere direct butcher and dairy standards, and that is its remarkable adaptability for crossing with and improving other varieties of cattle. The value of this special power of transmitting its good points to other varieties, and thus raising their usefulness, greatly exceeds the breed's own meat-producing faculties, or any other excellence which, if it had been kept within itself, it could possibly have developed. The great bulk of Improved Shorthorns have therefore, during the existence of the race, been employed as indirect, rather than direct, agents in the production of meat—in bringing meat out of other races rather than raising it upon their own frames. It was for this far-reaching purpose that the breed was first introduced into various parts of Scotland and Ireland about fifty or sixty years ago. To this great object it has ever since been in the main devoted. How well it has fulfilled the mission an attempt will now be made to show.

The agriculture of both Scotland and Ireland has made remarkable progress during the past fifty years. In bringing about this rapid development, many agencies, such as extensive drainage, the use of bone, guano, and other extraneous manures, the extension of turnip-growing, improved methods of cultivation, the adoption of labour-saving implements and machines, the use of cakes and other feeding-stuffs, and the general advance in the well-being of the country, have all gone hand-in-hand with the improvement of live-stock. It cannot be doubted that the last-named factor, the improvement of cattle in particular, has played an important part in the good work, and that in this respect Shorthorn breeding has been the most active and efficacious influence. To estimate exactly the extent or value of this influence would be impossible. It has certainly been most powerful and valuable, more than sufficient to stamp the spread of the Improved Shorthorn as a great national boon.

WHAT SHORTHORNS HAVE DONE IN SCOTLAND.

Reference to some historical notes, given in the form of appendices, will show that in Scotland the breed began its work at a very early date. Mr. Robertson's herd at Ladykirk, Berwickshire, established more than ninety years ago, very soon made an impression upon the stock in the Border districts. Mr. Heriot, of Ladykirk, whose father accompanied Mr. Robertson on his first tour of inspection into Durham and Yorkshire, described, in a paper read before the Members of the Highland and Agricultural Society of Scotland, at Inverness, in 1839, the "effect produced on the race of cattle in the Border counties" by the use of pure bred Shorthorn bulls as "most remarkable." He adds, "I perfectly recollect the time when, generally speaking, the cattle of Berwickshire and Roxburghshire, although of a breed of *Shorthorns*, were kept to a great age, and then fattened with difficulty, while now the race in these districts possesses all the qualities of profitable stock. The *Improved Shorthorns* are now spreading far and wide."

Mr. Rennie, of Phantassie, East-Lothian, more than half a century ago astonished the country with his splendid cross-bred oxen, produced by pure-bred Shorthorn bulls. At a time when from 15*l.* to 20*l.* would have been thought a very handsome price for a fat bullock four or five years old, Mr. Rennie received as much as 33*l.* a head for steers not more than thirty or thirty-six months old. In many other districts throughout the south of Scotland, Shorthorn bulls had, during the first three decades of the present century, been introduced and used for crossing purposes with great effect. The native breeds were of various kinds, but were all deficient in size, form, and quality, as well as slow in growth and difficult to fatten. The Shorthorn bull, wherever tried, at once produced a marked improvement in all these points. Indeed, the improvement in the first crosses over the cows from which they had sprung was in many instances so remarkable, that the fame of some of the earlier Shorthorn sires still lingers in farming circles.

Mr. James Currie, late of Halkerston, referring to the cattle of his district, says:—"I believe the general stock of cattle in this part of Mid-Lothian, before Shorthorns were introduced, were very rough and bad to fatten, as compared with the crosses of the present day. These crosses, mainly owing to high breeding, are worth at least one-third more per head than the old unimproved cattle, while they can easily be finished from one to two years sooner. On the farm of Wester Middleton, which I managed for seven years, the cows, when I got them, were altogether a rough lot, and no one could say how they had been bred. The young cattle were never fed till rising four years. I put a pure-bred Shorthorn bull to the cows, while the heifer calves of that and following years were always, at the age of about fifteen months, put to a pure-bred Shorthorn bull, the calves being allowed to suckle their dams. The heifers, after having fostered their calves, and when about three years old, were fattened, thus not only reaching the butcher a year sooner than the old unimproved cattle, but also producing and fostering one calf. From 1870 to 1875, the average price obtained for these heifers was from 22*l.* to 25*l.* a head. The bull calves were kept for breeding, and were sold privately at home at the age of from nine to fourteen months, at from 18*l.* to 24*l.* a head. They went to all parts of the surrounding country, and did a vast deal of good. I may add that, after the fourth cross, the produce of these rough, slow-growing cows, would have passed for pure-bred Shorthorns. They had grand constitutions, and never having been overfed, were always in demand. The farm of Wester Middleton lies from 800 to 1100 feet above the sea-level."

By 1840 the use of Shorthorn bulls had become pretty general in the chief cattle-raising districts of the south of Scotland; and by degrees the small, ill-shaped, slow-maturing varieties that early in the century had occupied the greater part of the country gave place to a vastly superior stock of cattle. In the West, the Ayrshire and Galloway breeds have survived, and are fulfilling useful purposes. Beyond the limits of these two breeds, however, the Shorthorn element has for many years prevailed in the southern and midland counties. Mr. John Wilson, late of Edington Mains, Berwickshire, writing on the 25th of December, 1882, in reference to the stock of cattle in the lower valley of the Tweed, says:—"Since the end of the last century the cattle bred in this wide district have been more or less of the Shorthorn type; only a very small percentage of them has at any time been Shorthorns of pure pedigree; but the general stock has partaken sufficiently of the characteristics of this breed to warrant their being in a loose way classed as belonging to it. From an early period the district has possessed a good many herds of pure descent, which have done excellent service in keeping up a regular supply of good bulls. Up to about 1830 the cattle fattened in Berwickshire were for the most part home-bred. Subsequently to that date, as the result of extensive tile-draining and the general use of bone-dust, guano, and other fertilisers, the turnip-crop was so much increased as to require a greatly augmented stock of cattle to consume it. These extraneous supplies of young store-cattle have been derived from the northern counties of England, from the grazing farms in the upper valley of the Tweed and its tributaries, and from Ireland. This demand for store-cattle has gone on increasing, and has now attained very large dimensions. I cannot say much for the quality of these imported cattle. They are all more or less of the Shorthorn type, and a portion are really well-bred; but a large portion are of very mongrel breeding, and nearly all have been further deteriorated by being poorly fed during their first year. I do not need to point out that animals which have been poorly kept as yearlings can never, by any process of after feeding, be finished off so as at all to equal the quality of others that have been well kept from their birth. A large proportion of the home-reared calves in this district are the produce of the cows which belong to the farm-servants, and which consist chiefly of an inferior class of Ayrshires, and yet, when crossed by a really good Shorthorn bull, it is altogether astonishing to see how good the calves are."

With but little modification, Mr. Wilson's remarks might be applied to the whole of the Lothians and the eastern counties as far north as Forfarshire. In some districts home-breeding kept pace with the demand for fattening cattle to a later date than in Berwickshire; but all the lower and better-favoured parts of the extensive region indicated—the parts adapted to the growing of wheat and potatoes—have for many years had to buy-in a large portion of their supply of store-cattle chiefly from upland Scotch farmers, and from Ireland and the north of England. In these bought-in cattle there has been a most marked improvement in recent years. A good many are still inferior in form and quality, and badly reared, but the great majority approach nearly to the Shorthorn type, and are thus far superior to the corresponding class of cattle even ten or fifteen years ago. The home-bred cattle are decidedly better than either the English or Irish, but the home-bred stock are now very scarce. In recent years there has been a marked decline in cattle-breeding in upland as well as lowland districts of Scotland, a circumstance attributable mainly to the want of confidence, aroused by periodic outbursts of destructive contagious diseases. With less risk of loss from contagious diseases, home-breeding would certainly increase, and the country would thereby be vastly benefited. The improvement in store-cattle offered for sale in Scotland has shown itself even to a greater extent in form, quality, and precocity than in size. Formerly, few cattle were fattened until they were more than four years old; now the majority are slaughtered before they complete their third year, many indeed, when only from twenty to twenty-four months old. This is a great gain, and to a large extent it is due to the influence of Shorthorn blood.

The craze for crossing native breeds with Shorthorn bulls which had been set agoing by the achievements at Ladykirk, Phantassie, Ury, Eden, and elsewhere, took root in the county of Forfar at an early date. The native cattle consisted largely of the Polled varieties, and so successfully did the Shorthorn bull mate with these, that several farmers ran out their stock of polled cows by persistent and unregulated crossing—an error which they soon bitterly regretted. The crosses far excelled the native stock in size and early maturity, but it was found that, wherever the supply of native cows had been once exhausted, the new system of breeding became less successful. Among the first in the county of Forfar to use a pure-bred Shorthorn bull was the late Mr. David Morgan, Mains of Irwin. About 1830 he received as much as 30*l.* a head for his cross-bred bullocks; although at that time native oxen, ripe in years and fattened, were not worth more than from 15*l.* to 18*l.* a head.

The north-east of Scotland, in particular the county of Aberdeen, has long been famed for the production of the choicest class of fat cattle. For nearly half a century the raising of beef for the London market has been the staple industry of the lower parts of the north-eastern counties. In the shops of the great West-end butchers "Aberdeenshire beef" has for many years brought the top prices. The improvement of the native races of cattle in this part of Scotland by crossing with imported breeds was commenced about 1770. Until after the advent of the present century, however, almost the only aim which improvers had in view was the raising of bullocks sufficiently large and powerful to perform the arduous farm-work that in those days fell to the lot of oxen. Of all the various breeds (including Dutch and the old-fashioned, ungainly, unimproved Teeswater cattle) that were resorted to in the attempt to raise suitable working oxen, the Fife or Falkland race was by far the most successful. Between it and the native varieties there was produced a really good class of cattle, which became widely known as the "Horned Breed of Aberdeenshire," but which is now extinct—having been driven out by the Improved Shorthorn and the native Polled breed.

In the early years of this century northern farmers began to find a profitable outlet for their surplus cattle; and a gradual increase in the price of the better sorts induced them to give special attention to the development of the beef-producing and early maturing properties of their stock. At the right time and in a becoming manner Captain Barclay stepped upon the scene. He had visited Phantassie. He recognised the splendid oxen there as the class of stock the farmers of the north-east ought to aim at producing, and lost no time in bringing the Improved Shorthorn into their midst. Others, as will be shown, soon followed the example of "The Captain," as he was familiarly called; and by 1840 the reputation of the Improved Shorthorn as the best of all breeds for crossing purposes had become fully established and universally acknowledged. From that date onwards the breed spread over the north-east with great rapidity, clearing away nearly all the native varieties of horned cattle, and producing in their stead a new class of stock nearly twice the value of the old. The native Polled breed alone made a stand against the popular invader; and had not the late Mr. William McCombie and a few other ardent admirers of the black "humlies" or "doddies" come to their rescue, these two would have fallen a prey to the remarkable craze for the new-fashioned cross. The "deliverance" of the blacks was a fortunate circumstance. The Polled Aberdeen or Angus, and the Shorthorn breeds, now hold undisputed sway all over the north-eastern counties, and between them they produce the finest class of butchers' cattle to be found anywhere. The one breed adds to the value of the other. A Shorthorn bull for crossing purposes is worth more among Polled cows than amongst cows of any other known variety of stock. Two elements, congenial yet distinct, are required to produce a satisfactory "cross." The Black Polled breed of the north-east of Scotland supplies the best possible base for the Shorthorn edifice—hence the fame of the "Aberdeenshire beef," and here also is found substantial proof of the wisdom of the late Laird of Tillyfour in preserving his favourite black cattle.

At the outset, as might be expected, the Shorthorn met with opposition in certain districts. It was supposed or feared that the race was delicate, and would not thrive in the rigorous climate of the North. Wherever it received a fair trial, however, the breed produced such excellent results, and so readily adapted itself to the peculiarities of climate and treatment, that it soon overcame all prejudices. The Strathbogie Farmers' Club was established in 1835, and one of its rules declared "That no Shorthorn cattle will be allowed to compete [at the Show of the Club], as they are considered unsuitable for the district." Three years later Mr. C. Bruce, of Broadland, moved that this Rule be rescinded, and only one member stood up against him. Having discovered their error, the Strathbogie farmers turned kindly to the "new comer;" and for more than thirty years the great majority of bulls used by them have been pure-bred Shorthorns. Here, as throughout the north-east generally, the stock of cattle prior to the introduction and spread of Shorthorns consisted chiefly of the black horned and black polled varieties. The crosses between Shorthorn bulls and cows of these native races are usually reckoned to be as good at two years old as the old unimproved cattle were at three years old.

Mr. W. S. Marr, of Uppermill, states that after a short trial the Aberdeenshire farmers took very favourably to the Shorthorns, and that the improvement effected through the influence of the breed was everywhere most marked and rapid, the native cattle having been improved in size, form, quality, and early maturity. "Before the introduction of Shorthorns," adds Mr. Marr, "the common price of two-year-old cattle in spring was about 8*l.*; now the cattle the same age bring over 20*l.* I believe the Shorthorn cross might be matured in about half the time the unimproved cattle used to require. My own first Shorthorn bull, which was bred by Captain Barclay, and used at Uppermill on common Buchan polled heifers, which were bought by me, rising two years old, at 7*l.* a head, produced a lot of uncommonly good cattle, the heifers of which were sold when thirty months old at 20*l.* each, and the bullocks when thirty-four months old at 26*l.* a head. These were considered very great prices in those days—about forty years ago."

The improvement which, since the use of Shorthorn bulls commenced, has taken place in the cattle bred and reared in some of the higher lying and more inland districts of the north-eastern counties, is indeed remarkable. It is not to be claimed, of course, that the whole of this great improvement is due to Shorthorns. Various influences, such as the inherent but hitherto undeveloped good properties of the native stock of cows, the increase in turnip husbandry, and improvement in the housing, feeding, and general treatment of cattle, have all contributed to the change. It cannot be doubted, however, that the Shorthorn bull has been one of the chief agents at work, if not the most effectual. Some of the Upper Straths in the county of Banff, that of Glenrinnes in particular, supply striking evidence of the extraordinary improvement which has followed the introduction and general use of Shorthorn bulls. Glenrinnes, about twenty miles inland, is surrounded by bleak hill-ranges; and its arable land lies from about 700 to 1000 feet above the sea-level. Formerly, say about thirty years ago, the cattle reared here were, as a rule, about the worst to be seen in any of the markets throughout the north-east. Now there is scarcely a second-rate animal bred in the Strath, while for some years back the Glenrinnes cattle have taken a clear lead in the local markets. The old stock of cows possessed a large dash of the native black polled or black and grey horned varieties, and good well-bred Shorthorn bulls have produced from these a race of animals which, with liberal and judicious rearing and feeding, have attained great excellence. The bulk of the cattle are fattened and sold when about twenty-four or twenty-eight months old, and usually bring from 22*l.* to 28*l.* a head. The other year Mr. Charles Kemp, of Recletich, now of Mether Cluny, sold for slaughter four steers, bred from a Shorthorn bull and native polled cows, for the handsome price of 34*l.* a head, and yet they had only just turned their second year.

Mr. Robert Bruce, of Manor Farm, Great Smeaton, Northallerton, who for a good many years maintained an excellent herd of well-bred Shorthorns at Newton of Struthers, Morayshire (his herd there having been sold by Mr. Thornton in 1876 at an average of close on 50*l.* a head for eighty-six animals), in a communication to me says: "Many instances could be given of extraordinary results arising from the use of well-bred Shorthorn bulls amongst common country cows. There is perhaps no district in the United Kingdom where a better class of cross-bred cattle is to be found than around Elgin, and more especially in the parish of Urquhart, and its neighbourhood. For many years the late Mr. William Stephen, from his well-bred Shorthorn herd at Inchbroom in this parish, sold his bull calves privately to the farmers in the district, having a fixed price of 20*l.* upon tops and tails. Small farmers, having stocks of five, or ten, or fifteen ordinary country cows, bought these bulls, and their stock were so much superior to the other cattle of the district, that attention was year by year more directed to cattle-breeding and feeding, so that eight years ago, when I lived in that county, 24*l.* to 28*l.* a head for cattle about twenty-four months old was by no means an uncommon price. Another instance of the great benefit derived from the use of Shorthorn bulls may be given. The late Mr. Grant, of Carron on Speyside, for several years annually bought and presented to his tenantry on his high-lying poor estate some four or five Shorthorn bulls. These bulls were mated chiefly with small black polled cows, and I have it on the testimony of the largest buyer of lean stock in the North, that the young cattle over the whole of the Carron property were in a few years raised at least one-fourth in value by the use of these gift bulls alone."

Few counties in Scotland have derived greater benefit from the use of Shorthorn bulls than the county of Caithness. Early in the present century the cattle of Caithness partook largely of West Highland characteristics, the Kyloe breed having been introduced by Sir John Sinclair, and others, to improve the native stock. Although large and handsome in form, these shaggy cattle were slow in maturing. About 1820, Mr. Horne, of Scouthall, with the object of removing this defect from his stock, began the use of Shorthorn bulls. The results more than fulfilled his most sanguine expectations, the crosses being larger and finer shaped than the ordinary cattle of the county, while they also grew and fattened much more rapidly. Mr. Horne reared an excellent class of stock, and, having fattened his bullocks with much care, he usually obtained the top prices in the London market. In 1838, he sent a remarkably fine lot of twenty four-year-old cattle to the London Smithfield Market, and for each he received the then remarkable price of 40*l.* a head. Soon after this the use of Shorthorn bulls became general in Caithness, and for many years few other sires have been taken into the county. The soil of Caithness is not suited to fattening. It will grow bone, but is slow in putting on fat. The farmers have therefore given attention chiefly to the raising of store-stock, for which, when twelve, fourteen, or eighteen months old, they find an excellent demand in Ross-shire, Aberdeen, or other parts of the north-east. These Caithness store-cattle partake mainly of the Shorthorn type; and generally speaking they are of large size, good form, and fine quality. From 18*l.* to 20*l.* are common prices for lean animals ranging from fourteen to seventeen months old. The Shorthorn has carried its work of regeneration into the Orkney and Shetland Islands, and has there produced results almost as satisfactory and beneficial as those attained in Caithness. The farmers of Caithness, Orkney, and Shetland purchase Shorthorn bulls in Aberdeenshire and elsewhere in the east and south, and in turn send back to be fattened a fine class of lean stock. The Caithness demand is now to some extent supplied by local herds, which have been established with care and enterprise.

The demand for Shorthorn bulls throughout Scotland has, ever since the introduction of the breed, been constantly on the increase. At times it has outrun the supply, unduly raising prices and calling into use many animals not well fitted for the production of stock. In recent years, however, there has been no lack of good bulls, and prices have taken a turn in the favour of buyers. Formerly the leading breeders held annual auction sales at their respective farms, but lately that costly and troublesome system has almost entirely given place to large Joint Sales at convenient centres. Sales of this kind are held once or twice a year, in spring and autumn, at St. Boswells, Perth, Aberdeen, Forres, Inverness, and elsewhere. Probably three-fourths of the whole supply of bulls are disposed of on these occasions. The Aberdeen Joint Sale, held in spring and autumn, is the largest. For the sale there, in February this year, 260 Shorthorns were catalogued. Prices of course show a considerable range. Exceptionally good lots now and again realise from 40 to 50 guineas each. The more successful breeders generally obtain from 35 to 40 guineas. The average all over would probably run from 25 to 28 guineas.

WHAT SHORTHORNS HAVE DONE IN IRELAND.

In Ireland as well as in Scotland Shorthorns have had an active and most useful career. In the Green Isle the work of improvement amongst farm stock has had to contend with obstacles not experienced to the same extent in Scotland. Of the 499,109 agricultural holdings in Ireland, nearly one-half, or 226,453, do not exceed 15 acres in extent, while the number not exceeding 30 acres reaches the enormous total of 348,970. These hundreds of thousands of tiny farms are as a rule occupied by men who are proverbial for their unwillingness to adopt new systems or changes of any kind, and who have either no capital, or no will, to lay out what they do possess, preferring to store up their savings for dowries to their marrying daughters. It will thus be easily understood that the improving of native varieties of cattle by the use of costly sires cannot make rapid progress in many parts of Ireland. Among the larger farmers pure-bred Shorthorn bulls have been freely used for a long period; but the tenants of small, and what in Ireland might be called medium-sized, holdings have been very slow to take advantage of the vast number of high class Shorthorn sires reared in that country every year. A great proportion of these small farmers still pursue the old system of either rearing a mongrel bull for their own use, or of paying 1*s.* per cow for the service of their neighbour's bull, an animal quite as bad as they could possibly rear themselves; and this too, notwithstanding the fact that for the modest fee of 5*s.*, or perhaps even less, they might have the use of a really good pure-bred bull. An enterprising farmer in the west of Ireland was in the habit for some years of rearing and keeping good half-bred or "grade" Shorthorn bulls, which he let to his neighbours at a fee of 2*s.* 6*d.* or 3*s.* 6*d.* per cow. A friend having heard that the farmer had given up the practice of keeping these bulls, inquired the reason, and was told that it was because the neighbours would not pay the fees. The friend said he believed that these small farmers, if they got the best bull in Ireland for 5*s.*, and the worst for 2*s.* 6*d.*, would choose the worst. "No, sir," replied the farmer, "but if they got the best at 1*s.*, and the worst for 11*d.*, they would choose the worst." No wonder, then, that even yet there are reared throughout Ireland a very large number of mediocre cattle—very unsatisfactory alike in size, form, quality, and rate of growth.

But in spite of these formidable obstacles, the Shorthorn breed, in conjunction with other beneficial influences, has effected a marvellous improvement in the general stock of cattle in Ireland, thus enhancing the wealth of the country to an almost incredible extent. No inconsiderable proportion of the agricultural wealth of Ireland is derived from its cattle. For a good many years back more than half a million head of cattle have been exported annually from Ireland into England and Scotland, and the amount of British gold received in return for these has been variously estimated at from seven to ten millions sterling. The rearing of store cattle for shipment to England and Scotland has long been a source of much profit to Irish farmers; and Shorthorn bulls have rendered valuable service in helping them to take advantage of this trade. In 1881 no fewer than 571,557 head of cattle of all classes were shipped from Ireland to England and Scotland. In connection with this it is interesting to note that, according to Marshall, the number exported in 1795 was only 36,000 head. In 1881 more than a quarter of a million head (250,899) of store-cattle for fattening or breeding purposes left Ireland for England and Scotland, the large majority going into the ports of Liverpool, Glasgow, Stranraer, Bristol, Milford, Barrow, and Ardrossan. Many wide districts, both south and north of the Tweed, where there is little home-breeding, are mainly dependent on Ireland for their supply of fattening cattle. From nearly all these districts accounts have been obtained testifying to the great improvement which has appeared in Irish store-cattle during the past twenty years. Complaints are heard from some quarters to the effect that, while the bulk of the Irish lots are good well-bred animals, they often include "a tail" of very unsatisfactory merit—a feature already accounted for—and that they generally indicate too plainly that they had received scant fare in their youth, and perhaps also bad treatment in the journey. As to the fact, however, that there has been very substantial improvement in the Irish store-cattle sent to England and Scotland during the past twenty years, there is a gratifying concurrence of testimony.

Norwich Hill Fair has long been one of the principal rendezvous in England for Irish lean cattle, and a well-known English agriculturist, who has been attending there for nearly half a century, stated to me a short time ago, that, between the Irish stock now being exhibited at that market, and those he recollected seeing there twenty-five or thirty years ago, there was a marvellous contrast. The improvement in the character and quality of the animals themselves, entirely irrespective of the increase in the value of cattle, would, he believed, amount to

25 or, perhaps, even 30 per cent. of the current average price. The improvement began to appear even earlier than thirty years ago, but it was only within the past fifteen years that it could be said to have made rapid progress. It was evident that the improvement was in the main due to the influence of Shorthorn blood, for the change in the form and character of the stock consisted in a gradual and easily-recognisable approach to the type and attributes of the Shorthorn. The experience in Scotland has been very similar; and in some parts of that country, where formerly they found little or no favour, Irish cattle are now held in high esteem. The Kincardine Farmers' Club discussed the question of "Our Cattle Supply" at its meeting in December last, 1882. It was stated that that part of the country was mainly indebted to Ireland for its supply of store-stock, and all admitted that Irish cattle had exhibited great improvement in recent years. One member remarked that Irish cattle were now as well bred as any they could produce at home, and that the only drawback to the trade was the bad treatment which the cattle had to undergo in the course of their journey from Ireland to Scotland.

There is no need, however, to go outside Ireland for proof of the good work which Shorthorns have accomplished amongst its herds of cattle. Of this there is within the Green Isle itself more than sufficient evidence. It will be shown that the breed was early introduced into the counties of Wexford and Wicklow. Forty years ago the cattle in those counties, as in most other parts of Ireland, were more useful for dairy purposes than for the production of beef. They were wholly of the old Irish sort, of mixed breeding and varying type, black, brindled, or brown in colour, thin and irregular in frame, light-fleshed, and very slow in growing and fattening; and when ripe for the butcher at a pretty long age, generally four or upwards, would have weighed about 5 cwt.—a large portion much less. Few pure specimens of this variety are now to be seen. The Shorthorn has driven them out of existence, bringing in their stead a larger, better-shaped, thicker-fleshed, and more precocious, and altogether greatly superior race of stock, partaking largely of the colour, form, and general character of the Shorthorn. Improvement became widely apparent soon after 1852, and has been making progress ever since. There is, perhaps, no part of Ireland better stocked with good cattle than these counties, and in the main this is due to the strong Shorthorn influence radiating from such centres as Coollattin, Vinegar Hill, The Island, Thorneville, Ballyhyland, Lisnevagh, &c. Referring to the advance in the value of cattle due to the improvement effected by Shorthorns, Mr. Samuel Armstrong says:—"The prices of cattle were very low after the potato failure in 1846, and up till about 1854, when they rose somewhat. The average price per head at the present time is from two to two and a-half times more than in 1852, and one-fourth of that value may be fairly assigned to the use of Shorthorn bulls." Mr. Armstrong has known some remarkable instances of the ability of pure-bred Shorthorn bulls to produce good stock from small inferior cows, cases in which the produce of Kerry cows and Shorthorn bulls brought, when sold in store condition at two years old, twice the price of similar cattle of the original Irish breed. He has found that the Shorthorn cross reaches maturity at least twelve months earlier, and weighs, when matured, about 1½ cwt. more than unimproved cattle. As further proof of the value of Shorthorn blood in crossing, Mr. Armstrong mentions the case of neighbouring small farmers who have had the use of his bulls for over thirty years. "These farmers," he says, "had four or five common cows at the commencement, which were kept entirely for dairy purposes, and which, at present prices, would have been valued at about 15*l.* a head, when close at calving. Their cows are now worth 25*l.* each; and they say when they sell their yearlings they get fully 2*l.* a head more than their neighbours, who have not followed the same practice; and, besides this, their animals are always easily sold."

Throughout the property of his Grace the Duke of Leinster, ample evidence is to be found of the ameliorating influence of the Shorthorn. His Grace has been in the habit of keeping good pure-bred Shorthorn bulls at different places for the use of his tenants, and from this commendable practice a great amount of benefit has arisen. At Carton his Grace owns a small Shorthorn herd, and, besides, rears and feeds a large number of excellent mixed-bred cattle. A good many Kerries are brought in; and from these and Shorthorn bulls stock of wonderful size and quality are bred. Indeed, I have seen steers at Carton, crosses between small Kerry cows and Shorthorn bulls, which, in shape and size, showed but little inferiority to highly graded Shorthorns. Some were blue in colour, like the Galloway and Shorthorn crosses, so highly esteemed in the North-West of England; while others were red, and a few roan, the majority having black or spotted noses. In Queen's County and surrounding districts the general stock of cattle has been improved very greatly by the direct and indirect use of Shorthorn blood. The small farmers breed only half-bred bulls—that is, bulls from the best of the common country cows and pure-bred Shorthorn bulls—but through this much good has been done in improving the cattle of the district. Few farmers will pay more than from 1*s.* to 2*s.* 6*d.* for the service of a bull except with the object of producing a bull-calf for a sire. Forty or fifty years ago the cattle of this part of the country would not have weighed more than from 3½ cwts. to 4½ cwts. when fully matured. Now they mature nearly a year sooner, and weigh about a third more. Mr. H. Smith, whose valuable herd at Castlebrock has rendered great service to the country, states that he has frequently seen wonderfully good animals bred from plain old Irish cows and Shorthorn bulls; some, in fact, that would almost pass for pedigreed animals, and that would sell either fat or in-calf for at least 6*l.* more than the dam.

In the fairs in the counties of Meath and West Meath, the Shorthorn element has been pretty strong for a good many years. Since about 1860 the progress in this part of the country has been most marked. An improvement has taken place in all the features that add value to cattle, notably so in form and quality, rate of growth, and tendency to fatten. From all sorts of cows the Shorthorn bulls have raised improved stock, and now there are few of the real old Irish mixed-bred cattle in these counties. At Mr. R. Reynell's farm, Clondrisse, Killucan, there are at present some animals that afford an interesting illustration of the excellent results realised by the crossing of the Shorthorn bull with Kerry cows. A good specimen of the Dexter variety of the Kerry race, a thick, short-legged, little cow, has produced three calves—each by a pure-bred Shorthorn bull. All the three are, for butchers' purposes, far superior to the dam. They would at maturity be worth, perhaps, from 25 to 30 per cent. more than the cow. As evidence in favour of a well-supported theory in breeding, it is interesting and curious to note the graduated departure of the three successive calves from the type of the mother. The characteristic features of the Kerry are less marked in the second calf than in the first, while in the third they are more faint still.

Throughout the north of Ireland there is great variety in the character of the stock, the progress of improvement having been very slow in some districts as compared with others. Before the introduction of Shorthorns the cattle stock over the north generally was of the very worst description; of mixed breeding, small in size, badly formed, thin in flesh, and not arriving at maturity until five or six years of age, and inferior to the cattle of the south in milking properties. In several districts there is still great need for improvement, but in the better farmed parts of all the northern counties the cattle reared are for the most part fairly good Shorthorn crosses. In every fair throughout the north young cattle are to be found approaching nearly to the Shorthorn type, and worth at least 50 per cent. more than unimproved stock. Prior to 1860 the work of improvement was confined to various isolated localities, but during the past fifteen years it has made a rapid advance, and extended in all directions. Before well-bred sires were introduced into the north, the cattle of the district sold at very low prices, yearlings about 4*l.*, and two- and three-year-olds about 7*l.* a-head. At the present time the cattle of the corresponding ages, in lean condition of course, bring on an average about 8*l.* and 14*l.* respectively. Of this handsome increase, fully 30 per cent. is usually attributed solely to the use of Shorthorn bulls.

From northern agriculturists a great deal of interesting information has been received as to the extent, nature, and value of the improvement effected by Shorthorn bulls upon the common stock of the country. There is remarkably little variety in the testimony. In no case has a good Shorthorn bull failed to produce from common cows animals greatly superior to their dams; and in many instances stocks of cattle nearly equal in value to the butcher to pure bred Shorthorns have been reared from small ill-shaped, old-fashioned cows, by the sustained and skilful use of good Shorthorn bulls. It is generally estimated that the produce of good pure-bred Shorthorn bulls, and the ordinary cows of the present day, will bring as yearlings or two-year-olds from 2*l.* to 5*l.* a-head more than if the sire had been cross-bred, even although in the two cases the feeding and all other circumstances had been similar. The stock of the pure-bred sire would usually be almost as well matured at two as that of the mongrel bull at three years old. Moreover, while the latter would often be difficult to dispose of at anything like fair value, the improved Shorthorn crosses always find willing purchasers.

Mr. William Jeffcott, land agent, Londonderry, states that many instances have come under his observation of the great advantage to be derived from the use of Shorthorn bulls. The following is a good sample. A tenant holding a fair-sized farm, upon which he kept twelve pretty fair dairy cows, and reared the calves each year, had for many years used very bad bulls, so that for his yearlings he could not obtain more than 5*l.* a-head. After a good deal of persuasion, Mr. Jeffcott induced him to try the service of a Shorthorn bull. A yearling of good colour, large size, and plenty of substance, was selected by Mr. Jeffcott, and his first crop of calves showed a great improvement over the tenant's former lots, the bullocks as yearlings realising 8*l.* 10*s.* a-head. The heifers were retained for breeding; and ever since the farmer has continued to use a good Shorthorn bull. At present his dairy cows are a very excellent lot, and last year (1882) he sold his yearling bullocks at 12*l.* a-head—7*l.* more than he obtained before using a Shorthorn bull. He now takes great interest in his stock, and feeds them well. On the same point Mr. John McElderry, of Ballymoney, Co. Antrim, gives strong testimony. He states that many instances have been known to him of farmers selling from ordinary cows and pure-bred Shorthorn bulls animals from twelve to fourteen months old at from 10*l.* to 12*l.*, whilst others had difficulty in realising 5*l.* or 6*l.* for stock of the same age and from equally good dams, but got by cross-bred bulls.

On the Earl of Caledon's demesne farm at Castle Hill, Co. Monaghan, crosses have been raised from Shorthorn bulls and cows of the Kerry and Ayrshire breeds, which at the age of three years realised 28*l.* a-head. The heifers bred from the Ayrshire cows and Shorthorn bulls were retained; and having again been crossed with the Shorthorn, the result was an excellent dairy cow, combining the symmetry and substance of the Shorthorn with the milking properties of the Ayrshire. A bullock and a heifer bred at Castle Hill from half-bred Irish cows and a Shorthorn bull were sold for slaughter in Dublin the other year at 50*l.* and 48*l.* respectively, the age of each being about three years. On Sir John Leslie's demesne farm, at Glaslough, in the same county, there are some beautiful cows, descended from a pure-bred Ayrshire cow with four Shorthorn crosses on the top. In frame and general appearance they would rank as very good pure-bred Shorthorns, while they have to the full extent retained the excellent milking qualities of the Ayrshire. For the Irish farmer, or indeed for any farmer, one could scarcely wish a better class of cows than these, fit as they are to breed steers and heifers of the highest merit for their respective uses.

Similar results have been experienced at Crom Castle, Newton Butler, the Earl of Erne's seat, in Co. Fermanagh. In his lordship's dairy some years ago there were cows of the Ayrshire, Kerry, and Alderney breeds. A Shorthorn bull was always used with these, and the progeny invariably gave great satisfaction, the females making excellent dairy cows, and the bullocks being large, well-formed, and easily fattened. In the spring of 1876 and 1877 several steers bred in this manner, and not quite three years old, brought an average of 25*l.* a-head in the Dublin market. It is estimated that had the sires been of the same race as the dams, the progeny would have taken a year longer to mature, and would have realised one-third less than was obtained for the Shorthorn crosses. Regarding the improvement of cattle in the Newton Butler district, a leading agriculturist in that locality says:—"Twenty years ago few farmers in the neighbourhood were owners of Shorthorn bulls. The number is now much increased, and is yearly increasing, there being much friendly rivalry as to who will obtain the best. Men that some years ago considered 20*l.* a high price to pay for a bull are now freely paying from 45 to 60 guineas; and I believe there is not another district of the same area in Ireland that takes so large a number of young bulls from the Dublin Spring Show and Sale. These bulls are let at moderate fees, and are highly prized by those who cannot afford to buy bulls for themselves. It is needless to say that, as the result of this enterprise, the cattle in the district are very superior, and are much sought after by dealers. The contrast between the cattle in districts where Shorthorn bulls have been freely used for some time, and where no good sires are employed, is most striking. It is no unusual occurrence to find a two-year old Shorthorn cross realising as much as an ill-bred four-year old."

In reference to what Shorthorns have done in the portion of the West comprised in the counties of Longford, Roscommon, and Sligo, no better testimony can be produced than that of Colonel Ffolliott, of Hollybrook, Boyle, whose father was one of the first in Ireland to use bulls from Warlaby and Killerby. Colonel Ffolliott's recollection carries him back to about the year 1835. The cattle at that time seen in the fairs were, with few exceptions, long-horned, red, and brindled, and had none of the quality or rapid growth of the Shorthorn. At the outset there was great prejudice against Shorthorns in these parts, but the valuable properties of the breed were not long in overcoming these objections. Within twenty years the Shorthorn cross had changed the appearance of the fairs in Longford and Roscommon, and the desire for Shorthorn blood became general. Since 1855 the improvement has been no less marked. Shorthorn blood has gone on spreading in the western counties, and where in 1855 one would have looked in vain for a well-bred heifer, scores of excellent ones may now be easily got. This, it cannot be doubted, is due to the remarkable influence of Shorthorn crossing. It is not only the first or the second cross that is good, nor only the cross with particular breeds; but, wherever a Shorthorn bull has been, the influence may be traced through several generations. In Sligo, Colonel Ffolliott's father was the pioneer of Shorthorns, and the blood of Hollybrook stock is now all over the county. Most of the county gentlemen and not a few farmers have for many years been in the habit of buying good Shorthorn bulls, chiefly at the Dublin Spring Show and Sale, and although in some parts of the West the cattle are still below the standard of mediocrity, there is no lack of good bulls and good cattle wherever a county gentleman or an enterprising farmer resides. In Longford, largely through the influence of the excellent lot of bulls which the late Hon. Lawrence King-Harman and others lent to their tenants, the general stock of cattle have attained a surprising degree of excellence.

"The value of good blood," adds Colonel Ffolliott, "has become so well known in Roscommon within the last twenty years, that I believe better cattle can now be found nowhere in the West than in that county. I consider that what is most noteworthy about Shorthorns in Ireland is their remarkable value for crossing purposes. Even a bull with but one or two crosses of pure Shorthorn blood has improved the stock far beyond what could have been expected, so that, notwithstanding the parsimony shown in declining to pay anything like value for the service of really good bulls, the breed has effected great improvement in the county. Of course, where a really high-class bull has been used, the improvement has been proportionally greater."

In county Clare, the Shorthorn influence upon the general cattle stock began to show itself about twenty years ago, and during the past fifteen years the improvement has made rapid progress. In the better-farmed districts of this part of the West a large proportion of the cattle consists of good half- or three-parts bred Shorthorns ; and in all respects—alike in regard to size, form, quality, and early maturity—they present a striking contrast to the rough slow-growing cattle of twenty or thirty years ago. Before Shorthorn bulls were used, the best class of three-year-old heifers sold at about 12*l.*, and steers at about 13*l.* a-head. Now they would average from 18*l.* to 19*l.* each—in store condition, of course. More than one half of the advance is credited solely to the use of Shorthorn bulls. It is found that the Shorthorn cross becomes as well matured in growth and condition at two and a-half years old as the unimproved cattle even of the present day will do when a year older.

In the county of Limerick and adjoining districts the improvement by the use of Shorthorn bulls commenced at a very early date. Although the many excellent herds that existed at one time or another in that county (since the late Mr. Christy first gave his attention to the rearing of Shorthorns, now more than half a century ago) have all been scattered, the good they have done still displays and develops itself. The value of a pure-bred bull is duly appreciated by the leading agriculturists, and the proportion of good well-bred Shorthorn crosses in this part of the country is pretty large. No better proof could be desired of the great value of well-bred Shorthorn bulls, even for the direct production of beef- and milk-yielding cattle, than is afforded in the experience of the Hon. H. G. N. Massey, of Elm Park, Clarina. Mr. Massey maintains large dairies of good, useful, mixed-bred cows. With these he has always kept a well-bred Shorthorn bull ; and he has found it profitable to pay even as much as 100*l.* for a bull for this purpose. He usually selects one of the best bulls of the season, and never pays less than 50 guineas. "I find it the greatest advantage," says Mr. Massey, "to use a Shorthorn bull, as by doing so I am enabled to sell the cattle I breed a year earlier than I otherwise could. So much do I consider breeding essential, that I would give an extra price for a lot of bullocks that I knew to be descended from a good Shorthorn bull. Without breeding, I find it very hard to bring the animals out properly fattened, and every one knows that that is an important point. Cattle when good and well finished will sell fairly well even in a dull market; while ill-bred, half-fed animals will likely have to be driven home again. I am sorry to say farmers, as a rule, look more to colour and size than quality, and if a bull is big and red, they at once buy him. I always keep a Shorthorn bull which I give free to neighbours, and one would be surprised to see the nice cattle sometimes bred by these bulls out of very poor cows."

While breeding Shorthorns at Islanmore, Mr. E. J. Smith, some twelve years ago, made an interesting experiment with the crossing of a Shorthorn bull and Kerry cows. From a lot of Kerries passing his back-gate, he selected ten two-year-old heifers, for which he paid 4*l.* 10*s.* a-head. To these he put a yearling Shorthorn bull. Six had bull calves; and these calves, after the third day, were put on warm skim-milk, to which was added, when the calves were old enough to digest it, gruel made from ground linseed-cake. They were taught to eat linseed-cake, turnips, and hay as soon as possible, and had a run on the after-grass along with the common calves. During their first winter they were kept in a small yard, with a shed to lie in, and got plenty of hay and sliced turnips, with 1 lb. of cake each per day. Next season they were kept on the grass till November, when they were put in a straw-yard with other bullocks, getting turnips, hay, and straw. In the following year they were tied-in off the grass early in October, and were sold in March in the Dublin market, when about three years old, for 26*l.* a-head. Eight of the Kerry cows were sold a week before, very fat, at 18*l.* a-head. Beef was then very high in price, "top" varieties bringing about 95*s.* per cwt.

In the counties of Cork and Waterford the improvement by Shorthorn bulls, first becoming manifest about thirty years ago, has gone on rapidly during the last ten or fifteen years. Many farmers unfortunately still use bulls that are not pure-bred, merely highly graded Shorthorns. The larger dairy-farmers, however, are year by year becoming more anxious to have well-bred bulls, and there is good reason to believe that, in the course of a few years, the number of pure-bred Shorthorn bulls in use throughout these counties will be much larger than at the present time.

Before Shorthorn bulls came into general use, even as late as ten or fifteen years ago, the cattle of these counties were mostly of a very bad description; they were of fair size, hardy and good milkers, but ill-shaped, thin in flesh, slow in growth, and very hard to fatten, not reaching maturity until nearly four years old. In some districts Dutch cattle were bred pretty extensively for their excellent milking properties. Bulls of this race were crossed with the ordinary dairy cows, and from these unions sprang the blue or grey-coloured cattle that at one period were numerous in this part of the country. The cattle with Dutch blood were very bad feeders; and farmers found that, in order to derive advantage from the growing export trade in store-cattle, they would have to rear a different class of cattle. It was then that the superiority of Shorthorns for crossing purposes forced itself upon the notice of farmers, and induced them to commence the improvement of their stock by their influence. The valuable herds at Ballywalter, Ashfield, Glanatore, and Ballymartle, &c., have been of great service to this part of the country, while much good has also been done by proprietors keeping bulls for the use of their tenants, the Duke of Devonshire having as many as four high-class bulls employed in this way on his estates. Before Shorthorn bulls were freely used, the best class of yearlings sold at about 5*l.* a-head. Now they bring 9*l.* or 10*l.*, and from 2*l.* to 2*l.* 10*s.* of this advance is claimed as due entirely to the influence of good Shorthorn bulls. Unimproved heifers in-calf sold at from 8*l.* to 10*l.* 10*s.*; while, at the present time, good young Shorthorn crosses in-calf sell at from 17*l.* to 22*l.* a-head.

Major Gumbleton, of Glanatore, has lately made some interesting experiments with Shorthorn bulls crossed upon other varieties of cattle, and in every case the results have been most creditable to the sire. "Some years ago," he said, "I purchased a lot of six two-year-old cows, in-calf, at a fair on the borders of Kerry. The price of the lot was 5*l.* 10*s.* a-head. Two were of the Kerry race, three appeared to have a cross of some other kind—perhaps a distant dash of Shorthorn blood—and one seemed to be a half-bred Jersey—all small, half-starved-looking beasts. I crossed them with a first-class Shorthorn bull, nearly, if not quite, pure Booth blood. In the first crop there were four heifer calves and two bulls. The bullocks were sold as two-year-old stores off the grass for 15*l.* 15*s.* a-head, one being from a Kerry, and the other from one of the nondescript trio. One of the heifers was sold as a three-year-old, in calf, for 20*l.*, and I refused 21*l.* for the heifer of the half-bred Jersey. She is still here, as I wish to see what the second cross with a first-rate bull may produce. Since then I have sold the produce of those six cows in April at an average of 5*l.* 10*s.* each, when just a year old. Sometimes the calves, even not so old, bring the price their dams cost at two years old. So much for the Shorthorn bull! No extra feeding was resorted to—nothing but grass, and some hay and roots in winter, when the animals came in at night. I should also state that these calves were poorly reared, because I give all the milk to my bull calves. My experience of the value of the Shorthorn cross with cows of a larger and better type has been equally satisfactory, though, of course, not so marked. I have had a good opportunity of observing the effect of such crossing. My nearest neighbour has for the last twelve years used one of my bulls, or one as well bred. He is a tenant dairy-farmer, and keeps 100 head of cattle of all ages. He grows little grain or roots, and his cattle have therefore hard times in winter. In spite of this, however, his stock are of excellent quality and character; and when his badly wintered young animals are sold off the grass, they top everything in the fairs. Indeed, the dealers know him, and come to his place for his stock, so that he usually gets his own price."

In county Kerry the operations of the Shorthorn have been equally beneficial in their results. Although this county is the head-quarters of the only pure native breed of cattle in Ireland—the well-known and very useful little black Kerries and Dexters—it also contains a large portion of the Shorthorn element. Mr. James Bogue, whose recollections of cattle matters in Ireland stretch back to an early date in the century, relates a most striking instance of the power of a well-bred Shorthorn bull, when crossed with a cow of another variety, to carry the produce after himself. "A dairy-cow," he says, "the commonest of the common, brindled, with black nose, was at Ardfert Abbey put to 'Regal Booth' (27,262), and the produce was a roan heifer, a Shorthorn all over." Mr. Bogue mentions another interesting case. He says, "In the year 1848, I bought for a friend, at Mill Street Fair, ten mountain-heifers, at about 3*l.* 10*s.* a-head. They were put to a pure-bred Shorthorn bull on a mountain-farm in county Cork. The calves, fostered on their dams, were sold by weight, when twenty-four months old, to a butcher in the town of Bandon, at 3*l.* per cwt.—the highest price, I think, that had been paid for beef in Ireland from the time of the first Napoleon. I saw the carcasses weighed, and I have a distinct recollection that one, a black, weighed 58 stones, and the smallest, a brindled, 50 stones. The gentleman who bred and fed these now turns out bullocks, when from eighteen to twenty-four months old, at 25*l.* a head, got by a Gwynne bull bred at Ardfert Abbey."

In Ireland, as in Scotland, bulls are generally disposed of when from eight to fifteen months old. Mr. W. T. Talbot-Crosbie, of Ardfert Abbey, and Mr. R. Wellsted, of Ballywalter, still maintain their annual auction sales which have gone on for thirty and twenty years respectively, and which have become so familiar as landmarks, or rather as marks of recurring seasons, in the routine of Irish Shorthorn history that every one would be loath to find them discontinued. Most other breeders sell their bulls either privately or at joint sales in Dublin, Belfast, Cork, Limerick, or elsewhere. The principal rendezvous has long been the Spring Show of the Royal Dublin Society, held annually in March. Here about 100 or 120 head of young Shorthorn bulls are usually exhibited, and the great majority of them are sold by private treaty during the continuance of the Show. Prices as a rule are rather higher in Ireland than in Scotland. In the former, to be sure, a good many third-rate bulls are sold at such low prices as from 16 to 20 guineas, but then the proportion of the Irish supply that exceeds 40 guineas a head is greater than that of the Scotch. In 1882, 120 bulls were sold publicly in Ireland at an average of 35*l.* 2*s.* 6½*d.*, being 6*l.* 7*s.* 10¾*d.* a head above the average in 1881.

CONCLUSION.

No variety of cattle fits itself more easily and readily to varying conditions of life than the Improved Shorthorn. This undoubtedly is one of the most valuable attributes of the breed. Without it Shorthorns could have made but little headway in foreign countries, where they are now doing good work. In both Scotland and Ireland they have thriven admirably—nearly as well, indeed, in the cold dry climate of the north-east of Scotland, with close house winter-feeding, as in the mild moist climate of the South of Ireland, with daily field-exercise all the year round. In both countries there are numerous pure-bred herds of high individual merit, a few of them ranking among the finest in the kingdom. The Aberdeenshire Shorthorn has attained a well-recognised type—somewhat deficient in high-class Shorthorn character perhaps, but, at the same time, broad, deep, well-fleshed, and thoroughly useful. Then, as to well-bred and well-cared-for Irish Shorthorns, who has not been struck by their rich, soft, natural touch, and beautiful, rank, glossy coat of hair, as well as by their attractive character generally?

But while the breed reared in its purity has maintained a high character in these countries, it cannot be doubted that in crossing with other varieties of cattle it has achieved still more remarkable results. Shorthorns have been crossed freely with all the local races and sorts of cattle, and have everywhere and upon every sort effected marked improvement. In all that adds value to cattle, improvement has followed in the wake of the Shorthorn—in size, form, quality, rapidity of growth, and aptitude to fatten at an early age. Among the small, scraggy, old-fashioned Irish cows, Shorthorn bulls have produced results truly wonderful. Stock from an ordinary Irish cow and a good Shorthorn bull will, it is estimated, reach maturity at least a year sooner than unimproved cattle—at 2½ or 3, instead of from 3½ to 4, years old. Moreover, the cross, besides being far superior in quality, will also show an increase in weight of from 1 to 1½ cwt. per head. It is certainly within the mark to place the increase in the value of one-year-old Irish cattle, due to the use of Shorthorn bulls, at from 2*l.* to 3*l.* a head on an average. In many instances it has risen as high as 5*l.*, and in few cases has it failed to reach 2*l.*—that is, above the value of the corresponding class got by native or cross-bred bulls. In Scotland the experience with the breed has been equally satisfactory. The stock of native cows in Scotland are, as a rule, larger and finer than those of Ireland, and therefore the contrast between the native cattle and the improved crosses has generally been less marked in the former country than in the latter. In some parts of Scotland, however, where the native cattle were small and slow in growth, the transformation effected by Shorthorn bulls has been quite as remarkable as in Ireland. Witness, for instance, the case of the cattle on the Carron estate on Speyside mentioned by Mr. Robert Bruce, and also that of the Glenrinnes cattle.

Much, however, as it has accomplished, the Shorthorn has not yet finished its work of improvement amongst the general cattle-stock of Ireland and Scotland. In the former country, in particular, a vast deal still remains to be done. The march of improvement has been slower in Ireland than in Scotland. In the nature of things this might have been expected. Shorthorn-breeding has of course had a full share of the dire effects of the wide-spread and deep-rooted depression from which British Agriculture is now only emerging. Prices have receded somewhat; and although an appreciable improvement took place in 1882, as compared with 1881, the whole of the lost ground has not been regained. But nevertheless there need be no fear that Shorthorn-breeding will have to be given up as unprofitable. While the demand for bulls is maintained—and there are good prospects of its becoming still larger—judicious Shorthorn-breeding may be expected, or at least ought, to yield moderate profits.

Among other important points there is one to which, in order to insure more general success, financially and otherwise, breeders must give better attention than, as a rule, they have hitherto bestowed upon it. It is desirable, above all, that there should be a truer classification of herds—a clearer distinction between herds or strains intended and fitted for the production of animals to be employed in the perpetuation and maintenance of the breed in its purity, and herds or strains kept merely for the raising of bulls to be crossed with ordinary cows. These two purposes are so distinct and so different, that any attempt to use the same material in the fulfilment of both must, sooner or later, result in failure. In the one case the object is simply to produce the best possible meat-yielding stock—animals to be slaughtered as soon as they reach maturity. In the other, the breeder has to produce stock fitted not only to perpetuate the race with unsullied character, to pass the pure article on from generation to generation without spot or blemish, but even capable of removing spots or blemishes where, perchance, they may appear. How vast the difference between these two objects! Has its significance been recognised and grasped fully by breeders as a body? Here, at the end of a paper already sufficiently long, the discussion of a subject so delicate and critical as this cannot be attempted. There is, perhaps, at the present moment no other question that more urgently demands the serious consideration of those interested in the breeding of Shorthorns.

APPENDIX I.

INTRODUCTION AND SPREAD OF SHORTHORNS IN SCOTLAND.

By way of background to the preceding notes a very brief historical sketch of the introduction and spread of Shorthorns in Scotland and Ireland is here produced. The sketch is necessarily imperfect and not so well connected as could have been desired. An effort, however, has been made to utilise fully the available extent of space.

Improved Shorthorn cattle were first introduced into Scotland in the year 1789, by the late Mr. William Robertson of Ladykirk, near Berwick-on-Tweed. Even at that early date the fame of the Teeswater cattle had travelled beyond the Border. Mr. Robertson, then a young enterprising agriculturist of good fortune, had his enthusiasm aroused by the reports which had reached him regarding their remarkable beef-producing and rare milking properties. In 1789, accompanied by Mr. Heriot, his favourite tenant, he visited Durham and the adjoining parts of Yorkshire for the purpose of examining personally the much-spoken-of race of cattle. Mr. Robertson at once recognised "the vast superiority of these cattle," and lost no time in taking steps to form a herd of "Improved Shorthorns" upon his Scotch home farm.

In 1789 and two following years Mr. Robertson purchased from the Messrs. Colling and Mr. Charge twenty-five cows and heifers and two bulls, which were in his opinion "the best of the respective stocks of these gentlemen." The prices paid for the females varied from twenty to fifty guineas, and for the bulls forty guineas each—sufficient guarantee of the high opinion this intelligent young Scotchmen had formed of Shorthorn cattle on the occasion of his first visit to their native district. That Mr. Robertson made his selections with great skill and enterprise is attested by the fact that the names of many of the animals he imported into Scotland lie in close association with the fountain-head of highly esteemed existing strains.

It is acknowledged that the history of Shorthorn-breeding dates from the purchase of two females by Charles Colling from Mr. Maynard, Eryholme, in the year 1783. These animals were "Favourite" ("Lady Maynard"), by "R. Alcock's Bull" (19), and her daughter, "Strawberry" ("Young Strawberry"), by "Dalton Duke" (188). "Strawberry" was then a young heifer, and cost, it is said, only ten guineas. When well up in years, she was sold to Mr. Robertson for twenty-five guineas, and thus one half of the memorable "purchase" with which the systematic breeding of Shorthorns commenced ultimately passed into Scotland. Among the other females bought by Mr. Robertson were C. Colling's "Mary," half-sister to "Strawberry," and own sister to "Phœnix" (the dam of the bull "Favourite" (252)), being out of "Favourite," *alias* "Lady Maynard," and got by "Foljambe" (263); C. Colling's "Delight," by "Foljambe" (263); and R. Colling's "Broadhooks," by "Hubback" (319), and out of a cow got by "Dalton Duke" (188). Along with "Strawberry," her half-brother, Lady Maynard's bull (356), then sucking "Strawberry," went to Ladykirk. This calf, got by C. Colling's "Lame Bull" (357), cost Mr. Robertson the modest sum of five guineas, and during two seasons, 1794–5, he was used at Ladykirk. The price paid for "Mary" was thirty guineas.

The first sire purchased and used (1790) by Mr. Robertson was the "Newton Bull," bred by Mr. John Charge, Newton, and got by "Dalton Duke" (188) (Maynard's bull). There are good grounds for the belief that the "Newton Bull" is the animal entered in the Herd Book as "Ladykirk" (385). In the following year, 1791, he was succeeded by Colling's "Lame Bull" (357), got by a son of "Dalton Duke," Mr. James Brown's "White Bull" (98), and out of a cow of Charge's. Thereafter, the principal sires imported and used at Ladykirk were, in 1796, "Punch" (351), by "Broken-horned Bull" (95), hired from R. Colling at thirty-five guineas per season; 1810, "Wellington" (679), got by "Comet" (155), out of "Peeress," by "Favourite" (252), grand-dam "Cherry," hired from his breeder, C. Colling, at forty guineas per season; 1813, "Midas" (435), hired from his breeder, R. Colling, for 100 guineas per season, out of "Red Rose," by "Favourite" (252), and got by "Phenomenon" (491), whose dam, by "Punch" (351), was the grand-dam of "Comet" (155), and "North Star" (458); 1817, "Barmpton" (54), hired from his breeder, R. Colling, at 160 guineas per season; out of "Moss Rose," by "Favourite" (252), and got by "George" (275), whose sire was "Favourite" (252), and whose dam and grand-dam were got by the same sire; and 1830, "Sultan" (631), bred by General Simpson, Pitcorthie, Fifeshire, and bought from Mr. Jobson; out of "Phœnix," by C. Colling's "North Star" (458), and got by Jupiter, also got by "North Star," and out of a cow, by "Punch" (351), grand-dam, by "Favourite" (252). About 1820 or 1821 Mr. Robertson sent seven of his best heifers to Mason's "Cato" (119), and one to his sire, "Charles" (127); but the experiment was not satisfactory, for he states that the produce differed from his own stock in being coarser and not good handlers.

In 1831 the Ladykirk herd was dispersed by public auction, in consequence of the death of its owner. Long before this the herd had earned a wide reputation. Breeders had come to set a high value upon its principal strains, and well they might, for few herds contained so much of the best and purest of the blood of the Collings and other noted early improvers, as that at Ladykirk. There can be no doubt that, in the improving and breeding of Shorthorns, Mr. Robertson rendered noble service to his country, and his name will live as that of the first Scotch patron of the breed. Mr. Mason, of Chilton, went to him for a change of blood, and having selected the bull "Satellite" (1420) he used him with good results, when his herd was in want of fresh material. Then, through the free use of Mr. Robertson's bull, "Caliph" (1774), in the herds of the Hon. C. Arbuthnot and Sir C. Knightley, the valuable properties of the Ladykirk herd have been transmitted to a large number of modern Shorthorns.

From the Ladykirk herd a great many Shorthorns were spread throughout the south as well as the north of Scotland. Wherever they went the stock they produced gave the utmost satisfaction, far exceeding any variety of cattle formerly known, alike in regard to precocity and yield of meat; while they, as a rule, also proved well fitted for dairy purposes. Mr. Robertson gave a good deal of attention to the rearing and fattening of Shorthorn steers and oxen; and, with the view of making known the rare beef-producing properties of the breed, he sometimes published the results. An ox, one of the first Shorthorns bred by him, when slaughtered in 1794, at the age of four years and ten months, was found to weigh 145 stones (8 lbs. per stone) 3 lbs. of meat, with 24 stones 7 lbs. of tallow. Afterwards he seldom kept on any feeding animals to so great an age, and the weights he was able to show for younger animals were perhaps still more astonishing to those hitherto unacquainted with Improved Shorthorns. A steer bred at Ladykirk, and slaughtered in 1802 at the age of three years and six months, yielded 123 stones of meat and 21 stones of tallow.

The late General Simpson, of Pitcorthie, Fifeshire, was the next in Scotland to take up the systematic breeding of Improved Shorthorns. Comparatively little is known as to his operations as a breeder. Doubt exists as to the date of the foundation of his herd. At the outset he, like Mr. Robertson, went to the fountain-head, and it is stated that in the years 1789 and 1791 he hired bulls from the Messrs. Collings. A few years later General Simpson would seem to have decided to go into Shorthorn breeding energetically, for from C. Colling in 1806 he not only purchased a female for the then almost unprecedented price of 300 guineas, but also hired a bull for two seasons at a fee of 100 guineas per season. The former was "Mary," out of "Venus" (the daughter of "Phœnix" and "Ben"), and got by "Favourite," being thus own sister to one of the cows purchased from C. Colling by Thomas Bates in 1800. The bull bred was "North Star" (458), own brother to the 1000 guineas bull "Comet" (155). When selected by General Simpson, "North Star" was only a calf, and he was not removed to Scotland till the spring of 1807. General Simpson persistently refused to allow this bull to return to England, notwithstanding urgent pressure from R. Colling, who had bespoken him from C. Colling before the latter's sale in 1810. General Simpson had only a very few cows to mate with "North Star," and yet at the substantial figure of 100 guineas per season he retained him till he died in his possession in the spring of 1811, at the age of five years. "North Star" proved himself an excellent sire, and he has left his mark on the pedigrees of many good Scotch Shorthorns. From the stock of "North Star," Mr. Grey of Millfield (latterly of Dilston), established his herd; while from "Rolla," by "North Star," a great many good Shorthorns will be found to trace. As illustrating the enormous value set upon the blood of these two famous sons of "Phœnix" and "Favourite" (252), it may be mentioned that when "North Star" died, the owners of "Comet" had an offer of 1500 guineas made to them for that sire, then in his eighth year. It has been stated that through "Sultan" (631) the blood of "North Star" was infused into the Ladykirk herd. General Simpson dispersed his herd on the 11th of October, 1818, when 37 animals—12 cows, 5 two-year-old heifers, 4 one-year-old heifers, 7 bulls, 3 bull calves, and 6 heifer calves—brought a total of 1388 guineas, or an average of nearly £40 a-head.

Among the first and certainly the most successful of the followers of Mr. Robertson, of Ladykirk, was the late Mr. John Rennie, of Phantassie, near Prestonkirk, East Lothian. Mr. Rennie probably did more than any other man of his time to send the good name of Improved Shorthorns throughout the length and breadth of Scotland, more particularly into the north-eastern districts, where for nearly half a century the breed has been held in high esteem. In the year 1818, Mr. Rennie introduced stock from the Ladykirk herd, and in subsequent years he went to the county of Durham for three of his stud bulls. The animals throve admirably, and so skilfully did he develop the beef-producing and early maturing properties of the breed, that the Phantassie steers exhibited at the first Shows of the Highland and Agricultural Society of Scotland far excelled any specimens of fat cattle that had ever before been exhibited in Scotland. As early as 1823 he exhibited steers of enormous weight, one under twenty months old having yielded 118 stones 1 lb. (Smithfield weight) of dead meat. He produced many steers, which, when slaughtered at from two and a half to three years old, gave from 80 to 100 imperial stones of meat; and in one year prior to 1830 he sold eighteen 2½-year-old steers, whose dead-weight ranged from 85 to 100 imperial stones, and for which he received the handsome price of 33*l*. a-head. Between 1823 and 1830, Mr. Rennie held three or four public sales, which were attended not only by many celebrated breeders of Shorthorns, but also by many fresh patrons of the breed, who had been attracted by the fame of his fattened oxen. The Phantassie herd contained a good deal of excellent blood. He used such sires as "Satellite" (1420), and "Pilot" (496), and for some of his own best bulls he received prices varying from 50 to 120 guineas. From an important sale held at Phantassie, on February 16, 1827, several well-bred animals went to the north-east of Scotland, chiefly to Ury and Shethin.

Before 1830, many other enterprising agriculturists in the south of Scotland, tenant-farmers as well as landlords, had adopted the Shorthorn breed, some rearing pure-bred herds, and a much greater number crossing Shorthorn bulls with the common cows of the respective localities. It is recorded in Mr. Bell's 'History of Shorthorns,' that General Watson, of Fifeshire, had in the year 1789 bought "Princess," by "Hubback," from C. Colling, but of this transaction we have been unable to obtain any further information. Mr. Abraham Wilson (father of Mr. John Wilson, late of Edington Mains, now at Wellnage Dunse), who was an enthusiastic and skilful breeder, not only of Shorthorns but also of Leicester sheep and cart-horses, owned a small herd of well-bred Shorthorns about 1820. Among the bulls used by him was R. Colling's "Diamond" (206), by "Lancaster" (360), and out of "Venus" by "Wellington" (680), and sold as a calf at the Barmpton sale in 1818, to Mr. Donaldson, Harburn House, near Durham, at 102 guineas. Soon afterwards, "Diamond" was bought by Mr. Abraham Wilson and three of his neighbours at 160*l*., and ultimately he became the sole property of Mr. Wilson. Of this bull, Mr. John Wilson informs me that he has still a tolerably distinct recollection. He was rich roan in colour, very thick in carcass, and low on his legs, and at a comparatively early age he becamo so fat that, being useless, he had to be sent to the butcher. Between 1820 and 1830 a great many Shorthorns were introduced into the county of Roxburgh, where the excellent properties of Shorthorn crosses gained numerous supporters to the breed. The rapid progress the race made in this county is well illustrated by the fact that at the Kelso Show in 1832 no fewer than thirty Shorthorn bulls were exhibited.

As early as 1818, the late Mr. Currie, of Halkerston, Gorebridge, father of Mr. James Currie, of Eastwood, Gorebridge, brought the first Improved Shorthorn into Mid Lothian. This was a bull bought from Mr. Abraham Wilson, of Edington Mains, Berwickshire. His breeding is unknown, but he proved himself an cxeellent sire, he and his produce having effected great improvement in the cattle of the district. Soon after this, Shorthorn cows were introduced into the dairies around Edinburgh; while at a later date, before 1830, the Roxburgh cow—a cross between the Shorthorn and West Highland breeds—was also tried largely and successfully in these dairies. About 1830, Mr. Allan, late of Middleton, now of Kinning, near Perth, purchased a well-bred Shorthorn bull from Mr. Grey, of Millfield, Northumberland. He turned out well, and from a rather rough stock of cows he raised remarkably fine animals. A few years later, Mr. Watson, of Esperston, also went to Mr. Grey for a pure-bred bull, which, among a similar class of cows, proved equally useful and impressive. In West Lothian, Shorthorn bulls were tried even before this date; and having been found to produce better results than any other race, they were used very freely throughout the county.

In Ayrshire, Renfrew, and other parts of the south-west, Shorthorns were obtained, and bred and used successfully by many leading agriculturists. In these districts, however, the smaller Ayrshire breed, with its superb milking properties, kept all rival races in abeyance. The county of Selkirk was early in the field for Shorthorns; and here, for crossing purposes in particular, the breed soon came to be very highly esteemed. Youatt mentions that Mr. Milne imported "a fine Shorthorn bull from Northumberland," through whose stock a change—a vast improvement of course—was effected in the breed of the whole district. In Fifeshire, as elsewhere in Scotland, the spread of the Improved Shorthorn was for a time retarded by an impression that these finely-bred southern cattle would not stand the rigorous climate of the north. The great excellence, however, of the stock reared by General Simpson and by other early breeders gradually dispelled this ill-founded idea, and the more enterprising Fifeshire farmers became enthusiastic admirers of Shorthorns. Among those who in early times took up the good work so pluckily begun by General Simpson, Lady Mary Lindsay Crawfurd, of Crawfurd Priory, was one of the most energetic and successful.

In more recent times the southern division of Scotland has been more largely devoted to the growing of wheat and potatoes than the raising of live-stock. In the history of Shorthorn breeding within the last forty years it has nevertheless played an important and creditable part. The noble and fascinating work, begun in the Valley of the Tees by the Collings, and carried to Tweedside by Mr. Robertson, has since 1840 been prosecuted with much enterprise and conspicuous success at various centres in the south of Scotland. The existing herds are few in number, but many that have been dispersed did good service in their day and generation.

The principal modern herds in the south of Scotland, now extinct, were those owned by the late Mr. James Douglas, of Athelstaneford, East Lothian; the late Mr. Barclay, of Keavil, Fifeshire; the late Sir William Stirling Maxwell, Bart., of Keir; Mr. James Currie, of Halkerston, Mid Lothian; the Earl of Dunmore; the late Duke of Montrose; Viscount Strathallan; Mr. Tweedie, Deuchrie; the late Mr. Mark Stewart, of Southwick, Dumfries; the late Lord Kinnaird; Mr. Milne, of Faldonside; Mr. Ainslie, of Costerton, &c.

The Athelstaneford herd would demand lengthened notice were it not that n 'Field and Fern' (South) Mr. Dixon has, in his wonted happy strain, given in interesting account of Mr. Douglas's achievements as a breeder of Shortiorns. Beginning about 1842, Mr. Douglas devoted close attention to the breeding of Shorthorns for nearly a quarter of a century, his last appearance as an exhibitor having been at the Highland Show at Stirling in 1864. As to the showyard career of his herd, it will suffice to say that it has scarcely a parallel in the annals of Shorthorn breeding. Ireland has been indebted to Mr. Douglas for much good Shorthorn material; and it is curious to note that one of his earliest and most successful selections was made in that country in 1851, when at Mr. La Touche's sale he purchased "Rose of Autumn," the daughter, by "Sir Henry" (10,824), of "Pelerine," which, along with her twin-sister "Polka"—out of the original "Mantalini," by "Buckingham" (3239)—Mr. La Touche had transplanted from Killerby to the Green Isle. At Athelstaneford these "Roses" or "Mantalinis" bred remarkably well, and attained great fame in the national showyards. "Rose of Autumn's" first calf in Scotland was "Rose of Summer," by "Velvet Jacket" (10,998) (see 'Herd-book,' vol. xi. p. 681), which became one of the most celebrated cows of her day. In one season she won the first prize at each of the three national shows of England, Scotland, and Ireland—a remarkable feat which other two females bred at Athelstaneford ("Third Queen of Trumps" and "Rose of Athelstane") also achieved. "Rose of Autumn" went from Athelstaneford to Mr. Mark Stewart of Southwick, and at the latter's sale in 1860 her daughter, "Rose of Promise," was bought by Lady Pigot at 270 guineas. At Mr. Pawlett's sale at Beeston in 1872, "Rose of Promise" and twenty of her descendants realised the handsome average of 247*l.* 7*s.* a head. At the Killerby sale in 1852, Mr. Douglas bought, among other females, the heifer calf "Officious," by "Hopewell" (10,332), from which have descended all the animals of the famous "Bracelet" tribe now living. From Warlaby he obtained "Isabella Hopewell," out of "Isabella Exquisite," and originally named "Ecstasy." To "Hymen" (13,058) (sold to M. F. R. de la Trehonnais at the Paris International Show in 1856 for 200 guineas, and got by the 330 guinea Fawsley bull "Duke of Cambridge") this cow produced the celebrated "Lamp of Lothian" (16,356), which, after gaining the gold medal for the best bull at the Royal Dublin Society's Spring Show in 1858, went to Ardfert Abbey, where he proved one of the most valuable sires ever introduced into Ireland. The Athelstaneford herd was at its best about 1858, when in the female classes at the Yorkshire Show at Northallerton it made a clean sweep of the highest honours with "Queen of Trumps," "Rose of Athelstane," and "Maid of Athelstane." Mr. Douglas was a most skilful and painstaking breeder, and the admirable model he kept in his mind was thus described by himself: "An animal of apparently small scale, but in reality not so, having a great propensity to fatten, on short legs, with fine bone, massive compact body, wide chest, ribs well sprung, thick loins, and well filled-up quarter; with deep twist, body all equally covered over with flesh, plenty of soft hair, and having no coarse beef on any part."

The Keir herd, one of the most useful that ever existed in Scotland, was founded in 1852 by the purchase of two cows—"Grandiflora," by "Rajah" (6595), and "Carrara," by "Ravenscroft" (10,680)—at the dispersion of Mr. Boswell's herd at Kingcausie, Kincardineshire. From the latter, by Mr. Troutbeck's "Gwynne," or "Princess," bull "Blenco," came "Young Carrara," the dam (by the famous Farnley Hall prize bull "John O'Groat," 13,090) of "Marble Cutter," sold at 250 guineas for exportation to Australia. The more important subsequent purchases were "Drapery," a cow of the "Coldcream" tribe, and "Chemisette," by "Earl of Dublin" (10,178), from Sir Charles Knightley's sales at Fawsley; "Flora" and "Rosanna," both got by "Lovemore" (10,476), of Knightley blood, from Colonel Pennant, Penrhyn Castle; "Windsor Flower," by "Earl of Scarborough" (9064), purchased from Mr. Wetherell for 250 guineas shortly before the dispersion of that gentleman's herd; "Miss Nightingale," by "Grand Turk" (12,969), secured for 200 guineas, at the sale of Mr. Ambler, Halifax, Yorkshire; "Picotee," by "Refiner" (10,695), and "Laura Bell" by "Phœnix" (10,608), from Mr. Chrisp's dispersion at Hawkhill, for 100 and 150 guineas respectively; "Vesta" and "Winning Witch," at 200 and 180 guineas respectively, from the Bushey Grove sale in 1862; the famous Show bull "Royal Butterfly XI." (20,719), and "Another Roan Duchess," by "Master Frederick" (18,348), purchased at the Townley Park dispersion for 400 and 225 guineas respectively; "Pride of the Morning," by "Scottish Chief" (22,849), and "Flower Girl," by "Baron Killerby" (19,280) (first-prize yearling heifers at the Royal Show at Worcester), from the Duke of Montrose's sale in 1867; "Ferooza," by "Knight Errant" (18,154), and her beautiful prize-daughter "Henrietta," from the Costerton sale in 1869; "Flower of the Rhine," purchased at the great Aylesby sale in 1875 for 510 guineas, &c. To the 330 guinea Fawsley bull "Duke of Cambridge" (12,742), "Chemisette" produced "Princess of Cambridge," which became the dam of many fine animals, including the prize bull "Allan" (21,172), used in the Sittyton herd ten or twelve years ago. "Anna Rose," daughter of "Rosanna," by "John O'Groat" (13,090), became the dam of "Forth," generally regarded as one of the most useful sires ever bred in Scotland. In national and other showyards he proved invincible; and at Keir and Sittyton he transmitted valuable properties to a numerous progeny. "Winning Witch" became the dam of "Wizard" (25,467) (by the Sittyton bull "Lord Chamberlain," 22,129), which was about the best sire used in Mr. Stephens's herd at Inchbroom, Morayshire, and which afterwards did good service in the herd of Mr. Geddes, Orbliston, in the same county. From "Flower of the Rhine" several very good females have sprung; and these, along with the old matron herself, now in her eighth year, have all gone to enrich the valuable herd belonging to Messrs. Mitchell, of Alloa. The bulk of the Keir herd was dispersed in 1881, when the prices were much lower than the character of the stock would have warranted.

The Halkerston herd, founded in 1856 and dispersed in 1880, was conducted carefully and successfully, and was conspicuously successful in disseminating the valuable properties of the Shorthorn amongst the general farm stock of the country. Halkerstou farm, although only ten miles inland, lies about 800 feet above the level of the sea; and the success attained by Mr. Currie at this great altitude testifies to the hardiness of judiciously bred and well-cared-for Shorthorns. The herd was established chiefly by animals tracing from Northumberland stocks, and when dispersed consisted of old Raine blood, enriched by contact with good Booth and Crofton strains. The small but select herd belonging to the Duke of Montrose was dispersed in August 1867, when twenty animals brought an average of 68*l.* 7*s.* a-head. The herd was full of choice Booth blood, the "Mantalini" and "Medora" tribes having been well represented. Viscount Strathallan's herd, also made up of good material, was sold on the same day. Twenty animals brought an average of 38*l.* 5*s.* a-head.

The Dunmore herd will claim a chapter to itself in the history of Shorthorn breeding. Founded in 1868, and sold by Mr. Thornton in 1880, it was the only pure Bates herd ever established in Scotland, and may be regarded as holding an unique position in the annals of herds of that line of blood. Lord Dunmore's draft sale on August 25, 1875, has no parallel in British Shorthorn history. The thirty-nine animals sold realised a total of 26,223*l.*, or an average of 672*l.* 8*s.* The average for thirty cows and heifers was 576*l.* 5*s.* 6*d.*, and for nine bulls and bull calves, 992*l.* 16*s.* 8*d.* For the "Duke of Cambridge," Lord Fitzhardinge gave 4725*l.*, the highest price ever paid in this country for any animal of the bovine race.

The north-eastern counties have long been the chief centre of Shorthorn breeding in Scotland. Probably in no other part has the inherent good qualities of the breed been more fully developed or made more thoroughly useful to the country. The pioneer in this district was the late Captain Barclay, of Ury, near Stonehaven, in the county of Kincardine, who carried to the north the noble work which had been commenced on the Borders by Mr. Robertson, and taken up in the Lothians by Mr. Rennie. Captain Barclay began to breed Shorthorns in 1822. Little is known as to his earliest purchases. At the Chilton sale in 1829 he secured "Lady Sarah" (No. 20) for 150 guineas, the highest price paid for a female at the sale. "Lady Sarah" was got by "Satellite" (1420), and when brought to Scotland, was in-calf to Mason's "Monarch" (2324). The produce was "Monarch" (4495), and he in turn was mated with his own dam, the offspring in 1836 having been "Mahomed" (6170). In the following year the bulk of the herd was dispersed, and most of the animals were purchased to enlarge or to establish herds in the north-eastern counties. To recruit the herd after this sale, ten heifers selected by Mr. Wetherell were brought north. Captain Barclay having had evidence of the great excellence of the stock of "Lady Sarah," procured as the stud bull of his fresh herd her son "Mahomed" (6170), which had been sold to a Ross-shire farmer. Mainly through the use of this closely-bred bull, another fine lot of cattle were reared; and these, when sold a few years afterwards, the last of them in 1847, still further increased the strength and improved the character of the Shorthorn herds in the north of Scotland. The early improvement of northern Shorthorns has been attributed chiefly to the blood of "Lady Sarah," so successfully concentrated and used by Captain Barclay; and of the Shorthorn stock at present in the north of Scotland a very large proportion trace back to the Ury bred. Of "Lady Sarah's" produce, "Mahomed" was the most closely bred.* Among the more valuable females (besides "Lady Sarah") purchased by Captain Barclay were "Rose," by "Satellite" (1420), "Lucy," by "Mars" (411), and "Marshal Leopold," all from Phantassie in 1827; "Magnet," by "Magnet" (392), "Rosebud," by St. Leger" (1414), "Julia," by "Paganini" (2405), "Emily," by "Reformer" (2509), and "Mary Anne," by "Sillery" (5131). "Invalid" (4076), also by "Satellite" (1420), was one of the earliest sires used, and to him "Lady Sarah" brought forth three daughters, "Julia" in 1831, "Cicely" in 1834, and "Ellen" in 1835. The other early sires were "Champion," bought at Phantassie in 1827 for 100 guineas; "Commander" (3439), and his son "Young Commander" (3443), and "Monarch" (4495), and his two sons "Mahomed" (6170), and "Emperor" (3716). In the second herd at Ury, "Mahomed" was used three years, and afterwards passed into the possession of Mr. Ladds, of Ellington, and Mr. Yorke, of Thrapston. To succeed "Mahomed," Captain Barclay hired "Second Duke of Northumberland" from Mr. Bates; but his produce not having been satisfactory, he was sent away to make room for "The Pacha" (7612), a son of "Mahomed."

The shrewd, practical agriculturists of Aberdeenshire had been in search of an improved breed of cattle even before the advent of the present century. Many varieties were tried, including the old, ungainly, unimproved "Teeswaters." More than a hundred years ago Mr. Udny, of Udny, had a stock of Northumberland cows and an English Shorthorn bull, which are highly spoken of in Mr. Wight's 'Survey of Aberdeenshire,' drawn up in 1779. It was not, however, until the Improved Shorthorn was introduced that the

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* "Satellite" (1420) was the sire of both "Lady Sarah" and "Monarch" (2324), while the dams of these two were by "Cato" (119). "Monarch" (2324), more than half brother to "Lady Sarah," was put to that cow, and produced "Monarch" (4495), which, put to his own dam, produced "Mahomed" (6170).

properties sought for were obtained. The late Mr. Alexander Hay, of Shethin, Tarves, Aberdeenshire, accompanied Captain Barclay to Mr. Rennie's sale in 1827, and secured the four-year-old white bull "Jerry" for 31 guineas. "Jerry" was a most active and impressive sire, and did a great deal to improve the cattle of the district. His stock created speculation throughout the county, and his sons were eagerly sought after for crossing with the cattle of other parts. He afterwards became the property of the Rev. Mr. Douglass, who occupied the farm of Auchterellon in the same neighbourhood, and who had been associated with Mr. Hay in the original purchase. "Jerry" was remarkably well bred. His own sire was R. Colling's closely in-bred "Barmpton" (54), hired by Mr. Robertson, of Ladykirk, at 160 guineas per season, and not only out of a daughter and grand-daughter of "Favourite" (252), but also got by a son and grandson of that famous sire. Then "Jerry's" dam was got by C. Colling's "Wellington" (679), whose dam was "Peeress," by "Favourite" (252), out of "Old Cherry," and whose sire was the 1000 guinea bull "Comet" (155), while "Comet," the son of "Favourite" (252), was also the sire of "Jerry's" grandam. It will thus be seen that in "Jerry" the blood of "Favourite" (252) predominated in a greatly concentrated form. No wonder that he effected a vast improvement in the Aberdeenshire stock to which he was introduced.

In 1835 Mr. William Hay, brother to Mr. Alexander Hay, formed a Shorthorn herd at Shethin, drawing a good deal of material from Ury. For several years at the outset he used bulls inheriting the blood of Captain Barclay's "Monarch" (4495). "Kelly the 2nd" (9265) and his son, "The Hero" (10,934), were notable sires, and produced a large number of very fine heifers. At the Kirklevington sale, on the 9th of May, 1850, Mr. Hay purchased "Grand Duke" (10,284) for 215 guineas, the highest price of the sale, and also secured "Waterloo 13th" for 71 guineas. "Grand Duke" did not fulfil expectations, and so, at the purchase price, he was soon after sold to Mr. Bolden, with whom he did service of immense value. As a successor to "Grand Duke," Mr. Hay purchased "Red Knight" (11,976), for 110 guineas, at the Killerby sale in 1852; but he too was less successful than could have been wished. Among the other sires used at Shethin was Mr. Bolden's "Cherry Duke the 2nd" (14,265), bought at Mr. Atherton's sale at Chapel House, near Liverpool, in March 1858 for 205 guineas. From Shethin this bull went to Rossie Priory, Inchture. The Shethin herd, which for some time had been carried on by Mr. Shepherd, Mr. Hay's son-in-law, was dispersed in 1863. The majority of the animals were retained in the north, where the herd had done much good. Some "Waterloo" females went into the herds of Lord Penrhyn and Sir Wilfrid Lawson.

Improved Shorthorns were introduced to Brangan, in the Banff district, in 1829. In 1831 the late Mr. Andrew Longmore, of Rettie, near Banff, purchased a son of the Phantassie bull "Jerry," and used him with good results amongst the common stock then on the farm. Three years later, Mr. Longmore founded a herd of Shorthorns, and continued Shorthorn breeding till his death in 1880. He was very successful in the raising of bulls; and through the spreading of these throughout the northern counties the improvement of the general stock of cattle was greatly promoted. Public sales of bulls and other animals were held annually at Rettie, from 1847 till the dispersion of the herd in 1881. For bulls the average prices, as a rule, ranged from 28 to 35 guineas per head. The highest average was obtained in 1857, when ten young bulls brought 55*l.* 13*s.* a-head.

The late Mr. Grant Duff, of Eden, made his first purchase of Shorthorns in 1836. Three years later he founded a pure-bred herd with five females and the Crofton bull "The Peer" (5455), all obtained at the sale of Mr. J. Chrisp of Doddington, Northumberland; and three cows bought from the Earl of

Carlisle. In 1840 "The Peer" was succeeded by the Kirklevington closely-bred bull "Holkar" (4041), for which 162*l.* was paid. He was a handsome animal and an excellent sire. "Robin O'Day" (4973), by Mr. Wiley's "Carcase" (3285), succeeded "Holkar;" and as a sire he was even more successful. Among the other bulls used were the "Second Duke of Northumberland," which did no better at Eden than at Ury; "Sir Thomas Fairfax 2nd" (6493), and "Duplicate Duke," (6959) out of "Carnation," a Foggathorpe cow, and got by the "Second Duke of Northumberland." Several draft sales were held at intervals of two or three years, beginning in 1841, and from these a large number of excellent Shorthorns were spread throughout the northern counties, where many of their descendants may still be found. The herd was dispersed on the 24th of May, 1854, when thirty cows and heifers brought an average of 54*l.* 8*s.* 6*d.*, and ten bulls and calves 29*l.* 3*s.* 9*d.* a head. The bulk of the herd was retained in Scotland, but several of the best animals were taken to England and Ireland.

Improved Shorthorns were first introduced into Morayshire about 1831, the earliest breeders having been the late Mr. John Stephen, of Coulardbank; his son, the late Mr. William Stephen, of Inchbroom; the late Mr. Mellis, of Spynie; and the late Mr. Sutherland, of Shempston. The cows "Peg," by "Champion," son of "Pilot" (496), and "Flora" (winner of the first prize at Elgin in 1835), were brought from Ury to Coulardbank in 1831. From this purchase Mr. William Stephen laid the foundation of the Inchbroom herd, which was subsequently enlarged and improved by the introduction of females and bulls from leading herds, notably the celebrated herd at Athelstaneford. The Inchbroom herd was conducted with much skill and success, and through its influence a vast improvement was effected in the cattle-stock of the surrounding districts. The herd was dispersed in 1868, after Mr. Stephen's death, and nearly all the animals were bought by northern breeders, the best females bringing from 45 to 75 guineas. A good many of the more useful tribes in the north of Scotland trace through the Inchbroom stock, which is well entitled to be ranked as a pioneer herd. Another herd that did much to bring Shorthorns into favour in the more northern counties was that maintained at Hillhead, Nairn, by Messrs. C. Smith and A. Davidson. At its dispersion in April 1860, northern breeders secured some valuable material, for which they paid moderate prices.

The limits of space prevent anything more than simple mention of many other northern herds, which, in earlier or later times, have done much good to the country, but which do not now exist. In Strathmore, chiefly in the county of Forfar, Shorthorns were bred by Colonel Dalgairns, of Ingliston Glamis; Mr. Wood, of Hatton of Eassie, Glamis; Mr. Taylor, of Kirktonhill, Montrose; Mr. Lyall, of Kineraig; and others. In Kincardineshire the example of Captain Barclay was at an early date followed by Mr. Boswell, of Kingcausie, who bred some very good cattle; while in more recent times a few small useful herds have been maintained by others in this county. In the counties of Aberdeen and Banff a great many excellent herds, besides those already mentioned, have ceased to exist. Chief among these are the herds which were owned by Mr. Morison, of Mountblairy; Mr. Ferguson Simpson, of Mains of Pitfour; Colonel Tower, of Kinaldie; Mr. Stronach, of Ardmeallie; Mr. Whitehead, of Little Methlick; Mr. Jopp, of Nether Boddom; Mr. Milne, of Kinaldie; Mr. Harvey, of Tillygreig; Mr. Mitchell, of Meikle Haddo; Mr. Cochrane, of Little Haddo; Mr. Marr, of Cairnbrogie; Mr. Campbell, of Blairton; Mr. Thompson, of Newseat; Captain Gordon, of Cluny; Messrs. Cruickshank, of Lethenty; Mr. Mitchell, of Auchnagathle; Mr. Scott, of Glendronach; Mr. Cantlie, of Keithmore; Mr. White, of Clinterty; Mr. Morrison, of Mains of Montcoffer; Mr. Aiken, of Meikle Endovie; and Mr. Hutchison, of Monyruy.

Still further north, useful herds, not now in existence, were maintained by Mr. Mackessack, of Balnaferry; Mr. R. Bruce, of Newton of Struthers; Mr. Harris, of Earnhill; and Mr. Geddes, of Orbliston, all in Morayshire; and by Mr. Cran, of Kirkton, Inverness; and Mr. Fletcher, of Rosehaugh, Ross-shire.

Throughout Scotland there are at the present time a very large number of Shorthorn herds. In the southern counties, where, as already indicated, the breeding and rearing of cattle occupy a secondary position in the calendar of farming operations, there are a few valuable herds whose names are well known. Prominent among these are the Duke of Buccleugh's herd at Dalkeith Park, and that owned by Messrs. A. and A. Mitchell, of Alloa. The Dalkeith Park herd has had a long and exceedingly useful career, a great number of excellent sires having gone from it all over Scotland. The Alloa herd contains some choicely bred strains; and here the Warlaby bull "Royal Studley" (45,548), by "Royal Stuart," and out of "Royal Lady," by "Royal Benedict," is at present on hire.

Lord Polwarth's herd at Mertoun is composed of excellent Booth material. Mr. Bain, of Legars, Kelso, owns a small herd, and so also do Mr. Balfour, of Whittinghame, M.P., Sir David Baird, and Sir Thomas Buchan Hepburn, all in East Lothian. Mr. Bethune, of Blebo, Fifeshire, has a good herd, while in Perthshire the chief breeders are Mr. Dundas, of Dunira, Mr. Whyte, of Muirhead, Col. Williamson, of Lawers, Mr. Maxton Graham, of Redgorton, and Mr. D. Fisher, of Keithock, &c. In Forfarshire Mr. Geikie, of Baldowrie, Mr. Granger, Pitcur, and a few others, have for some time maintained useful herds.

The great majority of Scotch Shorthorn herds are situated in the north-eastern counties, with the lower parts of Aberdeenshire as the head centre. Here Shorthorn breeding has gone on continuously for close on half a century. At present between 500 and 600 young bulls are sold in these districts annually; and although prices latterly have been rather lower than some years ago, owing to an increased supply and other causes, there is every probability of that demand still continuing to grow. The principal herds in Aberdeenshire are those owned by Mr. Cruickshank, Sittyton; Mr. S. Campbell, Kinnellar: Mr. W. S. Marr, Uppermill: Mr. Davidson, Mains of Cairnbrogie; Mr. Bruce, Broadland; Mr. Scott, Towie Barclay; Mr. Mackie, Petty; Miss Hepburn, Keithfield; Mr. Shepherd, Shethin; Mr. Duthie, Collynie; Mr. Cowie, Cromblybank; Mr. Bruce, Myreton; Mr. Nares, Bructor; and Mr. Stewart, Sandhole, Fraserburgh. In Morayshire valuable herds are kept by the Duke of Richmond and Gordon, Gordon Castle, Fochabers; Mr. James Bruce, Burnside; Mr. Lawson, Braelossie; Mr. Watt, Garbity; Mr. McWilliam, Stoneyton, and others. At Dochfour, near Inverness, Mr. Evan Baillie owns a herd composed of very good material. Lord Lovat has some well-bred animals; while Mr. Gordon, Udale, Ross-shire, has the remnant of a large and very useful herd, which was presided over for several years by the 400 guinea prize-bull "Rosario" (35,315). In Caithness, Mr. Adam of Lynegar has established a herd of good animals, selected chiefly in Aberdeenshire.

A short account of the composition of the chief existing herds would have been interesting. This, however, would have occupied too much space; and therefore, as a good sample, the Sittyton herd may be briefly noticed. Not only the oldest in Scotland, but also the largest, the Sittyton herd, alike in respect to the material of which it has been built up and the principles upon which it has been managed, presents an excellent illustration of the system of Scotch Shorthorn-breeding from which the country has derived so much benefit, and which has at the same time brought out in their best and most useful form the valuable properties of our principal national breed of cattle. In 1837 Mr. A. Cruickshank imported a heifer from Durham, and in the following year the bull "Inkhorn" (6091) was obtained from Captain Barclay, of Ury. In subsequent years several cows were introduced from Ury, Lincolnshire, and the north of England; and by 1847 there were fifty females on the breeding list. Of the tribes which by that date had been established at Sittyton, two, those from "Clipper," by "Billy" (3151), and the "Orange Blossoms," are of Ury descent; the "Violets" represent the Lincolnshire purchase—"Moss Rose," by "Grazier" (1085); "Venus," by "Saturn" (5089), was bought from Mr. Rennie, of Kimblethmont, whose stock traced through the Phantassie herd to that of Mr. Robertson, of Ladykirk; the cow "Premium," by "George" (2057), came from the stock of Mr. Chrisp; and "Pure Gold," by "Young Fourth Duke" (9037), was bred by Mr. Grant Duff, of Eden, from the stock of Mr. R. Wilson, of Brawith. In later times "Victoria, by "Lord John" (11,731), was bought at the sale of Mr. Holmes; "Sympathy," by Duke of Athole" (10,150), at the sale of Mr. Tanqueray; the Tortworth cow "Chance," by "Duke of Gloucester" (11,382), came from Mr. Robinson, Burton-on-Trent; the "Lavenders" are descended from a cow bought by Mr. Wilkinson, of Lenton, from R. Colling; at Mr. Dudding's sale, "Avalanche," by "Sir Samuel" (15,302), was bought; "Butterfly's Pride," by "Royal Butterfly" (16,862), came from the Towneley Park sale in 1864; the descendants of "Lovely 8th," by "Bosquet" (14,183), bought at Shethin, represent the old blood of Mr. Lovell, of Edgecott; and the cattle tracing to "Sybil," by "Lord Warden" (7167), and "Jenny Lind," by "Jews' Harp" (8180), are from the Wiseton blood of the late Earl Spencer. All these animals have left numerous descendants, and they are all represented in the herd as it now exists. The sires which followed "Inkhorn" (6091) were "Toucher" (6596), "Premier" (6308), "The Pacha" (7612) (the latter two from Ury), and "Billy 2nd" (5974). "Fairfax Royal" (9506), bred by Mr. Torr, was used in 1847–8–9, and during the next twelve or thirteen years sires were introduced from the herds of Mr. Douglas, Mr. Linton, Mr. Wiley, Mr. Smith, West Rasen, Mr. Chaloner, and Mr. Mark Stewart. From 1863 to 1870 the principal bull used was "Champion of England" (17,526), bred at Sittyton, and got by the Lenton bull "Lancaster Comet" (11,663). This fine bull did more good in the herd than any other animal ever connected with it. He was a most impressive sire, and a great many excellent animals got by him were spread throughout the northern counties. He was assisted by several of his sons; and at this period the well-known Keir bulls, "Forth" (17,856) and his son "Allan" (21,172), as well as "Baron Killerby" (23,364) and "Prince Alfred" (27,107), bred by Mr. Pawlett, were also used. Since the death of "Champion of England" in 1870, his sons, grandsons, and great-grandsons, all bred at Sittyton, have been almost entirely relied upon; and they have, on the whole, proved worthy of the trust.

During the forty-five years in which the Sittyton herd has been in existence the extent of land in occupation has varied, and the number of bull calves raised every year has ranged from a half-dozen, or so, at the outset, to as many as eighty head in one season. In all, about 1400 bulls have been bred at Sittyton, and have been sold principally to farmers throughout the northern counties for the purpose of crossing with the ordinary farm-stock. What a vast influence the herd has thus exerted in the improvement of the general cattle-stock of the north! It has been a veritable mine of wealth to that part of the country. Sittyton bulls have always been in demand. The range of prices has been considerable. For spring-calves, sold in the autumn of the same year, they have seldom averaged less than 25*l.*, and have not often exceeded 45*l.* a-head. At present there are over 100 females in the herd, and three or four stud bulls are kept in use.

A few sentences ought to be added in reference to the two herds that rank next in importance to that at Sittyton, namely the Kinnellar and Uppermill herds. The Kinnellar herd was established in 1847 by the purchase of two heifer-calves at the Ury sale. In subsequent years it was enlarged by selections from local herds, as well as from that of Mr. Betts, Preston Hall. It now numbers about 120 head, and from it a great many very useful animals have gone to various parts of the north-east. Among the sires used have been Mr. Richard Booth's "Sir Christopher" (22,895), by "General Hopewell" (17,953); "Under Sheriff" (32,745), bred at Peepy and got by the Warlaby sire "High Sheriff" (26,392); and "British Prince" (33,228), bred by Mr. Lambert, Elrington Hall, Hexham. "Sir Christopher" was the first Warlaby sire used in Aberdeenshire; but, like the Bates' bulls used at Ury, Shethin, and Eden, he did not "nick" so happily with the northern cows as did the home-bred bulls. Mr. Campbell's first public sale took place in 1857, when eight young bulls brought an average of 43*l.* 16*s.* 7*d.* Since then his annual crop of bulls has been disposed of at public sales, and prices have averaged from thirty to forty-three guineas per head. The prices lately have been rather lower than formerly.

The Uppermill herd, founded in 1857 by purchases from the local herds at Little Methlick, Shethin, and Mountblairy, and at Mr. Chrisp's sale at Alnwick, Northumberland, now numbers upwards of 100 head, and has had an exceedingly useful career. A great many excellent animals have gone from Mr. Marr's herd to various districts in Scotland, as well as to America and elsewhere abroad; and wherever they have appeared they have been highly appreciated. Well-bred sires have generally been used, the most successful of all having been the fine Keavil "Seraphina" bull, "Heir of Englishman" (24,122). This animal proved one of the best sires ever brought to the north of Scotland; and when his produce at Uppermill were in their prime, Mr. Marr's herd, in respect to average merit, had few equals in the country. The "Heir" was succeeded by his son, "Young Englishman" (31,113), also a prize-winner and a tolerably good sire; and a few years afterwards a fresh dash of "Seraphina" blood was infused through the light-roan bull "Cherub 4th" (3359), purchased from Lord Sudeley for 200 guineas. "Cherub 4th," however, as a sire, did not equal his illustrious relatives that had preceded him at Uppermill. The number of bulls bred every year averages about thirty head. They are disposed of, when from six to eight months old, at public sales in Aberdeen in spring and autumn, and are bought chiefly by northern farmers, to whom they have done much good service. The average price obtained is about 30*l.* a head. A few of the best bulls have been exported to America and Australia, at prices exceeding 100 guineas each.

The Gordon Castle herd, it may be mentioned, was established in 1843 by the late Duke of Richmond, for the purpose of facilitating the improvement of the cattle-stock in that part of the country. The herd has ever since been maintained for the same laudable object, the present Duke having taken up heartily the excellent work begun by his noble father. Annual sales of pure-bred cattle and sheep have been held regularly at Gordon Castle since 1843, and through these the surrounding districts have derived much benefit.

APPENDIX II.

INTRODUCTION AND SPREAD OF SHORTHORNS IN IRELAND.

Although the history of systematic Shorthorn breeding in Ireland may be said to date from 1829, a good many small and isolated importations of Improved Shorthorn cattle, chiefly bulls, had been made before that date. These early introductions did much good in their way, and it cannot be doubted that for them Ireland is in a great measure indebted to fox-hunting. About the beginning of the present century there was comparatively little intercommunication between England and Ireland. From the rural districts, at least, few went across the Channel, excepting some gallant country squires drawn from home by an ambition to show the Saxon by example how to follow the hounds. On days unsuitable for the chase, inspection of farms and farm-stock would seem to have been a congenial pastime, and thus, through cogitations on these "days not out," the Improved Shorthorn made its way into Ireland.

It is generally understood that the late Mr. Luke White, of Woodlands, Co. Dublin, grandfather of the present Lord Anally, had the honour of bringing the first highly bred registered Shorthorn into Ireland. In May 1818 he purchased from Mr. Booth, of Killerby, the bull "Agamemnon" (9), calved in 1814, and two heifers, and the produce of these passed chiefly into the Westland and Kingsfort herds. The "Medora," or own sister to "Isabella" tribe, a numerous variety in Ireland, trace to "White Cow" by "Agamemnon" (9).

The example of Mr. White was soon followed by a good many enterprising country gentlemen, by whom a number of good Shorthorn bulls, most of them of excellent lineage, although not to be found in the Herd-book, were brought over and used with great effect amongst the native cattle. A few unregistered cows and heifers came along with the earlier bulls, and from the outset these are said to have thriven well and to have bred admirably. Among the earliest importers, besides Mr. White, were Mr. La Touche, of Harristown, Co. Kildare; Mr. R. Archbold, of Davidstown, Co. Carlow; Sir J. Kennedy; Mr. Borrowes, father of Major Borrowes, of Giltown; Sir R. Bateson, Belvoir Park, Belfast; Lord Ross; Mr. G. Fasbery, of Curragh Bridge; Mr. John Christy, Lord Cloncurry, Mr. Kearney, Mr. McClintock, Colonel Cradock, &c.

At the great Chilton sale, in August, 1829, Ireland made a bold start in the systematic breeding of Shorthorns. The "Irish Contingent" formed an important element in the assemblage, and the selections made for the Green Isle reflected much credit on the judgment of the enterprising gentlemen who made the purchases. The following are the Irish purchases made on that memorable occasion:

Cows and Heifers.—Messrs. Adamson and Holmes bought No. 1 (8 years old), by "Cato" (119), the progenitrix of the "Victorias," for 131 guineas. Mr. Robert Holmes also secured No. 37 (1 year old), by "Satellite" (1420), for 125 guineas; No. 61 (3 months old), by "Monarch" (2324), for 46 guineas; and No. 62 (11 months old), got by "Monarch" (2324), for 40 guineas. Mr. Adamson acquired No. 8 (5 years old), by "Dr. Syntax" (225), the progenitrix of the "Britannias," for 52 guineas; No. 22 (3 years old), by "Satellite" (1420), at 35 guineas; and No. 42 (1 year old), by "Satellite" (1420), for 78 guineas. Mr. La Touche purchased No. 16 (4 years old), by "St. Albans," for 73 guineas; No. 27 (2 years old), by "Satellite" (1420), for 60 guineas; No. 31 (2 years old), by "Satellite" (1420), for 69 guineas; No. 38 (1 year old), by "Satellite" (1420), for 78 guineas; and No. 44 (1 year old), by "Monarch" (2324), for 78 guineas. Mr. Archbold took No. 17 (4 years old), by "St. Albans," at 54 guineas; and No. 26 (3 years old), by "Richard" (1376), at 37 guineas. Mr. Cusacke obtained No. 24 (3 years old), by "Satellite" (1420), at 21 guineas.

Bulls.—Mr. La Touche bought "Monarch" (2324), (3 years old), at 270 guineas. Mr. Archbold secured "Driver" (1928), (3 years old), at 33 guineas. Mr. O'Farroll purchased "Herdsman" (2117), (2 years old), at 28 guineas. Mr. Cassidy took "Punch" (2471), (1 year old), at 32 guineas.

With these valuable importations the systematic breeding of high-class Shorthorns was begun in earnest in Ireland. It may truly be said that few singl events have resulted in greater substantial benefit to the agricultural interests of the country. A great many of the Shorthorn breeders of Ireland, whose large and skilfully managed herds have, in the course of the past half century, been so instrumental in promoting the agricultural welfare of the Green Isle, being as it were mines of ever-increasing and ever-spreading wealth, have been indebted to those Chilton purchases for not a little of their very best material. Want of space prevents me from attempting to trace the career of the Mason tribes in Ireland, although much that would be interesting would be brought out in the inquiry. Even in this hurried sketch, however, at least one tribe, Holmes "Victoria," the descendants of No. 1, by "Cato" (119), demands mention. At Moycashel Farm, Co. West Meath, Mr. R. Holmes, who in visiting the Booths, Thomas Bates, and other early English breeders, about 1823 and following years, had imbibed a strong liking for Shorthorns, built up a very fine herd, almost entirely of the descendants of the cows, No. 1 and No. 8 at the Chilton sale, purchased by himself and Mr. Adamson. The bulls used were of the best breeding, and several of them, including "Volunteer" (1553), and "Augustus" (1662), calved respectively in 1825 and 1827, were hired from the Booths. His herd was dispersed on September 29, 1853, by Mr. Strafford, when twenty-four "Victorias" brought an average of 80*l*. 15*s*. a head, eight "Britannias," descendants of Mason's No. 8, averaging 35*l*. 5*s*. each. The "Victorias" are still held in high estimation in Ireland. At the Islanmore dispersion in 1875, eleven of the tribe averaged 88*l*. 9*s*. 9*d*.

Mr. Robert Holmes was breeding Shorthorns some years before the Chilton sale, and it is believed that his first cow was "Moaish," got by "Remus" (550), and bought from her breeder, Mr. J. Booth. In 1826 this cow presented Mr. Holmes with the well-known bull "Belzoni" (783), got by Mr. J. Booth's "Captain Parry" (838). Mr. La Touche imported a good many valuable Shorthorns in addition to his selections at Chilton; and from his highly-bred herd a great deal of excellent material was spread throughout the country. From Killerby he was plucky and fortunate enough to obtain the two celebrated twin daughters of "Mantalini" and "Buckingham" (3239), "Pelerine" and "Polka." "Pelerine" produced "Rose of Autumn," the ancestress of the famous Athelstaneford "Roses," and through the descendants of "Ladylike," by "Stars and Stripes" (12,148), bought from Mr. Douglas by Mr. Campion in 1853, and through other channels, the strain is still well represented in Ireland. At the Studley sale Mr. Archbold purchased "Young Maria" and the bull "Argus," and he also bought many other good Shorthorns from England. At his dispersion sale in 1847 no fewer than 106 Shorthorns were offered. Several cows brought from 40*l*. to 46*l*., the majority realising from 20*l*. to 30*l*. a head. The stud bulls at the time were "Sockburn," bred by Mr. T. Bates, got by "4th Duke of Northumberland" (3649), and out of "Blanche 3rd," by "Short Tail" (2621); "Lord of the Valley," by "Provost" (4846), and "Guy Faux" bred by Mr. Crofton, Holywell, and got by "Gainford" (2044). It is believed that the first bull introduced by Mr. Archbold was "Streamer," (624), got by "Comet" (155), and out of "Rosa," by a son of "Favourite" (252). This bull, calved in 1813, came to Davidstown about 1818 or soon after, and ultimately passed into the possession of Mr. John Dempsey, of Marshalstown. He proved an excellent sire, and bulls got by him did much good in the surrounding districts.

At a very early date Shorthorns found their way into the counties of Wexford and Wicklow. Mr. Wentworth Taylor, Tinahely, states that about 1826 his grandfather purchased from Mr. Archbold, of Davidstown, a young bull, a son of the famous sire "Streamer" (624) just referred to. This young bull was used freely amongst the old-fashioned black-and-white cattle then occupying the county, and the very first cross showed marvellous improvement. By this gentleman and his son, the late Mr. Robert Dowse, the use of

Shorthorn bulls was ever after continued. The latter was one of the most successful exhibitors of cattle at the shows in Co. Wexford.

Mr. John Brownrigg, Moneylawn, Co. Wexford, obtained through his brother William, who was agent for Mr. La Touche, the bull "Planet" (1325), a grandson of the famous "Comet" (155); and so highly was he estimated as a stock-getter, that he was used till his horns almost dropped off. Mr. R. Dowse saw "Planet" when twelve years old, and described him as then showing "a magnificent outline of an old bull." Mr. Brownrigg also obtained some Shorthorn females from Mr. La Touche, and from these and others he reared an excellent stock of well-bred Shorthorns, although he did not enter them in any Herd-book. After "Planet," Mr. Brownrigg used Mason's "Ploughboy" (4239), which was got by "Monarch" (2324), out of Mr. Adamson's No. 8, purchased by Mr. Davison at the Chilton sale in 1829 for 40 guineas. This was a bull of immense size, and had a wonderful coat of hair. In 1834 or 1835 a sale was held at Moneylawn, when Mr. Robert Chaloner, agent for Earl Fitzwilliam, purchased some heifers, with which the long-established herd at Coollattin was commenced. Mr. Brownrigg continued Shorthorn breeding for some time after. The last of his stock were dispersed in 1852.

The Coollattin herd, thus founded more than half a century ago, was maintained till 1881, when all excepting a few animals, retained as the nucleus of a fresh breed, were dispersed. Probably no herd in Ireland has exercised a greater or more directly visible influence in the improvement of the general cattle-stock than that so long kept at Coollattin. The late Earl Fitzwilliam, ever active in philanthropic work, established the herd for the sole purpose of providing means for the improvement of the cattle on his estates and in the surrounding districts. The present Earl, who has manifested a keen interest in Shorthorn breeding, foresaw the benefit the country would derive from a plentiful supply of high-class pure-bred Shorthorn bulls. Taking up heartily the good work begun by his father, he devoted much attention to the enlarging of his herd and the advancing of its character and usefulness. The females were of good well-formed sorts, and no expense was spared in procuring sires, which were always of choice blood as well as of high individual merit, the later bulls having been rich in Booth blood. Mr. Robert Murray, who so successfully managed the herd for the long period of thirty-five years, made several important selections of females in England, and these as well as the Irish purchases produced good stock. An annual sale of young stock was commenced at Coollattin in 1857, and was continued till the herd was dispersed. In all, nearly 500 young bulls have been sold from Coollattin. The great majority of these have been employed in the improvement of the general cattle-stock throughout Ireland, chiefly in the counties of Wicklow, Wexford, Carlow, and Dublin.

In 1837 the late Earl of Courtown, Courtown House, Gorey, Co. Wexford, imported through Mr. Wetherell the bull "Priam" (4758), and a few cows and heifers, from a sale held by Mr. Denton, near Carlisle. From these many useful animals were raised. The Courtown herd is still maintained, and has done much good in the country. Two years later, Mr. Francis Davis, of Enniskerry, obtained from Mr. Baker Greenwell, of Barmpton, the bull "Wellington" (5626), *alias* "The Duke" (20,951), along with two heifers. Mr. Davis did not form a herd; but his bull "Wellington," let at a fee of 10*s.* per cow, made a wonderful impression upon the cattle of the district. After having been employed for two or three years in this way, "Wellington" was sold to Mr. Brownrigg, and ultimately went to Coollattin, where he was used for some time with great good effect.

In 1847 Mr. Samuel Armstrong founded his well-known "Vinegar Hill" herd, by the selection of a few cows in the Gorey district, tracing from such bulls as "Planet" (1325), "Ploughboy" (2439), and "Monarch" (2324). In his native Cumberland Mr. Armstrong had imbibed a strong love for the improved Shorthorns, and in 1852 he purchased the bull "Hetman Plutoff" (13,024) from his breeder Mr. Isaac Hutchinson, of Braystones, Whitehaven, Cumberland. This bull was not only a famous prize-winner, but was also a noted sire; and having been let at a fee of 10*s.* per cow, he effected a most marked improvement in the cattle of the locality generally, as well as in his owner's herd. In 1854 Mr. Armstrong imported from Cumberland three handsome well-bred cows. One was "Hyton Lowther," the dam of "Hetman Plutoff," and another, the first Shorthorn owned by Mr. R. Jefferson, of Preston Hows, the eight-year-old cow "Tink-a-Tink," from which many good animals have descended, including some that did well in the The Island herd.

Mr. Joseph Meadows, of Thornville, founded his famous herd about 1858. Mr. Moffat, of Ballyhyland, followed his example about two years later; while Mr. William Bolton, of The Island, who had been breeding Shorthorns for many years, built up his large and important herd soon after 1862. At the outset, Mr. Meadows and Mr. Bolton drew largely upon Mr. Armstrong's herd; but in after years they went further afield, introducing some of the most valuable material in the country. The Thornville herd produced the celebrated showyard champion "Bolivar" (25,649), the winner of upwards of twenty prizes and cups at the leading national and provincial Shows in Great Britain. "Charlie" (25,745), half-brother to "Bolivar," and also from the Thornville herd, had an almost equally brilliant Showyard career; while with cows and heifers Mr. Meadows also won many prizes. The chief tribes represented were the "Bracelet," "Fanny," "Chemisette," "Medora," "Lady Sarah," &c. The sires used were of good Booth blood. The bulk of the herd was dispersed in 1874, at an average of about 50*l.* a-head. At the first sale at Thornville, Mr. Wentworth Taylor, of Tinahely, purchased a heifer of the "Fanny" tribe, and has since continued to breed Shorthorns. He has made important purchases at The Island and Coollattin, as well as in England, and now owns a promising herd of well-bred animals.

Mr. William Bolton, of The Island, had long been using bulls from strains of high repute, and by degrees he collected a large stock of excellent females of good breeding. His chief tribes were the "Gwynne," "Glossy," "Woodbine," "Sylph," "Rosamond," "Fame," "Lady Sarah," and "Mantalini." The representatives of the last-named tribe were obtained from Westland, and for one, Alpine's heifer "Mantalini," Mr. Bolton paid 750 guineas. For several years Mr. Bolton used bulls from Warlaby; and from his herd a large number of high-class animals have been spread throughout Ireland. The herd was dispersed in 1881, when, for the high character of the stock, the prices were low. The choicely-bred "Mantalini" bull "Albion" (36,112) was secured by Mr. Allen, Unicarville, at 230 guineas. The females of the "Mantalini" tribe had, at an earlier date, gone to the Prinknash Park herd in Gloucestershire, at high figures.

At Lisnevagh, in Co. Carlow, the late Colonel Bunbury long kept a good herd of Shorthorns, from which the district derived much benefit. His son, Lord Rathdonnell, the owner of the celebrated "Anchor" (32,947), has gone heartily into the breeding of high-class Shorthorns, and his promising herd at Lisnevagh is presided over by a bull on hire from Warlaby.

At Straffan, Co. Kildare, Major Barton has raised a very fine herd of animals of high average merit, and, in particular, showing good substance and great wealth of flesh. The choicely bred "Vesper" bull "Star Fitz-Halnaby" (44,092) is at present on hire from Ardfert Abbey, and he is assisted by the beautiful young "Riby" bull, "Riby Marquis" (46,980), purchased at Mr. Talbot Crosbie's sale in 1881 for 135 guineas.

At Castlebrack, in the adjoining county, Mr. Humphry Smith maintains one of the largest and most useful herds in the country. Established thirty-five years ago, it now numbers over 140 head, and includes good representatives of the "Fame," "Mantalini," and "Madaline" tribes, besides several other strains that have earned a good name in Ireland, some of them having come through such herds as those of Mr. Tynte, of Tynte Park, and Mr. Jaffray Barcroft, of Kilboget, co. Dublin—two well-known and very successful early breeders. Mr. Smith has for several years used Booth bulls of excellent lineage—of the "Bright" tribe chiefly. To this part of Ireland a good many Shorthorns were introduced between forty and fifty years ago by the more enterprising landlords, notably the Marquis of Drogheda, Sir Charles Coote, Lord de Vesci, General Dunne, and others, from whose stocks much good material has been circulated.

County West Meath was at one time a famous centre of Shorthorn breeding. Now it is more extensively devoted to the fattening and grazing of stock than to breeding. Thirty years ago, or later, there were several large and important herds, in addition to that of Mr. Robert Holmes already mentioned. The principal ones were owned by Mr. Adamson, also a purchaser at Chilton, Mr. Jones, Mr. St. George Grey, Mr. R. S. Fetherstonhaugh of Rockview, Mr. R. W. Reynell of Killynon, Sir Percy Nugent of Donore, Sir Richard Packenham of Cooluse, and Mr. Dease of Turbotstown. All these herds, unfortunately, ceased to exist some time ago. One of the most celebrated animals in the herd of Mr. St. George Grey was the cow "Rose de Manx," by "Collard." The Rockview and Killynon herds were of Mason blood, afterwards crossed with Booth bulls, Mr. Reynell obtaining sires from his esteemed friend, Mr. T. Barnes of Westland. The "Blossom" family attained great excellence in the Rockview herd. Some time ago well-bred Bates bulls from Lord Bective's herd were used at Cooluse, but about two years ago the animals in that herd were nearly all dispersed. The only herds of high standing now in West Meath are owned by the Earl of Longford, Packenham Hall; Mr. R. Reynell, of Clondrisse; and Mr. B. Hannan, of Riverston. Lord Longford used bulls from the late Major O'Reilly's herd, and nearly all his stock are red in colour. The Athelstaneford "Jenny Linds," from Crocknacrieve, are well represented at Riverston. The Clondrisse herd, founded in 1869, is small but very select, and of high merit. It is composed entirely of the "Lady Sarah" tribe and the "Medora" branch of the "Isabella" family.

In County Meath, once the Yorkshire of Ireland, the herds of Mr. Pollock of Mountainstown, Mr. P. J. Kearney, Mr. Stawell Garnett, Mr. Radcliffe, Mr. R. Chaloner, and Mr. Keating, as well as the celebrated Westland herd of the late Mr. Thomas Barnes, have all ceased to exist, leaving a remnant of the Kingsfort herd as almost the sole representative of olden times. The generations of men who made this county famous in the annals of Shorthorn breeding have passed away. Changes in the condition of Irish agriculture have brought grazing and fattening more into favour than breeding; and thus centres once renowned for their stocks of pure-bred cattle have been devoted to other purposes.

Westland was truthfully termed the Warlaby of Ireland. It was made so by the genius of the late Mr. Thomas Barnes—a man of no ordinary ability, distinguished as a breeder of hounds and hunting-horses, as well as of high-class Shorthorns. It is stated that the first Shorthorn owned by Mr. Barnes was a cow presented to him by Lady Ross, and believed to have been descended from some Teeswater cattle introduced into Ireland by Lord Ross prior to the days of the Collings. This cow was put to "Kearney's Bull" (4144) (s aid to have been imported from Mason's herd as early as 1822), and the produce long remained at Westland. From his schoolfellow and friend, Mr. Robert Holmes, Mr. Barnes received some Shorthorns about 1836; and with the

Moycashel bull "Prince George" (2464) as stud bull, he started a pure-bred herd. The bulk of his first herd succumbed to distemper; and in 1844 he laid the foundation of that celebrated herd in connection with which his name will live as that of one of the greatest of Shorthorn breeders. In that year he went to England, and purchased from Mr. John Booth "Modish" and "Milliner," both got by "Lord Stanley" (4269), and respectively daughter and grand-daughter of the famous "Mantalini." At later dates other well-bred animals were added; and when dispersed in 1871 by Mr. Thornton his herd consisted chiefly of members of the "Mantalini," "Isabella," and Chilton "Bright Eyes" tribes. All the others were descendants of the cow referred to as having been put to "Kearney's Bull" (4144). In conjunction with his friend and neighbour, Mr. R. Chaloner, of Kingsfort, Mr. Barnes hired his bulls from Killerby and Warlaby. Their first selection was the famous bull "Buckingham" (3239), whose sad fate in the voyage across the Channel is recalled with melancholy interest by those versed in Shorthorn lore. The ship took fire, and the bull and his faithful attendant, "Old Lary" (who refused to leave the valuable animal committed to his charge) were both lost. The next bull chosen was "Roseberry" (5011), bought by Mr. Torr from Mr. Booth at 50 guineas: and he was followed by "Hamlet" (8126), son of the celebrated cow "Bracelet;" Royal Buck" (10,750), "Baron Warlaby" (7813), "Hopewell" (10,332), "Windsor" (14,013), "Sir Samuel" (15,302), "Harbinger" (10,297), "British Prince" (14,197), "Prince of Warlaby" (15,107), "British Flag" (19,351), "General Hopewell" (17,935), "Ravenspur" (20,628), "Royal Sovereign" (22,802), and "King Richard" (26,523). These sires were selected with great care, and produced at Westland many celebrated Shorthorns, including the famous bulls "Dr. McHale" (15,887), "The Druid" (18,981), "Lord Napier" (2688), and "Royal Prince" (27,384), which Mr. Torr found helpful to him in building up the renowned Aylesby herd. For the "Mantalini" female "Victoria," Lady Pigot gave Mr. Barnes 500 guineas; while, as already noticed, Mr. Bolton, of The Island, paid 750 guineas for a heifer of the same tribe ("Mantalini," from "Alpine") at the Westland sale in 1871. At the time of that sale the herd was suffering from foot-and-mouth disease, but still good prices were obtained—not higher, however, than the character of the stock warranted. Forty-four animals brought an average of 100*l.* 14*s.* 1*d.*—33 cows and heifers averaging 110*l.* 10*s.* 8*d.*, and 11 bulls 71*l.* 4*s.* 2*d.* Ten animals of the "Mantalini" tribe—all descendants of "Milliner"—realised an average of 234*l.* 7*s.* 2*d.* each. High as this average for the "Mantalini" animals may seem, it would no doubt have been considerably higher had not Mr. Barnes thought it necessary (with the view of reviving the breeding properties of his herd) to introduce a dash of strange blood. The famous "Mantalini" cow "Sylph" was sent to Mr. Bolden's "Grand Duke 3rd" (16,182). The produce, "Grand Duchess," brought forth to "British Flag" (19,351) a heifer, whose son, "Royal Duke" (25,004), by Booth's "Royal Sovereign" (22,802), was used freely by Mr. Barnes for three years.

The Kingsfort herd, established about 1835, obtained great fame for bull breeding. The principal tribes were the "Alma" branch of the "Medoras," the "Louisas" and "Tellurias" of "Mason" descent, the "Sweetheart" and "Lady Bountiful" branches of the Arbuthnot "Sylphs;" and an old sort, called the "Nancy" tribe, introduced to Kingsfort in 1835. The late Mr. Chaloner was a painstaking and skilful breeder, and having joined Mr. Barnes in the hiring of Warlaby and Killerby bulls, he enriched and developed his herd by the best of Booth blood. He bred several renowned bulls, notably "Sovereign" (27,538) and "Anchor" (32,947). The whole of the herd, excepting the "Alma" tribe, was dispersed in 1878, when comparatively low prices were obtained. A small but select herd is still maintained at Kingsfort, under the direction of Mr. Claud Cole Hamilton. The sire at present in use is "King Ludovic" (41,758), hired from Warlaby.

The county of Longford was one of the first inland counties into which Improved Shorthorns were introduced. Mr. Fox, of Fox Hall, obtained a few selected for him in England by Mr. Wetherell. Among the number were "Moss Rose," by "Matcham," the foundress of the "Louisa" family, and the bull "Second Comet" (5101), calved in 1833. "Mason" blood predominated in the herd, which was dispersed in 1844, several of the animals having been bought on commission for English breeders. Some years afterwards, the Hon. Harman King Harman, the Rev. F. Gregg, and Mr. Bole, formed herds, and it is probable a portion of Mr. Fox's stock had been bought by these gentlemen. The only herd of importance now in the county is that owned by Mr. Bole. Through the dispersion of the Hon. Harman King Harman's herd in 1874 the county sustained great loss, for while it existed it was a most valuable source of good blood. He made it a practice to give bulls on loan to his tenants, bringing them back after a few years to be fattened; and in this way a great boon was conferred on the district.

Among the first in the county of Roscommon to breed Shorthorns was the late Mr. Ffolliott, of Hollybrook, Boyle. He procured some of the Chilton cattle, and was one of the first in Ireland to use pure Booth bulls. He held a sale of Shorthorns in 1832, and some of the young animals then disposed of were got by Booth's "Volunteer" (1553) and "Augustus" (1662), and Mason's "Monarch" (2324). It has been noticed that Mr. Robert Holmes hired "Volunteer" and "Augustus;" and it is believed that Mr. Ffolliott either had a turn of these bulls, or had been associated with Mr. Holmes in the hiring. In 1850 Mr. Ffolliott had another sale, when the majority of the animals sold belonged to the Chilton "Lady Sarah" and "Ruth," and the "Medora," by "Bagdad," tribes. Among the sires in use before that sale was Mr. Wiley's "Marquis of Chandos," got by Booth's "Buckingham." The herd was continued by Colonel Ffolliott, son of the late Mr. Ffolliott, and his stock now includes very good representatives of the Holmes "Victoria" and "April Daisy" tribes, and also of the "Miss Mary" and "Gerty" sorts, procured at Windsor in 1877.

The earliest noted breeders in the county of Fermanagh were the late Mr. H. M. Richardson, of Rossfad, and the late Mr. N. M. Archdale, of Crocknacrieve, whose herds, formed about thirty or thirty-five years ago, consisted principally of strains obtained from Mr. Fox, of Fox Hall, and Mr. Douglass, of Athelstaneford. In Mr. Richardson's herd many good animals were bred, including the fine cow "Alma," the dam of Mr. Chaloner's "Anchor." The Athelstaneford "Jenny Linds" were long famous at Crocknacrieve, where a fresh and promising herd has been established by Captain Archdale, from which a very useful crop of young bulls is disposed of annually by private bargain, and at the Dublin Spring Show and Sale. Mr. John Madden, of Roslea Manor, started a herd at a later date, and had some very well-bred cattle, including the valuable bull "Heir of Lothian" (28,841), bred by Mr. E. J. Smith at Islanmore, which did a great deal of good in the district, he having been used there for six years.

At Leslie Castle, Glaslough, Co. Monaghan, the property of Sir John Leslie, Bart., a herd of well-bred Shorthorns has been maintained for nearly a quarter of a century; and from it a great many excellent animals, well calculated to improve the stock amongst which they were put, have been spread throughout the country. The first sale was held in 1855, while in 1867 Mr. Carr conducted another sale at Glaslough; among the tribes represented in the catalogue on the latter occasion being "some of great celebrity, connected with the names of the late Earl Ducie, Lady Pigot, and Mr. Mason of

Chilton." Long prior to the formation of a regular herd, the late Colonel Leslie had introduced and used Shorthorn bulls; while the late Mr. Murdoch, of Armacol, Caledon, and the late Earl of Caledon, Castle Hill, were also early breeders of Shorthorns, their stocks having made a marked impression upon the cattle of the locality. The first herd at Castle Hill was established about 1845, and was dispersed in 1855, after the death of the late Earl. The present thriving and useful herd was formed three years later by purchase from Sir Percy Nugent's herd at Dronore, Mullingar. At a subsequent date the "Jenny Linds" were introduced from Crocknacrieve, and they have done remarkably well. At Drummilly, Co. Armagh, Mr. J. A. M. Cope has built up a large herd of Bates' cattle—the only herd in Ireland of this line of blood. The stud bull is the Earl of Dunmore's "Third Scots Fusilier" (43,994), and the tribes are the "Elviras" (a valuable branch of the "Princess" family), "Place," "Revelry," "Statira," "Honey," "Craggs," "Barmpton Rose," "Melody," "Wild Eyes," "Nell Gwynne," "Lady Mildred," "Medea," "Sweetheart," "Louisa," and "Maid of the Vale."

In County Down the late Mr. J. W. Maxwell, of Finnebrogue, Downpatrick, introduced Shorthorns in 1831; while in 1845 the late Lord Dufferin's famous herd was founded. This latter herd, which was dispersed in March 1859, was made up of valuable material, and did great service in that part of the country. Lord Dufferin used some excellent bulls, such as "Vulcan" (40,898), "Welcome Guest" (15,497), and "Prince of Warlaby" (15,107). The Unicarville herd, the property of Mr. George Allen, and one of the most highly-bred and most useful herds in Ireland, was founded in 1847. Mr. Allen has selected his stock carefully and at considerable cost from the leading Booth herds in the country. At present his herd is composed of animals of the "Mantalini," "Madeline," "Fame" or "Farewell," "Heath Rose," "Lady Sarah," "Fanny" (descended from "Prince Ernest"), "Jenny Lind," "Irish Girl," and other tribes. The sires used have been well-bred Booth bulls, the present stud bull being "Albion" (36,112), one of the purest "Mantalinis" in existence, purchased at The Island sale in 1881 for 230 guineas. From fourteen to sixteen bulls are bred annually, and sold either privately or by public auction at Belfast, at prices averaging about 30 guineas a-head. Many of the bulls are bought for service in pure-bred herds, others being used for crossing purposes.

The improvement of cattle in County Antrim was begun more than a century ago. In 1775, Mr. Leslie of Leslie Hill, grandfather of the present owner, introduced one of Bakewell's Longhorn bulls, which would seem to have been used with good effect. Sir R. Bateson, of Belvoir Park, Belfast, purchased some Shorthorns in 1820, and these are said to have bred well. Among the other more enterprising early breeders in this part of the north were the late Mr. S. Orr, of Flowerfield, Coleraine; Mr. C. J. Knox, of Cranagh; and Mr. H. Anderson, of Bushmills. About 1840, Mr. Orr bought from Mr. Whittaker the cow "Remnant," by "Remus" (550), said to have been the best of the sons of "Comet" (155). Mr. Knox's herd was made up mainly of stock from Kingsfort and Westland; while Mr. Anderson had cows from Mr. Topham, of Candlesby, and Mr. Holmes, of Moycashel, he having also purchased the cow "Rennet," bred by Mr. R. Booth, of Warlaby. These three herds, sometime ago dispersed, did much good in their day. They were well bred and judiciously conducted. Mr. Orr in particular was careful in developing milking and beef properties equally. At Balymoney, Mr. John McElderry owns a small but select and thriving herd. Mr. Charley, of Seymour Hill, introduced in 1846 a few well-bred Shorthorns from England from the stock of Mr. Unthank, of Netherscales, and these turned out satisfactorily. Like several other northern breeders, Mr. Charley obtained some good material at Lord Dufferin's dispersion in 1859, and his herd has had a very useful career. Among the sires used at Seymour Hill were the Aylesby bulls "Subaltern," "Fawsley Prince" (17,837), and "Fitz Dane" (21,752).

In County Donegal, Mr. J. G. Wood (afterwards Mr. J. G. Grove), of Castle Grove, Letterkenny, was one of the earliest as well as one of the most successful breeders of Shorthorns. About 1842 he formed a herd of mixed-bred cattle, which turned out well, producing excellent bulls, that were bought by Ulster landlords and farmers for crossing purposes. In early life Mr. Grove had enjoyed the friendship of Messrs. Bates, Booth, and Jobson, and other celebrated English breeders, and through his acquaintance with the herds and the systems pursued by these men, he was induced to give attention to the rearing of finely bred strains. Like most other Irish breeders, he adopted the Booth line of blood; and with carefully selected cows of good lineage he mated first-class Killerby and Warlaby bulls. The following eleven Booth bulls were used at Castle Grove:—"Prince Arthur" (13,497), "King Alfred" (16,334), "King Arthur" (13,110), "War Eagle" (15,483), "Sir Roger" (16,991), "Elfin King" (17,796), "Sir James" (16,980), "British Crown" (21,322), "The Sutler" (23,061), "Great Hope" (24,082), and "England's Glory" (23,889). His herd was dispersed on August 25, 1871, when thirty-six cows and heifers averaged 111*l.* 12*s.* 5*d.*, and 8 bulls, 44*l.* 17*s.* A large portion of the herd was made up of animals of the "Fame" or the "Farewell" tribe, and eleven cows and heifers of these realised an average of 139*l.* 9*s.* 2*d.* There were four females of Mason's "Lady Sarah" tribe, and these brought an average of 143*l.* 3*s.* 6*d.*; while three "Campanulas" fetched 196*l.* a-head. The "Fames" were all descended from "Norma," by "Druid" (10,140); and it is interesting to note that at the dispersion of the herd (established in 1848) of Sir Henry Bruce—one of the earliest sales of the kind in the north of Ireland—Mr. Grove purchased "Norma," as being hopeless as a breeder at the modest sum of 25 guineas.

All the old herds in this part of the country have been dispersed, excepting that of Mr. Hart of Kildery. Established in 1852 by the purchase of two cows and a heifer of mixed breeding from Mr. Smith's herd at West Rasen, Lincolnshire, the Kildery herd now numbers about fifty head, the large majority being descended from these Lincolnshire animals. Good sires, deep in Booth blood, have been used, and many excellent young bulls have been sold from the herd, which has thus contributed its full quota to the great work accomplished by Shorthorns in the north of Ireland.

The Favour Royal herd is one of the oldest and most celebrated in the north of Ireland. The late Rev. W. Moutray having seen the great improvement in the young stock reared from his dairy cows and Shorthorn bulls, which he began to use in this way soon after 1840, resolved to form a herd of pure-bred Shorthorns. Starting in 1852 with some prize heifers and a bull bought at the Dublin Spring Show, he in later years made important selections from the Glaslough, Dartrey and Thornville herds, as well as from that owned by Sir Robert Paul, an enthusiastic and eminent Irish breeder. Large sales were held in 1872 and 1878; but the herd is still continued, and contains some very good material. Good well-bred bulls have always been used at Favour Royal, the more recent sires, which were full of Booth blood, having been bred at Castle Grove, Islanmore, The Island, Ashfield, and Straffan.

At Donaghmore House, Co. Tyrone, the Messrs. Lyle have for more than twenty years maintained a useful and well-bred herd. Females have been introduced from the Glaslough, Brownhall, Thornville, Kingsfort, and other herds; and the stock having been managed carefully and judiciously, it has done much good in the surrounding districts.

In addition to the gentlemen already named, many others in the northern counties have given attention to the breeding of Shorthorns. Among these may be mentioned Lord Dartrey, Lord Clermont, Major Hamilton, of Brownhall, Co. Donegal; Mr. W. Taylor, Clonrolla House, Lurgan; Mr. Mulholland, M.P.; Mrs. Pery, Coolcronan, Co. Mayo; the late Major O'Reilly; Mr. Watt, of Ramelton, Mr. G. Cather, Mr. S. M. Alexander, Viscount Bangor, &c. At Clermont Park, near Dundalk, Lord Clermont owns a very good herd, from which an excellent lot of young bulls have been sold. The late Mr. Lee Norman had at one time an excellent herd in Co. Louth, in which some animals imported from Sittyton (now represented at Clermont Park) produced good results. Mrs. Pery's herd is made up of very well-bred Booth cattle.

The county of Limerick was early in the race for Improved Shorthorns. The first of the breed introduced (about sixty years ago, it is believed) into that part of the country were the bull "Regent" and his sister, which a well-known Master of Hounds and enthusiastic sportsman, the late Mr. G. Fasbery of Curragh Bridge, purchased for 180 guineas. "Regent" proved a valuable sire, and worked till fifteen years of age, when he died, after having been driven from Castle Oliver to Curragh Bridge. He was let for some years at a fee of seven guineas, and afterwards at two guineas, and he produced a great many fine cattle, whose rare properties were much talked of throughout the country.

The earliest and perhaps the most celebrated systematic breeder of Shorthorns in County Limerick was the late Mr. John Christy, father of Mr. Luke Christy, Carrigeen, Croom. In the end of last century Mr. Christy had been through England, and was much struck with the sheep, cattle, and horses he had seen with Bakewell. Having settled in county Limerick in the end of 1815, or beginning of 1816, he introduced for service among his dairy cows a Longhorn bull. Soon after, however, his attention had been attracted by the wonderful merit of Mr. Fasbery's Shorthorn bull "Regent" and his produce; and this, followed by a visit to Captain Barclay of Ury, in the north of Scotland, convinced Mr. Christy of the superiority of the Shorthorn. He therefore lost no time in obtaining possession of some animals of the improved breed. Prior to 1840 he kept no pedigrees; but after that he gave close attention to the building up of a large and well-bred herd. In 1845 he imported the bull "Shotley 2nd" (or "King Ben") (7494), and in the following year he brought over six heifers from the herds of Lord Spencer and others. The produce of many of the earlier-introduced Shorthorns fell into the hands of Mr. Christy, and the character of the herd he succeeded in forming is attested by the fact that, at his sale in 1856, 110 animals realised within a few shillings of 5000*l*., or nearly 45*l*. 9*s*. a-head, the largest average ever obtained in Ireland for so large a number of animals.

Soon after Mr. Christy began to turn his attention to Shorthorn breeding, Mr. Adamson, who was associated with Mr. Holmes in the purchase of Mason's "No. 1," brought a few Shorthorns into County Limerick; while, a little later, Mr. Atkinson of Birdhill imported a good lot from England, including the heifer "Miss Booth," which was bought in Darlington Market, as a hopeless breeder, from Mr. John Booth of Killerby, and which became the ancestress of some very fine animals. Mr. Atkinson's stock ultimately went into Mr. Christy's herd, a few of them having for a time been owned by Mr. Joseph James, of Buncraggy, Co. Clare, and Mr. Paul Gobbett, of Limerick.

About 1840, and soon after, Shorthorn breeding was enthusiastically taken up by Mr. John Croker, Mr. A. Croker, Lord Clarina, and others in Co. Limerick. At a later period high-class herds were successfully maintained by Mr. R. Maxwell, Captain Ball, and Mr. E. J. Smith, of Islanmore. At Elm Park, although the rearing of pure-bred Shorthorns has been given up, the old-standing and excellent practice of keeping a first-class pure-bred bull for the use of tenants on the estate is still maintained—a system also pursued by the Hon. Hugh N. G. Massey. Mr. E. J. Smith's herd at Islanmore was in its day one of the best in the country. Founded by the purchase of some animals from Captain Ball, including the celebrated prize-cow "Recherché," this fine herd, when at its best, was made up mainly of the "Victoria," "Medora" or "Isabella," "Lady Sarah," "Mantalini," "Bliss," "Pauline," and "Britannia" tribes. The sires used were admirably bred. The herd was dispersed in March 1875, when thirty-nine cows and heifers averaged 82*l*. 6*s*. 1*d*., and eleven bulls 48*l*. 17*s*. 6*d*. Eleven females of the Holmes "Victoria" tribe averaged 88*l*. 8*s*. 9*d*., while four "Isabellas" brought 143*l*. 1*s*. 3*d*. each. All the many Limerick herds have ceased to exist, and at present almost the only pure-bred Shorthorn females in the county are a few in the possession of Mr. Luke Christy, at Carigeen, Croom.

Shorthorn bulls were introduced into County Clare about fifty years ago. Among the first purchasers were the late Colonel Vandelure of Kilrush, Sir L. O'Brien, Mr. Doxon of Fountain, Mr. Molony of Kiltannon, Mr. Blood of Riverstown, Colonel O'Callaghan, and Lord Leconfield. Sir L. O'Brien brought over the bull "Solomon," whose direct descendants are still in the stock of Mr. Cannon, Carraghan, Kildysart. Colonel Vandelure did not keep a pure-bred herd; but always had a pedigreed bull for use among his tenantry, and the high quality of the stock owned by the small farmers in the south-west of county Clare attests the wisdom of this course. Those early introductions into Clare were closely followed by others made by Mr. Joseph James of Buncraggy, Mr. W. Cannon, Mr. F. Healy, and Mr. McRea. The last-named gentleman imported from Sir E. Morgan, Glamorganshire, three or four heifers, whose produce ultimately became the property of Mr. John Christy. Mr. Frank Maurice, of Springfield, founded a herd by purchases at Mr. Christy's sale in 1856, and he has now an excellent stock of pure-bred cattle. Mr. R. P. Blake, of county Galway, imported five heifers and a bull, one of the heifers, named "Stately," afterwards having gone into the Carrigeen herd.

Into County Cork well-bred Shorthorns were introduced at an early date by Mr. William Coppinger, of Barry's Court, whose example was soon followed by Mr. R. Welsted of Ballywalter, Mr. Rowland Campion, and others. Mr. Coppinger was an enthusiastic admirer of Shorthorns; and for animals that took his fancy he paid long prices. The Townley bull "Jasper" (11,609) was a prize-winner at the Killarney Royal Show in 1853, and he was hired by Mr. Coppinger at a long figure. At the time his herd was dispersed in 1863 it was composed largely of the "Verbena" branch of the "Bright Eyes" tribe, and of animals tracing from No. 25 at Mr. Mason's sale, got by "Richard" (1376), and bought at Chilton by Lord Althorp for thirty-six guineas. Mr. Campion's herd was dispersed in 1861, and from that sale the fine "Mantalini" cow "Ladylike," purchased by |Mr. Campion from Mr. Douglas, Athelstaneford, in 1853, went to Ballywalter; while her daughter and grand-daughter, "Elfleda" and "Regalia," were secured by Mr. Allen, Unicarville.

Mr. R. Welsted's famous herd was founded in 1848 by the purchase of five pure-bred heifers from Mr. Peacock, of Haddockstanes, Yorkshire. Their first crop of calves, two heifers and three bulls, were all sold—the one heifer going to the late Captain Ball, and the other to Mr. Talbot-Crosbie, in whose herd its descendants, "Peacocks," "Duchesses," are still doing well. The bulls were bought for crossing purposes. Soon after, Mr. Welsted made other importations, including animals of Mr. Maynard's "Rosamond" tribe, now well represented in the herd. The "Ballywalter" herd is not only one of the largest, but holds a high rank among British herds. It numbers over 140 head. The principal tribes are the "Mantalini," "Fame," "Medora," "Victoria," Aylesby "G." and "M.," "Sylph," "Rosamond," and Cowling's "Cowslips." For twenty years Mr. Welsted has depended almost solely upon bulls hired from Warlaby, most of them at a fee of from 200 to 300 guineas per season. The Warlaby sires used have been, "Elfin King" (17,796), "Ravenspur" (20,628), "Sir James" (16,980), "Prince Christian" (22,581), "England's Glory" (23,889), "Master of Arts" (34,816), "King William" (34,358), "Royal Mowbray" (42,330), and "Lord Provost" (46,697), the present stud bull. Since 1863 a sale of young bulls and heifers has been held annually at Ballywalter, and through these the herd has done a vast deal of good in the country. The average price obtained for the young bulls, about eight months old, in 1863, was 22*l.* 17*s.* 4*d.*, and last year (1882) twenty-five realised 46*l.* 2*s.* 4*d.* a-head, whose average age was under nine months.

In later years herds of high standing have been established and maintained by Mr. John Downing, of Ashfield, Fermoy; Mr. R. J. M. Gumbleton, of Glanatore, Tallow; Mr. W. R. Meade, of Ballymartle; and others. Mr. Meade has been specially successful in breeding thick, substantial, useful bulls, which have found a ready sale at fair prices. Mr. Downing's herd at one time or other contained representatives of several of the most valuable tribes in the country, including the "Fame," "Mantalini," "Madaline," "Heath Rose," "Bright Eyes," and "Medora," and for many fine animals bred by him he obtained long prices. In April 1882 the Ashfield herd was dispersed. Twenty animals realised fully 56*l.* a-head, while for ten heifers the average was 72*l.* 6*s.* 11*d.*, the highest in the United Kingdom for the season. Mr. Downing has laid the foundation of a fresh herd. Mr. Gumbleton's herd was founded in 1871 by purchases at Castle Grove and Westland. It numbers over sixty head, and the principal tribes are the "Fame," "Medora," "Anna," and "Heath Rose." Bulls of good Booth blood have been used.

Prior to 1840 some well-bred Shorthorns were introduced into Co. Kerry by Mr. Pierce Mahony. From his sale in 1841 the stock went chiefly to Mr. W. T. Talbot-Crosbie, of Ardfert Abbey, and Mr. T. Sanders, of Tallow Glen. The stud bull "Robin," bred by Lord Cloncurry, and got by "Constitution" (11,307), grandam the Rev. Henry Berry's cow "Lady Sultan," was obtained by Mr. John Christy. "Robin" won the first prize at the Royal Dublin Society's Show in 1838. Soon after this, herds were formed by Mr. Maurice Sanders, and Mr. Charles Nash, of Ballycarthy. Through the annual sales of bulls held for some time by Mr. Nash much good was done in the locality. None of these herds now exist.

The Ardfert Abbey herd, the property of Mr. W. T. Talbot-Crosbie, was founded in 1841 by the cow "Bess," bought from Mr. Pierce Mahony. There are no representatives of this cow now at Ardfert Abbey, but there are many in the possession of farmers throughout the county. The herd numbers close on ninety females, and the principal tribes are the "Riby" branch of the "Anna" family, the "Flower," "Portia," "Vesper," Aylesby "G.," "Medora" or "Isabella," "April Daisy," "Florence," "Gwynne," "Peacock," "Duchess," and Topham's "Venus." The "Ribys" consist of that beautiful cow "Riby Marchioness," by "Knight of the Shire" (26,552), and three of her female descendants. At the great Aylesby sale in 1875 Mr. Talbot-Crosbie gave 1323*l.* for "Riby Marchioness," then only 5 months old. She has turned out a fortunate investment, for she has already laid a substantial foundation for what promises to become a numerous and most valuable family. At the spring sale in 1882 three young bulls, one son and two grandsons of "Riby Marchioness," realised an average of 113*l.* 1*s.* each. For about a quarter of a century the sires used at Ardfert Abbey have been of highly prized Booth strains. The celebrated Athelstaneford "Isabella" bull "Lamp of Lothian" (16,356), taken to Ardfert in 1858 at a cost of 250 guineas, was followed by three "Fame" bulls from Castle Grove, Mr. R. Booth's "Royal Sovereign" (22,802) coming in between the last two "Fame" sires. Then came Mr. Bruere's "Vesper" bull "Regal Booth" (27,262), Mr. Pawlett's "Mantalini" bull "Lord Blithesome" (29,067), Mr. Booth's "England's Glory" (23,889), Mr. Meade Waldo's "Royal Fitz-Rose" (37,390), the "Flower" bulls "Foreign Prince" (36,656) and "Foreign Glory" (39,890), Mr. Booth's "Royal Halnaby" (39,041), the "Riby" bull "Riby Prince" (40,593), and Mr. Booth's "King David" (43,417). The last-named bull is at present on hire from Warlaby. It will thus be seen that the Ardfert Abbey herd contains a great deal of valuable Booth blood. Since 1852 annual sales have been held regularly at Ardfert Abbey, and from these a large quantity of very fine material has been spread throughout the country, doing good work wherever it has appeared. The price obtained for twenty-five young bulls in the spring of 1882 was 50 guineas a-head. There are several other very good herds in Ireland deserving of mention, had space permitted.

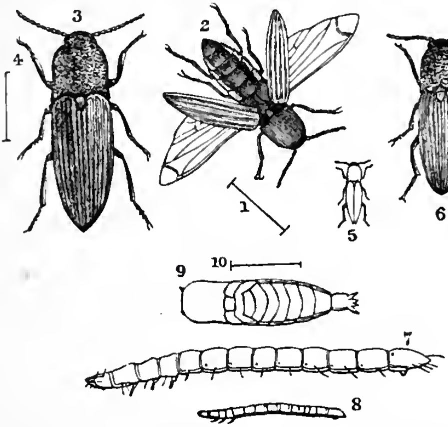
A noteworthy and potent feature in Irish Shorthorn breeding has been the great effort made by the leading breeders to obtain the use of the very best material to be found in the principal English herds. At the outset, Irishmen declared in favour of the Booth line of blood, and to that choice they have still adhered. It has been seen that Booth's "Volunteer" (1553) and "Augustus" (1662) were on hire in Ireland, and used by Mr. Holmes and Mr. Ffolliott, prior to 1832; and from that time a direct and constant connection has been maintained between Warlaby and Killerby and the chief Irish herds. As already indicated, there is a long list of the best of Booth bulls which have been brought to Ireland by purchase or on hire. As evidence of the enterprise and determination manifested by Irishmen in the selection of their sires, the most important and critical part of the breeder's work, it may be mentioned that the mere use for one year of some of these Warlaby bulls has entailed an outlay of nearly 400*l*. If the amount of money which English Shorthorn breeders have drawn from the Emerald Isle could be counted up, the sum-total would excite the curious and surprise every one.

III.—*Report on Wireworm.* By Miss Eleanor A. Ormerod, Honorary Consulting Entomologist to the Society.

The following Report on Wireworm and measures found to be of service in preventing its ravages has been prepared from information forwarded in reply to the circular issued in June of 1882, by the Seeds and Plant Diseases Committee of the Royal Agricultural Society, by Members of the Society, and also by contributors to my yearly Reports on Injurious Insects.

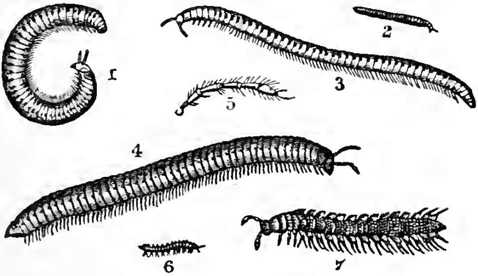
Wireworms are the grubs or larvæ of the small beetles known as "Skip Jacks," "Snap," or "Click Beetles," from their habit of flying up in the air with a kind of snap or click when laid on their backs, and thus regaining their natural position. Like other beetles they pass through three stages (larva, pupa, and complete insect), but they differ from a large number of species in the fact of continuing in the grub, or larval state (that is as wireworms), *for many years:* the pupal, or chrysalis stage, appears only to last in summer for a very short time—a fortnight or so. The change to this state takes place at a considerable depth in the earth, and many of the beetles come up from the pupæ, or chrysalids, in July and August; but it is considered that some probably pass the winter in this condition, and come up with the return of warm weather in the next season.

*Figures illustrative of the Wireworm in the several stages of its development.**



1, 2, 7–10. *Elater lineatus*; 3, 4. *E. obscurus*; 5, 6. *E. sputator*, magnified, and with natural length shown.

*Figures illustrative of Millipedes often mistaken for Wireworms.**



1. *Julus Londinensis*; 2, 3. *J. guttatus*, nat. size and mag.; 4. *J. terrestris*; 5. horn magnified; 6, 7. *Polydesmus complanatus*, nat. size and mag.

The click beetles are of many kinds, and are commonly from a quarter to half an inch in length, and of a breadth of about a third of their length, and brownish in colour, with a pair of long horns, and six legs. The wireworms are commonly of a straw colour, and of the shape given in Figs. 7, 8. When examined very carefully they will be seen to have six little legs, like claws, one pair on each of the three wings nearest to the

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* After Curtis, 'Farm Insects,' by permission of Messrs. Blackie and Son.

head; and by *having six*, and *no more than six*, *legs*, they may be easily distinguished from daddy-long-legs grubs, which have *none*, and from julus worms, millipedes, centipedes, &c., which have *many*, and which are often confused with the true "Wireworm" or grub of the click beetle. From the habits of the beetle and the locality where the young wireworms are found, there appears to be little doubt that the eggs are laid either a little below the surface of the ground near the food-plants, or amongst the leafage just about the ground level.

For convenience of reference the communications received have been divided into paragraphs, according to the subjects to which they mainly refer, and classified under special headings, the name and locality of the contributor being in each case appended to the information furnished. The series is thus arranged so as to run on continuously, from the commencement of remedial measures (in the breaking-up of pastures or leys), by which egg-laying may be prevented or the wireworm killed, to the various methods of treatment of the soil, the kinds of crops calculated to prevent or forestall attack, and further notes on various kinds of manures and applications which have been found to check attack when present.

It will be observed that two of the points mainly brought forward are the importance of compressing the ground (by methods varying according to the nature of the soil and the condition of the crop), so that the wireworms may not have free passage in the land; and also of maintaining such a vigorous growth as may carry the plant over the injury caused by an average attack.

The season of 1882 having been generally favourable to plant growth, it has turned out that though wireworm began to run early in the season, yet that the crops suffered less than was threatened, and notes of serious damage have only been returned from a few districts. Therefore, injury not being prevalent, few estimates have been given. The following communications, however, give some idea of the power of the wireworm when present in the land.

ESTIMATES AND NOTES OF AMOUNT OF INJURY.

"The extent of injury and money loss from wireworm is difficult to assess, but on my farm of 1000 acres (Old Alresford, Hampshire) I do not think I shall be far wrong if I value the loss from wireworm, on 350 acres of corn in an average of seasons, at not less than 2*l.* per acre, or 700*l.* per annum. There is also much damage to the root crops, causing further loss from the poorer condition of the crops, owing to the less time that the sheep are on the land.

"I am sure the loss on most Hampshire and South Wilts farms is quite equal to the rent.

"My chief experience of losses caused by wireworm was whilst farming in the parish of Old Alresford, Hampshire, the damage done in this county (Gloucestershire, neighbourhood of Cirencester) being nothing to compare to that on the light chalky soils of the south-western counties. Sainfoin being one of the best crops for such soils, together with old leys, a large proportion of the land is taken up with them; and being the breeding-places of the wireworms for years together, naturally on breaking them up the succeeding crops suffer much.

"T. R. Hulbert, *North Cerney, Cirencester.*"

"Concerning damage from wireworm on a field of 15 acres, the first crop injured was turnips, which were worth at least 6*l.* per acre, and half the crop was destroyed by the wireworm, which would make the loss 45*l.* exclusive of labour. Last year (1881) it had wheat grown upon it which ought to have been 10 bags to the acre (72 lbs. to the bushel), instead it was only 2 bags, so I consider the loss to be 8 bags at 1*l.* 1s. per bag, which would be 126*l.*

"The consuming price of a ton of straw lost per acre would be about 1*l.*, or loss on this item on 15 acres, 15*l.*

"Total loss during two years would thus amount to:—

	£
"Turnips . .	45
Wheat . .	126
Straw . .	15
Total .	£186

"J. Heatley, *Passingham, Wolverhampton.*"

"I have a 9-acre field of light sound gravelly soil, rich and good, which is very full of wireworms. The injury done is very serious, being about 5 bushels per acre in the patches where it is taken.

"J. Prince, *Foston, Derby.*"

"In some fields wireworms often spoil half the crop of wheat.

"G. Burgess, *Petworth.*"

"We have suffered much from wireworm on the chalk lands during the last two or three years, but not so much during the present one.

"On the clay lands we have not suffered to the same extent as upon the chalk, except in cases where we departed from the four-course rotation and sowed wheat after a two years' ley. I attribute this partly to their having been in clover for two years, and partly that, being undrained, we have to ridge up the field in small lands, which prevent the roller taking proper effect.

"A. H. Bowles, *Clandon, Guildford.*"

"Wireworms have not troubled us for several years past, but previously they were a source of great injury, in loss of oat crops and turnip crops. Probable money loss no one can tell accurately.

"J. Forrester,
"For Right Hon. Viscount Portman, *Bryanston, Blandford.*"

"Injuries are mainly confined to the crops on light porous soils, excepting very sharp sands. On land subject to periodical attacks of this pest, my estimate of the average amount of injury is about one-tenth of the crop.

"E. Beard, *Horton, Canterbury.*"

"The wireworm this year was much better than last. In dry unkindly springs under our chalk hills the Lent corn (oats and barley) suffer very much from it.

"R. Cooke, *Detling, Maidstone.*"

"Loss this year on one farm a quarter of the crop; on another from a quarter to half; on another loss estimated as usually a quarter, but sometimes half the crop.

"Per Rev. J. H. White, *Weybread, Suffolk.*"

"The wireworm has this season been a great pest in the fens, and also on the high lands.

"C. Caswell, *Peterborough.*"

"On one of the farms which I occupy, I lost, when I first took it, an entire crop of wheat: money loss, rent, rates, taxes on the field; also seed, and labour of putting in.

"C. R. Colville, *Burton-on-Trent.*"

"Wireworms have done great damage in this district this season. Some fields of grain were ploughed down last month (May) and re-sown, so that there will not be such a great loss; but there are many more in which the wireworms have not left half a crop, and the loss in consequence must be 50 per cent.

"M. Dunn, *Dalkeith.*"

"I have 17 acres of barley injured this season by wireworms; taking the average loss over the field at 2 quarters per acre, this is 3*l.* per acre at present market price.

"D. Husband, *Struthers, Cupar, Fife.*"

"Wireworms have (as usual) been rather numerous, particularly amongst lea oats, and have kept back the crop from ripening early. Consequently where wireworms have abounded a good many farmers have not yet (Oct. 6) got all their crops into the stackyard, and they deteriorate by long exposure.

"T. Dow, *West Idvies, Forfar.*"

For estimates of amount of injury in the Isle of Man, see Abstract and Tables, pp. 133–143. By M. C. Kermode, Ramsey.

If we look now merely at the amount of injury named in the various foregoing estimates, beginning at the lowest direct loss stated, we find two instances of this being about an eighth of the crop, one of loss of two-fifths, two of a quarter, two of a quarter to half, and four mention a loss of half of the crop. Two entries give notes respectively of the entire loss of a field of wheat, and of crops having been ploughed in. Of the others, of the 17 returns which give definite amounts of loss, one is at the rate of 5 bushels, another of 2 quarters per acre: an average of loss near Canterbury places it at one-tenth of the crop; and another giving the average of money loss on 350 acres of a 1000-acre farm in Hampshire, places it at 2*l.* per acre. This does not include loss on roots or further loss consequent thereon.

These statements give some slight idea of what the wireworm can do in the way of injury per acre; and it should be remembered that when it has injured one crop its work is by no means done. It lives on for many years—for five years as far as we know—feeding the whole time (excepting when it may go down deep for shelter in winter) on almost any crops, or failing them, on grass roots, or what it can find.

Some parts of the country, as the Orkneys, and parts of the Scottish seaboard and islands, appear to be little troubled with it; but it is widely spread, and one of our pests which is never totally absent; and looking at the acreage under crops which it particularly attacks (as wheat, barley, and oats, also hops, swedes, turnips, mangolds and potatoes), amounting, as stated in the Government Agricultural Returns for 1882, to 8,406,709 acres in England only, each farmer can see for himself the vast cost of entertaining such a guest. The following communications show methods by which its presence may be much diminished, and injury from its ravages lessened, even if it cannot be wholly got rid of.

PRESENCE OF WIREWORMS AFTER CERTAIN CROPS.

Presence of wireworm after certain crops, such as grass, clover, &c.; also after crops which, by reason of the amount of stalks or stumps remaining from them in the ground, give thereby shelter to the wireworms, or cause the soil to be open and unconsolidated.

"My experience of wireworm in excess was on land reclaimed by the spade from old turf, covered with furze, ferns, and such like, inhabited by birds of various kinds, devouring beetles, worms, &c. The land was sown to oats, which were devoured by wireworm, the wild birds having been scared by the continued presence of workmen; the roller, sheep-treading, and any means available to compress the land were used; the turnip-crop in succession was destroyed. Pressure was again applied, and the land left without crop. .In the spring and summer birds fed in great numbers on the land. A crop of mustard was sown and fed off by sheep, then oats and seeds for two years, and no more trouble with wireworms.

"J. FORRESTER,
"For Right Hon. VISCOUNT PORTMAN, *Bryanston, Blandford.*"

"We generally get wireworm in land which has been laid down to grass two or three years, or after a crop of sainfoin which has been down some time. On light land in this hill district (on the chalk formation) old leys are often broken up and sown with oats, which rarely suffer from wireworm, but the following year we generally find them, and in each succeeding year they are often very troublesome.

"In 1873 a piece of sainfoin which had been in existence for ten years was broken up and sown to oats, in which no wireworm appeared. The next autumn vetches were sown after the oats, and produced a good crop. These were fed off in 1874 by sheep, and the land was sown to rape; *this was entirely destroyed by wireworms.* Then it was sown to mustard, which was also eaten by them as soon as it came up, and is the only instance which has ever come under my observation of this crop being attacked by wireworms. Then the land was sown to wheat, and no wireworm put in an appearance, neither have I seen any there since of any consequence.

"THOS. HY. BAKER, *Mere, Wiltshire.*"

"Old turf is generally found (on being broken up) the *most* likely to be full of wireworm, and requires the utmost care before being turned over, and very great watchfulness afterwards. Next to this 'seeds' which have lain two or more years would be most likely to prove troublesome, then those seeds which have lain one season. Vetches and peas are fouling crops, and give shelter to the worm.

"ADAM LEE,
"For Right Hon. the EARL OF POWIS, *Lydbury North, Shropshire.*"

"The cereal crops seem to be the most often affected by wireworm. Wheat, for instance, if sown after 'seeds' (containing grasses) is particularly liable to attack, and wheat sown on weedy land, especially if the weeds be wild grasses, such as the long 'water-grass,' often very common on wet land. I judge that the eggs are laid in the dead grass rubbish on the field, and that when the young crops are sown and growing (even from January during the spring of the year, if there be no frosts), the wireworm pursues its way from plant to plant, half burying itself in the tender stalk, and then, after eating out its heart, leaving it for another.

"Mangolds, when young, are often attacked and destroyed if sown after weedy white straw crops that have likewise suffered from the wireworm.

"ROBERT L. PUDNEY, *Halstead, Essex.*"

"Land is more subject to wireworm after clover and beans, but there is no crop that increases wireworm so much as 'couch' and weeds, and often when land has been fallowed the previous summer, the wireworms are quite as destructive in the next spring as they are on the clover-ley wheat.

"G. BURGISS,
"Manager to Right Hon. EARL OF WINTERTON, *Strutherglen Park,*
"*Petworth.*"

"Certainly I think there is more danger from wireworms after clover than after any other crop. I believe that after a crop of beans or cabbage they are also troublesome, but consider that this may be because, if a large amount of beanstalks or cabbage-stumps are ploughed down, the land would lie so open that it could not be properly consolidated by rolling, and the wireworm would have a chance to harbour and work in the stumps. After these crops, therefore, the land should be got as free as possible from stalks and stumps, as well as weeds, before ploughing.

"M. LOCKE BLAKE, *Ilminster.*"

"I have observed that the wireworms have appeared upon land immediately after a turnip crop, when not grazed by sheep or other animals. I have hitherto supposed that the appearance of the wireworm after turnips was due to the pulverized condition of the soil rather than the nature of the preceding crop.

"L. P. WILLIAMS, *Penberry, St. David's.*"

TREATMENT TO PREVENT EGG-LAYING; TO DESTROY OR STARVE OUT WIREWORM.

Observations concerning such treatment of pastures or clover leys by close grazing, treading with sheep, dressing with lime, gas lime, salt, nitrate of soda, &c., as may best prevent the click beetles from laying eggs, or which may destroy such eggs or wireworms as may be in the soil, before the land is broken up. Various methods of ploughing and consolidating the land, also of paring, burning and cleaning out roots and rubbish, and of cropping and manuring suited to starve out or destroy the wireworm and promote good growth of the next crop.

"Feed down the land as bare as possible before ploughing it, and leave as few stumps of grass as possible or leaves to plough in. I believe a top dressing of lime, or lime and salt, to the land after it is eaten down bare, and before it is ploughed would also tend to check the wireworm. After the land is ploughed, roll it down as tight as possible.

"M. LOCKE BLAKE, *near Ilminster.*"

"In order in some degree to prevent mischief from this pest, it is well to consolidate the surface thoroughly and to graze every bit of plant off all leys or pastures which it is desired to break up. For this purpose sheep and cattle should be fed with cake, corn, or other feeding stuffs, so that each inch of land shall be trodden and eaten bare. By this means the grub would be destroyed, or, if it escaped being trodden to death, it would find great difficulty in obtaining food, both through the scarcity of vegetation and the solidity of the surface soil. A dressing of gas-lime on the surface and ploughed in has a good effect on any of the worms which may have escaped the treading and starving.

"On land suspected of containing this plague, it is advisable to sow the crop broadcast in preference to sowing in drills, as the worm has been observed to follow the drill mark with great regularity, and crops sown in drills have been found to suffer much more than those sown broadcast, the reason being the greater facility with which the grub finds a new plant when it has eaten the old one.

"ADAM LEE, *Lydbury North, Shropshire,*
"For the Right Hon. the EARL OF POWIS."

"We have no clover leys here, but we have considerable trouble with wireworm in old grass leys. I treat these as follows:—

"If the lea is broken for oats (our general crop), it is sure to be attacked more or less by wireworm. I top-dress with 4 cwt. agricultural salt, 2 cwt. superphosphate, and sometimes 1 cwt. nitrate of soda. I have never found this to fail if applied in time. If the lea is broken in the autumn to have green crops in the following year, I have the land worked as much as possible, and apply 8 tons hot lime to the statute acre—lime as hot as possible. I always sow the seed with a liberal dressing of farmyard dung for such crops as mangolds, turnips, cabbage, carrot, and parsnip, and I use the following dressing of artificial:—2 cwt. best bone meal, 1 cwt. nitrate of soda, and 3 cwt. common salt. I find the plants are soon forced up beyond the reach of damage. On the Old Red Sandstone formation, I find lime absolutely necessary. I do not think 8 tons per acre is quite enough, and would use 10 tons if I could procure it quickly. That and common salt will reduce most of these pests, and nitrate of soda in small quantities is most useful to force on almost any crop.

"SIR RICHARD KEANE, *Cappoquin, Waterford.*"

"Some years ago we suffered rather severely in this neighbourhood from wireworm; but since adopting the following system of top-dressing previous to ploughing, the wireworm has ceased to trouble us.

"In preparing lea for oats, I either top-dress the surface with lime or by sheep. When by lime I prefer to draw the lime daily as it leaves the kiln, and put it down in heaps, which I cover with earth. The heaps are small and placed conveniently for spreading. They are allowed to remain until the stones are pulverized, and then the lime is spread in the hot state over the surface. The effect of hot lime is to burn off the grass and thus destroy the food of the wireworm; also, when (as is well known) they come to the surface after a freshet, they do not do well amongst the lime. Further, I am of opinion that this system of top-dressing has a good effect in destroying eggs from which wireworms would have hatched.

"I use from 60 to 80 barrels of lime (measured before being pulverized) to the Irish acre.*

"Top-dressing by sheep-folding involves a system of farming which I think could be extended with good results in Ireland. My method is to pen such of the flock as are intended to be fattened during the winter upon the field. The size of the pen depends on the number of sheep and the extent of the land to be top-dressed. I begin at one side of the field, and enclose as much ground only as will be thoroughly trodden in one week, removing the pen regularly once a week. The ploughs follow the moving of the sheep, so that the system does not retard the spring ploughing, as by the time the last of the sheep are sold off, and the last move made of the pen, the field is within a day or two of being ploughed. The sheep are fed with turnips, oats, and hay.

"This is a perfect method of manuring the field. The braird comes up strong and healthy, and very soon places itself beyond the ravages of the worm; but the secret of success is in doing the work thoroughly. I use 15 stone of seed per acre of oats, and 12 of barley, employing a heavy roller as soon as the braird is above the surface.

"I may add that three years ago a field of 7 acres was as an after-thought ploughed without having undergone any system of top-dressing, and it was almost entirely destroyed by wireworms. In fact the produce in oats from the entire field was only 1004 stone, when we calculated on 300 stone per acre.

"S. SYM SCOTT, *Ballinacourte, Tipperary.*"

"I have for the last ten years here grown from 45 to 60 Irish acres of turnips. My system of cultivating them is to plough deep in autumn, leave the land exposed all the winter until the proper time in spring for preparing for green crops, when I first harrow down the winter ploughing, then grub deep with 3 or 4 horses. Again harrow and pick off any weeds, grub again with a light grubber drawn by two horses, again harrow and roll if required (and this is generally all that is required). Before opening the drills, I like to leave the ground that is prepared a few days in dry weather before opening, so as to draw a little moisture. A man with pair of horses then opens the drills, others cart in the farmyard dung. While another set of men and women spread the manure and sow the artificial manure, another man with a pair of horses closes the drills, and a man with pony sows the turnips and does odd work in the field.

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* 100 Irish acres are equivalent to 162 English acres; consequently an Irish acre amounts to about one acre and three-fifths English measurement.

"I mix mould or ashes amongst the artificial manure, and salt on dry soil before sowing it. The farmyard-manure I get turned if possible ten days or a fortnight before using it, and saturate it well with liquid manure, so as to have it in proper order.

"WILLIAM STODDART, Steward for LORD CLERMONT,
Clermont Park, Dundalk."

"I have been farming on gravel land on the four-course system, feeding off the roots by sheep on the land, and thereby treading it. As the growth of clover as often as every fourth year encourages wireworm, and the land is liable to become clover-sick, I have occasionally (when I had any cause for alarm) substituted beans or peas, on about the worst half of the land for clover; the other half the same, next time. By this means and by firming the land, and getting it into good condition by manure, the crop is better able to stand attack of wireworm.

"RICHARD R. RIDLER, *Moreton-on-Lugg, Hereford.*"

"As a rule I always plant oats, or dredge (the latter a mixture of oats barley, and peas), as I find the peas fill up should the wireworm thin the oats too much. Care should (I think) be taken not to plough the ley-grounds too long before planting the oats, &c. If the land gets too stale, *besides getting grassy*, experience tells me the crops suffer most, therefore I prefer not ploughing before the beginning of the new year, for sowing in February. I also prefer sowing the corn broadcast on such ley ground, giving it as many as seven double turns with the harrows and then rolling it,—when drilled I fancy the wireworm follows the drills more quickly.

"The chief damage generally arises on the succeeding crop; * after the oats I generally sow vetches, the next most certain crop and least liable to the attacks of the wireworm; after being fed off and the land planted with turnips the same season the roots generally fail, also the succeeding crop of barley is sure to be much injured.

"The good old plan of *paring* and *burning* (breast ploughing) old sainfoin and seeds is the best way of preparing such land for any future crop, as it destroys many of the eggs, &c.; but the increased cost and the scarceness of labour render the plan often impossible.

"T. R. HULBERT, *North Cerney, Cirencester.*"

"We have had no wireworm attack except on one piece of 5 acres of barley, which was almost entirely spoilt, rolling heavily being of no avail. This was old meadow land; but perhaps it is worth notice that about one acre of this field which was *burned* about five years ago was not nearly so bad as the

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* The following note was received in reply to inquiry regarding presence of wireworm sometimes occurring in larger amount on the second crop than on the one immediately succeeding broken-up ley (E. A. O.):—

"My opinion as to why the wireworm attacks the second crop more than the first is, that it is in consequence of the mechanical state of the soil. When ploughed after old ley the furrows come up very tough, and after being well rolled and harrowed, are so consolidated together that it is difficult for the wireworm to make a fast progress. Also there is other food (old roots) plentifully at hand. This is proved, I think, by ploughing early, and thus letting the old roots rot too much before planting the crop; consequently the wireworm at once begins the new crop for food, and thus it suffers more. With the second crop the land is generally properly cleaned: the cleaner it is the more hollow and loose the land becomes, and the more the wireworm attacks the crop; it being easy to get about, and nothing else to feed upon.

"T. R. HULBERT, *North Cerney, Cirencester.*"

other four acres. Fires were made about 11 yards apart, and all the rubbish, weeds, roots, &c., burned, and the ashes spread on the land.

"R. W. Christy, *Boynton Hall, near Chelmsford.*"

"Probably there is more wireworm in wheat after seeds than at any other time on the four-course system.

"The special management is to plough the seeds up soon enough to give the turf time to rot; by rollings to give a firm seed-bed, and by rolling *after* putting in the seed (where this is practicable) to compress the soil with a view to preventing the frost lifting the surface and so injuring the young plant. The judicious use of fertilizers strengthens the plant, and generally enables it to resist alike the effects of frost and the ravages of the wireworm.

"On land where, after seeds have been grazed for two or three years, the ground has been ploughed for wheat in August (giving time for the turf to rot), and a firm seed-bed has been secured by plentiful rolling, also some fertilizer, such as guano or superphosphate, sown at the time the seed is drilled, we shall not find any unusual amount of wireworms. If, on the contrary, it is ploughed later in the season and the land treated only as in the case of one year old clover, the poverty of the surface will be shown by the large proportion of dead plants which have "damped off," whilst the remainder "slow growing" will show wireworm active amongst them. In ordinary cases—cultivating the land immediately after harvest; burning all grass and other roots carefully, and so destroying the eggs of the beetle; repeated ploughings, which enable the rooks to carry off a large percentage of the wireworms, and a thorough pulverizing of the soil which may expose them, appears to me to be the effectual way of dealing with the wireworms—or larvæ of the click beetle.

"Ralph Lowe, *Sleaford, Lincolnshire.*"

"Wireworm is especially destructive after two years' seeds, more particularly when the land is sown with corn immediately after ploughing, and so little worked that considerable spaces are left between the unbroken furrows. Early ploughing clover lea in the autumn, and rolling wheat or oats in the spring, have been very advantageous, but we attribute this rather to the solidity of the land, which enables the roots to work better, than to the destruction of the wireworm.

"During autumn last year we used gas-lime on clover lea before ploughing up for oats, and, whether from that or from some other cause, there was no perceptible injury to the following oat-crop. On a farm which I formerly had in hand, but which I let some years ago, there were when first I began to occupy it a great number of wireworms, these almost entirely disappeared in the course of a few years, and we attributed this fact to the more thorough cultivation and working of the land. My bailiff suggests that the removal of weeds, especially 'twitch,' in which the click beetle may have laid its eggs, is, perhaps, the cause of this. It is certain that the wireworm is fast disappearing from the farm I now occupy, and we have found no appreciable injury from it this year.

"Joseph Paget, *Stuffynwood, Mansfield.*"

"Breaking up clovers and rye-grass is generally done early so as to insure decomposition of the plant, thus giving full effect to firming of the land by pressing with iron ring-rollers.

"Treading with sheep where affected, rolling, and harrowing are the means generally adopted.

"H. Hayward, *near Hereford.*"

"I have suffered most in the wheat crops grown upon the clover leys, and the best treatment that I ever discovered was to plough shallow; and after the seed was drilled either roll well or tread with sheep to well consolidate the ground.

"Another system I have adopted is to plough the clover lea early, and get a crop of rape or mustard. Feed it off for sheep, and then plough again for wheat. This method I have found a great preventive for wireworms, but at the same time, by the early ploughing, some part of the summer feed is sacrificed.

"RICHARD PULLEN, *Standeford, Wolverhampton.*"

"Wireworms are most plentiful on land that has lain long fallow, and from old pastures, or from clover ley. The methods of prevention in treating clover ley are judicious fallowing and such a thorough burning of rubbish as will destroy the eggs and grubs. Heavy rolling and bush-harrowing will destroy many of them.

"Ploughing the surface two inches deep with a breast plough, the turf being burnt or allowed to die, is recommended.

"JOHN SUTHERLAND, *Berridale, Caithness.*"

"This year I have a splendid crop of oats on very old lea. I used an American Prairie plough, with revolving mould board, which brings up the subsoil to the surface. This made the ground easily broken down, and almost covered the sods. I then sowed with fine rape meal and oats mixed in the hopper, and the crop promises to be earlier than any sown at the same time.

"CHARLES LITTLEBOY, *Straffan, Kildare.*"

"The field now in work for wheat after mowing clover twice is ploughed deep, then is harrowed well so as to make the land solid, and keep a good tilth for seed. Lime is applied at the rate of 4 tons per acre, worked in with the large harrow, and the land is sown as solid as possible. This produces me the best crop, as the action of the lime converts the turf into suitable soil for wheat.

"J. PRINCE, *Foston, Derby.*"

"In breaking up old sainfoin I sow about 5 cwt. of salt to the acre before ploughing it, and let it lie and get quite stale before planting. If I find any wireworms I well press it.

"JAS. BULFORD, *Hordley.*"

"Salt sown at the rate of about 8 cwt. per acre on grass land before ploughing for a crop is recommended as a preventive of wireworm. Gas-lime at the rate of about 15 tons per acre spread on turf or seeds before ploughing has been found a certain cure, and soot sown before ploughing or after sowing is a good preventive, and promotes growth, especially for wheat.

"Per J. CRAIG, *Shifnal, Salop.*"

"I believe that the best method to get rid of the wireworm from pastures is to apply a good coat of lime on the surface. An effectual plan is to plough up any land subject to the wireworm and mix the lime in the soil, say at the rate of 6 tons per acre, after which a crop of turnips should be grown, and eaten off the ground by sheep hurdled up in pens. I have never seen that course a failure.

"OWEN PRICE, *Nantyrhain, Brecon.*"

IMPORTANCE OF HEALTHY GROWTH.

NOTES ON MANURES.

Importance of such treatment of the seed and preparation of the land as will insure healthy germination and vigorous growth from the first, with mention of various artificial manures and applications serviceable for this purpose, and opinions of various observers as to the farmyard-manure being attractive to wireworms.

"Wireworm infests pretty nearly all dry light soils; its ravages are most fatal where the surface of the land is deficient in plant food, or where the seed used has been weakened from any cause, where the seed has been deposited too deep, or the sowing has been out of proper season, and the plants have to a considerable extent damped off. In the case of seed oats that have been slightly heated in the stack and make no proper progress, the wireworm will be found to work its pleasure amongst them. Or again, the swathe clover root has been ploughed up late in the season, the turf has not rotted, the wheat has been put in late, and the work is unsatisfactory, In this case the plant comes up pretty well, but in February it may be found that a large proportion has damped off. A dressing of rape-cake, or superphosphate, or guano would have prevented this mischief. As it is, the wireworm has its own way with the remaining plants, and obtains the credit of having destroyed the whole of the crop.

"RALPH LOWE, *Sleaford, Lincolnshire.*"

"If land is in good condition and in a high state of cultivation, wireworm does not often seem to hurt the crops.

"M. LOCKE BLAKE, *Ilminster.*"

"Injury from wireworm is most severe when the corn is attacked just as the seeds are striking root; that is, when the food supplies in the grain are exhausted, and the plant is beginning to depend on its roots for nourishment. When the plant has reached the height of six or eight inches it does not fall back so readily under attack.

"ROBERT COUPAR, *Scone, N.B.*"

"I observe that when the turnip plant is attacked in its young state—that is, when about two inches high—the wireworm nips into the centre of the root and the plant dies; but when the plant gets a little stronger, and one or two fibres begin to spring out from the sides, the plant receives little harm.

"R. RENTON, *Earlston, N.B.*"

"The quicker you can get the seed to germinate and grow the less injury the wireworm can do, but in dry weather and cold nights the wireworm will do much mischief.

"I consider that by sowing 2 cwt. of rape cake per acre the crop may be partially saved, as the wireworm will feed on this while the seed is growing, and thus get a good start.

"JOSEPH ADDISON, *Mapledurwell, Basingstoke.*"

"The application of artificial manure is doubtless an assistance to the plant by strengthening it, and causing it to tiller out, and so in part to compensate for the damage done.

"The wireworm is most destructive during a cold dry season, with east wind prevailing; in short, when the growth of the plant is suspended. After a copious fall of warm rain the destruction is seen to cease and the plant to revive.

"David Rowland, *Titley, Herefordshire.*"

"There seem to be two plans for trying to get rid of the wireworm: one the starvation of the worm by fallowing, the other by the application of something strengthening to the crop, and, if possible, also injurious to the worm; rolling and hoeing are resorted to—anything, in fact, which may push on the crop and disturb the worm.

"R. Cooke, *Detling, Maidstone.*"

". . . having arrested their progress, it is advisable to resort to the most highly stimulating manures, and with no sparing hand, in order to force the remaining plants to such a degree as to enable them to cover the ground and become sufficiently strong to resist the attack of the worms that may escape from their imprisonment, or may hatch afterwards.

"Here again is another point in favour of keeping land in the very highest state of cultivation, both as to manure and mechanical condition. Weeds should on no account be allowed in anything but a state of infancy, as, if permitted to cover the ground, they weaken the crops, and afford a ready supply of cover and food to the pest.

"Adam Lee, *Lydbury North, Shropshire,*
"For the Right Hon. the Earl of Powis."

"Manures into the composition of which sulphuric acid largely enters are thought, when drilled with turnip seed, to repel the wireworm; but I do not consider that any caustic manure or rape cake put into the land will in any way affect wireworm, except by stimulating the rapid growth of the plants.

"On light land probably the application of—

"2 cwt. of rape cake, at the cost of	7*s.*
2 cwt. of superphosphate, at the cost of ..	8*s.*
1 cwt. of kainite, at the cost of	6*s.*
Total ..	21*s.*

per acre, will be found one of the best fertilizers of wheat. When sown broadcast at the time of drilling the seed, this manure carries the plant out of reach of attack, and gives a satisfactory return on light lands. On clay it is useless.

"Ralph Lowe, *Sleaford, Lincolnshire.*"

"If the crops are attacked the best means that I have noticed for saving them (white straw crops), is to dress them with some nitrogenous manures, such as nitrate of soda, by which they are induced to grow away fast from the pest, which prefers very young growth.

"Robert L. Pudney, *Halstead, Essex.*"

"The use of artificial manures, nitrate of soda to the corn crops, and superphosphates to the root crops, I have no doubt is the proper thing, so as to push the young plants on as quickly as possible.

"T. R. Hulbert, *N. Cerney, Cirencester.*"

"In a 20-acre clover ley, dunged and sown with wheat, a strip right through was attacked rather severely. This was rolled and *nitrate of soda* was applied, and at harvest this part was quite as good as the rest of the field.

"R. Cooke, *Detling, Maidstone.*"

"The only manure used as a top-dressing is soot, and this is an excellent remedy against wireworm and a valuable manure.

"H. Hayward, *Blakemere, Hereford.*"

"We suffer but little from the ravages of wireworm in this district . . . its effects are chiefly observable where the soil is somewhat poor and too open and porous. It is considered it can be best kept under by dressing with lime, soot, and salt, and severe rolling.

"Rev. G. T. Blomfield, *Norton, Ilminster.*"

"Turnips sown May 25 were ready for thinning June 20; but on June 22 so many of the plants were found to be dying from attack of wireworm, that we did not thin until eight days later, to allow them to get stronger. Then I believe an eighth part of the plants were destroyed, but as they had been sown very thick there were plenty of plants left, and, being fine growing weather at the time, they began to do well.

"As a stimulus a part was sown with nitrate of soda, 2 cwt. per acre; another part with common salt, 4 cwt. per acre; and another with dissolved bones and guano, 3 cwt. per acre, or thereabouts. It was plain that the nitrate of soda answered best, and the whole was re-sown with it. Now the crop is a pretty fair one, but I believe that if nothing had been done, it would have been lost.

"R. Renton, *Earlston, N.B.*"

OBSERVATIONS REGARDING WIREWORMS BEING ATTRACTED BY FARMYARD-MANURE.

"Some farmers consider that spring crops sown on land that has been dressed with farmyard manure are more infested with wireworm than those sown on land dressed with artificial manures. I think artificial manures are of great use, as on every account it is good to force on the plant at the time the insect is at its work. In this part of the country ferns are used in great quantity by most farmers for bedding purposes; but in one locality it is considered that the wireworm occurs in such numbers in manure made from ferns that the farmer will not allow a load of these to be brought into his yard, and I have seen potatoes planted in manure made chiefly from ferns very badly infested by wireworm.

"Thos. Jones, *Penpont Farm, Brecon.*"

"I have noticed in former years that portions of land which have been treated with farmyard manure have been seriously attacked by wireworm, while adjoining portions covered with ashes, road-scrapings, &c., have at the same time been entirely free from them.

"L. P. Williams, *Penberry, St. David's.*"

"I think heavy dressing with farmyard-manure helps to encourage wireworm.

"J. Prince, *Foston, Derby.*"

"It is a well-known fact that salt is an effective preventive of the grub and wireworm in corn-fields, and besides is valuable as a fertilizer, and in strengthening straw grown on land deficient in saline matter. If farmyard-manure, and especially stable dung, were turned over and salted in spring, or salted after having been spread in the drills previously to being covered, I believe we should have fewer grubs of all sorts.

"JAMES KAY, *Bute Estates, Rothesay.*"

The above points are well worth further observation and consideration, for one great principle of prevention of wireworm attack is to press the land so firmly that the wireworms have not free passage in the soil; and it is plain this state cannot be thoroughly attained where farmyard-manure is used in the condition in which it is commonly applied to the soil; and where large quantities of any kind of vegetable matter that takes long in rotting are added, the difficulty is of course much increased. Further, it has been observed that the wireworm of the common striped click beetle [*] has been found, and sometimes in great numbers in dung, and in vegetable manure or in vegetable earth; and thoroughly rotted horse dung has been found to be a feeding-place for the wireworm of the black click beetle, [†] and consequently these kinds and conjecturally several others, whose habits as far as we know are very similar, may thus be easily carried out to the coming crop in the manure.

ROLLING AND TREADING WITH SHEEP, &c.

Notes of wireworm being most destructive on light and friable soil, or when land is in this condition from weather effects, such as are caused by long frosts.

Pressure of the land by rolling, or by treading with sheep, or other measures calculated to compress the soil firmly and keep the wireworms from travelling strongly recommended as methods of prevention, and as remedies when attack is present.

"Wireworm infests land of almost all descriptions, but more frequently those of a light, friable, and dry, or moderately dry, texture. It seems to delight in being able to run freely from one plant to another, and damage all crops more or less; but its effects are never so plainly visible as in the early spring to the wheat, barley, oats, and small turnips, and other plants.

"Where measures of prevention have been unthought of, or have failed, and the young crop is attacked—the first thing to be done would be to roll with a heavy, flat, smooth roller; or with a Cambridge roller or ring roller first, and a flat one to follow, and this should be done when the land is as wet as it is possible to work the implement on, free of clogging, in order to arrest the progress of the worm from one plant to another.

"To drive sheep over it until no part can be seen without a sheep track is also a good plan; but it is heavy work for the sheep.

"ADAM LEE, *Lydbury North, Shropshire.*

"For the Right Hon. the EARL OF POWIS."

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[*] *Agriotes lineatus*, Esch.

[†] *Athöus niger*, Linn.

"Rolling after sowing is generally admitted to be the best preventive. By rendering the soil firm and compressed, it prevents the ready passage of the wireworm from plant to plant, and thereby localises the damage.

"Where crops are affected, rolling or treading by sheep where practicable is a plan universally adopted, and is, I think, the best remedy.

"David Rowland, *Titley, Herefordshire.*"

"Rolling and treading at the time of sowing the seed have been found serviceable.

"Ralph Lowe, *Sleaford, Lincolnshire.*"

"Wireworms are more active in the spring months after a long frost (on account of the land being then more porous), than they are in mild winters. I have used 30 cwt. of gas-lime to the acre on clover ley, and harrowed the land a week or nine days before being ploughed up for wheat with good effect, and put the shepherd to drive *sheep close over* the field when the drill was planted. In March, if the land is dry enough, put *cattle* and *sheep to tread it* and roll down. I do not think rolling does as much good as the *horses* do in treading, especially if they are driven three abreast.

"G. Burgiss, Farm Manager to the Right Hon. the **Earl** of Winterton, *Strutherglen Park, Petworth.*"

"No doubt in Hampshire the wireworm is a scourge, but it is not numerous enough here (Downton) to cause us trouble. Our ground is heavily stocked with sheep, and probably their constant treading interferes with its movements.

"Most of our land carries sheep at least once a year, and much of it twice; vetches *fed* followed by roots *fed* alternating with the ploughings and dressings necessary for the cultivation of the crops must be an unsatisfactory state of things for the wireworms. On poorer soils, where only about half the number of sheep per acre is maintained, the wireworm is to be found established more frequently.

"Prof. J. Wrightson, Coll. of Agriculture, *Downton.*"

"Our treatment of land where crops are affected is, frequent use of the ring-roller and steady driving of sheep backwards and forwards over the land.

"J. Forrester, *Bryanston, Blandford,*
"For the Right Hon. Viscount Portman."

"The firmer the land the better; consequently I have often used *sheep* on the wheat land when too wet for rolling. Good cultivation—plenty of harrowing, &c.—is always beneficial.

"T. R. Hulbert, *North Cerney, Cirencester.*"

"Treading the ground with *sheep* and *cattle*, and *rolling* with a heavy roller, are good measures for killing the worms.

"John Sutherland, *Berridale, Caithness.*"

"If the wireworms attack a crop, the only way that I have found to stop them is to get the land into as firm a condition as possible. If the land is open they can travel easily from plant to plant, and may often be seen working up a drill and killing all the plants in succession. If the land is firm and hard pressed, the wireworm has more difficulty in working about in it. *Rolling* constantly with a heavy roller, or turning *sheep* backwards and forwards on the ground is the only way to get it properly consolidated.

"M. Locke Blake, *near Ilminster.*"

"All light land subject to wireworm ought to be *rolled* twice with a ring-roller as soon as the seed is sown, either in the autumn or the spring; you cannot well get the land too firm.

"Joseph Addison, *Mapledurwell, Basingstoke.*"

"On the chalk at Mere Down, Wiltshire, it is noted that the *Cambridge ring roller* is the best remedy—the heavier the better—and that it should be passed over the same land two or three times.

"Thomas Henry Baker, *Mere, Wilts.*"

"I have tried rolling both with and without salt, and salting without rolling, the two former with good effect, the latter apparently with none. This year being particularly favourable for rolling the wheat crop, it was all well rolled in good time; we have not suffered.

"A. H. Bowles, *Clandon, Guildford.*"

"I have suffered considerable loss by the ravages of the wireworm in my wheat plant, on land where the previous crop was seeds, and the most convenient method for destroying them is to roll the ground and make it like the turnpike-road. The wireworms come to the surface, and the crows take them.

"Thomas Allen, *Thurmaston, Leicester.*"

"A field on my farm (light soil on the sea-coast of Pembrokeshire), which had been under grass since 1878, was ploughed two inches deep in the spring of this year; a second ploughing during April went to 4½ inches deep, no manure was applied, and it was sown with barley. The wireworms soon appeared, more especially in the bores, when a heavy *Crosskill's ribbed roller* was used first across the furrows and afterwards along them. This had the desired effect, the wireworm practically disappeared, and a good average crop of barley followed.

"L. P. Williams, *Penberry, St. David's.*"

"It is a general custom when crops of barley or oats are injured to use the *Cambridge roller* as soon as possible, which no doubt does good, as it kills some of the insects, and helps to keep alive the plant which had been partially destroyed.

"Thomas Jones, *Penpont Farm, Brecon.*"

"I have found that compressing the soil before sowing the crop, and during the early growth of the plant, has to a limited extent prevented the worm from working: hoeing the crop is also good—in short, any means of disturbing the worms or hastening the growth of the plant to enable it to get away from their attacks is beneficial.

"Frederic Beard, *Horton, near Canterbury.*"

MUSTARD.

Notes of the serviceableness of mustard as a preventive for wireworm; also instances of wireworm not being observed as attacking various leguminous crops, as clover, peas, &c., if no grass was present either as a part of the crop or as a weed amongst it.

"It has been found by practical experience that the growing and ploughing-in of white mustard will get rid of wireworm. . . . The use of mustard as a growing manure crop is not sufficiently resorted to.

"Per C. Caswell, *Peterborough.*"

"Mustard sown thickly and allowed to grow to a considerable length, and then ploughed in, has been found to be a good preventive, and, at the same time, to add considerably to the fertility of the land.

"Adam Lee,
"For Right Hon. the Earl of Powis, *Lydbury North, Shropshire.*"

"Found mustard a good preventive, and sometimes the only safe crop to sow where wireworm prevailed.

"J. Forrester,
"For Right Hon. Viscount Portman, *Bryanston, Blandford.*"

"I think mustard acts as a preventive.

"George Burgiss, *The Farm, Strutherglen, Petworth.*

"For fallow after cleaning sow rape or mustard-seed, about the end of July, and plough it under when about a foot or eighteen inches high.

"Per J. Craig, *Shifnal, Salop.*"

"The wireworm has been known to disappear after a crop of white mustard, of which one half was eaten on the ground by sheep.

"Joseph Paget, *Mansfield.*"

"I have no doubt of mustard being a good remedy where it can be applied so as to be ploughed in for the crop. . . .

"I would suggest that flax should be substituted for the corn crop on all land most liable to the ravages of wireworm, especially now that the fibre harvested and threshed can be utilized for paper-making, thus opening up a new and remunerative article of farm produce. I have heard, and believe, that it is invulnerable to the wireworm, but cannot speak to the fact from my own experience.*

"T. R. Hulbert, *North Cerney, Cirencester.*"

"White mustard sown and allowed to stand until it comes into flower is a very useful preparation, when ploughed in and pressed, for all corn, and I think prevents the wireworm from doing so much mischief.

"Joseph Addison, *Mapledurwell, Basingstoke.*"

"I have never known wireworm troublesome after mustard or vetches.

"M. Locke Blake, *Ilminster.*"

"I have not found that red clover encourages wireworm, but when mixed seed and much rye-grass are used, I have found them very productive of wireworm. The best remedy, and one frequently adopted, is to break-up early and plant mustard, which is an excellent preparation for wheat; and I have found mustard the best preventive of attack.

"H. Hayward, *Blakemere House, Hereford.*"

"I have not noticed wheat after clovers, beans, or peas affected if no grass had grown among those crops. As for remedies, I can only suggest clean cultivation, sowing the *clover-seeds* only for feeding or hay, if wheat or oats is to be taken as the next crop.

"Robert L. Pudney, *Halstead, Essex.*"

"I have never known peas attacked by wireworm.

"Thos. Hy. Baker, *Mere, Wiltshire.*"

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* The only beetles that I find reference to as injuring the flax crops either in their perfect or grub state, are cockchafers, and also a kind of flea beetle.—E. A. O.

SALT AND KAINITE.

Notes of heavy dressings with salt having been found serviceable to kill couch-grass, and also to destroy or drive away wireworm. Lighter dressings found useful in promoting vigorous growth of wheat. Salt also serviceable in garden cultivation, to protect cabbage from wireworm attack. Observations of benefit from use of kainite.

"Salt, at the rate of 5 or 6 cwt. per acre on light land, is considered useful if sown before breaking sainfoin or clover leys.

"JOSEPH ADDISON, *Basingstoke.*"

"In former years I have experienced much benefit from the use of common salt, applied at the rate of 5 cwt. to the acre.

"L. P. WILLIAMS, *Penberry, St. Davids.*"

"An old ley was dressed with 10 cwt. of salt per acre in the autumn, and the salt ploughed in. This plan not only killed the couch and twitch, but on this piece of land there was no trouble from wireworm or from grub, and none has been known to occur since.

"Per CHARLES E. CURTIS, *Alton, Hants.*"

"I have known a heavy dressing of salt (10 or 12 cwt. per acre) applied some weeks previous to sowing to have a good effect.

"On the lighter lands of Radnorshire I have observed that wireworm is most destructive on old and poor grass-land ploughed up for oats. The land being light, porous, and exhausted, offers every facility for the action of the wireworm. In such cases two or three crops are frequently destroyed in succession. The general treatment is to *lime* and salt liberally, and to treat the land by consuming the root-crops with sheep.

"On the other hand, I have known strong loam rich with farmyard dung and artificial manure, but *without lime* or *salt* suffer severely. I do not think that either salt or lime will directly kill wireworm, but I venture to suggest that soil thoroughly impregnated with one or both may become an unfitting abode for it.

"DAVID ROWLAND, *Titley, Herefordshire.*"

"For six years, previous to the year 1873, every crop in a 13-acre field belonging to me and in my occupation was more or less attacked by wireworm. I farmed the field on the four-course system, and on two occasions 4 acres of wheat in the middle of the field were destroyed by wireworm. In 1873 the field was a clover ley, and was dressed with 8 cwt. of salt to the acre previous to ploughing for wheat, and 5 cwt. of damaged decorticated cotton cake per acre was also put on it at the time the wheat was sown (the cake was best decorticated cotton cake, but had been a little damaged by fire, and cost 5*l*. per ton delivered at my station). The crop of wheat was very good, and that portion where the wireworm had previously done so much damage was the best. Every crop has since done well, and there has been no return of the pest.

"JAMES WHITAKER, *Worthen, Shrewsbury.*"

"A piece of old turf on light soil having been broken up for oats was then sown with turnips eaten off by lambs; this was next worked for potatoes, and large quantities of wireworms were observable. Two loads of common salt were procured and sown broadcast, and it was not found that any of the potatoes were eaten by the wireworms.

"S. Massey, *Church Lawton, Cheshire.*"

"I had two fields in clover last year, both heavy crops, and each dug up in the autumn. One was sown with about 4 cwt. of salt per acre, the other left without any dressing. No wireworm has appeared on either, but the salted field is more than double the crop in both thickness and vigour, though I should incline to say that the other field was naturally rather the better, and both were treated to exactly the same quantity of manure last year. So we may say that the salt (even minus the effect on wireworm) has had a valuable effect.

"I see some few fields worked by wireworms principally after wheat, which was itself worked by wireworms last year, and being a late-cut crop (the worst field was not cut at all, and was shooting until the end of September 1881), probably the eggs were laid in the crop of weeds at the bottom.

"G. W. Latham, *Sandbach, Cheshire.*"

"When I see cabbage or any of the *Brassica* tribe showing signs of wireworms being at the root, I put a ring of salt about 3 inches from the stem around each plant. This either kills or disperses the wireworms, and the plant makes fresh roots and does well. In very dry weather the plants require watering with a rose after the application of the salt.

"J. Craig, *Shifnal, Salop.*"

"In the year 1871 my attention was called to the damage done to a field of wheat by the wireworm, nearly one-sixth of which was destroyed by them. I was induced to try the effect of Leopoldshall kainite, and applied a dressing of about 3 cwt. per acre to the whole field, at the same time applying superphosphate and nitrate of soda. The wireworms did no farther damage.

"Some two or three years after I noticed many wireworms when my potatoes were got up, and just before sowing with wheat I applied 5 cwt. of kainite to the potato-ground (1 acre), none being applied to the other part, where mangolds were growing. In the following spring the land which had received the kainite was unhurt, whilst the other portion was thinned a good deal by the grub, and we had to dress it also. I have frequently had to use kainite since, and I never knew it to fail if applied in time.

"T. S. T. Carrington, *Uttoxeter.*"

"Regarding the attack of wireworm, there is never destruction to any great extent by it in this district. I have never had trouble with it to any extent beyond small patches in a field, these I always dressed with nitrate of soda. The soil, where I had to apply it, was stiffish, and mortar-like, where a proper mould could not be easily got. I applied the nitrate at the rate of 2 cwt. per acre, and the kainite about 4 cwt., but I think more kainite could be applied with advantage. Care must be taken to apply these salts when wet, otherwise there is a risk of burning the plants.

"J. H. Leslie, *Blairgowrie, Perth.*"

Gas-Lime.

Application of gas-lime as a means of clearing ground of wireworms.

"For several years a portion of one of my fields was infested with wireworms; and in spite of rape-cake and other supposed remedies, every successive crop was more or less injured, until one autumn I ploughed in refuse gas-lime, and from that time have never seen a wireworm in that field.

"THE RIGHT HON. THE EARL OF ESSEX, *Cassiobury, Watford.*"

"I do not think we are much troubled here with wireworm, except in very old pastures, and then our usual plan is ploughing up and dressing with gas-lime.

"W. ELIOTT LOCKHART, *Hawick, N.B.*"

"For clover-leas I should put about 10 cwt. of gas-lime to the acre, and then plough it under. I think this is a great preventive. If used for turnips, sow it on broadcast and work it in, and then add what may be thought best for the crop.

"S. MASSEY, *Church Lawton, Cheshire.*"

"I dressed a few acres with gas-lime in March, and it seems to have freed the ground wonderfully.

"JOHN HEATLEY, *Passingham, Wolverhampton.*"

"Some years ago complaint was made of the destruction of grain crops on a limited portion of a field of rather light soil. I advised the trial of gas-lime, and several cart-loads were applied with the result that not a trace of wireworm was seen for several years after.

"JOS. ELLANS, *Anglesey.*"

ALKALI WASTE.

This material, which much resembles gas-lime in its properties, is sometimes largely used in the neighbourhood of alkali works, and is valuable on account of its intensely caustic nature, which destroys all life in weeds or insects alike that it may come in contact with, before its nature is altered by exposure to the air. After this the "waste" is a safe and serviceable manure, usually procurable at a very small cost, or merely at the remover's expense of carriage from the works.*

The following communication is with regard to the use of alkali waste produced in the manufacture of soda-ash at Widnes, Lancashire.

"The Lancashire farmers get the waste for carting, and use it in large quantities to mellow heavy land, and destroy perennial weeds, as couch-grass, coltsfoot, or thistles, but a dressing of 2 or 3 tons per statute acre is as much as grass-land will bear at one time, and then it must be spread quickly, or the heaps will destroy the grass-roots, as well as the herbage.

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* For further particulars see "Alkali Waste," pp. 616, 617, 'Journal of R. Ag. Soc.,' vol. x., 1st series. From this it appears that alkali waste when fresh possesses caustic properties highly dangerous to vegetation, but after a time by exposure to air the sulphur compounds are altered and "essentially, then, alkali waste consists of sulphate and carbonate of lime, and may be used with advantage and economy wherever gypsum would be of use."

"This quantity per acre will be very fatal to the wireworm, and is surprisingly penetrating. After much rain, drains 3 feet deep in a heavy soil yield milky-white water after an application of 2 or 3 tons per acre.

"On arable land 5 tons per acre is a good dressing, and fatal to all insect and worm life; deep-rooted perennial weeds require more, especially coltsfoot.

"This 'waste' and gas-lime are somewhat similar in nature and effect, but the waste is more caustic, and contains about 2 per cent. of soda, very valuable in agriculture. It loses the caustic nature when exposed to air and moisture, and the rule is to leave it on the surface of arable-land exposed to air and rain for at least 6 weeks before ploughing it in; if it is buried in the soil before it has lost its caustic properties it destroys the seed, &c., when sown.

"Care is requisite in carting it in wet weather, for any liquid drippings falling on the horse take off the hair, and make the skin raw and blistered.

"JOHN CROMPTON, *Rivington, Chorley.*"

"Many people in the neighbourhood of Widnes use the chemical waste for killing worms, and also for manure on strong land.

"S. FITTON, *Nantwich.*"

GAS-TAR WATER.

"Four years ago I had a field of 9 acres on light good gravelly soil in wheat after oats, and in February the plant began to die. Rape-dust, heavy rolling, and nitrate of soda at the rate of 2 cwt. per acre were successively tried, but little benefit appeared to result. I then, as we have gas made near, got a water-cart about half filled with the water off the gas-tar; and diluted it just weak enough not to kill the plant, and applied it by means of a watering-can, and found a most beneficial result.

"J. PRINCE, *Foston, Derby.*"

APPLICATION OF SEAWEED.

"The Island of Shapinsay is 7 miles long and 5 miles broad, and is surrounded on the east by the German Ocean, on the north and west by the Atlantic; it is distant from Kirkwall 4 miles by sea.

"Good crops are general when the spring is warm and dry. The principal manure used for ley ground is *seaweed*, which probably accounts for the absence of wireworm, which is quite unknown to the farmers in Orkney.

"T. MCDONALD, *Kirkwall, Orkney.*"

"In regard to seaweed, it is largely used all along the sea-coast, where it can be procured. It gives good crops of all kinds, especially turnips and grass. Corn does well in dry seasons, but in wet it is liable to lodge, and the corn and straw are inferior. Seaweed is destructive to all kinds of insects, and I doubt not to the wireworm also.

"JOHN SUTHERLAND, *Berridale, Caithness.*"

"The wireworm is sometimes troublesome in the gardens; but to the farm crops it does very little damage, in fact, it is very seldom seen. The farmers and crofters use a great quantity of seaweed, which I have no doubt is the reason why there is so little wireworm.

"C. GRIERSON, *Isle of Mull.*"

"From inquiry made at some of the coast farms it appears that they are never troubled by wireworm. It is quite possible that the seaweed applied to the soil is a preventive.

"D. Husband, *Struthers, Cupar, Fife.*"

"As far as my information and observations go, wireworm is not very troublesome in this district. Seaweed is used a good deal by some of the small farmers about here, principally for potatoes in sandy soil.

"Joseph Ellans, *Bodorgan, Anglesey.*"

RAPE-CAKE, MEAL, &C.

Communications regarding the serviceableness of various kinds of rape-cake, nuts, or meal in diminishing amount of injury from wireworm-attack, whether by acting as a fertiliser or by attracting the wireworm away from the crop.*

The entries to which an asterisk is prefixed refer to observations regarding "Indian" Rape, *i.e.*, Mustard Cake.

"Found rape cake of great service in stopping the ravages of wireworms to growing crops, either because they preferred it to the plants (as could be seen

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* The following experiments were tried in consequence of the belief often expressed that wireworms feed so greedily on rape-cake that they burst. This, however, I did not find to occur in any instance.

Through the courtesy of the manager of the Phœnix Oil Mills, Liverpool, and of Messrs. Ayre, Waterloo Mills, Hull, I was supplied well with the "Indian" rape-cake from the former, and with Black Sea rape-cake from the latter firm. These two kinds are both known to be serviceable for manure, but I found them somewhat different in their action on wireworms.

The Indian, or Kurrachee, cake is formed from mustard-seed; this I pounded into small lumps and dust, and mixed it with water, and then placed a good supply of healthy wireworms on it, with a little bit of turf. For about three days the smell of the mustard was very powerful, and the wireworms would not leave their turf; and those that were placed on the mustard-cake, which presumably had still its stinging power, appeared very uneasy.

About the fourth day a putrescent smell succeeded that of mustard, and the wireworms began to go into the cake where they fed (or, at least, I presume they fed, as there was nothing else for food) for about a fortnight. They seemed all well and thriving until the end of the fortnight, when I found many dead, or dying. I put fresh turf, and broken potato and turnip in addition to the cake, but all died.

The wireworms which I placed on Black Sea rape-cake (that is, true rape), broken and moistened as above mentioned, went into it at once, and, like the others, fed (or appeared to feed, having no other supply); but, whereas the mustard-cake wireworms died in about a fortnight, these were still alive at a period of three weeks or more after having been put on the cake. I cannot tell how much longer they would have lived, for it was difficult to keep the cake in an evenly-moist state; and by disturbance in examination, and possibly by attack of birds, the specimens lessened in number; but from August 2 to August 22 might be taken as a time during which they were thriving. *None* of the wireworms which were experimented on burst from effects of eating, but it frequently occurred that when one was dead, or had so stiffened itself that it was cracked across in being moved, that, consequently, its white contents burst out where it was broken, and this may not improbably have given rise to the belief above referred to.—E. A. O.

by the presence of many eating their way into the lumps of cake), or, as some asserted, by poisoning them.

"J. Forrester,
"For Right Hon. Viscount Portman, *Bryanston, Blandford.*"

*"I have no doubt that the rape-cake I have used acted as a stimulus to the crop, the barley being much heavier on the portion of the field dressed with rape-cake than on the other portion; but as the part on which the cake was sown was previously infested with wireworms, I believe it attracted the wireworms from the plant; it may have killed them also; but of that I am not sure.

"Geo. McQueen, *Coed-y-Dinas, Welshpool.*"

*"About the application of rape dust to the land to destroy wireworm, I may say that in 1874 I got 2 tons of very fine rape dust (as fine as flour). I mixed it up with turnip manure, and sowed it in the drills in the usual manner. The result was very good. There was no wireworm, and the crows did not look for any; but on about an acre of the field that got no rape dust, the worm was bad, and the crows pulled up the turnips. In 1875 I used 3 tons with the same good result. Of course it has a certain value as manure as well.

"Edw. Gordon, *Mains of Kelton, Kirkcudbright.*"

"Rape-cake sown on the land has been found of much benefit.

"Adam Lee, *Lydbury North, Shropshire.*"

"I have seen very good results from the application of artificial manure, particularly from rape-cake. The wireworm is very fond of this food, and by leaving the crop in order to feed on the cake, thus frees the plant from attack.

"Fred. Beard, *Horton, Canterbury.*"

"Rape-cake of good quality is an excellent fertilizer for wheat when sown at the same time, and turnips do well as the following crop, but I do not think that it would have more effect on the wireworm than superphosphate or other applications of equal value as fertilizers.

"Ralph Lowe, *Sleaford, Lincolnshire.*"

*"I took this farm 12 years ago. It had principally been a grazing farm. A year afterwards I ploughed up a field of 16 acres of old ley, and sowed it with 16 bushels of oats. It brairded very well, but very soon it began to show signs of wireworm, and I scarcely got back the seed. After that I sowed fine ground rape meal mixed with the seeds, and have never had anything like the loss which I had before doing so.

"My mode of treatment has generally been to mix oats and fine rape meal together, put them in the hopper of Hornsby's Sowing Machine, and sow this once up and down, and then across, so that both corn and meal are nicely divided over the field, and from that I have generally a beautiful braird and very good crops.

"Chas. Littleboy, *Barbersham Castle, Straffan, Leinster.*"

"About eight years ago I enclosed a piece of old pasture-land and converted it into a vegetable garden. The first year the cabbages were destroyed and large holes eaten in the potatoes by wireworm; and I dressed the garden thoroughly with lime, salt, and soot; but, notwithstanding that, the vegetables were destroyed in the second year, nearly as badly as before. I then covered the garden with rape nuts, and have had no wireworm since.

"R. Paver-Crow, *Ornham Hall, Boroughbridge.*"

Wireworm in Hop-Land.

"Wireworms frequently are most injurious to hop plants, especially in fresh planted grounds. These are the larvæ of the striped click beetle, *Elater lineatus*; and they attack the 'sets' or cuttings which are put in to form the hop stocks directly they are planted. They bore into the juicy parts of the stems of the sets and suck out the sap; and they gnaw off the shoots as fast as they make their appearance. Old meadows and orchards are often converted into hop grounds; and in these sometimes the mischief caused by wireworm is very great, and unless expensive means are adopted to catch them two or three years elapse before a good plant can be obtained.

"Planters do not like to pare and burn the turf with the humus, as it affords so much food to the plants if it is turned in and buried deeply; and all that can be done in these circumstances is to feed the sward off as closely as possible before it is ploughed in.

"As hop land is usually kept particularly free from weeds, and the hop-plants are set from 5½ feet to 6½ feet apart, the food for the wireworms is not plentiful, and they therefore concentrate their attacks perforce upon the hop-plants.

"The soil is often disturbed by the nidgetts between the plants, and by the spud around them, so that for the sake of peace and quietness the wireworms take refuge in the plant centres, and soon destroy the plants if they are not checked. If hop-plants show signs of weakness and decay, they should be closely examined for wireworm. Even in well-established hop grounds that have been planted for a considerable time, wireworms do much harm; and weakness or slackness of bine which is often produced by their attack is attributed to other causes, such as the unsuitableness of the subsoil, or the want of manure, or influence of climate.

"When the presence of wireworms is discovered in the plant centres, they can only be got rid of by catching them; they are beyond the reach of caustic applications, and of the effects of rolling and nidgetting. In these circumstances traps should be laid for them in the shape of small pieces of rape-cake, mangold wurzel, turnip, or carrot placed close to each 'hill,' or plant centre, but the best of all these is rape cake. The wireworms soon discover these tempting baits, and speedily bury themselves in them, and women are employed to look at them two or three times a week, and take out the wireworms snugly ensconced therein. As many as 200 wireworms have been taken in this way from one plant-centre in the course of three weeks or a month. It is a fallacy to imagine that rape-cake directly causes the death of the wireworm by inducing them to gorge until they burst. Rape-cake acts, as has been shown above, as a capital trap by which they may be caught and got rid of; or, when it is applied broadcast to hops or corn, by taking their attention from the plants which they had attacked before the rape was applied.

"I saw a striking instance of this last spring, in the case of a field of oats, taken after wheat, in which the plants were looking thin, patchy, and sickly from the attack of wireworm. 6 cwts. of rape-dust were put on per acre, which diverted the insects from the plants, and at the same time stimulated their flagging energies. The crop was the stoutest I ever saw, and yielded close upon 11 quarters per acre. If the straw had not gone down in places after the deluge of rain the yield would have been greater.

"Rape cake is very largely and generally used as a fertilizer for hops, and there is no doubt wireworms are encouraged to a certain extent by its extensive employment in hop-land, but it is certain that they will not prey upon the hop-plants so long as rape cake is obtainable. I have tried to oust wireworms from hop-plants by putting nitrate of soda, and lime, and soot close round the hills, but the results were not satisfactory. To prevent wireworm attack the hop-land should be kept very clean, and the weeds and grass growing on the outsides and hedgerows carefully kept down.

"CHARLES WHITEHEAD, *Barming House, Maidstone.*"

HANDPICKING.

"Where wireworms are unusually numerous upon turnips, there cannot be a more effectual or cheaper method of dealing with them than that of picking them by hand. A field of 70 acres, between Sleaford and Lincoln, which was sown with common turnips, and had a full plant nearly ready for the hoe, was found to be infested with wireworms of different ages. A number of girls were set to work, and taking each a drill-row, and guided by the different colour, or withered appearance of the plant, by a quick movement of the finger dislodged the 'worms,' and picking them up placed them in a small bottle carried in the left-hand. These wireworms were greedily eaten by the poultry.

"RALPH LOWE, *Sleaford, Lincolnshire.*"

"I have seen the wireworms caught in large numbers by placing sliced roots in the hop-hills, women doing the work and being paid by measure. A successful but expensive plan.

"FRED. BEARD, *Horton, Canterbury.*"

"I have not been a sufferer from wireworm ravage this year, but a neighbour has found them cause considerable damage among young hops, so much so that he opened each hill, and inserted pieces of potato in every one. The next day the wireworms had chosen the potatoes, and ten or a dozen were found boring into the pieces at each hop-root. At least two kinds were destroyed, the wireworms or larvæ of the click beetle, and the *Julus guttatus.** This method proved effective, and saved his young plantations.

"D. TURVILL, *Alton, Hants.*"

ROOKS, ETC.

Rooks, serviceable by clearing large numbers of wireworms, but also frequently injurious by pulling up the plants (especially turnips after being singled) in search of their food. (For further observations regarding rooks, see Tables and Abstract of Isle of Man Report.)

Notes as to usefulness of other birds, and also of moles.

"In the month of May I opened the crops of several 'Crows,' as we call them in Scotland (rooks in England), and found them full of wireworms.

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* The *Julus guttatus*, Fab. (*I. pulchellus*, Leach), is one of the snake Millipedes sometimes known as false wireworms. These feed on vegetable matter, but how far they also feed, as matter of regular diet, on animal food, as worms, snails, &c., is not yet ascertained. *Polydesmus complanatus*, Linn., the flattened Millipede, is another kind, that sometimes does much damage to the roots of wheat.

Earlier in the season I killed a crow feeding on some damp grass-land, and found about three dozen *Tipulæ* (Daddy long-legs) grubs in its crop. There is no doubt of the crow or rook being a valuable friend to the farmer in the spring months. Taking the seasons round, I am of the opinion, after long and careful observation, that the rook does more good than harm to the farmer. No doubt if the birds are allowed to become too numerous, and insect food fails, they will fall on the crops rather heavily; but the cure is easy in that case, and in my experience of nearly a quarter of a century in England, Scotland, and Ireland, I have rarely seen it required.

"MALCOLM DUNN, *Dalkeith, N.B.*"

"Where wireworms abound, the rooks, plovers of different kinds, partridges, and other birds, feast, and are the best friends to the farmer.

"J. FORRESTER, *Bryanston, Blandford,*
"For Right Hon. VISCOUNT PORTMAN."

"A good hoeing will help by disturbing the wireworms and bringing them to the top, when rooks will greedily search for them and devour them.

"ROBERT L. PUDNEY, *Halsted, Essex.*"

"The remedies I know are ploughing in of mustard, deep winter ploughing, and repeated stirrings of the land; but the best remedy is one that nature has given us in the assistance of the rooks and starlings. I strictly preserve birds, and now I have no wireworm.

"C. R. COLVILLE, *Lullington, Burton-on-Trent.*"

"Many wireworms will be found early in the morning, say about 4 o'clock; and crows are most serviceable in picking up these larvæ, especially in the mornings, when they will be found working hard in infected fields.

"ROB. COUPAR, *Scone, N.B.*"

"If we go to the fields at daybreak at the beginning of May, we may observe the rooks beating singly over every yard of ground. These rooks are providing for their young; and if the pouch of these birds is opened, it will be found to contain a dozen sprouted barleycorns, a few dead dry earthworms, and upwards of thirty click beetles, soft and pulpy, which struggled up during the previous night from their chrysalids a few inches below the ground. After six o'clock A.M., the time when the horses go out to work, a stream of rooks may be seen coming and going, eagerly picking up wireworms and grubs in the furrows behind the ploughs. Each rook does not take fewer than fifty wireworms during the day of eight hours, whilst the horses are at work; and later on (at the dusk hour), if the pouch of the latest rook flying home be examined, it will be found to be filled with beetles, caterpillars, and a little corn.*

"RALPH LOWE, *Sleaford, Lincolnshire.*"

"Rooks will soon tell you where wireworms are. I have often seen acres entirely cleared of good strong plants of roots, by being pulled up by the rook in search of his favourite food. Nothing requires greater attention on the farm than keeping rooks off the roots when *first singled out*, where there is wireworm among them, as the cure is often worse than the disease.

"T. R. HULBERT, *North Cerney.*"

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* The observation as to the pouch of the rook being filled with beetles as it flies home at "the dusk hour" is particularly deserving of attention, as it is not generally known that the click-beetle may then be found in considerable numbers on the grass.—E. A. O.

"The wireworm does not do so much harm to the turnips as the crows do by pulling up the plants in order to get at the worm.

"R. Renton, *Earlston, N.B.*"

"I had great damage done once to 3 acres of swedes, not directly by the wireworm itself; but, when the worm was gnawing at the root of the plant, by the rooks alighting and drawing out the plant for the purpose of getting the insect, and so the piece was entirely spoilt.

"Thos. Jones, *Penpont Farm, Brecon.*"

Moles, etc.

"Owing, I think, to the large numbers of moles, the wireworm in this immediate neighbourhood is not much trouble.

"Wm. Taylor, *Longleat Gardens, Warminster.*"

"Moles are very fond of wireworms. You will always see them burrow most where the worms are thickest. A neighbour of mine never kills any moles, and has not done so for twelve years, and his crops are not so much destroyed as they used to be by wireworms; but I think they are almost, if not quite, as bad as the disease.

"D. Husband, *Struthers, Cupar, Fife.*"

"Having found that wireworms were the favourite food of moles, I determined (having first drained the land) not to destroy any more of the moles, but to let them destroy the wireworm, which having accomplished, they speedily deserted my land.

"G. W. Pretty, *Fressingfield, Harleston.*"

"Two pheasants were killed on the estate I manage, and in their crops were found 1500 wireworms.

"Prof. Chas. E. Curtis, *Farringdon, Alton, Hants.*"

Weybread, Suffolk.

Of five returns with which I am favoured through the Rev. J. H. White from the neighbourhood of Weybread, one makes mention of loss by wireworm ravage, amounting to a quarter of the crop; one mentions a quarter to a half; and another notes the loss as usually a quarter, but sometimes half the crop.

The preventive measures advised are to plough soon enough and keep the land solid, and to well bush and roll leys and pastures; also heavy rolling in spring to stop the worm (as the looser the soil the worse the attack); and hand hoeing and well rolling down the land are recommended.

Artificial manure, or nitrate of soda, is recommended to run the crop on past the power of the worm, and soot also is found useful; but no mention is made of the use of lime or of salt.

One observer notes that rolling and treading are very well on some soils, but when you have got the worm you must humour it, and give it something to eat (? rape-cake, Ed.), until it changes its state or the crop beats it. "Seeds and certain grasses which harbour the worm and in which it delights to breed, of course increase the scourge."

"A certain amount" of rooks are advised; and for moles, see p. 132.

ISLE OF MAN.*

Abstract and Tables.

The following information respecting wireworm and the means used for its prevention in the Isle of Man has been kindly forwarded by residents in the Island, in reply to forms arranged and circulated by Mr. Philip M. C. Kermode, to whom I am indebted both for his assistance in procuring these contributions and also for explanations and details which space does not allow insertion of in full.

For convenience of reference, the greater part of the information reported is given in tabulated form, the name of the parish in which the observations were taken being prefixed in the first column, with numbers to distinguish the different localities; but in deference to the implied wishes of the contributors, their names are not given. In the following Abstract the main points noted in the Tables are given in a connected form, together with a longer report and observations from Mr. McWhannel of Glenduff, which could not conveniently be condensed.

From these returns it appears that wireworm attack often occurs to a serious amount in various localities in the island, but that the damage this year has been less than in previous ones. Three of the largest amounts of loss, as specified, are:—about one-fourth of the crop of wheat, or 2 bolls to the acre; 2 bolls of wheat and of oats per acre; and about 1 boll per acre of oats. The last-mentioned is noted as about the same loss as last year, the two previous amounts of injury as less "than usual" or "in some previous years."

Another observer notes loss of 1*l.* 10*s.* per acre last year in wheat. Turnips have been injured up to a loss of half the crop; of 1½ tons per acre; and in one case to a produce of only 6 instead of 15 tons which was expected per acre. Carrots have suffered loss of half the crop in one locality, and in another were last year damaged at the rate of 10*l.* per acre.

In some cases, the greater or less amount of attack corresponds with the nature of the soil; taking four of the northern parishes of the island, we find no loss on the black soil at two localities noted

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* In the Isle of Man a boll of barley or oats equals 6 bushels; a boll of wheat 4 bushels, weighing 64 lbs. to the bushel.—E. A. O.

in Kirk Andreas; injury at several places in Leyzayre on light soil running to gravelly loam, not on strong earthy soil; at Kirk Bride injury in this or preceding years to some extent on light soil. In Jurby attack occurs on gravel and sand, but less on light land, possibly from the regular use of liquid manure; and looking at the returns as a whole, they appear to show both absence and presence of wireworm more or less on all kinds of soils.

For direct remedy the customary treatment of rolling is advised, together with applications which may make the ground unsuitable to the wireworm, or may push a vigorous growth of the plant, as gas-lime, salt, soot, and also guano, and liquid manure. Seaweed is a good deal used on the island, and its application as a manure is noted at three places where slight attacks of wireworm occurred; but in reply to inquiries on this subject so many contributors have entered "no seaweed used," that I have not thought it necessary to note the non-application.

Lime appears to be very seldom used, but (judging by the returns) to have a good effect when it is applied, and especially in one instance, where a liming a few years ago was followed in the present season by the application of kainite and superphosphate.

The observations regarding rooks are well worth consideration, as showing that the good these birds do in clearing out wireworm is by no means of an unmixed kind. There is no doubt either in the Isle of Man, or elsewhere, that rooks clear wireworm and other larvæ; but still where soil, state of crop, or want of food are such that the rooks grub up and destroy the plants bodily, it is matter of thought whether their numbers should not be lessened, or, at least, boys employed to frighten them off the crop during the few days after thinning, when their work does much more harm than good. The following communication is also from the Isle of Man, but being at some length did not admit of tabulating:—

"No injury of any great importance has been caused by the wireworm this season; the crops most affected are those grown after green crops and upon stubble; the previous crops to the injured ones were summer fallows, potatoes, turnips, and wheat out of ley; but corn on ley, which was on heavy clay soil, has been almost free from injury; and uninjured crop followed sown seeds and young pasture.

"The soil is fairly good, sharp, gravelly loam, intermingled by runs of white clay and peat, that which is most affected is light, open, sandy loam, and dry peat.

"The land was well dressed with farmyard-manure and bone superphosphate. Very little lime is applied, about 1 ton per acre in a five-course shift. No seaweed is used.

"Seed sown—of the injured crops generally in March and April—of the uninjured from November to Christmas. State of the weather, wet in autumn and over dry in spring.

"We are greatly troubled by rooks and larks, and they generally are the first to draw attention to the damage; it is impossible to detect the mischief until some time after the wireworm has been at work; then, though the young corn may appear healthy, the heart or central shoot will be found turning slightly yellow, and if pulled easily comes away.

"Various measures of prevention are advocated, as hard rolling, gas lime sown at the same time as the seed, or a top-dressing of soot, salt, or superphosphate; when the young corn is able to stand it, an after rolling; all these methods will no doubt tend to counteract injury from the wireworm by increasing the crop, but I do not think that they in any way destroy the wireworm.

"I am of opinion that when frost sets in, the wireworm goes down and returns again when the weather changes. I have noticed when trimming turnips—say the evening before frost, that wireworm could be noticed in hundreds about the roots of the turnips—a frost sets in, and if you pull up the whole field you will not find a wireworm where yesterday there were scores; but the weather changes and our friend reappears.

"The injury from wireworm has been less this year than almost any season I can recollect. I do not estimate my own loss, or that in the immediate neighbourhood or parish, at more than ½ bushel per acre.

"The above remarks apply entirely to this district, as other localities may very likely be affected in an entirely different manner.

"James M'Whannell, *Glenduff, Lezayre.*"

TABLE I.—ISLE

Parish of Observer.	Crop Injured and Nature of Crop preceding.	Nature of Soil.	Manure and Preparation of Land.	Date of Sowing and Weather at Time.
Lezayre .. I.	Oats and Wheat slightly injured. Previous crops, Grass and Turnips.	Wireworm most active on light soils.	Lime in a quick state laid on Lea destroys the larvæ.	.. ..
II.	Some injury to Wheat and Oats. Previous crops, Grass and Green crops.	Gravelly loam	.. ..	Spring sown crops suffered most. Ordinary weather.
III.	No injury	Turf and light and hilly soil. Loose soil more subject to attack.	Lime, farmyard and patent manure.	Wheat, end of Dec.; Oats, March; Barley, April; Greencrops, May and June.
IV.	1, Oats after greencrop much injured; 2, Lea Oats not touched.	1. Light soil on hill. 2. Rather strong earthy soil on lowland.	1. Only patent and limed in Lea. 2 Patent and farmyard.	1. Latter end of March (pretty dry). 2. 25th of April.
Kirk Bride I.	No loss through attack.	Light soil ..	No difference in preparation between injured and uninjured.	Wheat in Nov., weather dry. Uninjured crop in Jan., weather dry.
II.	Turnips have suffered; previous crop Barley.	Loose and sandy	We use Seaweed and farm manure.	June .. ..
III.	Potatoes slightly after Lea.	Light loam on sandy bottom.	Farm-manure ..	Planted in heavy rain in April.
Kirk Andreas I.	No Loss. Barley after Potatoes, Turnips after Lea.	Black soil ..	Yard manure ..	Barley, May 18; green crop about middle of June.
II.	No loss	Black soil, loam	Farm and patent, or patent only. No difference seen in work of Wireworms.	Wheat, Dec.; Oats, April; Barley, May; Turnips, June

F MAN.

Observations regarding Rooks.	Remedies made use of.	Amount of Loss to Observer, or in his Neighbourhood.	Injury more or less than in previous Years?	REMARKS.
Rooks always haunt crops infested by Wireworm.	.. ..	.. ..	.. ..	Injury from Wireworm has much increased of late years; partly from prejudice against the rooks and wholesale poisoning of these birds; partly on account of farmers not having limed to any extent of late years, owing to agricultural depression and general want of means.
Not so much troubled by Rooks this year.	Rolling and sowing salt.	Observer's loss about 2 Bolls per acre, not aware of loss in neighbourhood.	Less this year than usual.	
Always a great pest here, but do not take Turnips till they are singled.	Salt and rolling would as a rule prevent attack if in time.	.. ..	Less	If Rooks are kept away for two or three days after the turnips are singled, they will not touch the crop after.
Rooks numerous where the Wireworms were seen; not observed on the low field.	Salt sometimes used. Consider it does not destroy the worm, but helps the crop.	Observer's loss about a Boll to the acre, not seen any crop spoiled in neighbourhood	About the same as last year.	
Rooks on crop when 2 or 3 inches high. Injury about a month after.	Sowing salt and rolling for wheat.	None this year. Previously severe in Wheat and Carrots.	Less. In previous year Wheat 1*l.* 10*s.* per acre. Carrots 10*l.* per acre.	I consider Wheat sown in November as generally exempt from destruction by Wireworm.
Do much harm to the Turnips; but no doubt in trying to get at the grub.	.. ..	.. ..	Less. Suppose the season makes a difference.	The "cut worm" is more in heavier clay soils. The Rooks come when the Turnips are singled, because they can get at them.
Rooks never affect my crops though seen about.	None tried ..	At one locality ⅛th crop of Oats.	Less	Most damage to Oats in May, to Potatoes during autumn. Magnum Bonum slightly attacked. Skerries on some land sound.
Not much seen. Did a little harm by taking Potatoes.	A little salt and rolling.	Do not know of any.	Less	There were frequent showers in Spring to bring on and strengthen the plant.
Seldom on the land this year.	None used because Wireworm attack is never bad.	None noticed ..	Less than in some years.	

TABLE II.—ISL

Parish of Observer.	Crop Injured and Nature of Crop preceding.	Nature of Soil.	Manure and Preparation of Land.	Date of Sowing and Weather at Time.
Jurby .. I.	Carrots and Barley. Potatoes badly injured.	Sandy soil on gravel.	Farmyard manure and dissolved bones. No lime.	Carrots and Potatoes planted about middle of April. Weather fine, soil moist.
II.	None at Thie Vane. Turnips after Oats on old Lea at B'Managh badly attacked.	Sandy and gravelly; higher and most gravelly, least attacked.	Dublin and Wicklow patent manure. Hollow with soil more earthy most attacked.	Injured crop end of May. Weather dry, but soil nice and moist.
III.	No injury	Light land on gravel.	Farmyard and patent. No Lime. Wireworm are worst in light turfy soil.	Lea Wheat, Dec.; Barley, March; Oats, April; green crops beginning of June.
Ballaugh I.	Small amount of injury to Turnips only.	Black sand in the Curragh.	Lime, manure, and dissolved bones. Crops on dung unharmed.	Seed sown in May and June. Weather fine.
II.	About $\frac{1}{4}$ Wheat and $\frac{1}{8}$ Turnips injured. Wheat after Green-crops. Turnips after Oats.	Stiff Loam nearly Marl.	Lime not been used for many years.	Wheat, 1st week Jan.; Turnips, end of May, injured and uninjured same time; both in fine mild weather.
III.	No injury	Wireworm cuts worst in turfy soil. Wheat suffers most in this neighbourhood.	.. ..	.. ..
IV.	No injury	.. ..	.. ..	.. ..
V.*	Wheat crop out of Lea suffered.	Soil inclining to gravelly.	Land limed the year before.	Wheat about middle of December.

NOTE.—Of a 7 acre field observed, of which 3 acres were treated with farm-manure
portion was free from wirewor

OF MAN.

Observations regarding Rooks.	Remedies made use of.	Amount of Loss to Observer, or in his Neighbourhood.	Injury more or less than in previous Year?	REMARKS.
Did not see the Rooks where the Wireworm was.	None; been here only three years and never had much attack before.	Not much. Half crop of Carrots lost.	More on this farm.	Did not have Wireworm for fifteen years at Ballis Maughold. Soil more loamy and stony on the hill.
Rooks swarming on the part where the Wireworm was before we thinned.	None tried; never suffered to such an extent before.	Turnips in the neighbourhood suffered a little.	More on my land.	At Thie Vane the soil is in part rather heavy, in part rather sandy and peaty. The Wireworms are not found there.
Just when Wheat is peeping in bruit they do harm by pulling it up.	Liquid manure. Have tried this 8 or 10 years, and never found it fail to kill Wireworm.	Crops not suffered on the whole.	Less than usual. When crops are earlier than usual worm does less harm.	Have found a good method to keep off rooks to run a reel of cotton all round hedge of field and across field, just above corn.
Rooks are always on the crops when the worm is in them.	Have tried salt, which I think the best remedy.	.. ..	.. ..	
Rooks injured turnips much both before and after thinning.	Have used Gas-Lime with advantage.	About 2 Bolls (per acre) Wheat; and 1½ tons Turnips. About same loss in some neighbouring farms.	Injury much less than in some former years.	Have observed Wireworm do less injury after a soft mild winter than after a hard frosty one.
Have seen Rooks pull up the plant after being thinned, and pick out the worms.	Rolling Wheat early in spring is best. Have tried salt with little effect.	This neighbourhood has suffered very little.	.. ..	
.. ..	Soot and rolling the ground early in the morning when the dew is on.	Not aware of any loss this season.	.. ..	
No injury by Rooks this season.	.. ..	About $\frac{1}{8}$ of the portion of the crop affected.	Less than in former years.	Part of the field was dressed with seaweed for the green crop previous to the field becoming Lea; that part was uninjured.

a portion with patent manure, and about 2 acres with patent manure, and dirty salt, this last
and fly, and had the best crop.

TABLE III.—ISLE

Parish of Observer.	Crop Injured and Nature of Crop preceding.	Nature of Soil.	Manure and Preparation of Land.	Date of Sowing and Weather at Time.
Ballaugh VI.	Turnips suffered slightly.	Sandy	Seaweed put under Potatoes (not for Turnips).	Turnips sown about end of May.
VII.	No injury	.. ..	Last year Turnip crop a comparative failure where patent manure only was used.	Wheat from beginning of Dec. Weather favourable.
Kirk Michael. I.	Very little, if any	.. ..	.. ..	.. ..
II.	No money loss but some Turnips pulled up by Rooks (after Oats).	Light and sandy soil. No Turnips noticed pulled up on heavier land.	Patent bone-dust manure, no farmyard manure, and on heavier land farmyard manure.	Injured about 2nd week in June, uninjured about 25th May.
III.	Potatoes after Barley.	Light mould blackish loam.	Extra crop of Seaweed on it, and ploughed under. Farm-manure heavy.	Planted abou 5th of Apri in fine weather.
German ..	No injury	.. ..	.. ..	.. ..
Patrick .. I.	No injury	Soil dry	Land prepared in time, with Lime, Seaweed, and farm-manure.	.. ..
II.	Very little	Heavy soil ..	.. ..	.. ..
III.	Immaterial	.. ..	.. ..	.. ..

F MAN.

Observations concerning Rooks.	Remedies used.	Amount of Loss to Observer, or in his Neighbourhood.	Injury more or less than in previous Years?	REMARKS.
Rooks are sure to appear where there is Wireworm, but not much elsewhere.	.. ..	Turnips slightly attacked.	Less. As good a season free from cutting as I think we ever had.	
Rooks and Jackdaws come occasionally. Do little if any harm.	Have found soot serviceable in garden cultivation.	Have not heard of loss in neighbourhood.	Very much less.	
Rooks always appear on the crop about the same time as Wireworm injury.	Sufficient rolling is, I think, the best remedy.	Some injury to turnips, amount not known.	.. ..	The best remedy I know of and have tried is rolling; but the general impression here is that salt sown in with the seed or sometime previous is very good.
Rooks on the land within a few days after thinning.	None	No money loss to observer, very trifling to neighbours.	Should say less.	No injury to corn has come under my notice.
When Wheat is just in bruit, they come for the grain not the grub.	None	Trifling	Not more than average.	"Skerries" the worst attacked Potatoes. Sometimes destroyed in the spring, but most damaged in August.
Our crops have many times suffered injury from Rooks.	.. ..	We hardly ever suffer from Wireworm in this neighbourhood.	.. ..	This year the rooks have destroyed most of our Potatoes, and many a year they have destroyed acres of our Turnips.
Rooks did much injury to turnips before I had means of preventing them.	.. ..	No damage of any consequence, excepting to turnips by rooks.	.. ..	No injury to my Turnip crops by Wireworm within the last forty years.
.. ..	Salt	.. ..	Very much less.	
Rooks are the greatest pests. Even Turnips larger than an egg I have seen pulled by them.	.. ..	Have about 150 acres under white crop: but scarcely the 8th of an acre spoiled.	.. ..	Rooks possibly often on the look out for Wireworm, but have not noticed the following crop the least affected even on the spot most attacked by Rooks.

TABLE IV.—ISLE

Parish of Observer.	Crop Injured and Nature of Crop preceding.	Nature of Soil.	Manure and Preparation of Land.	Date of Sowing and Weather at Time.
Santon ..	No injury this year.	Have found peat soil most liable to wireworms.	Sowed this year with the drill, and did not do so formerly.	.. ..
Braddan .. I.	Slight to Oats sown in Ley field.	Sandy	.. ..	17th March ..
II.	No injury. Land previously, pasture; Turnips and Potatoes.	Good brown earth. Subsoil shale or rotten stone. Light or shallow spots attacked first.	Mostly use town and farm-manure mixed.	Oats, 20th to end of March; Barley about middle of April. Weather dry.
Onchan ..	Much less than usual.	Find Wireworm most troublesome on light land.	.. ..	In March. Weather dry.
Lonan ..	No injury this year.	.. ..	.. ..	.. ..
Maughold I.	Injury to Potatoes, Turnips, and Oats, about a quarter.	Light stony sharp soil.	Farmyard and patent, for green crop.	Oats about 16th March. Green crops 8th and 10th May.
II.	Oats after Grass, and Swedes after Wheat, slightly injured.	Peat	Limed six years ago. Swedes manured with 3 cwt. superphosphate, and 3 cwt. Kainite.	Oats, 18th Mar., Swedes, 1st week in June.
III.	No injury to crops, Turnips after Oats, Barley after Potatoes, Oats on Ley.	Partly loam clay and gravelly soil.	Barley well limed, Turnips on patent manure.	.. ..
IV.	Turnips ½ crop; Potatoes bad; Barley rather bad; Oats slight attack.	Peat and clay. No difference as to amount of attack.	Well limed for Turnips and Potatoes. Patent manure as top dressing.	Injured and uninjured sown about same time; weather wet.
V.	Very little. Turnips; previous crop Oats, which were very badly attacked.	Light soil. With us peat on the hills is clearest from the worm.	Both farm and patent and some seaweed in the field which was not attacked.	Uninjured in May, injured about the beginning of June.

F MAN.

Observations concerning Rooks.	Remedies used.	Amount of Loss to Observer, or in his Neighbourhood.	Injury more or Less than in previous Years?	REMARKS.
.. ..	Have found soot and gas lime the best remedy.	In the neighbourhood wheat suffered sown on clay land which had lain in grass.	.. ..	
Rooks on the crops at sowing time.	No remedy tried	Very slight injury in neighbourhood.	Less	
Some years rooks do great injury by pulling Turnips to get at Wireworm.	Guano sown on a wet day been found effectual in attack on light hill soil.	Oats after pasture crop chiefly injured in the neighbourhood.	Less	
Observed on Oats newly sown, and Turnips fresh thinned.	Have tried gas-lime with very satisfactory results.	Turnips and Lea Oats suffered much.	Fewer complaints of Wireworm this year than usual.	
.. ..	.. ..	No attack known of.	.. ..	
Would have been about, but kept them away all the time.	Have tried salt and tobacco by way of experiment, and found the latter kill the worm.	On B'corteen about half Turnips, I have about 6 tons Turnips where should be 15.	Less than last year when Wireworm loss was half the crop.	There was a previous green-crop to half the Oats, the rest on land broken for the first time; the former was the worst attacked.
Rooks observed on neighbouring land just after Swedes were thinned.	Do not know of any remedy.	Two acres of Swedes almost destroyed.	Injury rather greater this year.	I think that as farmers now leave their land longer in grass, this may account for increased destruction by Wireworm. They have time to increase as birds do not readily get at them.
.. ..	Have tried salt and nitrate of soda, but not been successful.	Do not know of loss in the neighbourhood.	.. ..	
Rooks on crop when quite young.	Salt and soot with varying success.	About 25*l.* to self.	Greater than usual.	
Some years are very mischievous, they come just after singling and go right where the worm is.	Salt and rolling whilst crop is in bruit. Lime sown before ploughing.	.. ..	Very much less this year.	Believe the worms work most in dry weather. Have seen gas-lime used with good effects, not a Wireworm after it.

IV.—*Supplementary Memoranda to the Report of the Royal Commission on Agriculture by certain of the Commissioners.*

PREFATORY NOTE.*

The conclusions arrived at by the Royal Commission on Agriculture were, as a matter of history, recorded in our last Publication: in like manner, and in continuation, the Council has now sanctioned the publication of the "Supplementary Memoranda." As a matter of historical record, the Council exceptionally publishes controversial views, which, according to the best traditions † of the Society, would otherwise be certainly excluded. The prolific and harmonious union of "Practice with Science" has, happily, produced an infinite variety of unmistakably kindred agricultural subjects, clamorously and exclusively demanding all our care, energy, and space. Nor is a wise and time-honoured limitation to be at any time regretted, because, busily operating altogether without our sphere, there are other and special organisations which advantageously camp upon and fully depasture the whole of the vast unfenced domain that may be aptly described as the all-important, yet unsettled, shifting, debatable ground of current politics.

1.—BY LORD VERNON.

I REGRET to be unable to concur with my colleagues in that portion of the Report which refers to the question of compensation for exhausted improvements.

On this subject I have deemed it right to express my independent opinion. This, with an outline of the mode in which it might, in my judgment, be carried into effect, I have now the honour to submit.

1. The principle of compensating outgoing tenants for the unexhausted value of improvements which they have made on their farms appears to be accepted by all witnesses who have been examined on the subject, partly on the ground of fairness towards the tenant, but partly also on the broader ground that unless such compensation is secured to him the maximum fertility of the soil of the country cannot be uninterruptedly maintained.

2. Whilst, however, all the witnesses agreed on the principle of compensation to outgoing tenants for unexhausted improvements, they differed in their opinions as to the mode in which it should be secured. Some contended that the obligation to compensate them should be made absolutely compulsory by legislation, but others expressed the opinion that liberty of action between landlord and tenant should not be interfered with.‡

3. I concur in the opinion of several witnesses of wide experience, who urge that, while due regard should be had to the interest of the outgoing

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* By Earl Cathcart, Chairman of the Journal Committee.

† 'Journal,' New Series, 1874, vol. x. p. 529.

‡ 56,892 (T. Rigby). 33,025–26 (J. Coleman). 33,375–77 (J. Bowen Jones). 36,554 (J. C. Shepherd). 4247 (E. P. Squarey). 47,012–17, 47,151–56 (W. C. Little). 47,588–92 (R. C. B. Clough). 48,375–77 (S. Miller).

tenant, equal regard should be had to that of the outgoing tenant's successor in the farm, whether such successor be the landlord or the incoming tenant. In practice, the incoming tenant has usually to bear the weight of the payments to the outgoing tenant; and, when such payments are heavy, the incoming tenant not only requires a larger capital to enable him to commence farming, but also suffers from the inconvenience of having a considerable part of his capital locked up for a period more or less long.*

4. It would also seem to be fair and reasonable that the rights of the landlord, whether he be the successor in the farm or not, and the tenant at the determination of a tenancy should be correlative; that is to say, that as the landlord should be placed under an obligation to compensate the outgoing tenant for unexhausted improvements effected by him, so the tenant should be placed under an obligation to compensate the landlord for waste, for dilapidations, and for any other matters done or omitted to be done by him whereby the farm has been deteriorated.†

5. As the law now stands, outgoing tenants may be compensated for their unexhausted improvements—

By (*A*) Private agreement.
(*B*) The custom of the country.
(*C*) By the Agricultural Holdings (England) Act, 1875.

But it is contended that this state of the law is not satisfactory for, amongst others, the following reasons:—

As regards *A*, because tenants are not in a sufficiently good position to be able to contract with landlords on equal terms.‡

As regards *B*, because "custom," even when liberal, is not always sufficiently comprehensive to embrace all improvements.§

And as regards *C*, because the Act is permissive and not compulsory.

6. Although every outgoing tenant is, in my opinion, entitled to be compensated for the beneficial value of the improvements which he may leave upon his farm of which he has not reaped the entire fruit, landlords and tenants should be left perfectly free to make such arrangements as regards compensation as may seem to them to be desirable.

7. In the absence of any agreement on the part of a landlord to compensate an outgoing tenant for the beneficial value of purchased feeding-stuffs and manures other than nitrogenous manures which that tenant has applied to his farm, compensation should be secured to him by Act of Parliament, which Act should be applicable to Scotland as well as to England. The Act, however, ought not to define or enumerate improvements, nor prescribe any limit of time within which any class of them should be deemed to continue unexhausted. But it should provide,—

(1.) That where an outgoing tenant has made improvements upon his farm which are in their nature lasting, such as those called "improvements of the first class" in the Agricultural Holdings Act, 1875, with the previous consent in writing of the landlord, but not otherwise, he should be entitled to payment for their value at the time of quitting his farm, without any limitation of time as to the maximum period of their duration, but to the extent only that they add to the letting value of the farm; ‖ and

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* 4071–75 (W. Sturge). 4240–4242 (E. P. Squarey). 47,225–28 (W. C. Little). 4510, 4642–47 (T. Huskinson). 7079–7082 (Jas. Martin).

† Agricultural Holdings Act, clause 19. 52,112 (H. Overman). 32,732–33 (J. Coleman). 47,261 (W. C. Little). 5242–51 (C. Randell).

‡ 58,773–74 (J. Howard, M.P.).

§ 49,322 (W. Frankish).

‖ 39,219 (A. Bruce).

(2.) That the same rule should apply where the outgoing tenant has made improvements upon his farm, the effect of which, though not so lasting, yet continues for some time, such as those called "improvements of the second class" in the above-mentioned Act; for it has been proved by the evidence not only of scientific but also of practical witnesses, that the application to the land of substances enumerated in the second class of improvements in the Agricultural Holdings Act, if made judiciously, may be far more beneficial to the landlord or incoming tenant than is provided for in that Act; and that, on the other hand, no benefit, but possible injury, may accrue to the landlord if the tenant should have improperly used or applied them.*

8. The differences of soil and climate and the varying duration of the action of manures, preclude the possibility of prescribing accurately any limit of time for their exhaustion which is generally applicable throughout the country.†

9. The principle which the Agricultural Holdings Act ‡ prescribes for ascertaining the amount of the tenant's compensation in respect of the application to land of purchased artificial or other purchased manure, and in respect of the consumption on the farm by cattle, sheep, or pigs, of cake or other feeding-stuffs not produced on the farm, viz., "such proportion of the sum properly laid out by the tenant on the improvement as fairly represents the value thereof at the termination of the tenancy to an incoming tenant," appears to me to be eminently just. But as scientific and other evidence goes to show that nitrogenous manures, such as nitrate of soda and sulphate of ammonia, do not convey any permanent or lasting fertilising property to the land, but merely cause it to produce a larger crop in the year in which they are applied, no compensation should be allowed to an outgoing tenant in respect of the application to the land of such manures.§

10. It has been pointed out by several witnesses,‖ that it is very difficult to ascertain the intrinsic value to an incoming tenant of the unexhausted residue of purchased manures and feeding-stuffs, which, as a rule, have been applied to the land or consumed by the live stock of the farm respectively many months before, and are necessarily underground, and consequently not visible or tangible at the time of valuation. The genuineness of these substances—many of which, when offered for sale in the market, are often adulterated and sold at a price greatly in excess of their true value—and their proper use, increase the difficulty in arriving at an equitable valuation between an incoming and outgoing tenant as regards them.

11. For these reasons it seems to follow that the amount of compensation to be awarded to an outgoing tenant in respect of the use of purchased artificial or other purchased manures or feeding-stuffs converted into manure can be more correctly ascertained by a valuation of the crops of the farm to which they have been applied, than by taking into account the actual outlay upon them, or otherwise estimating their unexhausted value; the crops being visible and tangible, which is not the case with the manures or feeding-stuffs

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* 57,507-18 (The Hon. Ed. Coke). 57,665-67 (Sir J. B. Lawes). 57,157–7,162 (Dr. Voelcker).

† 43,722–24 (Earl of Airlie). 46,973 (W. C. Little). 60,869, 60,903 (J. Prout).

‡ Agricultural Holdings Act, 1875, clause 9.

§ 35,308 (S. Rowlandson). 49,349–50 (W. Frankish). 57,001–9 (Dr. Voelcker). 42,346–50, 42,405 (J. Biggar). 36,236 (T. Mylne).

‖ 39,220–23 (A. Bruce). 66,885 (J. Clutton). 40,777–80 (J. Melvin). 43,939 (J. W. Barclay, M.P.). 45,286 (P. McLagan, M.P.). 56,958-62, 56,984, 57,343 (Dr. Voelcker). 68.216 (H. M. Jenkins). 67,719-27 (J. Coleman).

when once used.* To ascertain the amount of such compensation I recommend the following procedure:—

I. In the case of yearly tenancies, the length of notice to determine the tenancy, to be given by either the landlord to the tenant or by the tenant to the landlord, should be not less than twelve calendar months in every case.

II. If the parties cannot, at the time when notice is given, in the case of a yearly tenancy, or at the commencement of the last year of the tenancy in the case of a lease, agree upon the amount of compensation, such amount should be determined by valuation.

III. If the parties concur, a single valuer should be appointed by them jointly to make the valuation. If they do not, each party should at the time when notice is given, or at the commencement of the last year of the tenancy, as the case might be, or within fourteen days after, appoint in writing a valuer, and the valuers should apply forthwith to the Inclosure Commissioners to appoint an umpire, and upon such application the Inclosure Commissioners should make the appointment; but the umpire should not be called upon to act except the valuers differed. The decision of the valuers or the umpire, as the case might be, should be final.

IV. The valuation should be made during the year preceding the end of the tenancy, and not as at present after the tenancy has enpired. The valuer, valuers, or the umpire, should in that year visit and inspect the farm, as often, and at such reasonable times, as may be necessary to enable them to form an accurate judgment of the state and condition of the farm, and of the crops thereon; they should take cognisance of the acts of husbandry performed, of the manures, whether artificial or otherwise, and feeding-stuffs used or remaining for use, and of any special circumstance by which the interest of the outgoing tenant or his successor may be effected.

V. The valuer, valuers, or umpire should compare the bulk of the crops of each kind upon the farm with the average crops in the district on similar land, and in ascertaining the amount of compensation should have regard to such comparison.

VI. The tenant should be required to give the valuer, valuers, or umpire, due notice of the intended application of manures to each crop; and to hand to them, or him, the receipts for the money paid for all manures and feeding-stuffs for the use of which he claims compensation.

VII. The valuer, valuers, or umpire should have power to take samples and have analyses made of the manures used and feeding-stuffs consumed upon the farm; and the tenant should be required to afford them opportunity to take such samples.

VIII. In all other respects the valuation might follow the ordinary mode of procedure used in arbitrations.

12. Considering the difference of local circumstances, the customs of the country, although sometimes very erroneous, appear to afford the only practicable method for the valuation of tillages performed for the benefit of the outgoing tenant's successor, of hay, straw, and other severed crops left on the farm, and of the young seeds growing thereon. In these respects such customs cannot well be interfered with, but all payments under them should be proportionate to the benefit to be derived by the incoming tenant.

13. Inasmuch as a fair valuation of unexhausted improvements is of great pecuniary importance to both the outgoing tenant and his successor in the

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* 46,974 (W. C. Little). 57,668 (Sir J. B. Lawes, Bart.). 66,879 (J. Clutton). 67,725–26 (J. Coleman).

farm, it is essential that all such valuations should be conducted by men of honour and independence, who combine practical experience with scientific knowledge.* In order to secure this, valuers should hold some official certificate for their fitness to perform their duties.

(Signed) VERNON.

2.—BY MR. STANSFELD.

I greatly regret that my unavoidable absence from the last sitting of the Commission compels me to make a reserve upon some points, not of primary importance, in the Report of my colleagues, with which, generally, I cordially concur.

1. I approve of the suggestion that the cost of in-maintenance should be placed on rates or local taxes equitably adjusted according to means and substance; but I think that to defray them out of the Consolidated Fund would lead to an increase of centralisation and to extravagance.

2. The inclination of my opinion is in favour of the repeal of the law of distress.

3. I do not think it possible to indicate accurately the true composition of manufactured articles by their designation. I do not think that there is any analogy between fraudulently adulterated articles, such as some artificial manures, feeding-stuffs, and seeds, and beer brewed not exclusively from malt and hops.

It is part of the acknowledged policy, both of past and present excise laws, that beer should be so produced, and it is, and long has been, so produced in large quantities subject to excise duty and supervision.

(Signed) JAMES STANSFELD.

July 12, 1882.

3.—BY MR. CHAPLIN.

Being in accord generally with the views of my colleagues, I have signed the Report, but I wish to put on record my conviction that, if further bad seasons follow upon those which have produced such general distress, this country must be prepared either to witness the partial, if not the general, collapse of the agricultural interest, or else to provide relief of a more definite and immediate character than has been hitherto proposed. With respect to certain portions of the Report, I desire to submit the following observations:—

As regards the recommendations on the subject of Local Taxation, I think the proposed relief should not be limited to the maintenance of the indoor poor, as defined in the Report, but should be extended to other objects of national interest, which are now, either partly or wholly, a charge on local rates.

Considering the prominence which has been given to foreign competition as a leading cause of agricultural distress, and the place it holds in the evidence of so many witnesses, I think it has scarcely received sufficient notice in the Report, and I desire to state the reasons which have led me to concur in omitting to offer any definite proposal on the subject.

Witnesses of experience,† who have been examined before the Commission,

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* 61,902–61,914 (Sir E. C. Kerrison, Bart.). 62,799 (Sir J. Caird, K.C.B.). 67,727 (J. Coleman).

† 43,415. 41,923–4. 44,977. 35,884. 51,003-4.

have expressed the most confident opinions that American wheat and American beef could and would be sold in future in this country at prices at which, according to the evidence we have taken, English agriculturists would be unable to produce English wheat and English beef at a profit upon farms of average quality, even supposing they were held rent-free.

American beef, it was said, would pay the exporter at 6*d*. a lb. delivered in England,* whilst wheat would realise a profit at prices which were variously estimated, ranging between 42*s*. and 44*s*. a quarter as the highest, and 33*s*. and 32*s*. as the lowest, price which was named in all the earlier evidence which we have had upon the subject.

It is impossible to doubt that, at prices such as these, American competition would exercise a most disastrous influence upon the future production of wheat and beef as an industry in England.

One witness stated this conviction, in which I concur, that at 35*s*. a quarter wheat-growing in Great Britain must cease to be an industry at all.†

Nor does it appear from any evidence before us that there are any substitutes to take its place to any appreciable extent.

In reference to this subject, the Report expresses the opinion with regard to "market-gardening" and "dairy-farming," that, while there is room for some expansion in the milk-trade, and while the production of vegetables and fruit may, under certain conditions, be encouraged with advantage, these branches of agricultural industry are equally dependent upon their locality and access to a market, and it is only to a limited extent and within a limited area that a trade in these commodities could be conducted with a profit. In that opinion I entirely concur. No other branch of agricultural industry is suggested by the evidence as capable of being profitably substituted for the growing of wheat and the production of beef in those districts where the soil is not adapted for the production of barley and of sheep; and under these circumstances it would appear that a permanent competition with America in respect to these commodities, at the prices indicated by many of the witnesses whom we have examined, would be fatally injurious to the chief industry of England, in some of the largest and most important agricultural districts of the country.

Whether, however, a competition at such prices is likely to be permanent is a matter which is open to much question, and, after carefully weighing the evidence which we have taken, I incline to an opposite opinion; otherwise I should have felt it my duty to submit a definite proposition with regard to it. Undoubtedly for a time the prices of home produce were seriously depressed by American competition, and the Report very justly and prominently refers to it as one of the principal causes of agricultural depression in the past.

But, on the other hand, it must be observed that the prices which are being realised for English wheat and English beef to-day are very different from the future standard of those prices as indicated by the evidence which has been referred to; and it cannot be denied that the opinions which were so confidently expressed upon this subject are not supported by the facts, as to prices, at the present time.

Moreover, American competition, so far as it affects the price of English products, instead of increasing, would appear to be steadily diminishing, especially with regard to meat;‡ and some of the more recent evidence (in particular that of Mr. Clay, our American Sub-Commissioner, specially charged to obtain information on this subject) affords ground for the belief that this decrease in competition, especially in wheat, is likely to be maintained.

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* 21,724–6. 21,744–62. 9,583. 9,619–20.

† 51,004.

‡ 65,018. 65,034. 65,219–20. 63,232–6.

Mr. Clay lays stress upon the fact that both the value of land and the price of labour in the West of America has very materially risen, and he expresses the opinion "that the farmers of the West cannot possibly produce wheat so cheaply as they did" in consequence of this rise;* and it is undoubtedly the case that, so far from being permanently lowered, the prices of English beef and English wheat, from whatever cause, have risen rather than fallen, in spite of American competition, since this inquiry began.

Looking to these facts, as well as to some of the latest evidence on American competition which has come before the Commission, it would seem that the fears which were at one time entertained in many quarters in regard to it have been to some extent without foundation, and that, with a return of favourable seasons, there is reason to hope that the English agriculturist will be able to successfully compete with any competition from abroad which, as far as we can judge, he may be called upon to undergo.

If this hope, however, is to be fulfilled, it is essential that he shall be no longer prejudiced by the continued grant of preferential rates now allowed to foreign produce by some of the leading railway companies.

There are other matters dealt with in the Report to which I should have wished also to refer, and more especially to the subjects of the Agricultural Holdings Act of 1875 and of compensation for unexhausted improvements; but as I agree in the main with the recommendations contained in the Report, I am unwilling to add to the length of this Memorandum.

HENRY CHAPLIN.

11th July, 1882.

4.—BY MR. JOHN CLAY.

Though signing the Report, I find it incumbent on me to dissent on several points under the following heads:—

1. Compensation for unexhausted improvements and increased fertility.
2. Rent.
3. The law of entail.
4. The law of distraint and the Act of Sederunt of 1756 in Scotland.
5. The right of tenants to assign their leases under certain circumstances.
6. The management of landed estates.
7. Emigration.

My motive for this dissent is for the purpose of advocating the adoption of more decisive remedial measures than are suggested in this Report, because I think that unless these are adopted, not only will landed proprietors and tenants continue to suffer from agricultural depression in its various phases, but also the country at large.

1. With regard to compensation for unexhausted improvements and increased fertility, notwithstanding the full and distinct evidence taken by the Commission proving that the farmer is entitled to the most complete and absolute security for the capital he has invested in the cultivation of the land, the Report does not specify or indicate any sufficient means of affording such absolute security, or of giving the tenant that protection to which he is entitled, nor does it recommend any effectual measure to secure the whole interest of the tenant in his improvements, including his interest in his tenure. More particularly, while agreeing with the Report that legislative provision should be made for securing to tenants compensation in respect to their outlays, I go further, and think that the result of a tenant's energy and industry expended in improved fertility are as much capital as the cash he invests, and are as much entitled to legislative protection. The remedy

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* 65,001.

proposed in the Report appears to me to be inadequate. It is proposed to make the English Agricultural Holdings Act compulsory where compensation is not otherwise provided for, with the qualification that no compensation should be paid by an incoming tenant, except for outlays which are of value to him in the future cultivation of the farm, and that the compensation clauses should depend upon the additional value given to the holding. The Agricultural Holdings Act has admitted a principle, but the allowances arranged for by it are inadequate, and do not embrace increased fertility and value arising from the skilful and thorough cultivation of the land, and by its being kept in high condition. Most buildings are good for 50 years, while by the Act 20 only are allowed. Most drainage works are good for 30 years, and 20 only are allowed. Most manures are good for longer periods than the Agricultural Holdings Act allows, and some are not allowed for at all; while high cultivation, cleanness, and condition of the soil are ignored.

The compensation to be paid for improvements is naturally a charge upon the landlord's interest, and ought not to be a burden upon the capital of the incoming tenant, the landlord obtains an article of enhanced value and will recoup himself by the increased rent which an incoming tenant will be willing to pay for the ameliorated condition and increased fertility of the subject he hires.

The Agricultural Holdings Act is deficient in securing to the landlord the dilapidations that the tenant has caused to his property, and is justly entitled to compensation for the same on the same principle and mode as the outgoing tenant is allowed for his ameliorations.

Compensation for ameliorated condition being admitted, the Report should, in my opinion, have recommended a course by which values should be assessed. The natural course seems to me to be by arbitration, with a referee appointed by the Government in each district to act as oversman in case of the arbiters differing in opinion, such referee to be a practical agriculturist engaged in farming; or, the appointment of a referee might be placed under the jurisdiction of the Enclosure Commissioners.

In concluding this subject, I may refer to the following authorities:—

The Duke of Richmond and Gordon, in moving the Agricultural Holdings Act on 14th April, 1876, said, "The Government have thought that a measure should be brought in to secure the tenant the capital he has invested in the soil, and give the tenant that protection to which he is entitled; on the other hand, it does not invade the rights of the landlord, which in this country have always been held sacred."

The Earl of Beaconsfield, upon the same occasion, characterised the measure "As protecting the tenant's investments in the soil by placing him in a juster position, and inducing him to apply capital to the soil, an application which it is in the interest of all classes to encourage."

When moving for the appointment of the Royal Commission on Agriculture in 1879, his Lordship also used the following remarkable words: "I would be deeply disappointed if one result of the labours of the Royal Commission is not to afford the tenant the most complete and absolute security for the capital he has invested in the cultivation of the land." Mr. Gladstone said at Leeds in 1881, "It is of capital and immediate importance for the farmers to see that effectual and not abortive measures are taken to secure the whole interest of the tenant, not a part of that interest, but the whole interest in his improvements, and his interest, as the law may define it, in his tenure."

2. With reference to the subject of rent, ample evidence has been given before the Commission on this most important subject, its increase during the last 25 years, and the great losses that tenant farmers have sustained thereby. The Report does not sufficiently deal with this increase as an important factor in the agricultural depression, and one which has helped to bring about the

present crisis in the agriculture of the country, a crisis which for intensity, acuteness, and extent, has never before been experienced in this country, and one which involves the very basis of the country's welfare and prosperity. Our Sub-commissioners have corroborated the existence of this most unfortunate state of affairs in nearly every county of England and Scotland, and I am certain that if the seventh year, 1881, was taken into account, the losses in that year would be by far the heaviest, and if the history of the agriculture of this country for the last seven years was written, that of the past year would form one of its blackest pages. Both arable and hill farmers are in the same condition; for the high rents, the deficiency of marketable produce, and the increased cost of labour, have brought many of them into the bankruptcy list, while many others have been brought to that position that they have not capital left for the ordinary cultivation of the soil. Hill farmers, on the other hand, have been able to hold out longer, but now, with the price of wool reduced to one-half of the former average price, which formed part of the sheep-farmer's basis for calculating the rent which he could afford to pay, his prospects are almost as dark as those of the arable farmer, especially if the serious decrease of stock, and the damage that was done to the flocks by the unparalleled severity of winter of 1880–81, are taken into account. The well-known definition of rent is "the surplus yielded by the land after all legitimate expenses connected with its cultivation, interest on capital, and reward for industry, have been sufficiently allowed for." When there is no surplus, the rent has to be paid out of the tenant's capital, when an unprecedented succession of bad seasons occur, such as we have lately experienced, for which no human calculations could have been made; it is only a question of time how long the present tenants can have it in their power to pay any rent at all. A re-adjustment of rent is most urgently required by the large majority of the farmers in the country, and it is for the interests not less of landlords than of tenants that a re-adjustment should take place at once to meet the altered circumstances with which farmers have now to contend. The Report, in my opinion, should distinctly recommend such re-adjustment of rent for the adoption of the landlords. An abatement of rent for one or two years will not meet the difficulty, or allow tenants to recoup themselves and do justice to the land; what is required is a permanent reduction of rent to give the tenants some hope of regaining their lost capital, and an impetus to increase the fertility of their farms by the continued high cultivation of the land.

Sir James Caird puts the rise of rent in England for the last 18 years at 21 per cent., and in Scotland at 26 per cent., but I have no doubt that if we went back 25 years the rise would be 25 per cent. for England, and 30 per cent. for Scotland. The case is so urgent and pressing that nothing less than a reduction of rent of from 20 per cent. to 30 per cent. will save the present tenantry from ruin; and in cases, on estates where the fatal policy of rack-renting has been adopted, in that case, 35 per cent. will not meet the tenants' requirements. Evidence has also been given that rents have been unduly forced up by class laws, false and inflated competition, also by the letting of farms by tender, and screwing out of tenants more than what could honestly be paid from the produce of the soil.

3. The abolition of the law of entail should have been recommended in the Report, for it prevents landlords who hold their estates under entail from making sufficient allowance for the younger members of the family and from having the interest that they would otherwise have in the permanent improvement of their properties, and the law on that account prevents the free progress of agriculture, and will continue to do so more than ever under the altered circumstances of the present time. This law has had a direct influence in retarding the skilful cultivation of the soil, for it has the effect of inducing

a proprietor to prefer an indifferent tenant, who for a few years may promise to give a little higher rent for a farm, to a good tenant who will permanently increase the value of it. The result is that in the case of a 300-acre farm, worth 10,000*l.* sterling, let in the way I have indicated to an indifferent tenant, the market value of the land at the end of the bad tenant's occupancy, is reduced to 7000*l.* sterling, whereas if it had been let to a good tenant, the market value would have been raised to 12,000*l.* or 13,000*l.* sterling. Thus the agriculture of the country at large suffers from the law of entail, for there can be no doubt that it is for the benefit of the landlord as well as the country that the land should be kept in as high a state of fertility as possible, and that every law which interferes in any way with a high state of cultivation being maintained should be abolished. The Report should also have recommended a law regulating the easy and cheap transfer of land for the whole of Great Britain.

4. The Report should have recommended the total abolition of the law of distraint and the Act of Sederunt of 1756 in Scotland, for by these most unjust laws the rents of farms have been raised far above their real value, and farmers have had to offer higher, and in most cases excessive rents, and more particularly is this the case in regard to small farms, because there is greater competition for these than for larger farms. Landlords trusting to these laws accept tenants with insufficient capital and men who know nothing about the cultivation of the soil, whom, without these laws, they would not take, and thus the rent of land is artificially raised far beyond what can be legitimately paid. The real question at issue is whether there is anything in the relation of a landlord to his tenant which entitles the landlord in equity to have his rent paid in preference to the other debts of his tenant? Looking to the general interests of the community, these laws should be abolished, for their direct tendency is to drive away capital from the soil. I am clearly of opinion that the operation of these laws has been one of the chief causes of the present deplorable state of agriculture in this country.

5. The Report should, in my opinion, have recommended power being given to a tenant or his representatives to assign a lease under special circumstances, such as at the death of the tenant, or his insanity, or permanent disability from ill-health, to a suitable tenant farmer to be approved of by the landlord, the landlord, however, to have only one veto, and after the landlord has exercised such veto once, the matter to be referred to the judge ordinary or the sheriff in Scotland without power of appeal from the decision of either of them. And in case of the bankruptcy of a tenant his trustee should be entitled to take his place in the lease, and to dispose of it to a suitable and responsible assignee to be approved of as above for the benefit of the creditors.

6. The management of landed estates, regarding which explicit and valuable evidence has been given before the Commission, has been completely ignored in the Report. This, in my opinion, is a great omission, for the management of estates is one of the most important subjects upon which evidence has been given, and one which bears directly on the present lamentable state of agriculture in this country; ample evidence has been given to the Commission of the appointment of men to the management of estates who are unfitted for such a position from their want of practical knowledge of agriculture. Lawyers are often employed as land agents and factors for estates, and although they may be most excellent men in their profession, yet from this want of practical knowledge of agriculture and out-door management generally, there is not so much hope of the improvement of an estate but rather the reverse where it is placed fully under their charge. They are not so capable of giving the proprietor sound advice with regard to the choice of tenants and the improvement or management of the farms upon the estate,

and are more inclined to draw money from the estate than to lay out any upon its improvements; they view most things through the medium of the law, and hence often disturb that kindly feeling that should exist between landlord and tenant. Stringently drawn leases, hard-and-fast law, are not the best ways to further the landed interest and the profitable cultivation of the soil.

It also happens that the management of an estate in Scotland is placed in hands of lawyers in large towns who are apt to employ men of the same profession in small towns in the country who have also little knowledge of practical agriculture in preference to experienced local estate factors who are practically acquainted with the management and cultivation of the soil. These estates themselves suffer from more ways than one, and the tenants upon them also suffer.

I am strongly of opinion that the Report, after the distinct evidence upon that point, should have called attention to the subject, and recommended landed proprietors to employ in the management of their estates local factors who are practically acquainted with agriculture, and who know how to encourage its advancement in every way.

It is gratifying to see from evidence that several of our largest and best proprietors form an exception to the above rule, for they employ both trained and practical men as managing factors on their estates, greatly to their own advantage and to that of the tenants and labourers.

7. *Emigration.*—Evidence has been given that farmers' sons and agricultural labourers are leaving the country in increasing numbers, and it is highly probable that this exodus will continue unless a prospect of higher remuneration to both classes can be held out. A growing scarcity of labour and the withdrawal from the country of large numbers of young farmers is a serious evil threatening the future of our agriculture; and it must be borne in mind that while it is easy to drive off those whose experience and taste fit them for the successful cultivation of its soil, it is very difficult to recall them, and almost impossible to replace them.

JOHN CLAY.

5.—BY MR. HOWARD.

With the exception of the recommendation as to the Law of Distress, the Report has my full concurrence. I consider the Law of Distress of no advantage to the best and largest landlords, who, seldom, if ever, avail themselves of their powers; it is only of service to those landlords who, with this State guarantee, secure from tenants they would not otherwise have selected a high rent, paid in many cases at the expense of others. It is a preferential law unfair to other creditors, and, in my opinion, should be abolished.

CHARLES HOWARD.

6.—BY MR. PATERSON.

Though signing the Report, I find it incumbent on me to enter my dissent to the proposals in regard to the maintenance of the in-door poor, and in regard to the Law of Distress.

While agreeing in the principle of rating personality for the maintenance of the poor, and for other burdens at present levied entirely on real property, I am unable to agree in the proposal of throwing the support of the in-door poor in England and Scotland on the Consolidated Fund, for by so doing a heavy burden would devolve on Scotland for the support of the poor of England.

To meet the charge on the Consolidated Fund it would be necessary to increase the income-tax, and, if this were done, and an extra rate levied on Scotland as well as England for this purpose, the former country would be called on to pay a sum equal to one-half of the entire cost of its own poor, and equal to three or four times the amount annually expended on in-door relief in Scotland.

The principles of the Poor Law Acts for the two countries are totally different, and it does appear to me that, if the in-door poor or the whole poor of England are to be supported out of the Consolidated Fund, the only equitable mode of meeting the cost will be by an extra rate of income-tax levied in England alone.

With regard to the Law of Distress in England and the Act passed in 1880 for the purpose of abolishing Hypothec in Scotland, I am certainly of opinion that fresh legislation is required, and I trust it will culminate in the total abolition of both laws.

ROBERT PATTERSON.

V.—*Dairying in Denmark.** By H. M. JENKINS, F.G.S., Secretary of the Society and Editor of the 'Journal.'

PREFACE.

SINCE my report on the farming of Denmark, which was published in the second part of the Society's 'Journal' for 1876, the dairying of that country has been very much improved, both in the manipulation of the milk and the provision made for its production. It has therefore been deemed desirable to reprint here the report on Danish Dairying which I made to the Royal Commission on Agriculture. That having been decided upon, I take the opportunity of calling attention in this preface to the widely different details of the process of manufacture in the cases of fresh butter and keeping butter respectively. The former may be termed a wet process, and the latter a dry one. In addition to that difference, it appears that to make the best fresh butter, hard pressing seems unnecessary, but to make the best keeping butter it is deemed to be essential. But whether butter be intended for immediate or for future consumption, it is always made in Denmark (except by one firm and their clients) from cream which has been taken from sweet milk, but which has afterwards been artificially soured. I commend all these varying details of the manufacturing process to the careful study of dairy-farmers and of managers of dairy-factories.

H. M. J.

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* Reprinted from the Report on Denmark to the Royal Commission on Agriculture.

1. *Dairy Cattle.*—In Denmark, as now restricted in area, the only native breed is the black and white Jutlander, which combines a certain adaptability for feeding purposes with a considerable share of dairy properties. This breed is very generally met with in that part of the Cimbrian peninsula which is still included in the Kingdom of Denmark, but it is rarely seen on the Danish islands. The dairy breed, *par excellence*, is the Angeln, the original home of which was in North Schleswig; and until the separation of the Duchies from Denmark, it also could properly be termed a native race. But although the original home of the breed has been separated from the little kingdom the Angeln cattle have for very many years been almost the only breed kept on the Danish islands, where dairy-farming, in the form of "high dairying," as it may be termed, attains its highest development. A somewhat coarse variety of the breed is said to be indigenous to the island of Fyen, and many agriculturists give to it the distinction of a separate name taken from its island home.

The Angeln cattle, when pure, are self-coloured; either more or less light or dark red, the muzzle being of a much darker hue than the rest of the head. In size and conformation they approach most nearly to the Jerseys or Alderneys. A complete description of the breed, with illustrations, will be found in my previous report on the Agriculture of Denmark.* Englishmen had an opportunity of seeing some excellent specimens of this and the Jutland breed at the Royal Agricultural Society's International Show at Kilburn, in 1879, but I am not aware that their adaptability to our climate, and other circumstances, was tested by purchases made on that unique occasion.

On dairy-farms calves are seldom allowed to suck their dams; in fact, there must be some very unusual circumstance to account for this system being practised. Formerly all the calves, except about 10 per cent. of the heifers, were slaughtered immediately after birth; but now a more enlightened system is gaining ground, and a fearful waste of meat is therefore being slowly diminished. Calves get whole milk for four or five days or even a week, and afterwards those that remain get skim-milk with a diminishing proportion of whole milk up to two or three months, by which time meal has gradually been substituted for a portion of the skim-milk. They are generally kept in the cow-house until they are over a year old; thus, being calved in the winter months—November to March inclusive—they would not be turned out much until May of the following year, when they could be properly classed as yearlings. Most of the smaller

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* Journ. Royal Agric. Soc., 2nd series, vol. xii. pp. 344 *et seq.*

farmers put heifers to the bull at 15 months old, but the more advanced farmers prefer to wait another year. This practice is in direct opposition to that of the Jersey breeders, most of whom hold that for milking purposes both bulls and heifers should be used as early as possible. This divergence may, however, be due to differences in the climate of the countries where the two breeds are kept.

During the summer the cows are tethered in lines on the aftermath of first year's seeds, and the whole of the second and third year's grass; but they are rarely put on permanent pasture, and then only on the aftermath. It is very striking to see from 50 to 200 or more cows, all of one colour, tethered in one or two long lines in a large field of seeds. Water is carted to them at stated times twice a day, and they are also milked twice a day in the fields as they stand. In the winter they are entirely kept in the cow-house, and fed on chopped hay and straw, corn in the form of meal, bran, and cake. As a general rule, the allowance of meal, bran, and cake commences, soon after calving, with about 4 lbs. per head per diem, increasing gradually to 8 lbs., and in some cases even more. Most farmers think a great deal of the value of bran and rape-cake for milch-cows, but palmnut-cake or palmnut-meal is also extensively used. Linseed-cake is not held in much repute by dairy-farmers, and those who use it do so very sparingly, as its tendency is to produce an oily consistency in the butter, which is very prejudicial to its value in the market. About one-half of the artificial food is meal obtained by grinding oats and barley produced on the farm, and the remaining half generally consists of about equal parts of bran and oil-cake.

Of late years the system of keeping the cows in the stalls during a portion of the summer has found increasing favour with the best farmers, and they have modified their rotations accordingly. Thus the practice of keeping artificial grass down three years has been changed to that of a two years' ley; and the year in the rotation thus gained has been utilized by inserting a crop of vetches, oats, barley, peas, &c., mixed together, between the successive crops of cereals, which formerly were almost universally taken for three or four years following. Part of this mixed grain and pulse crop is cut green for early summer feed, and part left to ripen for use in the stalls when the cows return after their restricted sojourn on the artificial pastures.

2. *Keeping (or Sour-cream) Butter.*—This is the real Danish butter of commerce—in my opinion the best winter butter that comes to the English market. The following detailed description of its mode of manufacture will probably surprise many persons, therefore I will preface it by saying that it is an

accurate record of what I have seen done on many Danish farms.

The milk is weighed as it is brought into the milk-cellar, the produce of each cow being weighed and entered separately. It is then put into the cans or other vessels in which it is to be set for cream. As a rule, deep cans plunged in ice, or a mixture of ice and water, are used, especially in the summer, their place in winter being in some dairies taken by the shallow round wooden tubs, known as the Holstein system. There are, however, "running-water dairies," where the deep cans are plunged in a tank through which cold water flows continually. Other dairies, again, are furnished with the rectangular shallow "Destinon" troughs; but until recently the Swartz system was steadily driving all other methods out of the field. Now, however, the centrifugal cream separators are competing with the Swartz system, and probably most new dairies will be fitted with these machines, to the exclusion of all other means of obtaining cream from milk. The Swartz cans were originally long and narrow with rounded ends, and these are still seen in dairies which have been specially fitted with tanks appropriate to this system. But in other dairies, into which the system has been, as it were, imported, cylindrical cans are used and plunged in huge tubs filled with ice and water. If large cans are used, it is calculated that 1 lb. of milk requires 1 lb. of ice to keep it at the required temperature for 12 hours; but with cans of a smaller diameter $\frac{3}{4}$ of a lb. of ice is sufficient for 1 lb. of milk.

In the best dairies the cream is taken off after 12 hours standing, and the milk is skimmed a second time after remaining another 12 or 24 hours; but the two skimmings are never mixed together. The cream first taken off is used for making butter for market, and the second skimming for household purposes, or an inferior quality of butter. Each skimming of cream is weighed, and the quantity duly entered by the chief dairymaid. It is then put to *sour*—a process which varies much on different farms. The most usual practice is to warm the cream to about 63° F. and then to add from 2 per cent. to 3 per cent. of buttermilk, which is well mixed with the cream. Some dairymaids add only 1 per cent. of buttermilk, and some as much as 5 per cent.; but probably the temperature of the milk-cellar and other circumstances necessitate variations in this as in other dairy practices. Not a few dairymaids prefer to save some sour cream from each day's churning to mix with the sweet cream to be soured for the next day; and others again prefer a mixture of sour cream and sweet milk; but in these cases the quantity used is not so large as when buttermilk is employed, generally not more than from $\frac{1}{2}$ per cent. to 1 per cent., but occasionally as much as 2 per cent. of the mixture.

Whichever of these methods is employed, it is quite obvious that the germs of fermentation have a continued relationship. In other words, the souring material of to-day is a lineal descendant of that used yesterday, that of the day before, and so on. It may seem strange that continual "in-and-in breeding" of such microscopic organisms should act prejudicially upon the quality of the butter, but in practice this is found to be the case, so in well-managed dairies a new stock of souring material is obtained every month, by letting some milk or cream become sour without artificial aid. Indeed, so important is this matter considered that a new process has recently been advocated, and is now being tested on a large number of the best farms. A covered can is filled with new milk and warmed up to 104° F. (32° R.); it is then placed in a large cubical box thickly lined with hay (in fact, a rough kind of Norwegian oven), and locked up; at the end of 24 hours, when required for use, the can is taken out, and it is found that the milk has become sour and its temperature has fallen to 68° F. (16° R.). This sour milk is then used to sour the cream which will be churned the next day, and as a fresh supply of souring material is made daily the danger of inherited defects is removed.

The souring material having been added to the cream in a kind of barrel with a movable lid, through a hole in which projects the handle of the stirring-stick, it is left for about 24 hours, being occasionally stirred with the stick without removing the lid. It is then brought to the requisite temperature and placed in the invariable upright Holstein churn.

The cream is generally put into the churn at a low temperature, 55° F. being not unusual, and 57° rarely, if ever, exceeded. But it must be remembered that the upright Holstein churn is used, and that this machine has a very small dashboard power in comparison with its size. Therefore, the deficiency in power is compensated for by driving the dashboard at a high speed, generally between 120 and 150 revolutions per minute. The consequence is that when the butter "comes," which it does in between 30 and 40 minutes, the temperature has increased by 4° to 5° F., making it at the finish from 60° to 62° F., which is quite high enough to ensure the production of good butter, and its due proportion to the quantity and quality of the cream.

Churning is stopped when the butter-grains are no larger than grains of mustard-seed; in fact, as soon as they are distinctly formed. It is one of the advantages of the Holstein churn that by means of a small hole in the top, fitted with a sliding lid, the progress of the churning can be observed as often as desired. without stopping the churn. A thermometer can also be inserted in another hole, and thus the gradual rise in temperature can be noted. The butter having "come," it is carefully removed from the churn in the following manner:—The dairymaid takes a hair sieve, dips it into the churn, and brings up about a pound of butter in granules. She holds it for the buttermilk to drain off, and by gently tipping the sieve first to one side and then to the other, she gradually gets rid of most of the buttermilk, and also brings the granules into a loose roll. This preliminary and very simple operation is a good index of the skill of the dairymaid. Properly and gently done, the butter is drained of a large proportion of the contained buttermilk, it is fairly consolidated, and, more important than all, its *grain is not broken.* A careless or too energetic dairymaid will obtain none of these advantages, and will irreparably spoil the butter.

The roll of butter is then gently deposited on the side of the kneading-trough; and when the whole of the "make" has been similarly dealt with, the process of working or kneading commences. The dairymaid has close at hand three cans and a cloth, which she makes frequent use of as follows:—Premising that her hands are perfectly clean, she begins by thoroughly wiping them with the damp cloth. She then swills them well in the can which contains hot water; then plunges them into, and keeps them for some moments in, the second can, which contains cold water, or, preferably, a mixture of ice and water, and finally rinses them in the third can, which contains buttermilk just taken from the churn. Having thus prepared her hands, she proceeds to work the butter as follows:—One of the rolls is set on end, and gently but firmly pressed against the side of the trough, with one hand placed crosswise over the other, until it forms a flat cake. This is then rolled up, and set on end again, when the process is repeated, and so on until the butter has been thoroughly squeezed and consolidated, and most of the buttermilk expressed without injuring the grain of the still tender butter. Generally this first working necessitates seven times rolling and pressing; but the number varies from 6 to 12 on different farms and at different times of year.

After the last pressing the butter is loosely rolled and carefully placed on a board; and when the whole of the "make" has been thus dealt with, the board and the butter are carried to the small weighing-machine, which is a necessary article of use in every Danish dairy. The tare of the board being known, the weight of the butter is easily arrived at, and is duly entered by the dairymaid on the line on which she has, in other columns, already entered the quantity of milk, weight of cream, &c., so that she can see in a moment how much milk or cream she has used to make a pound of butter. She can also calculate to a nicety how much salt she requires to use according to the usual percentage found to be desirable, or stipulated for by the butter-merchant. This is generally from 3 to 4 per cent. Salting is done by carefully uncoiling each roll of butter, and spreading it out in its cake-like form on the bottom of the kneading-tub, until about one-half the number have been thus treated. They should be placed close together, so as almost to overlap. The salt is then evenly sprinkled over the butter, and the remaining rolls are uncoiled, and placed upside down on the others.

The dairymaid next takes a wooden knife and cuts pieces of a convenient size, vertically, out of the salt-and-butter sandwich. She then works each piece precisely in the same manner as before, and for about as many times, taking the same precautions as before to keep her hands clean and cool, and with only a butter flavour. In this way she thoroughly incorporates the salt with the butter, and expresses any lingering buttermilk, while still carefully preserving the grain of the butter. When it has been sufficiently worked in this way, she brings the butter into a "saddle" shape, so as to expose as much of its surface as possible to the cooling influences to which it will next be subjected.

These saddle-shaped pieces of butter are, in the best dairies, placed in a long wooden box fitted with movable laths resting on a ledge about a couple of inches from its solid bottom. This arrangement not only admits of drainage from the butter, but it also allows a current of air to sweep beneath as well as above and around the butter. The box is covered with a tin tray filled with ice; and thus the butter is left to harden for about two hours, as a rule. Where ice is not used, the butter is covered with a cloth, and left in the coolest available place for as long as four hours in summer, but in winter not longer sometimes than one hour. The test adopted to ascertain whether the butter is ready for the next operation is its comparative brittleness. If the pieces of butter can be broken short off, they are ready for the final working.

The butter is worked for the last time before it is packed, either by being passed through a mechanical butter-worker, or by a repetition of the hand process already described. Some few years ago the use of the circular butter-worker on large farms, and of the small longitudinal butter-worker on small farms, was almost universal; but at the present time many farmers have abandoned the use of these machines. I was at some pains to ascertain the reason, but was not completely satisfied with the result of my inquiries. However, the conclusion I arrived at was that good dairymaids believed that they could work the butter more completely with the hand, while preserving its grain, than could be accomplished by means of the mechanical butter-worker; and, on the other hand, bad or inefficient dairymaids used the machine recklessly, and overworked the butter at its final stage, so that the merchants had ground for complaint, and discouraged its use. When the butter-worker is properly used, the butter is not touched by the hand; but, by means of wooden patters or spatulæ, it is passed under the rollers about a dozen times, sometimes more and sometimes less, according to the temperature and the size of the machine. With a small machine the butter requires to be passed under the rollers more often than with a larger and more powerful machine.

The making of the butter being now completed, nothing remains to be done but packing it for market. This is a very simple operation, but is conducted with the same regard for cleanliness and neatness as every other operation in a Danish dairy. The butter is simply rammed, by means of a wooden pestle, into a new keg, at the bottom of which is placed a piece of clean linen lined with salt; and when the keg is full, a similar piece of linen covered with salt is put on the top of it, before the head is fixed in, which is not done until just before the butter is sent to the merchant or factor to whom the butter made on the farm is always consigned.

3. *Sweet-cream Butter*.—Some five or six years ago sweet-cream butter was made on many large farms in Denmark. In fact, this method of treating cream was regarded as an advance upon the sour-cream method. At the present time, however, it may be safely stated that sweet-cream butter is rarely, if ever, made in Denmark except for Messrs. Busck, jun., and Co. (Scandinavian Preserved Butter Company), for the purpose of being packed in hermetically sealed tins for exportation to tropical countries. It is possible that some smaller companies may adopt the same system, but all those whose managers I have seen now adopt the sour-cream method. This latter has the uncontested advantage of yielding from 3 to 4 per cent. more butter, with, it is alleged, better keeping qualities, and no inferiority in other respects. On the other hand, Mr. Busck pays his clients for the best sweet-cream butter, provided that it is made according to his directions, which include the dietary of the cows, about 20 per cent. more than is paid for the best sour-cream butter. Thus, in the first week of June in 1881, Mr. Tesdorpf was receiving 108*s*. per cwt., less 2½ per cent. commission, for first quality sour-cream butter, and 128*s*. per cwt. net for first quality sweet-cream butter. In the same week

the best Cork butter was quoted in the 'North British Agriculturist,' which I saw at his house, at 101*s.* per cwt. It should also be added that the sweet-cream butter entails very little expense for casks, as they are returned carriage free, while the casks containing the sour-cream butter are exported with their contents, and consequently never seen again.

There is nothing special in the method of manufacture of sweet-cream butter, except that the milk must be set in ice, and the cream churned immediately after skimming, with only the exception that the evening's skimming may be kept until the next morning, provided that the cream is put into a deep can, and kept in ice during the night. Previous to being put into the churn the cans containing the cream should be placed in a bath of warm water, the temperature of which must not exceed 100° F., until the cream is warmed up to 55° F., but not more. During the process of churning the temperature may increase to 59° F., but not higher; and in this, as in all other operations, the system already described under the head of sour-cream butter is closely followed, with one exception, namely, that no water is allowed to come in contact with the butter, not even for washing small particles off the dasher or the side of the churn; they must be removed by washing with buttermilk, or by using a small lump of butter as a kind of magnet to which they will adhere.

Mr. Busck will not accept butter made from cream obtained by the separator; but as this implement becomes better known, it is doubtful whether he will be able to maintain this position without losing the support of those of his present clients who are not shareholders in his company.

On all farms where sweet-cream butter is made, the cream from the second skimming, which is taken twelve or twenty-four hours after the first, is made into sour-cream butter for domestic use or for the ordinary market.

4. *Fresh Butter.*—This is rarely a product of Danish farms; but as there is one very notable exception at the well-known farm of Överód, where the butter for the Royal Family of Denmark is made, I will describe the process as I saw it carried out, merely premising that the farmer's wife (Mrs. Hanna Neilson) informed me that several of her old pupils pursued the same method in different districts of Denmark. The quantity of butter made is not large, considering the supply of milk to the farm, as the greater portion is used in making different kinds of native and foreign cheese, as will be subsequently described (p. 166, *et seq.*).

The evening's milk is put into deep cans, which are plunged in a trough packed as closely as possible with small lumps of ice, so as to keep the milk at a temperature under 40° F. Next morning the milk is carefully skimmed, and the cream is turned into a deep can, and warmed up to about 63° F., more or less, according to the temperature of the milk-cellar. In winter the cream is warmed up to as much as 65° F. Then, as the cream has been taken off the milk in a perfectly sweet condition, as much as 5 per cent. weight of buttermilk is added to it, for the purpose of starting vigorously the "souring" of the cream. The temperature of the cream is afterwards kept low by immersing the cream-can in a cold-water bath, in which it remains covered up for twenty-four hours, and when put into the churn it has a temperature of only $51\frac{1}{2}$° F. ($8\frac{1}{2}$° R.).

Churning begins at 5.30 A.M., and is done in an ordinary Holstein churn of small size, but fitted with a plug at the bottom, the use of which will be presently seen. The churning is done by two of the girl-pupils, who turn the handle fifty-five to sixty times per minute—a speed which corresponds with double the number of revolutions of the dasher inside the churn. The butter comes in about forty minutes, and the churning is arrested as soon as examination shows that the butter has formed little seed-like granules—the smaller the better. But it would indicate great inattention, and cause a serious depreciation of quality, if the butter were churned into particles larger than a grain of mustard-seed.

The butter having thus "come," the churn and its contents are lifted on to a table, this cumbrous method being necessary in consequence of the shape and construction of the upright Holstein churn. The part of the base of the churn in which the plug already mentioned is situated overhangs the edge of the table, so that it may be partially withdrawn to let out the buttermilk. This being done, and the buttermilk received in a can through a hair-sieve, which arrests any small particles of butter that may escape with it, the churn is partially filled with clear cold water, which is withdrawn in the same manner as the buttermilk. This process is repeated four times, and the last water comes out of the churn nearly as clear as it was when put into it. The butter is thus thoroughly cleansed of its buttermilk, and is besides consolidated into one firm mass of granules. It is then taken out of the churn with wooden patters, and, after being left to drain for five minutes, is still further consolidated to express the water remaining in the interstices between the granules, this being done always with the patters, so that, in fact, the butter is *never touched with the hand.* It is then placed in a trough, in one or several lumps according to the quantity made, covered over with a clean cloth, and left for an hour to become firm, ice being used in summer to facilitate this important stage in the process of butter-making. The butter is afterwards worked in a longitudinal butter-worker until all the liquid mixture of buttermilk and water has been, as far as possible, pressed out. It is then put in white porcelain pots, each holding a pound, stamped with the Danish Crown, and covered with a nice-fitting lid, being then ready to be sent to the King's Palace, or to be sold at Mrs. Nielson's shop in Copenhagen.

On farms where only a small portion of the butter is intended for immediate consumption as fresh butter, while the rest is made into keeping butter, the process of washing is varied as follows:—The butter having "come" as usual, the lid of the churn is taken off and the churn tipped to a convenient angle in the ordinary way. The butter is then taken out in small portions by means of a sieve, through the meshes of which most of the buttermilk drains away. The sieve and the contained butter are then plunged in a bucket of clear cold water, then raised out of the water to allow of drainage, and this is repeated three or four times, or as often as may be deemed necessary. The washing by this method is nearly as effective as the washing in the churn, and is exceedingly convenient on a large dairy-farm, where it is desired to make only a proportion of the butter into "fresh" for immediate consumption.

5. *Cleanliness.* — Whatever method of butter-making is adopted, excessive cleanliness in every particular is all but universal in Denmark. The wooden implements and machines are most carefully cleaned after use, generally by first rinsing in cold water, then by successive scrubbings with hot water, and finally by rinsing copiously with cold water again. Further, one of the most elementary practices, known to every Danish dairywoman, is, that no matter how clean a wooden implement may be, even if it is only a spoon, yet before it is allowed to touch the butter it must be first well rinsed in scalding water, and afterwards in cold water. This preparation prevents the butter sticking to the wood, and renders the various operations easy, neat, and clean, thus avoiding any undue pulling about of the butter to the injury of its "grain,"—that precious quality which, when once destroyed, can never be repaired or replaced.

In fine weather the churns and milk-cans of all descriptions are dried in the open air, but in wet weather they are dried under cover, but out of doors if possible. On the other hand, the "butter-working" utensils are generally left to dry in the butter-cellar. It should be remarked that the washing or cleansing is done in this cellar, where the milk is set for cream and the butter is stored in kegs, ready to be sent to market. No taint of any kind is allowed to come into this sanctuary, which, like the cheese-room, is always under lock and key, and receives the personal supervision of the head dairymaid, who is, except on very large farms, and frequently even then, the farmer's wife or daughter.

6. *Skim-milk Cheese.*—The exact process of manufacture of skim-milk cheese varies on nearly every farm in Denmark that I visited, so far at least as regards the temperature at which the rennet is added, and the proportion of butter-milk mixed with the skim-milk. As a general rule, however, I inferred that the richer the skim-milk, the smaller the proportion of butter-milk added to it, and the higher the temperature at which the rennet was added. But this statement is subject to many exceptions. Still it may be sufficient for the purposes of this report to state that in a Swartz dairy about 7 per cent. of butter-milk would be added if sour-cream butter is made, either entirely or as the product of a second skimming after sweet-cream butter; but more sweet-cream than sour-cream butter-milk can be used. In a Holstein or a "running-water" dairy, where the skim-milk is richer in cream, not more than from 3 to 6 per cent. of butter-milk would be added; while, where centrifugal separators are used, from 10 to 15 or 20 per cent. of butter-milk is mixed with the exceptionally poor skim-milk which is left after the extraction of the cream by this method. This addition of butter-milk to skim-milk is one of the peculiarities in the manufacture of Danish skim-cheese, and the variations in practice just indicated show that the true principles of the use of butter-milk for this purpose have not yet been clearly made out. Rennet is added at temperatures varying from 22° to 32° R. (81½° to 104° F.), according to the time of the year and the richness of the skim-milk; the richer it is in cream, the higher the temperature it will bear without becoming hard. About 86° F. may be quoted as a very usual temperature. After the rennet and the colouring matter are added and well mixed with the warm mess, it is covered with the boarded top of the cheese-tub, and left about half an hour, occasionally not more than twenty minutes.

When the curd is fairly formed, it is carefully and slowly cut vertically with a long wooden knife into strips about three inches wide. These are similarly cut across, so as to form pillars with a cubical section. Great care is taken not to break the curd during his operation, but to keep in it the little richness that it contains. Afterwards, a shovel-shaped curd-breaker, made of wood and wicker-work, is used; at first very gently to break the pillars of curd into shorter pieces, then by bringing some of them above the surface of the whey to make them break themselves against the wicker-bars by the force of gravity; and finally, by gradually increasing force, ending in a rapid stir-about motion, to get the curd into a tolerably minute state of subdivision.

The whey having been drawn off as completely as possible, the curd is gathered into the middle of the tub, and boards and weights placed on it to express as much of the remainder of the whey as can be got out by these means. In primitive districts the dairymaid stands on the board and stamps it with her feet alternately. Salt is then added in small quantity, unless, as is sometimes the case, the cheeses are afterwards kept in a salt-bath; and sometimes cummin or carraway-seeds are mixed with the curd at this stage, if the taste of the farmer's customers requires the addition of such a flavouring material. Curd-mills are seldom used, but the curd is laboriously picked to pieces with the fingers. Finally, the curd is put into moulds, pressed for a short time, and turned two or three times, by which means the remaining whey is expressed, and the cheese brought into its permanent form. It is then stamped with the name of the farm, the date, and its number for the year, placed in its cloth and permanent mould, and kept under the press for twenty-four hours. As before stated, on some farms it is afterwards put into a salt-water bath, generally for three days. It is, perhaps, needless to say that the cheese-rooms are models of neatness and cleanliness, that the greatest possible attention is paid to the regulation of the temperature and to the ventilation, and that every cheese is turned daily. The cheeses are sold when from three weeks to three months old, but between two and three months is the most usual age, and prices vary from 22 to 32 öre per Danish lb., or from less than 3*d.* to more than 4*d.* per lb. avoirdupois.

It will thus be seen that the manufacture of skim-cheese in Denmark has not yet been reduced to such a definite system as the making of butter; but there can be no doubt that the same spirit of investigation—fostered as it is both by the Government and the Royal Agricultural Society of Denmark—will shortly place this branch of dairy manufacture on a scientific basis equal to that which the butter-making of the country has now for some years attained under the same influences. It may, however, be remarked that while Danish butter is an article of diet—unfortunately not yet easily attainable by the masses in consequence of trade tricks—thoroughly appreciated by the English people, Danish skim-cheese does not commend itself to the English palate, and therefore has an interest only as an indication of the manner in which skim-milk may be utilised profitably by the dairy-farmer. The German method of making skim-milk cheese, which was exhibited at the Royal Agricultural Society's Show at Derby in 1881, appears to me much more worthy of imitation by our English butter-makers as a profitable means of using skim-milk, by converting it into an article of food that will keep well, and command a ready sale at remunerative prices.

7. *Children's Milk.*—Under this name (in Danish, of course), the Scandinavian Preserved Butter Company (Messrs. Busck, jun., and Co.), sell in Copenhagen a special milk in sealed bottles, both directly to the consumer and indirectly through the agency of most respectable druggists. It is claimed that the milk produced under the company's regulations for this purpose is specially suitable for infants and young children, invalids, and aged persons, as being richer in sugar, and not so rich in nitrogen as milk produced in the ordinary manner. I regret that I was unable to obtain a certified analysis of the milk in comparison with that obtained from the same breed of cow under ordinary conditions.

The cows used for producing this milk must be approved by the company's veterinary surgeon. In summer they must be fed entirely on clover and artificial grass; and in winter on hay, oats, bran, and straw. No cake or roots are allowed. As soon as the milk is brought to the farm-house it is run through one or two of Lawrence's refrigerators; in summer two are generally used, with a view to economise ice. The temperature is thus quickly reduced to about 40° F. or 41° F., and the milk is then put into small cans, holding only about two gallons each, and sent at once by rail to Copenhagen. The price paid by the company to the farmers is 7*d.* per gallon in summer, and 9*d.* per gallon in winter; and the company charge the public about 1*s.* per gallon in summer and proportionately in winter; not a high price, after all. Assuming that the virtues of the milk thus produced are what they are claimed to be, everything must depend upon the good faith of the farmer in carrying out his instructions. I was informed, indeed, that there are only two or three farmers in the district round Copenhagen who would undertake to comply with the regulations, and who at the same time could be trusted to fulfil loyally their engagements. The farm I visited belonged to Mr. Petersen, near Taastrup.

8. *Dairy Factories.*—These establishments abound in Denmark, and more particularly in the island of Fyen; therefore it is necessary to give a brief description of two or three of them, in order to complete the subject of Danish dairy-farming. The factories are very seldom on the co-operative principle, in fact I have not seen a single co-operative factory in Denmark. The milk is bought from surrounding farmers, but is generally sent

for by the proprietor of the factory. Thus at Maeslev, near Odense, the capital of Fyen, is a factory where the milk of about 300 cows is dealt with. The price given is from 7½ to to 8 öre per litre, or 4½*d.* to 4¾*d.* per gallon, which is a high price for Denmark. Two Laval separators of the old pattern * are used. They are worked by a three-horse power vertical engine by Marshalls, of Gainsborough, and the proprietor states that the engine is sufficiently powerful to work a third separator as well as the churn. There was nothing in this factory otherwise worth notice for its excellence; on the contrary, the arrangements left much to be desired. The proximity of such a good market for skim-milk as Odense naturally is, had made the people somewhat careless about the manufacture of skim-cheese, which was only made occasionally, and then, as it seemed to me, rather badly. From 8 to 12 per cent. of butter-milk was added to the skim-milk for cheese-making, as the separator so entirely denuded it of cream. Altogether this was not a model factory, and I left it under the impression that the proprietor would not make it pay.

A much better arranged and better managed dairy-factory I visited in the island of Laaland, at Holeby. Here the milk of about 500 cows is dealt with, and the average receipts amount to about 1100 gallons daily, the price paid being 6½ öre per litre, or 4*d.* per gallon; but at the time of my visit (September 1881) there was some talk of 7 öre per litre, or 4¼*d.* per gallon being demanded. Two Danish separators (Nielsen and Petersen) are used, and a four-horse power steam-engine is found amply sufficient to drive them and two large churns simultaneously. The milk is warmed to its natural temperature before being put through the separators. Two per cent. of butter-milk is added to the cream to sour it in twenty-four hours, so that the cream of yesterday is being churned at the same time as the separators are obtaining the cream from the milk of to-day. The proprietor finds that these separators take the cream so completely out of the milk, that he is obliged to add from 25 to 35 per cent. of butter-milk to the skim-milk in order to get any flavour at all into his skim-cheese. The temperature at which the rennet is added is also very high, namely, 100° F. to 104° F. (30°–32° R.), and the curd is cut in a quarter of an hour. The highest price which he can get for his cheese is about 25*s.* per cwt., but possibly the somewhat peculiar method of manufacture pursued may have something to do with this low price. It should, however, be remembered that these centri-

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* For a comple description and illustration of this machine, *see* 'Journal of the Royal Agricultural Society,' 2nd series, vol. xv., Part II., pp. 705, *et seq.* The new machine is described and illustrated in vol. xviii., Part II., pp. 619 and 620.

fugal separators are things almost of yesterday; and that a sufficient time has not yet elapsed to enable dairymen to find out exactly how best to treat skim-milk which is so entirely deprived of its cream as that which has passed through a well-managed separator.

A multiplication of descriptions of dairy-factories would serve no practical purpose, therefore I will now give a sketch of an establishment where milk is bought on a large scale, in addition to that given by a large herd kept on the farm. There are a very large number of home-farms where this system is pursued, both landlord and tenant, or, more correctly, both proprietor and peasant, finding the system mutually profitable. At Auno, one of the home-farms on the picturesque estate of Hofjægermester von Oxholm, near Vordingborg, in the south of Sealand, about 160 cows are kept, and milk is bought from the surrounding farmers. A new dairy has recently been built on the slope of a hill, advantage having thus been taken of geographical contour to save labour. The receiving room for the milk is on the highest level; after each can has been weighed, tested, and the result entered, the milk is turned into a huge vat, where it can be warmed to the required temperature by a coil of steam-pipes in the space between the true and false bottom. This vat is divided into two portions, simply as a matter of convenience, because when milk is scarce, the whole of it would be inconveniently large, and it is fitted with a gauze cover to keep out the flies. A pipe at the bottom, furnished with a tap, leads to a small cistern in the next room, the floor of which is at a lower level than that to the receiving-room. In this room are three Lefeldt * separators of the new type, and they receive the milk from the cistern by means of pipes furnished with taps, which radiate from the small cistern just mentioned. These pipes are movable, and can be taken to pieces to enable them to be cleaned, and, as a matter of fact, this is done immediately after the cream has been separated from each delivery or "meal" of milk. The cream from the separators is received into the ordinary deep cans, and the skim-milk flows through conduits into a cheese-vat or vats in a third chamber at a still lower level than that of the separator-room.

Before following the skim-milk, it may be as well to state that Mr. von Oxholm is perfectly satisfied with the Lefeldt machines, cumbrous though some may consider them, and notwithstanding that they cost altogether when in position and fit for working about 100*l*. each. In the two previous cases the proprietors of the factories were equally well satisfied with their

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* For a description and figure of this machine, *see* 'Journal of the Royal Agricultural Society of England,' 2nd series, vol. xvii., Part II.

type of separator; and as the rival claims have not yet been submitted to the test of a thoroughly competent and impartial bench of judges, after a sufficiently accurate and prolonged trial, I refrain from expressing any opinion on the subject, regarding it as still an open question. There can, however, be no doubt that by the use of these machines the quantity of butter obtained from a given quantity of milk of a definite composition is largely increased, but necessarily, *en revanche*, the quality of the skim-cheese is much impoverished. Thus Mr. von Oxholm obtains now 1 lb. of butter from between 26 and 28 lbs. of milk, whereas 1 lb. of butter to 30 lbs. of milk is generally considered a very good average in ordinary practice with a skilful dairymaid. On the other hand, he finds a difficulty in getting 25*s.* per cwt. for his skim-cheese.

Returning now to the practice in the dairy, the skim-milk flows, as stated, into the cheese-vat by its own gravity; it is then heated to about 82° F., instead of about 89° F., which was the rule when the Swartz system of setting the milk was used. From 12 to 14 per cent. of butter-milk is added to the skim-milk before the rennet is added at the temperature just stated. It will thus be observed that although the systems of cheese-making pursued at Auno and Holeby are as opposite as the poles, the result in price is about the same in each case. After the cheese has been made, the whey is drawn from the tubs by means of a tap, and flows directly through a hair-sieve into the pipe which leads to the whey-cisterns under the piggery.

The three kinds of separators already mentioned are the only varieties of this machine that I have actually seen at work in Denmark, and they are now more or less known in England, having been all exhibited at the Country Meetings of the Royal Agricultural Society of England by the Aylesbury Dairy Company. There are, however, two other varieties of separator which I have seen in a factory in the now German province of Holstein; therefore I may be excused for giving a brief notice of them in this place, as it is quite possible that some specimens are in use in Denmark on farms or in factories which I have not visited.

The first of these, the Fesca, is not unlike the Lefeldt separator in some respects, being boxed in; and it is like the old Lefeldt in requiring to be stopped from time to time in order to be re-charged. When necessary, the milk is warmed to a temperature of 82° F. in a vessel attached to the separator and surrounded by a steam-jacket; from this vessel it flows direct into the cylindrical box or drum where the separation takes place by the usual centrifugal action. Only the skim-milk flows away through a tube which taps the outside rim of the contents of the box, the cream gradually accumulating in the centre of it. After a certain time the box becomes full of cream, when the machine is stopped and the cream flows out through the same tube as that which carried off the skim-milk while it was in motion. A small quantity of cream clings to the floor of the collector, and is carried away by the first portion of skim-milk after each stoppage of the machine, whilst upon opening the machine to clean it, after the whole of the milk has been dealt with, this adhering remnant of cream must be washed out carefully with skim-milk. A structural peculiarity of the drum of this machine consists of three horizontal plates extending almost to its circumference, and turning with it. These plates are said to facilitate the separation of the cream, to aid in keeping it inside the drum while it is in motion, and at the same time to facilitate the exit of the skim-milk. The speed at which this machine is driven is said not to exceed 1200 revolutions per minute.

The remaining separator to be noticed differs essentially from all others in having its plane of revolution vertical instead of horizontal. The drum is very thin in proportion to its diameter, and contains a ring of metal perforated in two places. The milk enters the interior of the ring, and is there partially separated by the rotatory motion going on, so that the partly skimmed milk first enters the drum, where a final and complete separation takes place. The skim-milk passes through two small tubes into an outer ring, and is there brought into contact with a spoon terminating in a pipe, by which means it is drawn off. A similar arrangement draws the cream from the centre of the drum, and by varying the length and diameter of the two small tubes previously mentioned, the greater or less completeness of the separation may be regulated. The action is thus exactly the same in principle as that of the Danish separator, but the position of the drum is at right angles to it.

If it be wished to stop the machine, as much of the cream and skim-milk as is possible is drawn off by the spoons and their pipes, and the supply of milk having been stopped they are removed. The aperture of the drum is then closed by a cover, which can be pressed against the face of it while it is still in motion, and fits so as to be quite air-tight. The speed causes a small vacuum in the drum, so that when the motion is stopped, the skim-milk in the outer ring rushes back into the interior of the drum. These machines are very large, powerful, and somewhat costly, but it is claimed for them that they require for the work done only one-half the proportionate power.*

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* For an illustration of this machine, *see* vol. xviii., Part II. of the 2nd series of this Journal, p. 621.

9. *Pig-feeding.*—The profitable utilisation of the "refuse" materials, or "offal," of the dairy, is often a most difficult problem; and unless solved in a practical manner, the results of the dairying operations bring a loss instead of a profit to the dairy-farmer, no matter how skilfully his butter may have been made, or how high the market price of the day for the best product may have been. I have already given a sketch of the first process adopted in Denmark for converting the most valuable of the dairy "offal"—skim-milk—into a marketable commodity in the form of skim-cheese. But there still remains a considerable quantity of butter-milk and all the whey to be dealt with, and in Denmark these "refuse" products are used almost entirely for the purpose of mixing with meal as a feeding-material for pigs.

Pigs are generally fed on Danish farms, and fed off at from six to eight months old, but of course there are many variations of practice. As a rule, a good farmer, who sells his pigs at about seven months old, weighing 160 to 180 lbs., or a little more, live-weight, will turn off as many pigs per annum as he has milch-cows. This is considered very good practice if skim-cheese is also made as already described; and it is by no means unusual on farms where no more calves are reared than are necessary to replace cast cows, and where the pigs are sold at the age and weight just indicated, in which case they are generally killed and cured for exportation to England.

In some districts, and even on some isolated farms, the pigs are kept until they are older, heavier, and fatter, and then of course so many pigs in proportion to the number of milch-cows cannot be fed off. These larger and fatter pigs are from eight to nine months old, and weigh from 200 to 250 lbs., live-weight: they are invariably sold to go to Hamburg, whence they are sent to the southern districts of Germany, where fat bacon is in better request than in most districts of the United Kingdom.

The good understanding that exists between the Danish farmer and the butter-merchant prevails to some extent between the former and the pig-dealer, who is generally also the bacon-curer. If the pigs sent are too fat for the English market, or if the flavour of the bacon is too pronounced in consequence of the excessive use of any special food, not only is the price given affected, but the curer or dealer gives an explanation of the reason for the diminished return, and offers advice with a view to the improvement of the quality of the product in the future. In fact, inferior qualities of all dairy products, especially butter and bacon, have a powerful rival on the other side of the Atlantic; but first-rate goods are scarcely affected by American competition. Therefore it pays all parties concerned to help the farmer to produce a first-rate article; and fortunately the Danish farmer is generally ready enough to listen to the representations made to him by those who are accustomed to feel the pulse of the best market in the world—England.

As a rule the food of the pigs consists of equal parts of barley-meal and maize-meal mixed with whey, and either soaked for 24 hours or steamed or boiled in the dairy refuse. Maize is, of course, by far the cheaper food, but its too exclusive use gives a disagreeable taste to the bacon: and this is one of the points on which the curers are most particular. Some farmers use a larger proportion of barley-meal, especially when their crop of barley is light or discoloured, and therefore not suitable for brewing purposes. The quantity of meal given to pigs varies from ½ lb. per head per day, in their infantile state, to as much as 6 lbs., or else, as the French say, *à discrétion*, during the last six weeks of their existence.

At the time of my visit the top market price for good pigs, about seven months old, weighing on the average about nine score, live-weight, was as nearly as possible 2*l.* per cwt., at which price I was assured that they paid very well.

It can easily be understood that the foregoing sketch of the ordinary methods of utilising skim-milk, butter-milk, and whey, are subject to variations owing to local circumstances. Thus, in the west of Jutland, where dairying is not so important a department of the farm as on the east coast of the peninsula, and in the Danish islands, the small farmers buy young pigs to fatten for their own requirements, and the large farmers find it more profitable to keep a large number of breeding sows, and sell their produce young at good prices to their neighbours, than to fatten older pigs on the usual system. Again, where there is a good demand for calves, either for rearing on account of their excellent qualities—inherent or inherited—the skim-milk is turned to a more profitable purpose in that direction than by giving it to feeding pigs. But it very rarely happens in Denmark that there is any market of importance for skim-milk or butter-milk as food for the people. In fact, it will strike most English dairy-farmers as inexplicable, that small Danish farmers are willing to sell their milk to their larger neighbours at such low prices as I have just quoted, in describing a few of the dairies which depend either wholly or in part for their supply of milk upon that which is purchased from the surrounding farms.

Some farmers feed a much larger number of pigs up to the usual weight by an additional expenditure of capital in feeding stuffs, or by using an enormous proportion of the home-grown crops for pig-feeding. For instance, at Juellinge, the home-farm of Lehnsgreve Kraeg-Juel-Wind-Friis, there are 140 cows, but the tenant manages to fatten about 210 pigs, or 1½ per cow, up to at least 1½ cwt. each per annum, by using between 43 and 50 tons of meal in addition to the whey and butter-milk. The account of this operation would probably stand thus:—

	£	*s.*	*d.*
Receipt: 210 pigs at 1½ cwt., 315 cwt. at 2*l*.	630	0	0
Expenditure: 50 tons meal (half barley and half maize) at, say 8*l*. per ton	400	0	0
Balance to pay for whey, buttermilk, and attendance	£230	0	0

In this account I have taken the maximum quantity of feeding stuff and the minimum weight of the pig; so in actual practice the account would doubtless be somewhat more favourable. It is generally reckoned that it takes 3 lbs. of meal to make 1 lb. of pork, so that 50 tons of meal should make 333 cwt. of pork, live-weight, instead of 315. This difference alone would increase the calculated profit by 36*l*.

10. *Pig Killing and Curing Establishments.*—A great many of these establishments are scattered throughout Denmark. In Copenhagen itself there are two of considerable magnitude, but the processes employed differ considerably in detail, although they are necessarily the same in principle. Messrs. Hansen have killed as many as 26,000 pigs in a year, besides buying in the market a very large number already killed; but they say that the trade has recently fallen off to a woful extent, because most Danish farmers with whom they deal make their pigs too fat for Messrs. Hansen's customers. The farmers decline to alter their practice, because they can always sell fat pigs at a good price in Hamburg, whence they go to the Rhine Provinces, France, and elsewhere. They also complain that merchants like Messrs. Hansen and Messrs. Hayman want to stop the pig-feeding process at the very moment when it begins to be most profitable, and so convinced are they of the truth of their contention that they have not yet been tempted to sell leaner pigs for higher prices per lb. American bacon has not hitherto competed seriously with Danish, as the former shrinks so much in cooking; and in the year 1880 Danish was fetching on the London market just double the price of American.

At the factory of Messrs. Hansen, the following are the essential features of the curing process:—the pigs having been killed, they are singed by means of a movable semicylindrical frame containing about 120 gas jets; afterwards the carcass is divided into sides, and the head taken off; and then the sides are put into a pickle consisting of salt and water, ice, and saltpetre (the latter to give colour to the meat). This mixture of course has a very low temperature, probably not more than 70° F., but the warmth of the carcasses soon raises it. It is not allowed, however, to rise higher than 40° F., more ice being added as required to keep it down to that temperature. After the curing is finished, the sides are taken out and dried, and subsequently packed in bales containing four or six, according to circumstances. The heads are separately pickled in halves, and go to Ireland, where they find a ready sale. About 40 pigs can be killed and dressed per hour, and as many as 400 to 500 have been dealt with in one day, but these are unusual figures. In the winter many of the pig-carcasses are scalded, especially those bought ready killed. These are chiefly used for making salt pork, and they weigh from 110 to 130 lbs. per carcass dead-weight; but the summer pigs, whether for pork or bacon, weigh from 150 to 170 lbs. per carcass, which is, of course, a very heavy weight for the English market, in its present mood. A barrel of pork consists of 50 pieces of 4 lbs. each, and Messrs. Hansen do a large trade in provisioning the Navy and merchant vessels. It may be added that the Navy pork is packed in much stronger casks than those used for the mercantile marine, and that the former cost about twice as much as the latter. *Cui bono?*

Messrs. Hayman's establishment is much larger than the one just noticed, and presents several peculiarities of practice; thus, the pigs are singed in a cylinder surrounded by a coal fire instead of by gas; the carcasses then ascend by a wire railway to a loft capable of storing 1000; here they are cut up, and then sent to the curing tubs. At this establishment the temperature of the pickle is never reduced below 42° F.; and, after having been pickled, the sides and joints are stored in a chamber cooled by means of ice laid on the iron ceiling. The walls of this chamber are double, and the intervening space is filled with cut straw. Mr. Hayman has also had great difficulty about the fatness of the pigs; but two or three years ago he surmounted it by inducing his clients to use boars which he obtained from Mr. James Howard, M.P., of Clapham Park, Bedford; and this strain of blood has now the first reputation in Denmark. Pigs that are too fat to be cured into bacon for the English market, Messrs. Hayman send alive to Manchester, Birmingham, and other manufacturing centres, where they are readily bought; while the fattest of all are sent to Hamburg, whence they go, as already stated, to South Germany, and also to Holland. Messrs. Hayman agreed with Messrs. Hansen that the Hamburg competition had seriously reduced their business in pigs and bacon, and also that the heads are sent to Ireland, where they are easily sold at about one-half the price of bacon.

As an example of a provincial pig-killing and curing establishment I may notice the "Svineslagterei" at Holstebro, in Jutland, the advertisements of which are to be seen at most of the railway stations in that part of Denmark. The proprietors ask specially for *long* and half-fat pigs weighing from 1½ to 2 cwt. They keep a breeding stock of Howard's blood, and sell young boars to their clients at cheap rates in preference to realising higher prices for them from other farmers who dispose of their fat pigs elsewhere. They consider that this strain produces more lean in proportion to fat than the general run of pigs bred and fed on Danish farms, and they claim for them early maturity to the extent that the pigs are fit for market at five months old or a little more, instead of the usual term of seven months. With all their care, however, they sometimes receive pigs which are too fat for the English market, and these they keep in a well-arranged piggery near the railway station, feeding them on until they have sufficient to fill a railway truck—about 30—when they export them to Hamburg. The killing and curing are done very systematically as follows:—The pig, having been seized by one leg by a suitable apparatus, is hoisted up head downwards, stuck in the usual manner, and passed on by a sky-railway to the scalding room: having been scalded, the carcass travels onwards to a table where two men scrape it and take off most of the hair and bristles, and afterwards pass it on to the singeing-room, which is at present rather primitive in consequence of there being no gas-works at Holstebro. The carcasses are therefore singed by being surrounded with ignited straw, and this method is found in practice to produce a good result. Cutting up follows as already described, and great attention is paid to the manner in which this is done, as a careless cutter will take off from the high-priced parts a large amount of flesh which may properly be left on them, thus increasing the weight of the lower-priced joints. In this, as in other businesses, inattention to these details not unfrequently means the conversion into a loss of what might otherwise be a profit.

A novel feature in connection with this company is the establishment in the town of Holstebro of a shop where the "offal" of the pigs is sold direct to the consumers. A good demand is found to exist at the reasonable prices which are charged, but which give the proprietors a return of 20 per cent. more than they could get by selling the offal *en masse* in the usual way.

A REMARKABLE DAIRY FARM.

This farm is remarkable in many ways, and will thoroughly well repay the time and expenditure necessary to visit it by any landlord or tenant farmer who wishes to understand how dairying may be profitably pursued on arable land. For some years, in several reports published in this 'Journal,' I have over and over again shown, by descriptions of actual facts, how "arable-land dairying," as I have termed it, is carried on in different continental countries. But on this farm the system thus designated by me is pursued to an extent that is almost incredible to an Englishman who is accustomed to associate dairying with permanent pasture, for there is not an acre of permanent grass on the whole farm. More than that, the following description will show what can be done by a clever and energetic farmer's wife, in spite of all difficulties incident to an ignorance of foreign languages, weights, and measures, and in face of the too frequent prejudice against innovations on the part of the farmer himself.

The farm, known as Havartigaard, situated at Överód, near the railway station of Holte, about 15 English miles north of Copenhagen, consists of nearly 170 acres of land, *all arable.* It belongs to Mr. Neilson, who about thirty years ago kept about a dozen cows on a somewhat smaller acreage, and sold most of his produce, straw included, in Copenhagen at remunerative prices. With the introduction of what I have found it convenient to term "high dairying" this system was changed by the energy and perseverance of his wife. She visited Sweden and Germany, and learned how to make butter on the Swartz system, and skim-cheese and whey-cheese as practised in those countries. Then, although entirely ignorant of any language but Danish, except a smattering of German, she visited England, France, Switzerland, and Holland; and so thoroughly studied the dairy-practices of those countries, that to this day she makes butter on the Norman system, Camembert and Brie as the best representatives of French cheese, Cheddar and Cheshire cheese as made in England, Edam as made in Holland, and Gruyère as made in Switzerland. But her faculties are not only imitative, for she has the ability to vary her processes so as to make her cheeses, when necessary, more to the taste of her customers than the actual pure makes would be. She is also a merchant and a shopkeeper, buying her milk of her husband and her neighbours, and selling her cheese and butter at her shop in Copenhagen, the King of Denmark himself being regularly supplied by her, and her butter being therefore stamped with the Royal arms. When I add that dairy-work begins at 5 A.M. and is finished at 1 P.M., that Mrs. Nielson is in her shop at Copenhagen from 2 to 8 P.M., and catches the 9 P.M. train from Copenhagen to Holte, it will be admitted, I feel sure, that such industry richly deserves the success and the reputation which Mrs. Nielson has achieved. In brief, it is not too much to say that "Hanna Nielson" is regarded as by far the most remarkable woman of her class throughout the little country to which she does so much credit.

The farm is cropped on the following 8-course shift: (1) and (2) seeds after rye, (3) mixture of barley and oats, (4) roots, (5) barley, (6) oats, (7) half bare-fallow and half clover sown in the oats, (8) rye sown out with seeds. From 30 to 40 milch-cows are generally kept; and at the time of my first visit, in June 1881, there were actually 30 cows in-milk and a number of cows and heifers just about to calve. The system adopted is to buy in-calf cows and heifers in Copenhagen, and to keep them only for the season, feeding them well, and selling them off more or less fat when they run dry, or give too little milk to be profitable as dairy cows.

The actual process of butter-making is described on pp. 163 to 165; and it is only necessary to add with regard to cheese-making that most kinds of cheese are made from a mixture of the morning's whole milk with the skim-milk of the previous evening. For the Danish variation of Derby cheese, the milk is raised to 86° F.; and after the curd has been cut in our usual manner, the mess is rewarmed to about the same temperature as before, and the curd is left to cook until the whey begins to turn sour. The succeeding processes need not be described, as they differ very slightly from those usually practised in this country. It may be remarked, however, that Mrs. Nielson uses small cheese-tubs, and makes comparatively small cheeses, for Cheddar or Cheshire makes. Her kitchen, in which cheese-making and cooking go on simultaneously, can scarcely be 16 feet square, and yet I have seen three kinds of cheese—Derby, Edam, and Camembert—being made there simultaneously. The milk for Edam cheese is raised to 90° F. before the rennet is added, and twenty-five minutes are allowed to elapse before the curd is cut. Camembert cheese is made by adding the rennet at 95° F., and allowing the curd to remain undisturbed for five hours, the vat being all the time perfectly covered, and otherwise protected from smells and the influence of the external air. In fact the Camembert system is faithfully copied in all respects, except that the cheeses made are much larger than the French ones.

The making of whey-cheese requires a little more detail to enable a description of it to be understood. It is a "refuse" product, which is rarely made as such in Denmark, although a skim-milk imitation of it is frequently made on Danish farms, and is known as "*Appetit ost*" ("Appetite-cheese.") Whey-cheese proper is essentially a product of Norway and Sweden, where it is largely made, as also is a much appreciated pungent cheese made from skimmed goats' milk. Mrs. Nielson has devised a means of combining the excellencies of the true whey-cheese with a certain amount of richness in quality and piquancy in flavour, by adding to the whey a proportion of cream taken off goats' milk. This cream having been added to the whey, the mixture is poured into shallow open pans, and slowly evaporated by being heated nearly to boiling-point on the hot plate of the cooking stove, and continually stirred to prevent the least suspicion of burning. Each pan requires the undivided attention of one girl until the whey has evaporated to such an extent that only a syrupy mass is left, when Mts. Nielson devotes her personal attention to the most critical part of the process, as indeed she does in the case of all the products of her dairy. After gradual cooling, accompanied by continual stirring, the whey-cheese appears as a more or less brown and pasty mass, which has to be well worked with a wooden pestle in a large wooden bowl, to prevent the sugar of milk from forming large crystals. This is the laborious part of the process, and each of the girls in the dairy takes a short turn at it, working with a will to make the mass as smooth in the grain as possible. When quite cold and sufficiently worked, the whey-cheese is transferred to a mould, which is here a rectangular box; this is then subjected to pressure for about twenty hours, when the cheese is taken out and trimmed, being then transferred to the curing-room, where it remains for one or two weeks, according to circumstances, after which it is sent, like the other products of the dairy, into Copenhagen, for sale at Mrs. Nielson's shop.

The commercial aspect of this dairy may be briefly noticed. As already hinted, Mr. Nielson himself takes no part in the dairying operations, and originally had no faith in their success. His wife therefore began by buying from him the milk at what he regarded as a remunerative price; and this plan has been followed ever since, except that now, as she buys a large quantity of milk from surrounding farms, she pays her husband no more and no less than any other purveyor of the raw material to the dairy. Last June the price was about 5*d.* per gallon, which is very moderate for the neighbourhood of the capital; but it must be remembered that then the price of butter was very low, as, indeed, it usually is, speaking comparatively, at that season of the year. This, then, is the prime cost of the milk.

The cost of manufacture, which is the next element in the question, is reduced to a minimum in consequence of Mrs. Nielson's extended reputation as a first-rate dairy-woman. She generally has about a dozen farmers' daughters as working pupils, who are boarded and lodged in the farm-house, remaining for various periods extending from six weeks to two years. The pupils who remain only for a short time, pay for their instruction a considerable amount relatively, but they all work as hard as an ordinary dairymaid could be expected to. Their usual length of stay is six months, and vacancies in their ranks are always immediately filled up. I inquired the position of the parents of these girls, and learnt that most of them were peasant-farmers, keeping from ten to fifteen cows, but some have larger farms. One girl was indicated to me whose father kept forty cows; she was about to be married, and her parents thought her fortunate in being able to learn under Mrs. Nielson how the dairy of her future home could be turned to the most profitable account. Mrs. Nielson's only daughter—a married woman, whose only child is again a little girl—also helps in the dairy, but chiefly devotes her time to the housekeeping.

Each pupil has five cows allotted to her in rotation, and the results of the several milkings are carefully noted, the produce of each cow being entered separately morning and evening, together with the name of the milker. Mrs. Nielson thus has a practical means of knowing whether her pupils can perform satisfactorily one of the most important, as it is one of the most fundamental and most neglected, operations connected with dairy-farming. The knowledge that the results of their milkings are "booked," also produces a spirit of emulation amongst the girls which gives far better results than any system of supervision.

Very little need be said about farm-labour, as its cost is included in the price given for the milk; still, it may be interesting to state that so near Copenhagen the labourer's wages are 2*s.* 3*d.* per day in the spring (of course much less in the winter), and 2*s.* 7½*d.* per day in harvest-time. Unmarried labourers, sleeping in a room off the stable and fed in the farm-house, receive in money up to 8*l.* or even 9*l.* per annum, but nearly the whole of this is reckoned as for their summer-work, as during the long winter they are considered to be almost sufficiently paid by being boarded and lodged.

The third element in every manufacturing business is, of course, the price received for the manufactured article. When one has to deal with articles like butter, and many descriptions of cheese, the prices of which vary continually in sympathy with the seasons, the fluctuations of the popular taste, and other causes, it would be delusive to quote prices per lb. at any particular date. Mrs. Nielson makes for sale at her own shop in Copenhagen, and she can feel the pulse of her own market from day to day, and make accordingly. Moreover, she obtains the middleman's and retailer's profits as well as the manufacturer's. What I therefore desired to know was, what relation does the gross return from the sale of the manufactured article bear to the price of the raw material? Mrs. Nielson told me, much to her husband's amazement at her answering such a question in his presence, that, as a general rule, she received between two and three times as much for the cheese and butter as she gave for the milk used in making them; but that with Camembert and whey-cheese she could realise about three and a half times the cost of the milk. It would therefore pay her best to make nothing else but Camembert, if there were a sufficient demand for it; but Mrs. Nielson is too shrewd to glut the market with any one of her dairy products; she rather aims to keep up the demand for them all, and thus to sustain the prices at a highly remunerative figure.

The annexed tabular form (p. 183) is a translation of the one in use in Mrs. Nielson's dairy. It is the foundation of her book-keeping, which is done entirely by herself—the form being filled up in the dairy by the pupil in charge of it for the time being. I mention this so specially, not because it is anything exceptional, but because I have been so often twitted with recommending farmers to pay clerks to keep their books, when I have referred to the admirable manner in which farm-accounts are kept in continental countries, *generally by the farmer's wife.*

The farm-house and farm-buildings are quite typical of a modern Danish peasant-farm. Mr. Nielson erected these buildings a few years ago at a cost which he estimates at about 2000*l.* If he is correct in his statement, the steading is cheap at the money, although the price is 12*l.* per acre, which is too high for England, but not excessive for Denmark, where the long and severe winters require more protection to be provided both for crops and cattle than is necessary in our climate.

The farm-house and main buildings form a hollow square, as is generally the case in the north of Europe; with the single exception of the Netherlands. But it should be remarked that on this farm the manure is not kept in the central court-yard or "barton," but is stowed in a "back yard" outside the hollow square, being flanked also by the pig-sties and goat-house. The object of this arrangement clearly is to keep all pungent and deleterious smells as far away from the dairy as possible, and the example thus illustrated may be commended to the attention of the majority of dairy-farmers in the United Kingdom. Near

TABLE XI.—BLANK FORM OF DAIRY REGISTER kept at HAVARTHIGAARD, ÖVERÓD, DENMARK.

Date.	COWS.		Total.	MILK.								TEMPERATURE.		BUTTER.					ENGLISH CHEESE.					GOUDA CHEESE (DUTCH).				
				Cows' Milk from					Total.																			
	In Milk.	Dry.		Own Farm.	Farm A.	Farm B.	Farm C.	Farm D.	Home Produce.	Bought Milk.	Total.	Of Milk Cellar.	Of Setting Can.	Milk Set.	Milk Skimmed.	Butter.	Quantity of milk to 1 lb. Butter.	Temperature of Cream at Churning.	Whole Milk.	Skim Milk.	Total Milk.	Cheese.		Whole Milk.	Skim Milk.	Total Milk.	Cheese.	
	No.	No.	No.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Fahr.	Fahr.	Lbs.	Lbs.	Lbs.	Lbs.	Fahr.	Lbs.	Lbs.	Lbs.	Lbs.	No.	Lbs.	Lbs.	Lbs.	Lbs.	No.

EDAM CHEESE (DUTCH).					GRUYÈRE CHEESE.					ROQUEFORT AND STILTON CHEESE.				BRIE AND CAMEMBERT CHEESE.			WHEY OBTAINED FROM ALL KINDS OF FAT CHEESE.	ÖVERÓD SKIM MILK CHEESE.					TOTAL MADE.		CALVES.		GENERAL REMARKS.
Whole Milk.	Skim Milk.	Total Milk.	Cheese.		Whole Milk.	Skim Milk.	Total Milk.	Cheese.		Cows' Milk.	Goats' Milk.	Cheese.		Whole Milk.	Cheese.			Skim Milk.	Butter Milk.	Whey.	Cheese.		Cheese.	Whey Cheese.	Skim Milk.	Butter Milk.	
Lbs.	Lbs.	Lbs.	Lbs.	No.	Lbs.	Lbs.	Lbs.	Lbs.	No.	Lbs.	Lbs.	Lbs.	No.	Lbs.	No.	Lbs.	Per cent.	Lbs.	Lbs.	Lbs.	Lbs.	No.	Lbs.	Lbs.	Lbs.	Lbs.	

the "kitchen-passage," where the churning is done, is an ice-cellar, but its capacity is obviously insufficient for the annual requirements of the dairy. Therefore in the winter a bay in the barn is well lined with straw, so that when subject to the full weight of the ice it shall be at least a foot thick; the ice being stowed is then covered with a similar layer of straw, and thus can be kept with little loss until another supply can be obtained. On most well-regulated farms it is desired to make up every winter the supply of ice to a quantity sufficient to last two years, so as to provide against the contingency of a "green winter."

Another point worthy of notice is the manner in which the various "cheese-rooms" or "cheese-cellars" are divided and separated from one another. Thus there are two with separate entrances, but which can be warmed by one stove set in the partition wall; then there are again two, leading from one to the other, where heat is not so much an object as a certain amount of dampness. In the first of these is an ordinary copper, by means of which the air can be made sufficiently moist, if need be, to insure the development of the *fungi* which are essential to the proper ripening of Brie and Camembert cheeses in their first stage, and beyond is the room for curing the whey-cheese, which may be isolated from, or connected with, the room just mentioned, as the circumstances of the season require. It need scarcely be added that the arrangements for admitting or excluding light and air are both simple and effective, nor that every window and ventilating aperture is also fitted with wire gauze to prevent the incursions of flies, which are the greatest nuisance with which the dairywoman has to contend, especially during the curing of fine soft cheeses. As on all dairy-farms, the cheese-rooms are kept carefully locked, and on entrance to them you are politely requested to be quick in your movements, so that the door may be rapidly closed after you, and no flies admitted to leave a souvenir of your visit.

VI.—*Notes on Continental Poultry-keeping.* By H. M. Jenkins, F.G.S., Secretary of the Society and Editor of the 'Journal.'

The Journal Committee have desired me to draw up a short paper on Continental Poultry-keeping, as supplementary to Mr. Pope's article "On the Poultry of the Farm," and to Mr. Druce's description of "A Poultry Farm in Huntingdonshire," both published last year.* I have therefore reprinted the excellent contribution to the subject by my friend Mr. C. L. Sutherland, from his Report on West-central France to the Royal Commission on Agriculture, as well as quotations from my own Reports to the same Commission, and notes derived from other sources.

The text up to which I shall write may be thus stated:—In the same manner as the successful cultivation of land requires a rotation or at least an alternation of crops, so does successful poultry-keeping require a rotation or at least an alternation of land. Nothing poisons land so quickly as poultry; and it is my belief that the failures of large "poultry-farms," as they have been termed, are chiefly due to the fact that the necessity of shifting the poultry from one spot to another in a systematic (not a haphazard) manner has either not been sufficiently kept in view or has been impossible. Change of ground for poultry is of course well known as necessary to their being successfully kept, but the reasons generally given by writers are somewhat different from the cardinal principle which I conceive to be involved. Thus, Mr. Baily commences his well-known book † as follows:—"Just as change of air is at times necessary to the human being in order to preserve or regain health, so is fresh ground necessary for poultry. The constant occupation of the same spot becomes injurious to them." This sentence embodies a very prevalent view, while I maintain that a large number of fowls kept on a limited area require a systematic change of land for the reason which I have already given. Mr. Sutherland remarks, in the following quotation from his Report, that "so well is the necessity for change of ground understood in the districts where poultry-raising is a special industry, that great sacrifices are made by the breeders to secure fresh ground on which to rear their chickens,"—a statement which comes very near my own, with the exception that I insist upon the necessity of a *systematic* change instead of a *haphazard* one, and for poultry of all kinds and ages instead of simply for chicken.

A "poultry-farm" may, however, be successful as such without being so in a pecuniary sense; and on this point it is my conviction that "commercial" poultry will only pay as an accessory to something else, whether it be a farm or a household—to eat scraps which would be otherwise lost, and to utilise time which would be otherwise wasted. Where there are large poultry farms that have paid for any length of time, so far as my experience goes, they are either establishments

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* 'Journal of the Royal Agricultural Society of England,' Second Series, vol. xviii., pp. 104 and 503.

† 'Fowls.' By John Baily. This is a very practical book from the English point of view, and its price (2*s.* 6*d.*) brings it within the reach of every farmer.

where Show poultry of high-priced strains are bred (as at Crosne), or they are adjuncts to a farm or a forest (as at Svendborg).

One other remark may be received with surprise by some readers, namely, that in my opinion it is a mistake to assert that poultry-keeping is so much more general in France than in England. It is, no doubt, impossible to prove the accuracy of this opinion, because in England we have no poultry statistics; but we do know the number of fowls kept in France and in Ireland, and the number of eggs imported into the United Kingdom. In fact, the formidable total of these importations is continually quoted to show that our poultry-keeping is lamentably deficient.

The agricultural territory of France is rather more than 120 million acres, and the latest official statistics show that there are nearly 43 million fowls in the country, or in round numbers one fowl to three acres of land. The total area of Ireland is nearly 21 million acres, of which three-fourths (15,304,235) are cultivated; and in 1882, according to the official statistics, the Green Isle possessed nearly 14 million head of poultry, or about one head to one and a half acres of the total area, and nearly one to each acre of land that may be deemed "agricultural." If we suppose that the Irish "poultry" includes ducks, geese, and turkeys, which in France number 9 millions, and thus raise the total head of "poultry" to 52 millions in that country, still the number kept in Ireland per acre of *cultivated* land would be more than double that kept in France. With regard to England, as already stated, we can only guess either way. My belief, however, is that poultry-keeping is more general in England than in France; but that in this country the fowls are kept chiefly for the sake of their eggs, even by comparatively poor people; while in France they are kept for the sake of the money which the eggs and chicken will sell for, even by comparatively well-to-do people.

A little consideration will show how largely eggs in France are sold either for exportation to England or consumption in Paris or other large towns, although the official statistics on the subject do not bear out the commonly quoted statements. It is quite certain, however, that the number of fowls given in the last official census is what has been already stated by me, and is repeated below by Mr. Sutherland; and the approximate production of eggs per annum is officially given as nearly 1800 millions, or the large average of 91 per laying hen. Now in 1882 we imported about 800 million eggs, of which about one-half came from France, while the latter country itself imported about one-third of the number of eggs which she exported to all countries, her total imports having been about 200 millions, and her total exports 600 millions. The result goes to show that the average consumption of eggs in France would be about 40 per head per annum, if the whole of the number laid and imported could be eaten. But as this is impossible, it may be regarded as near the mark, in view of the large consumption of poultry in France, if I estimate the consumption of eggs in that country at 20 per head per annum, looking at the remaining half as used for the production of chicken. If I am right, and if the official statistics are to have any weight attached to them, we English people import more eggs per head annually than the total consumption of eggs in France.

As an illustration of the unreliability of the current assertions on poultry statistics I may quote Madame C. Millet-Robinet's statement as to the consumption of eggs and poultry in Paris: "Je sais par les tableaux officiels qu'en 1853 Paris a consommé 174 millions d'œufs et près de 11 millions de kilogrammes de volailles."* This would make an average consumption of about 120 eggs per annum per head of the population of the French capital; whereas the National French Agricultural Society issued an official report in 1880 in which it is stated that the consumption of eggs in Paris was 24 per head per annum in 1859 and 32 in 1878.†

My late friend, Mr. Gibson Richardson, in his well-known work entitled 'The Corn and Cattle-producing Districts of France' (p. 168), very nearly doubles the statement of Madame Millet-Robinet with regard to the consumption of eggs. "The excess of production is astonishing when it is considered how large is the home demand, eggs and poultry entering into daily consumption in France far more than in England. Hardly a meal is ever eaten in France at any table, above the very poorest, without eggs or poultry forming part of it; and it is quite credible that Normandy alone furnishes from one to two million head of poultry of various kinds to the Paris market yearly, and yet falls behind the supply from other provinces, besides providing for its own large local consumption. Six millions of eggs are sold weekly in the Paris market—not all for direct consumption; an important portion, indeed, is purely for manufacturing purposes. Many are used in pastry and for glazing ornamental cakes and sweetmeats. One large pastrycook buys as many as two millions in the year for these purposes. A large dealer uses half a million, of which he separates the white from the yolk—

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* 'Basse-cour, pigeons et lapins.' Neuvième Edition, 1881, p. 13.

† 'Enquête sur la situation de l'agriculture en France in 1879, faite à la demande de M. le Ministre de l'agriculture et du Commerce.' Vol. ii. 1880, p. 213. The eminent Perpetual Secretary of the Society, my friend M. Barral (who is an Honorary Member of this Society), assures me of the reliability of the figures given in the "Enquête," and says that the writers to whom I refer are mistaken. See also next page.

the white being sent to the manufacturing districts in the north, and the yolks being employed in dressing skins for gloves. The yolks not required by the pastrycooks are salted down, and find a sale in Belgium. With all this large surplus production, the agricultural writers are continually urging that more attention should be paid to poultry-rearing. They declare that the production might be easily doubled."

In the "Enquête" previously quoted the official character of the figures is thus announced: "Les données suivantes ont été fournies par la statistique municipale de la Ville de Paris à *l'annuaire* du Bureau des longitudes, pour les objets de consommation soumis aux droits d'octroi et entrés dans la capitale." To these official figures should therefore be added the number of eggs which are the produce of Paris-kept fowls; but this element in the question does not add more than one or two eggs consumed per head of the population per annum, to the number already given. Before casting any doubt upon the returns relating to eggs on account of their being below the popular estimate, it may be well to consider what the official statistics reveal respecting the consumption of poultry in Paris. It appears that this amounted to about 22 lbs. (10·05 kilos) per head in 1859 (about double that stated by Madame Millet-Robinet as the consumption of poultry in 1853), and to more than 25 lbs. in 1878. Considering that this means about ½ lb. of poultry per week spread over the whole population of Paris, and that it equals one-fourth of the consumption per head of butchers' meat in England, the quantity must be regarded as exceedingly large.

Passing from this matter to the practical details which are more especially the subject of this paper, I would make a few prefatory remarks on the number of eggs which an average hen may be expected to lay in the year under ordinary circumstances. The last-published Agricultural Statistics of France give, as already stated, the average number as 91 eggs per laying hen per annum; but they vary from 133 in the department of the Bouches du Rhône, with its southern climate and aspect, in addition to its rich soil, down to 62, or less than one-half, in the central and arid department of the Creuse. Many circumstances contribute to the laying qualities of hens in different districts, more especially breed, soil, and climate; but when all other circumstances are equal, the age of the hens is a factor of the first importance. M. Barral has calculated that a hen produces 80 eggs in its first year, 120 each in its second and third, and 80 in its fourth. After this period its productiveness rapidly decreases, and in France hens are rarely kept after their fifth year. Taking into account all the circumstances in France, I do not believe that in our climate an average of more than 80 eggs per hen per annum can be reckoned upon; and Madame Millet-Robinet considers 90 far too high for France, while it will be seen (p. 206) that less than 50 is the result on a poultry farm in North Germany, where accurate accounts have been kept for some years.

The influence of climate upon the productiveness of poultry is, in fact, most important; and if we consider how very much more suitable for poultry-keeping is the comparatively dry and continental climate of France than the humid and insular climate of England, it will be easy to understand what an excellent basis exists for that careful attention to details which has made French poultry-keeping famous in this country, and which probably justifies Mr. Sutherland's assertion, in a recent letter to me, that "a greater measure of success attends the keeping of poultry in France than in England." The main object of this paper is to draw special attention to the details of the practices of a few of the best poultry-keepers in some continental countries, without attempting anything like an exhaustive treatise on the subject.

Given a determination to keep fowls, the fowl-house must be appropriately furnished, the run must be laid out as a miniature garden and farm, with trees and shrubs, corn and grass and green stuffs, and all must be as carefully attended to as if the stakes were sovereigns instead of halfpence.

The maintenance of the healthiness of the runs is a matter of the greatest importance. Fowls should always have access to grass, which they eat almost continually; they must also have a sandy spot available to "*faire poudrette.*" M. Jacque* insists that when the run is small it should be turned over every month, especially during the summer, to prevent unhealthy smells from the excretions. Not only this, but grain should be sown, so that the decomposing dung may be utilised, and the fowls have an opportunity of scratching up a dainty in the shape of germinating corn, of which they are excessively fond. He even goes so far as to recommend that corners of the run should be temporarily fenced off for this purpose and used in rotation.

The interior of the fowl-house requires equal care. Its floor should always be above the level of the surrounding land, and it should be scrupulously cleaned out every morning. If the floor is of any porous material, such as sand, it should be completely removed and renewed at least every three months. Of course, if the fowl-house is movable this can be best done by altering its locality. Disinfectants should be used liberally, plenty of air without draughts should be given, warmth in winter should be ensured by means of straw often renewed, and

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* 'Le Poulailler.'

in fact as much care should be taken of the health and comfort of poultry as of human beings.

Mr. Sutherland gives the following account of poultry-keeping in France in his Report to the Royal Commission on Agriculture :—

"The chief breeds of poultry are the Houdan, La Flèche, La Bresse, and Crève-cœur. It is a commonly received idea in England that there exist in France huge poultry farms, where fowls are kept by several hundreds, and it has been over and over again urged on English farmers to adopt this poultry-farming on a gigantic scale as some sort of means of alleviating the present depression, and enabling them to make money. A long acquaintance with the chief French poultry-breeding districts, as well as answers to inquiries I have from time to time made on the subject, enable me positively to deny the existence of such establishments. The greatest number of heads of poultry that can be kept profitably on a single farm varies from 200 to 300. If a greater number than this is kept the ground becomes poisoned, and it is found impossible to rear chickens. Whenever large poultry farms have heen started in England, as for instance at Bromley, in Kent, they have failed, and chiefly owing to the above reason, a reason perfectly well known to and understood by all practical poultry keepers. The manner in which so many fowls are reared and eggs produced in France is as follows, independently, of course, of climatic influences, which must be held to be of some little account :—Every peasant proprietor, every *bordier*, with perhaps two or three acres of land, keeps fowls, the produce from which is collected by dealers, who scour the country. In this way a very large number of fowls in the aggregate is kept, but they are scattered about all over the country, and so well is the necessity for change of ground understood in the districts where poultry raising is a special industry, that great sacrifices are made by the breeders to secure fresh ground on which to rear their chickens.

"At Houdan, in the Seine-et-Oise, which I visited on the 26th of March, 1880, the poultry-breeding industry may be seen in full force. Houdan fowls alone are kept, and it is calculated that the pullets, when well fed, will commence to lay at five months old. Artificial incubation is not generally practised, but it is considered that it will come into use as soon as the means for hatching a larger proportion of the eggs can be discovered. At present it is found, in the case of incubators, that the embryo is very apt to perish on the 18th or 19th day. The majority of breeders adopt the plan of placing twenty-five fowls' eggs under a young turkey hen. When it is desired that the turkey hen shall commence to sit, be it January or June, she is placed in a suitable box almost entirely covered by a board, and some dummy eggs are put under her. She is generally kept in the dark. She soon takes to the dummy eggs, which are then removed, and twenty-five fowls' eggs are placed beneath her. She is taken off the eggs once a day to feed, and carefully replaced, not on the eggs but in front of them, and she then, after the manner of turkeys, carefully hooks them underneath her with her beak. When the chicks (*poussins*) are hatched they are removed from under her, to be either sold or sent off at once, or to be brought up by another turkey hen, which is perhaps an indifferent sitter, and which, in lieu of sitting, has from 80 to 100 chicks given her to bring up. Orders are kept on hand for these *poussins*, which, within twelve hours of being hatched, are despatched all over France in well-ventilated boxes holding from twelve to twenty each, and at the following prices, viz.: one dozen, 12*s.*; 25, 22*s.* 5*d.*; 50, 44*s.*; 100, 80*s.* The hen turkey which hatched out the chicks is then provided with twenty-five more eggs, upon which she at once sits, and this process I was assured is carried on six, seven, and eight times in succession. Young turkey hens are preferred to old birds for the purpose. Such a thing as a coop is rarely to be seen. In the morning, as soon as it is light, the doors of the sheds, in which the young chicks with their foster-mothers—the indifferently sitting turkey hens—have passed the night, are thrown open. The inmates are driven out mostly by old women with long poles, who conduct the whole lot gently into some covert, or along the country lanes, where the chicks can find plenty of insect life, the old ladies sitting with their work and keeping careful watch over their charges. The food consists chiefly of barley-meal and buckwheat meal for the chickens that are being fattened, and sometimes mechanical contrivances are adopted for administering it. Such a machine on a large scale may be seen at work at the Jardin d'Acclimatation in Paris. At thirteen weeks old the chickens are sold fat and alive in the Houdan market to the Paris merchants, who live in the neighbourhood of Houdan, and who kill and forward them to Paris. At the time of my visit (March) they averaged 2½ kilos (5½ lbs.) at four months old, and the market price for such a fowl at Houdan was 8½ francs (6*s.* 9*d.*), and at Paris 12 francs (9*s.* 7*d.*) Twenty francs (16*s.*) are sometimes obtainable in Paris for a veritable *poularde du Mans*. From the profit of the Paris merchant, however, it is calculated that at least 20 per cent. must be deducted for the expenses of freight, Paris *octroi* (3*d.* for each 2 lbs.), salesman, storing, &c. In April the price at Houdan is as high as 10 francs (8*s.*). After that and through the summer the price descends to 5½ francs (4*s.* 5*d.*).

"When fowls are kept in store condition their food consists of oats, barley, and buckwheat, with bran given in the form of bran mash, pollards and middlings being sometimes added. In many cases ducks are kept entirely on wheaten bran and water. It may be useful to English poultry breeders to know that scalded bran in winter given to fowls is a cheap way of increasing the animal heat, and materially increases the production of eggs. In Poitou, where no special attention is given to poultry raising, it is customary to feed the young ducks and geese on boiled nettles, as well as on the young leaves of the elm and the lime, mixed with curds, the nettle being often specially cultivated for the purpose.

"Hardly a *menu* in Paris is complete without the word *chapon*. Whilst a great many real capons find their way to Paris, it is certain that a large proportion of so-called capons are merely cockerels which have not been operated on. However, there is no doubt that the operation is much practised, as it is found that capons fatten more rapidly than cockerels. The operation is performed mostly by unskilled and self-taught peasant women—female fingers being smaller and better suited for such delicate work—and a very small proportion of the birds is lost. At the same time it is not an operation which should be attempted without practical instruction from an experienced person. Full details of the French system of caponising are given in Tegetmeier's 'Poultry Book,' and an American, calling himself 'Farmer Miles,' has lately been given instruction in the operation in England. Capons are sometimes used for bringing up young chickens.

"Duclair ducks having attracted some attention in England, and being thought by some persons to be a distinct variety, it may be as well to mention that, while they have a great reputation for early laying and early maturing, they have all the appearance of bad Rouens, with which variety they evidently have close affinity. Their colour is a black brown with white breasts, the drakes having green beaks and the ducks black. They breed tolerably true to feather, but are apt to throw white flights, which are not admissible.

"In the coloured atlas, entitled 'La France Agricole,' by M. Gustave Heuzé, the following numbers are given for the whole of France,* viz. :—

Fowls	42,856,790
Geese	3,881,557
Turkeys	1,760,506
Ducks	3,610,841

"The best book on French fowls is by M. C. Jacque, and is

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* These numbers are taken from the last published Agricultural Census of France.—H. M. J.

called 'Le Poulailler.' There is also another good work on the subject by Mdlle. Millet-Robinet. In the special official report of the National Society of Agriculture for 1879 it is stated that 'the raising of fowls has made great progress. The poultry yard, a mere accessory before 1861, has become an important factor in many of the farms during the last few years.'

"The following particulars of a poultry yard near Angers, attached to the Château de Varennes, belonging to an English gentleman famed for his kindness and hospitality, may not be without interest. The yard is a gravel yard 50 × 35 yards, faces south, and is a veritable sun-trap. The poultry are kept specially for the use of the château, and are all crossbred French and English. The stock consists of about 180 laying hens and 12 cocks, with perhaps 20 ducks and 10 turkeys in addition. In 1879, 13,341 eggs were laid,* while 40 adult cocks and hens, 97 ducks, 25 turkeys, and 171 chickens were killed for the table. The yard has the great disadvantage of having no grass run attached to it, but it is re-gravelled three times a year. It has been in use for three years. The food for the poultry is simply unlimited wheaten bran, mixed with kitchen water. The fatting fowls have in addition oats, buckwheat meal, and middlings. The whole is under the management of a capital Scotchwoman, and the results seem to speak for themselves."

In his well-known 'Poultry book' † Mr. Tegetmeier thus transcribes, from a report by Mr. Geyelin, the way in which turkeys are taught to hatch fowls' eggs:—"At any time of the year, turkeys, whether broody or not, are taught to hatch in the following manner: Some addled eggs are emptied, then filled with plaster of Paris, then placed into a nest; after which a turkey is fetched from the yard and placed on the eggs, and covered over with lattice. For the first forty-eight hours she will endeavour to get out of her confinement, but soon becomes reconciled to it, when fresh eggs are substituted for those of plaster of Paris: the hens will continue to hatch, without intermission, from three to six months, and even longer; the chickens being withdrawn as soon as hatched, and fresh eggs substituted. After the third day the eggs are examined, and the clear eggs withdrawn, which are then sold in the market for new-laid; but as they may be soiled or discoloured from having been sat upon, they clean them with water and silver sand to restore their original whiteness. The turkeys are taken off their nest once a day to feed and to remove their

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* An average of 74 per laying hen.—H. M. J.

† Published by Routledge and Sons, and illustrated by Harrison Weir.

excrements from the nest, but after a while they cease self-feeding, when it is necessary to cram them, and to give them some water once a day."

Mr. Tegetmeier's book contains a great amount of valuable information on poultry-keeping in France, and especially with regard to the characteristics of the chief breeds and the preparation of poultry for the table; but on these points I must refer the amateur to the book itself.

The following statement from my Report on the North of France to the Royal Commission on Agriculture is fairly indicative of the manner in which the capons and poulards are fed in the district of Le Mans:—

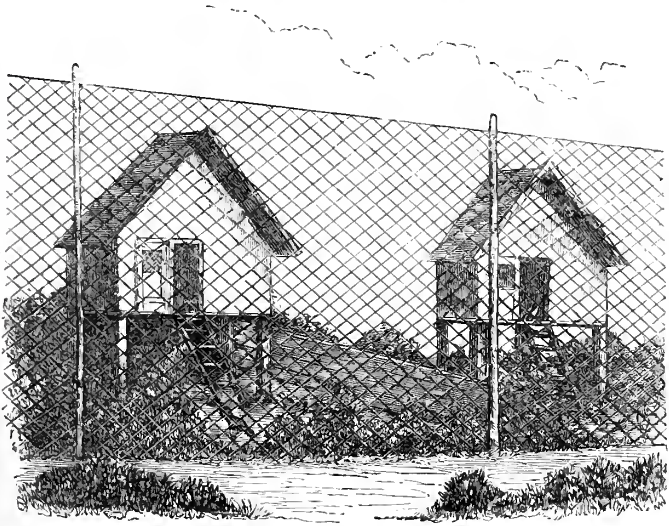
"The breed of poultry called La Flèche is considered by many competent judges the very best for the table; it is said that a fat capon will weigh up to 13 lbs., and a 'poularde' up to 9 lbs., at the age of eight months. Fattening commences when the birds are four to five months old; they are kept in a dark place, but are fed in the light twice a day, early in the morning and again in the afternoon. The food consists of a thick paste made into a bolus, about 2½ inches long and about a third of an inch in diameter, and composed of buckwheat-meal one-half, barley one-third, and oats one-sixth. Before being given this food the fowls have a little water or milk, and then manage to take a dozen or more of these boluses. One person can cram from 80 to 100 fowls in a day, and the fattening process occupies about six weeks."

Every one who has visited the annual "Concours d'animaux Gras" at Paris must have been struck at the display of dead poultry. In previous papers I have enlarged upon the clever manner in which French people turn their products to the best advantage, and they are encouraged to exhibit the results of their skill by the offer of prizes by the Government at the various "Concours." It ought to be worth consideration by the Smithfield Club whether a small sum offered as Prizes for the best trussed specimens of Poultry would not be a departure from ordinary practice that would be justified by its success. In the meantime I ought to mention that Mr. Tegetmeier has of late years devoted much attention to the subject of "table fowls" in England, and by his lectures and writings has done a great deal to instruct poultry-keepers about it.

I have thus described a well-known establishment where poultry of pure breeds and fancy strains are bred and reared for sale to amateurs:—

"The very remarkable poultry establishment of M. Lemoine, at Crosne, near Montgeron, deserves more than a passing notice, considering the increasing importance which attaches to poultry-farming in England. No less than twenty-six different breeds of poultry are kept, quite distinct, each in a kind of paddock of its own, surrounded by wire fencing, and containing a square grass-plot with a gravel walk surrounding it, and a border containing flowers on the other side of the gravel walk, while on the grass plot there are a few young trees, both conifers and deciduous. The young chicken also have access to a large lawn and to a wood which surrounds it; there are plenty of shrubs and flowers round about, and M. Lemoine thinks that variety of circumstances is essential to the proper rearing of chicken, so that they may be able to choose their own resorts. The chicken are further allowed to eat as much as they like and when they like, but the hens are fed twice a day. Variety in the composition of the food is held to be necessary to early maturity, successful production of eggs, and easy fattening. The food given consists of a mixture in equal parts of wheat, oats, barley, maize, and buckwheat bruised together. For the chicken it is given in the form of pudding, but to the breeding fowls it is given as crushed grain.

Fig. 1—*View of Fowl-houses at Crosne.*



"The preceding view, which I have borrowed from M. Lemoine's little book, 'Elevage des Animaux de Basse-cour,' published by Masson, Paris, gives a fair idea of the fowl-houses and their little parks at Crosne. It will be noticed that the houses are on poles about a yard above the ground; their floors are strewn with ashes. M. Lemoine considers that several matters are essential to the successful rearing of poultry. Cleanliness is the first, dryness in every way is also very important; light and ventilation, not neglecting warmth, are also necessary.

"The fowl-houses are cleaned out twice a week, and the turf in the little paddocks, as well as the gravel-walks, are renewed every other year to prevent them from becoming sodden with excretions and from giving rise to emanations. The Houdan is considered by M. Lemoine to be the best breed in every respect, except that the hens are bad mothers; therefore Cochin China hens are kept to sit on Houdan eggs. Each breed, however, has its special excellencies and defects, and requires special treatment. La Flèche is the breed which is said to fatten most easily, but Houdan chicken can be fattened for the market at three to four months old. M. Lemoine exhibits largely, and has won an immense number of prizes both for his fowls and his method of housing and managing them."

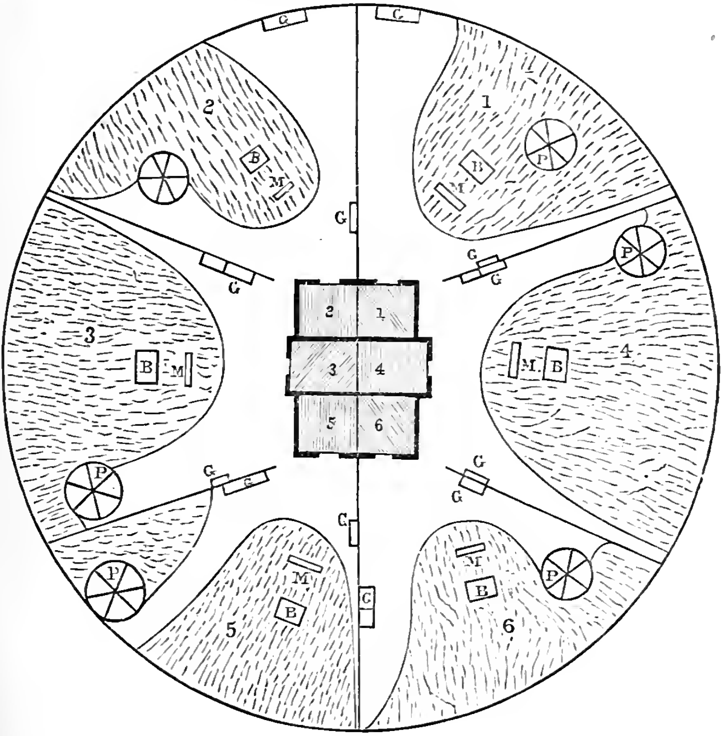
In the notice of his home farm prepared for the 'Concours Regional of 1868,' the Marquis d'Havrincourt gives the following brief account of his poultry-keeping:—

"I am extremely fond of this part of the farming, which is *so often neglected* in the north (of France); but as I cannot make it a speciality I am obliged to confine myself to the breeds which are the most profitable and the most hardy. The breeds which I keep, then, are the Houdan, la Flèche, the Dorking, la Caussade, Hergnies, as well as various crosses between them. The beautiful Crèvecœur does not succeed here, because, owing to the dust, their crest becomes charged with earth, and destroys their eyes. Ordinarily, as on all farms, the poultry are in the farmyard, on the manure-heap and the roadways, and under the sheds, as well as, in my case, under the small special shelters for them which I have constructed over sandy places, and where they can retire at any time. In these they always find open troughs full of water, and covered ones which are used for their food.

"Immediately after harvest I shut up the ordinary fowl-house, and bring close to it a travelling one. The fowls roost in the latter, and the following morning they and their habitation are transported to the fields in charge of a woman, being brought back again in the evening. The number of eggs rapidly increases, and as a rule soon becomes doubled. The fowls find in the fields corn, green food, and insects, and become extraordinarily healthy. Sometimes I send them also into the fields which are being ploughed, and there they eat the larvæ and worms in the newly turned-up furrows. In the evening they return to their vehicle, as if it were their ordinary fowl-house. They always lay in it and never go far off.

"For breeding purposes the fowls are put to lay in a special establishment constructed outside the farmyard, of which the following is a plan :—

Fig. 2—*Plan of Poultry-runs at Havrincourt.*



"I have thus six small fowl-houses placed back to back and forming the centre of the small separated runs which surround them, and which communicate with one another by doors situated at the points of contact between the fences and the fowl-houses. The greater the area which can be given to these runs the more fitted they are for their purpose. It will be understood at once how economical such an arrangement is with regard to feeding, cleaning, &c. The entire establishment is surrounded by a paling about 8 feet high, there being approximately 1½ inches between the laths, but duplicated to the height of 16 inches, so as not to allow the young chicks to get through. The palings between the runs are similarly constructed. Each building is surrounded by open ground and by walks which have been excavated to the depth of 10 inches, and afterwards filled in with coal-cinders covered with sand. The cinders facilitate the drainage of the water, dry the plots of land, and enable the fowls to avoid the dust which is so pernicious to them. The remainder of each run is laid down in grass sheltered by shrubs.

"The 'furniture' of each run consists of the following: *—

"(1.) A breeding cage, having a zinc roof, and comprising two divisions separated by bars or wires. The hen with its brood is put in one of the compartments, but the chicken can pass through the spaces into the other, above which is a large pane of glass or window, which keeps the chicken warm while there, as well as if they were under the hen. Each compartment has its door, which also is furnished with a small grating, in which, at night and in cold weather, a pane of glass can be slipped. At first the cage is kept shut, because young chicken are required to be kept warm, while they can obtain air through the little grated windows. Afterwards the door of one of the compartments can be opened, so that the chicken may go in and out. Several of these breeding cages may be put in one run, provided that the hens cannot get out to fight one another, or to kill the chicken belonging to the occupant of another cage.

"(2.) A stone trough (B) contains pure water, but inclined in such a manner that the chicken cannot drown themselves.

"(3.) A corn-bin (G), with a cover in the form of a roof to preserve the grain from the rain, and prevent the fowls from making it dirty.

"(4.) A small trough (M), in solid stone, sunk in the earth, to receive the steeped bran and cooked food which would rot the bin G.

"(5.) An umbrella-shaped shelter (P) to the fowls against the rain and the sun, which enables them always to find a place where they can '*faire poudrette*.' It is understood that this is the '*toilette*' of fowls, and that it is with the dust which they disperse over their bodies, and which they shake off directly afterwards, that they free themselves from the little insects which annoy them.

"The fowl-houses and annexed runs are chiefly used in the

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* I have somewhat abbreviated the original descriptions.—H. M. J.

spring. In each compartment I place a cock and six hens of the same breed, chosen as the best specimens in my yard. The eggs of these hens I have hatched in order to preserve the pure breeds, only that I take care not to use for this purpose eggs that have been laid until after an interval of at least six weeks after the separation of the breeds; because the breeds are all mixed in the farmyard, and the influence of the male remains at least six weeks. Similarly I take care to cut one wing of each fowl to prevent its flying over the paling."

The Marquis finds this arrangement equally serviceable for rearing and for breeding, as all the chicken are well under control, and can be kept separate according to age, or breed, or any other category required. Later in the year he also uses it for fattening ducks, geese, and turkeys, which are rarely confined entirely, as fowls generally are for that purpose. He adds that the great difficulty in his district has been to find servants who understand the rearing, and especially the fattening, of poultry. In fact, he states emphatically, "*Ce type n'y existe plus.*" Consequently he engaged a woman from the district of Bresse, who has produced on his farm the true "*poulardes*" of her own country. To blanch their flesh after they have been killed, her practice has been to wrap them in linen very tightly sewn, and then to soak them for ten or twelve hours in weak milk and water.

I should add that when I visited the Marquis d'Havrincourt in 1878, I found that his system of poultry-keeping was remarkably successful, and quite worthy of any eulogy that he had claimed for it.

The following quotation from my Report on Denmark to the Royal Commission on Agriculture, illustrates in a somewhat different fashion the same principle that the habitation of fowls must be systematically changed ; and it may be further regarded as a favourable example of the manner in which poultry-keeping might be profitably extended in this country. There are many thousands of acres under wood and underwood where a large stock of poultry might be usefully as well as profitably kept, if once the cardinal and essential principles of the business were thoroughly grasped by the managing mind. But without such a clear idea being inculcated into the person in authority, if not previously possessed by him, it need scarcely be said that any attempt to increase the rental of woodlands by poultry-keeping would end in disaster. Still, a perusal of the following extract will show how simple is the process when once it is understood, and how successful it has been in the instance mentioned.

"At the present time the attention of English farmers is being strongly directed to the necessity of adding the culture of fruit and vegetables and the breeding and feeding of poultry to their ordinary farm-practices. Therefore it may be worth while to give a brief account of an estate near Svendborg, in the south of Fyen, where these matters are at least as important as the production of corn and milk. The farm itself consists of 200 acres of land cropped in the usual manner, but there is a considerable extent of woodland all round it belonging to the same owner, a Mr. Weber, who was formerly a large merchant. Much of the forest land has been converted into orchard during the last eleven years. To enable this to be done a licence had to be procured, setting forth precisely what areas may be disafforested in any year and under what conditions. After the land is cleared, large fruit-trees, such as apples, pears, plums, and cherries, are planted 25 feet apart, the intervening spaces being used for bush-fruit, nursery-ground, &c. As the trees and bushes grow, the alternate rows of bush-fruit and the nursery plants are removed; and after a further interval it becomes necessary to take away the remaining bush-fruit. The earliest planted orchards are now in this condition, therefore it is not yet possible to give any definite statement as to the financial results of the experiments, if planting for profit on so large a scale can be thus designated. It may, however, be said that Mr. Weber is quite satisfied with the results which have been already obtained, and that he is making more new orchards, as he can obtain the licenses to do so. Most of the fruit goes to Copenhagen, where it is sold at remunerative prices; but it is hoped soon to find a better market for apples and pears in London. The climate of even this part of Denmark is too late to enable fruit-growers there to compete with French or even English growers of soft fruit on the London market. The winter of 1879–80 destroyed a large number of apple-trees in this district, chiefly of French sorts, just as it did in France, but this calamity is looked upon as quite exceptional.

"The poultry-keeping is, however, the most remarkable feature of this establishment. There are 20 breeds kept, and the total number of fowls is 600. Of these, 300 are laying-hens, 200 pullets and chicken, and 100 cocks and cockerels. Not more than 50 to 60 cocks are in use at one time, the system being to put one cock to five or six hens. Of the twenty breeds kept, Spanish, Houdan, Crèvecœur, and most English breeds are preferred, but Dorkings and the Asiatic breeds will not stand the snow, as it affects their feet. The average number of eggs is 2000 per month, making a total average of 80 per hen per annum.

"Each breed has a house with a separately fenced-off run laid out as a garden and plantation, on the French system, with paths, grass, deciduous and evergreen shrubs; and in addition, from August to February, which is out of the breeding season, all the fowls have the run of the orchards and forests except when the weather is too inclement. Although there are but 20 breeds kept, there are 24 separate houses and separately fenced-off runs, so that there are always four being renovated and disinfected. The earth of the runs is dug up twice a year and sown with grass-seeds or buckwheat, not for the sake of the crop but as a means of keeping the land disinfected. The sitting hens have a separate establishment, consisting of a circular building with an entrance-passage and a central lobby, from which access is had to six separate compartments, each containing a dozen nests. There are in this building the necessary adjuncts to such an establishment, including particularly a spacious infirmary, where any diseased fowls may be treated, and also separated from the rest. Gapes seldom occur, but an ophthalmic disease is rather troublesome. All the houses are kept sweet and clean by the plentiful use of lime as a whitewash, carbolic acid being also used largely as a disinfectant.

"The food is given twice a day, and when the fowls are in the orchards and forests the blast of a trumpet at the regular hours rapidly brings them together. Barley, oats, maize, and buckwheat, mixed together in various ways, are chiefly used as food; but the mixture is changed every three months, as by this means the number of eggs laid is found to increase. During moulting, horseflesh is also given.

"No turkeys are kept to sit on the eggs, as is so generally the case in France, but an incubator is used as an adjunct to the hens, some eggs being partially hatched in it before they are put under bad sitters. Mr. Weber is so well satisfied with the success of his poultry-farm, which has now been established four years, that he intends making others at separate places in the centre of new orchards in connection with the dwellings of the under-bailiffs."

The following sketch of another type of continental poultry-keeping is very interesting from several points of view, especially on account of the means adopted for hatching eggs, the curiously low prices of the eggs, fowls, and food, and the care with which the accounts have been kept, to say nothing of the remarkable results which have been inferred from the figures. All these matters can be easily discounted by practical poultry-keepers in England, and I reproduce the following very abbreviated statement on account of the lessons which it contains, without in the least concealing the differences in circumstances which render their applicability to this country a matter of some difficulty.

The account to which I have just referred was written by Mrs. Ida Bergell, who gave the financial results of her experience of poultry-keeping during five consecutive years in the 'Landwirthschaftliche Jahrbücher' for 1882. She has no model farm, and has not kept fancy-birds, her fowls having been originally of the native breed, but subsequently crossed with the Cochin-china.

Mrs. Bergell recognises the division of poultry into three classes, namely, (1) laying fowls, (2) rearing fowls, and (3) meat-making fowls. She regards the ordinary domestic fowl of the country as being surpassed, in the third category, only by the French breeds of Crèvecour, Houdan, and La Flèche; however, in her opinion, it stands in the first rank, and is followed by the Cochin-china. This last-named breed, however, has the reputation of being good sitters, and as this was the unique fault of the country breed, she thought that by crossing the two she would achieve a decided success.

This experiment did not succeed, because the Cochin-china breed could not stand the cold Mecklenburg climate. A more profitable attempt was made with Spanish and Italian fowls, the inconvenience arising from their disinclination to sit being overcome by a contract being made with the villagers, whereby each household must annually allow their broody hens to sit upon the eggs delivered to them for that purpose. Payment was made for each chicken hatched at 1*d.* per head, and for each duckling at the rate of nearly 1¼*d.* In this way the wives of the labourers obtained a small income, and Mrs. Bergell a considerable stock of young poultry. The only drawback was that the crosses ultimately adopted did not weigh more than from 5 to 6 lbs. per bird when fattened, while the Cochin-china crosses weighed generally from 8 to 10 lbs. when ready for the market. The fowls were fed twice a day with a mixture consisting of maize, and the tailings of wheat, oats, barley, &c.; while during the day they picked up their living in the manner to which they seem born.

The details, as regards the fowls, are given in the following Tables (pages 203 to 205).

From Table I. it appears that the average value of the stock of poultry was 9*l.* 12*s.* 10*d.* per annum, and from Table II. that the average profit during the five years was 5*l.* 14*s.* 4*d.* per annum. But then only 15*s.* a-year is charged for a girl's

TABLE I.—INVENTORY from MARCH 1st, 1875 to MARCH, 1880.

Year.	Number.	Kind.	Value per Head.	Total Value.	
			s. d.	£ s. d.	
1875	40	Ducks	2 0	4 0 0	
	7	Drakes	2 3	0 15 9	
	14	Cocks	1 0	0 14 0	
	66	Hens	1 0	3 6 0	
	50	Pigeons	..	0 15 0	
					9 10 9
1876	26	Ducks	2 0	2 12 0	
	12	Drakes	2 3	1 7 0	
	12	Cocks	1 0	0 12 0	
	91	Hens	1 0	4 11 0	
	10	Hens	1 6	0 15 0	
	50	Pigeons	..	0 15 0	
					10 12 0
1877	21	Ducks	2 3	2 7 3	
	6	Drakes	2 3	0 13 6	
	48	Hens	1 0	2 8 0	
	7	Hens	1 6	0 10 6	
	9	Cocks	1 0	0 9 0	
	70	Pigeons	..	1 0 0	
					7 8 3
1878	32	Ducks	2 0	3 4 0	
	8	Drakes	2 3	0 18 0	
	64	Hens	1 0	3 4 0	
	7	Hens	1 6	0 10 6	
	2	Cocks	1 0	0 2 0	
	7	Cocks (Half-bred Cochin-china	2 0	0 14 0	
	3	Cocks (Cochin-china)	3 0	0 9 0	
	80	Pigeons	..	1 5 0	
					10 6 6
1879	26	Ducks	2 0	2 12 0	
	8	Drakes	2 3	0 18 0	
	66	Hens	1 0	3 6 0	
	7	Hens	1 6	0 10 6	
	20	Cocks	1 6	1 10 0	
	100	Pigeons	..	1 10 0	
					10 6 0
		Grand Total			48 4 0
		Average			9 12 10
1880	34	Ducks	2 0	3 8 0	
	9	Drakes	2 3	1 0 3	
	33	Hens	1 0	1 13 0	
	7	Hens	1 6	0 10 6	
	8	Cocks	1 3	0 10 0	
	1	Swan	6 0	0 6 0	
	120	Pigeons	..	1 15 0	
					9 2 9

TABLE II.—RECEIPTS and EXPENDITURE connected with the POULTRY-YARD, from 1875–76 to 1879–80 inclusive.

RECEIPTS.	£	s.	d.	£	s.	d.
1875–76—For eggs and birds	19	2	6			
,, Increase of Inventory (Table I.)	1	1	3			
,, 2 lbs. Ducks' feathers, at 3s. ..	0	6	0			
Total Receipts	20	9	9			
Expenditure	15	2	9	5	7	0
1876–77—For eggs and birds	19	8	9½			
,, 2 lbs. Ducks' feathers, at 3s. ..	0	6	0			
Total Receipts	19	14	9½			
Expenditure	15	12	5½	4	2	4
1877–78—For eggs and birds	16	18	3½			
,, Increase of Inventory (Table I.)	2	18	3			
,, 2 lbs. Ducks' feathers, at 3s. ..	0	6	0			
Total Receipts	20	2	6½			
Expenditure	11	17	6½	8	5	0
1878–79—For eggs and birds	21	1	7			
,, 3 lbs. Ducks' feathers, at 3s. ..	0	9	0			
Total Receipts	21	10	7			
Expenditure	14	16	9	6	13	10
1879–80—For eggs and birds	16	13	9			
,, 4 lbs. Ducks' feathers, at 3s. ..	0	12	0			
Total Receipts	17	5	9			
Expenditure	13	2	2			
				4	3	7
Total Profit				28	11	9

EXPENDITURE.	£	s.	d.
1875–76—For food, hatching, &c.	14	7	9
,, girl's wages	0	15	0
	15	2	9
1876–77—For food, hatching, &c.	11	13	8½
,, depreciation of inventory	3	3	9
,, girl's wages	0	15	0
	15	12	5½
1877–78—For food, hatching, &c.	11	2	6½
,, girl's wages	0	15	0
	11	17	6½
1878–79—For food, hatching, &c.	14	1	9
,, girl's wages	0	15	0
	14	16	9
1879–80—For food, hatching, &c.	11	3	5
,, depreciation of inventory	1	3	9
,, girl's wages	0	15	0
	13	2	2
SUMMARY.			
Total Receipts	99	3	5
Total Expenditure	70	11	8
Total Profit	28	11	9
Average Receipts	19	16	8
Average Expenditure	14	2	4
Average Profit	5	14	4

TABLE III.—PRODUCE of HENS in EGGS and CHICKEN in each YEAR, from 1875 to 1879 inclusive.

Year.	EGGS.					CHICKEN.	
	Number of Hens.	Total Eggs.	Total Value.	Eggs per Hen.	Value per Hen.	Sold and Used.	Value.
			£ s. d.		s. d.		£ s. d.
1875	66	4,148	7 19 4	62·85	2 5½	28 Cocks and Hens	0 19 3
1876	101	4,291	8 4 4	42·48	1 6¾	95 do.	2 7 7½
1877	55	2,993	6 7 8	54·41	2 4¼	25 do.	1 5 6
1878	71	3,811	6 7 4	53·67	1 9	17 do.	0 16 6
1879	73	2,591	5 0 10	35·50	1 5	62 do.	2 6 6
Total of 5 years ..	366	17,834	33 19 6			227	7 15 4½
Average per annum	73	3,566⅘	6 15 11	48·85	1 11	45⅖	1 11 1

	£ s. d.	
Average Total:—Eggs	6 15 11	Average price of an egg, about ½*d.*
Chicken	1 11 1	Average price of a chicken, about 8*d.*
	8 7 0	

wages to feed and otherwise look after the poultry, collect their eggs, &c., although the average number kept was 86 fowls, 37 ducks, &c., and 70 pigeons. Of course it must be borne in mind that prices in Mecklenburg are very different from what they are in England; but it is curious to find so accomplished and accurate a bookkeeper as Mrs. Bergell calculating the profit on the basis of Table II. alone. She rejoices in calculating that the average net profit of the five years was 59·31 per cent. of the value of the stock (namely, 56·57 in 1875–6, 38·84 in 1876–77, 111·29 in 1877–78, 64·80 in 1878–79, and 40·49 in 1879–80), and so, no doubt, it was, as an accessory for the utilisation of things and time that would otherwise have been wasted. But it would be a lamentable mistake to infer that if she increased her stock indefinitely on the same land, her profits would continue as great in proportion to the capital employed.

Table III. (p. 205) shows that the average number of eggs obtained from each hen was under 50, and that the price obtained for them was only about ½*d.* each, while that received for chicken was not more than 8*d.* On the other hand, the price of the corn given them, nearly half a bushel per hen (exactly 17½ litres), is given at only 1*s.* 3*d.* per annum.

VII.—*Diagrams showing the Fluctuations in the recorded Weekly Average Prices of Wheat from* 1863–1882 *inclusive.* By HENRY ALLNUTT, 3, Holland Road, Kensington.

THE following Diagrams showing the fluctuations in the weekly imperial average price of wheat per quarter, in each year from 1865 to 1882, have been prepared differently from those which were compiled in previous years for this 'Journal,' and which do not give a correct idea of the amount of the fluctuations; the intervals between the dots (ascending or descending) in those diagrams were of uncertain value, the distances being solely influenced by the number of quotations in the prices.*

In the diagrams drawn by me for the subsequent years, 1865 to 1882, inclusive, the intervals between the horizontal lines are all of equal value, viz. 4*d.* Thus, if the rise in the price in the week has been 6*d.*, it is shown by a space and a half; or, if the fall has been 2*s.*, the drop from one dot to the other equals six lines or spaces. Thus the fluctuations are drawn in proportion to the amount of the rise or fall.

The figures on each side of the diagrams are shillings, and

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* See the Journals of the Society for the years 1856 to 1865 inclusive.

if it is desired to know the price at any one of the dots, it can be easily seen by means of its position on or between the lines. Each of the diagrams for 1865 to 1882 includes the last week in each preceding year; and the first week in the year in advance is also given. These outside dots form a key, by means of which the series of diagrams could be mounted on paper to follow each other in an extended form, in which case a panorama would be given, showing the weekly fluctuations for many years.

The annual average for each year is shown by a black line across each diagram.

A diagram is also given showing the annual average price of wheat from 1864 to 1882 inclusive.

The averages for the past four years have been very near each other—1879, 43*s.* 10*d.*; 1880, 44*s.* 4*d.*; 1881, 45*s.* 4*d.*, and 1882, 45*s.* 1*d.*

The average for the past 25 years was 50*s.* 1*d.*

The greatest extreme or range of fluctuation was 25*s.* 2*d.* in 1868, and the smallest 6*s.* 3*d.* in 1864.

The highest annual average in the past 25 years was 64*s.* 5*d.* in 1867, and the lowest 43*s.* 3*d.* in 1864.

The highest weekly average was 74*s.* 7*d.* on 9th of May, 1868, and the lowest weekly average 37*s.* 7*d.* on the 22nd of February, 1879; that of the 24th of December, 1864, was very close to the former, being 37*s.* 10*d.*

TABLE showing in what MONTHS in the past TWENTY-FIVE YEARS the PRICE of WHEAT has been HIGHEST and LOWEST.

Months.	Highest Price.	Number of Years.	Lowest Price.	Number of Years.
January	1858-62-63	3	1859-65-71	3
February	1874	1	1860-70-76-77-79-81	6
March	,,	..	1867-75	2
April	1880	1	1866-72-73	3
May	1859-68-77-78	4	..	..
June	1871	1	..	..
July	,,	..	1861	1
August	1864-69-70-72-75-82	6	..	..
September	1860-73-81	3	1880	1
October	1867	1	1863-78-82	3
November	1879	1	1874	1
December	1861-65-66-76	4	1858-62-64-68-69	5
	Years	25	Years	25

Highest Price.—During the past 25 years wheat has been at its highest price for six years in the month of August; four years each in May and December; three years each in January and September; one year each in February, April, June, October, and November; and the prices never have been highest in March or July.

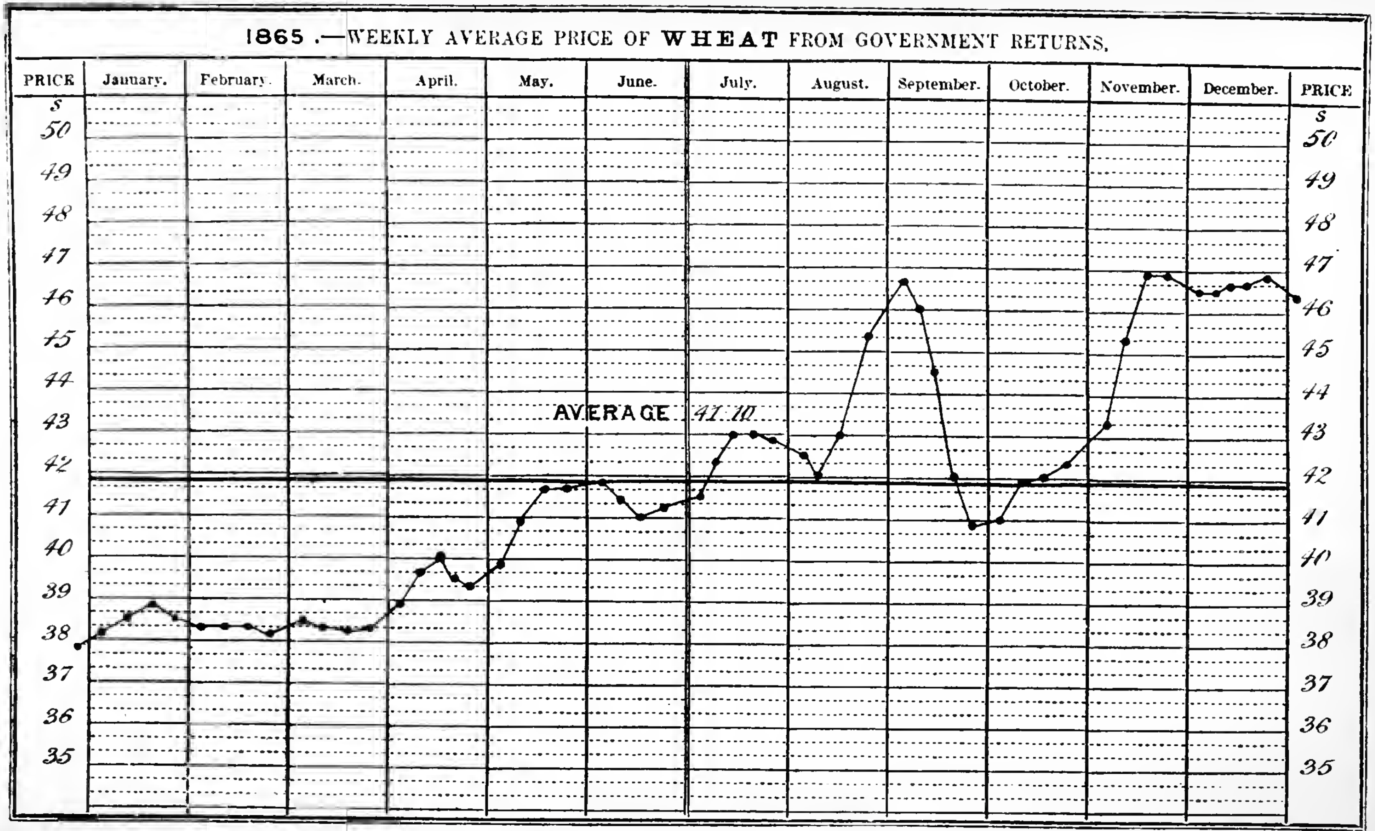
Lowest Price.—During the past 25 years, it has for six years been lowest in February, five years in December, three years each in January, April, and October, two years in March, and one year each in July, September, and November, and lastly, it has never been at its lowest price in May, June, or August.

The imports in the present diagrams are shown in *cwts.* instead of *quarters* as previously, in consequence of corn having been entered by *weight* instead of *measure* since September, 1864. 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, $485\frac{1}{3}$ lbs., or $4\frac{1}{3}$ cwts.; for barley, 400 lbs., or $3\frac{4}{7}$ cwts.; for oats, 308 lbs., or $2\frac{3}{4}$ cwts.

TABLES *showing* AVERAGE PRICE *of* WHEAT *from Government Returns*, 1865 *to* 1882.

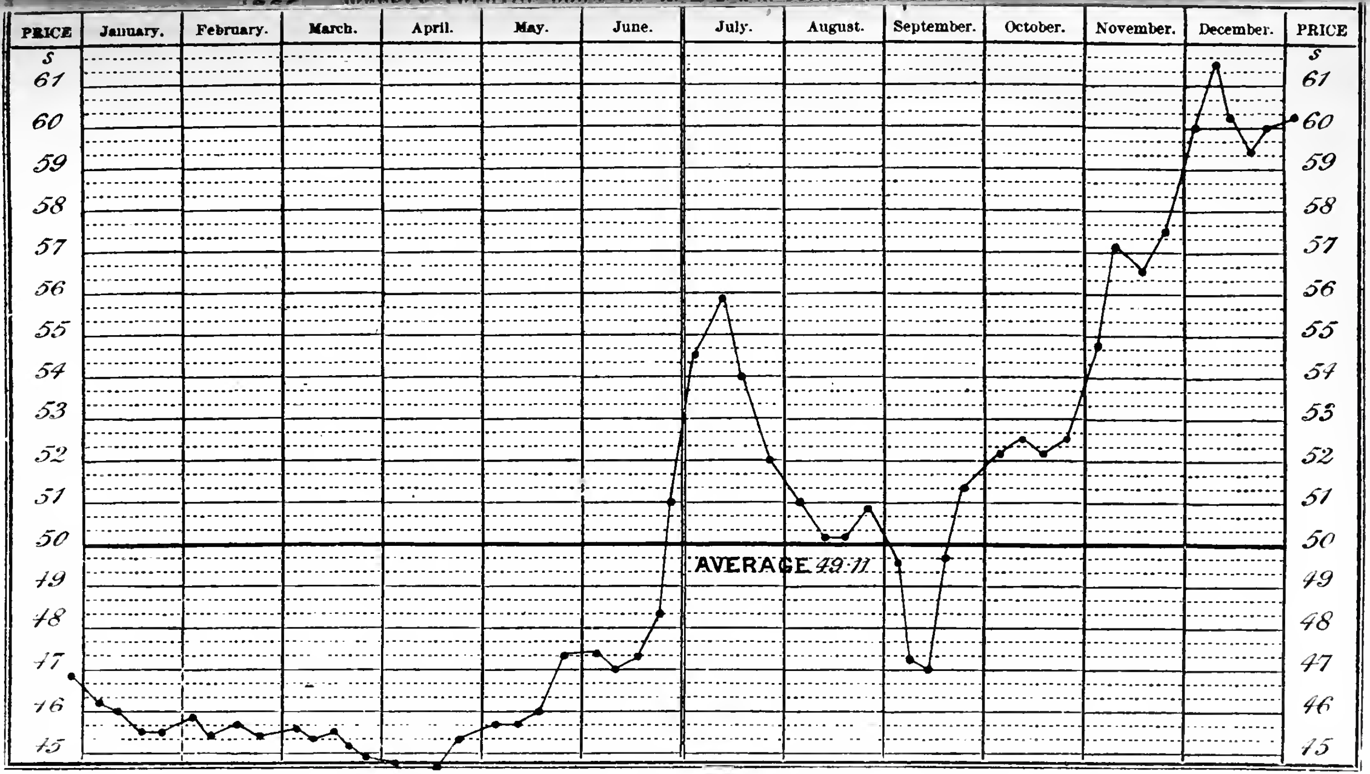
Plate A.

1865.—WEEKLY AVERAGE PRICE OF **WHEAT** FROM GOVERNMENT RETURNS.



	Wheat.	**Barley.**	**Oats.**	**Beans.**	**Peas.**	**Maize.**	**Flour and Meal.**
Average of Year	41 10	29 9	21 10				

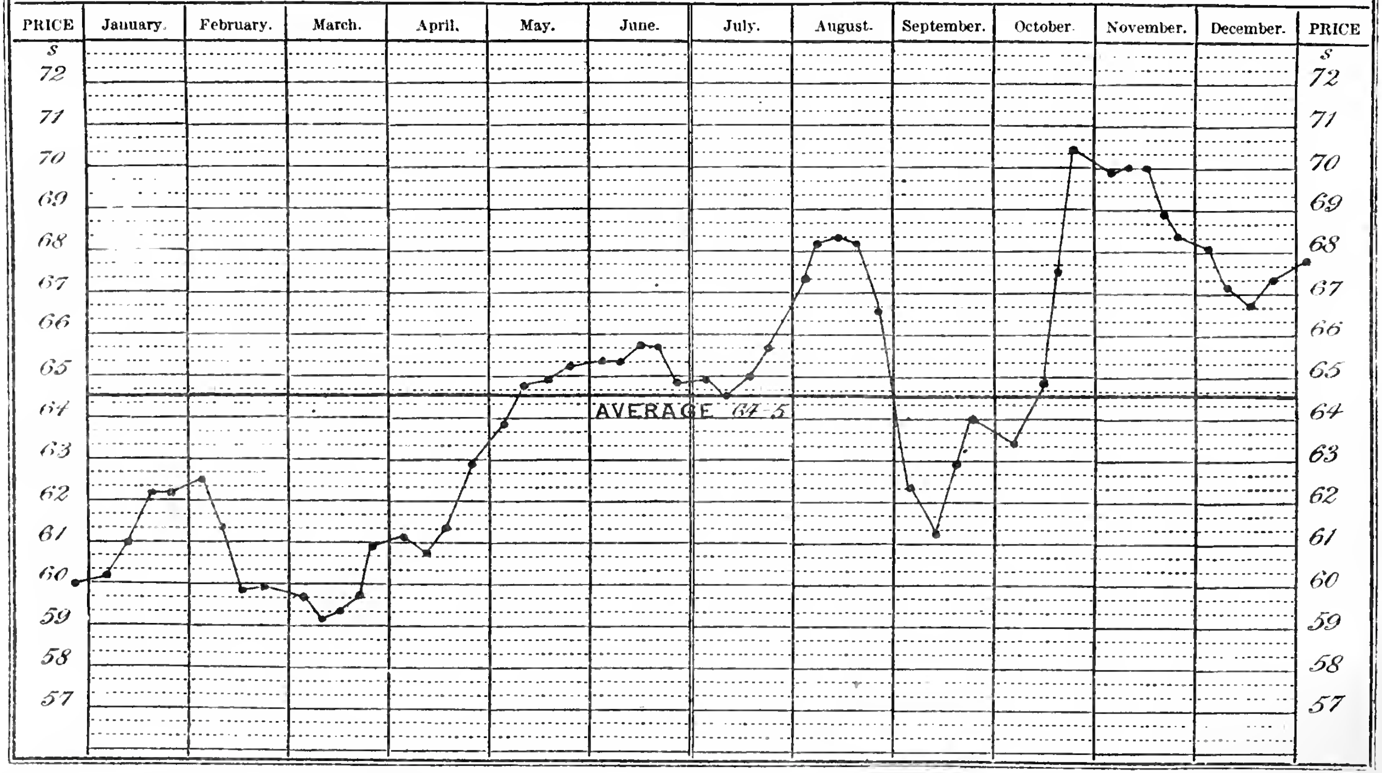
Plate B.



	WHEAT.	BARLEY.	OATS.	BEANS.	PEAS.	MAIZE.	FLOUR AND MEAL.
Average of Year	49 11	37 5	24 7				
Import of United Kingdom	cwts. 23 156,329	cwts. 8 433,863	cwts. 8,844,586	cwts. 1,324,173	cwts 1,211,835	cwts. 14,322,863	cwts. 4,972,280

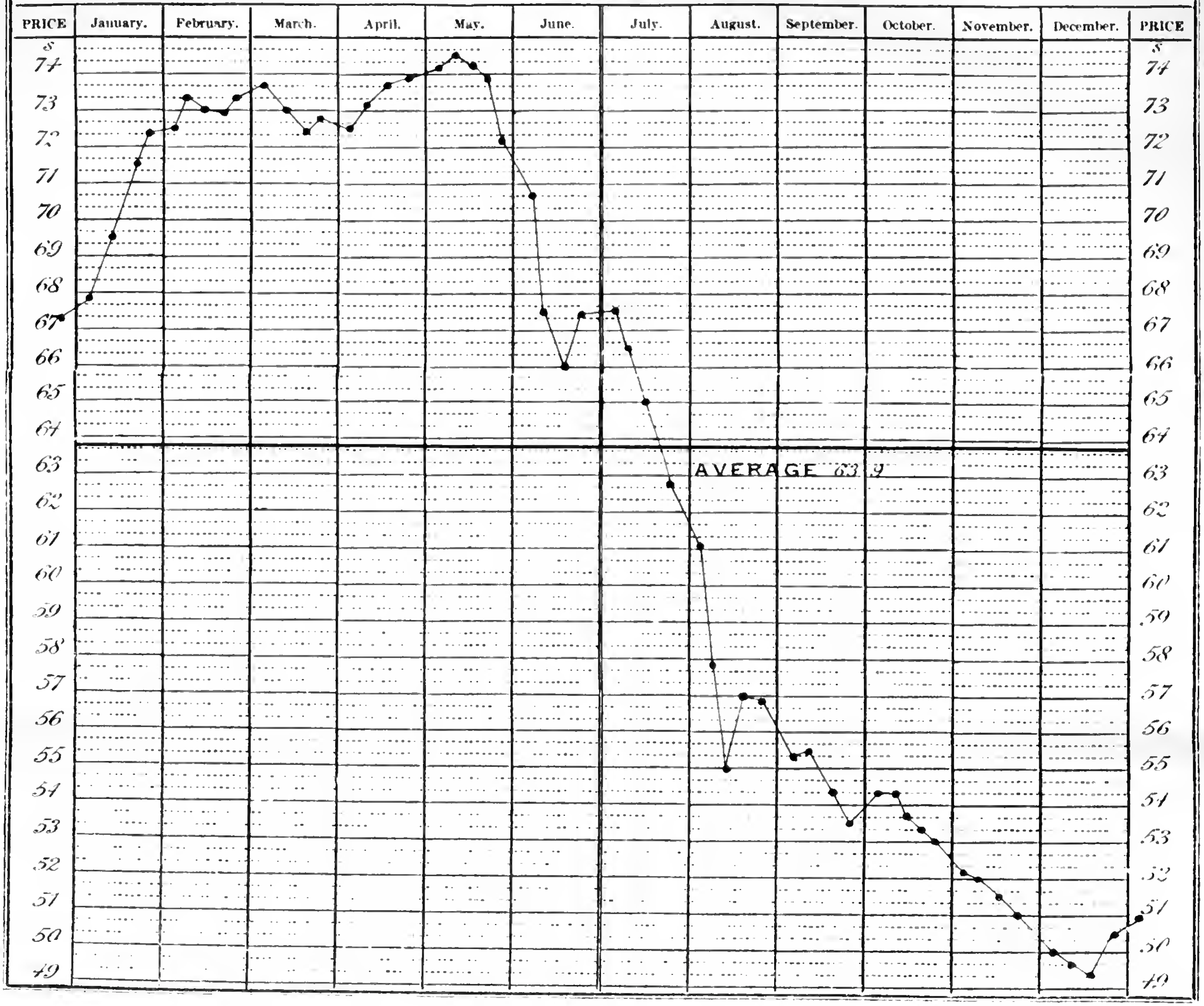
Plate C.

1867.—WEEKLY AVERAGE PRICE OF **WHEAT** FROM GOVERNMENT RETURNS.



	WHEAT.	BARLEY.	OATS.	BEANS.	PEAS.	MAIZE.	FLOUR AND MEAL.
Average of Year	64·5	40·0	26·1				
Import of United Kingdom	cwts. 34,645,569	cwts. 5,683,721	cwts. 9,407,136	cwts. 1,982,615	cwts 1,586,129	cwts. 8,540,429	cwts. 3,592,969

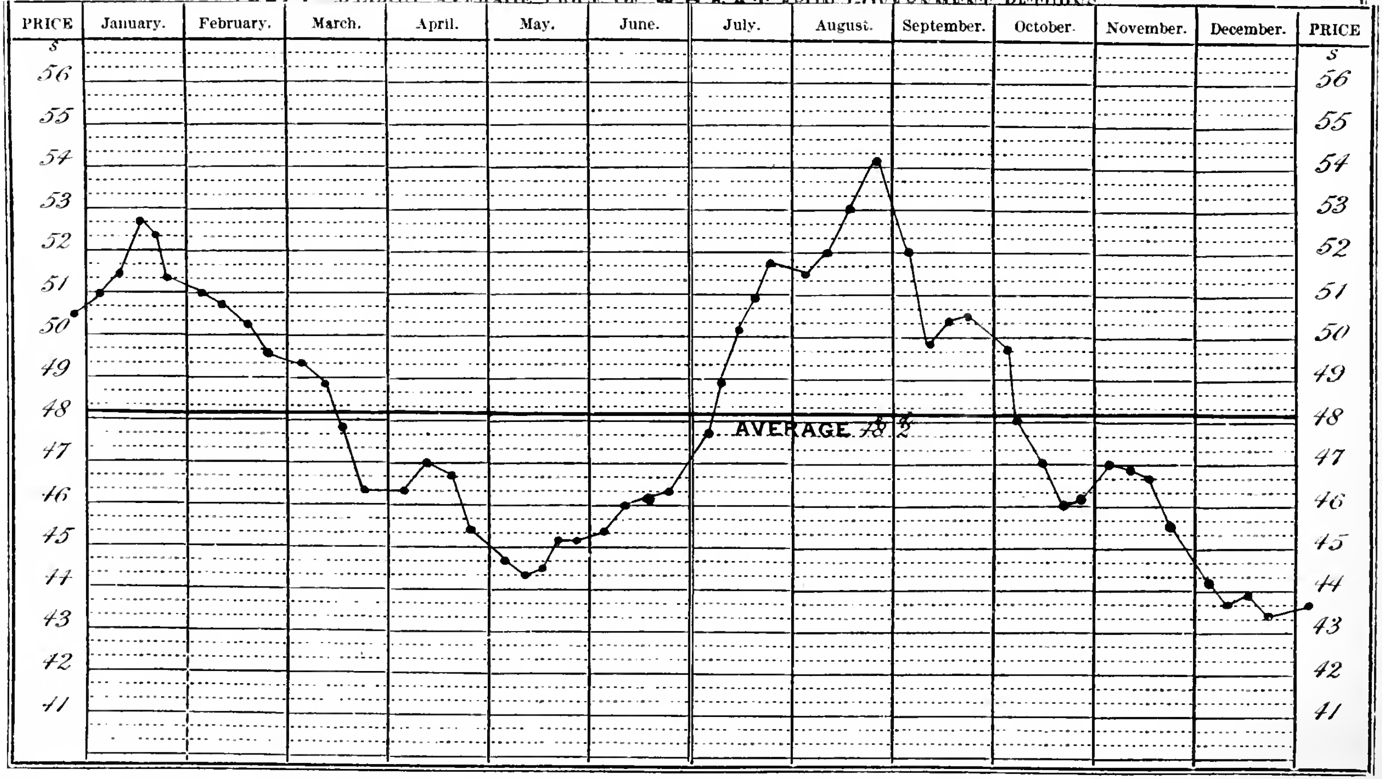
1868.—WEEKLY AVERAGE PRICE OF **WHEAT** FROM GOVERNMENT RETURNS.



	WHEAT	BARLEY.	OATS	BEANS	PEAS.	MAIZE.	FLOUR AND MEAL
Average of Year . .	63.9	43.0	28.1				
Import of United Kingdom	cwts 32639768	cwts. 7476,224	cwts 8,112,563	cwts. 2 617 390	cwts 1116,246	cwts 11472 226	cwts. 3,093,022

Plate E.

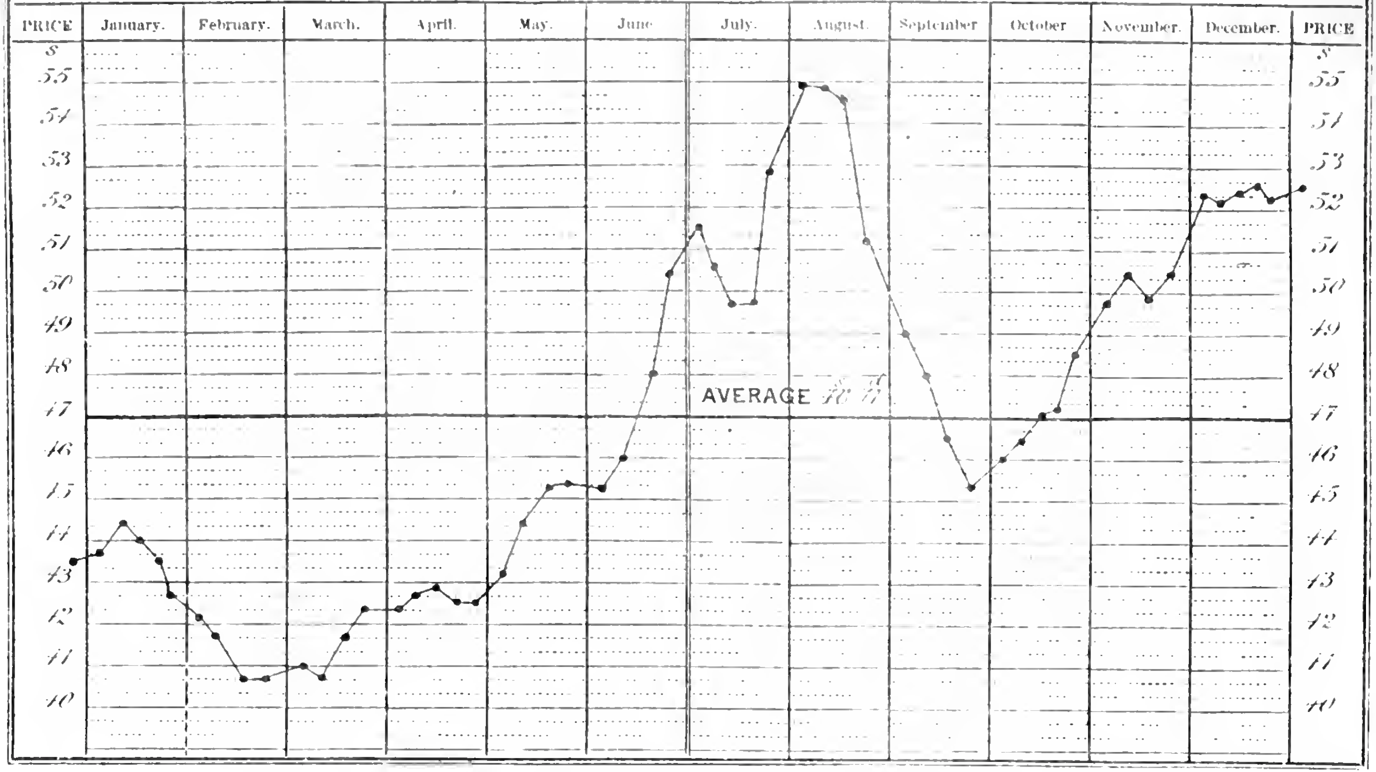
1867.—WEEKLY AVERAGE PRICE OF **WHEAT** FROM GOVERNMENT RETURNS



	Wheat.	Barley.	Oats.	Beans.	Peas.	Maize.	Flour and Meal.
Average of Year	48·2	39·5	26·0				
Import of United Kingdom	cwts. 37,695,828.	cwts. 8,053,660	cwts. 7,916,870	cwts. 1,897,220	cwts. 1,054,387	cwts. 17,664,113	cwts. 5 401 555

Plate F

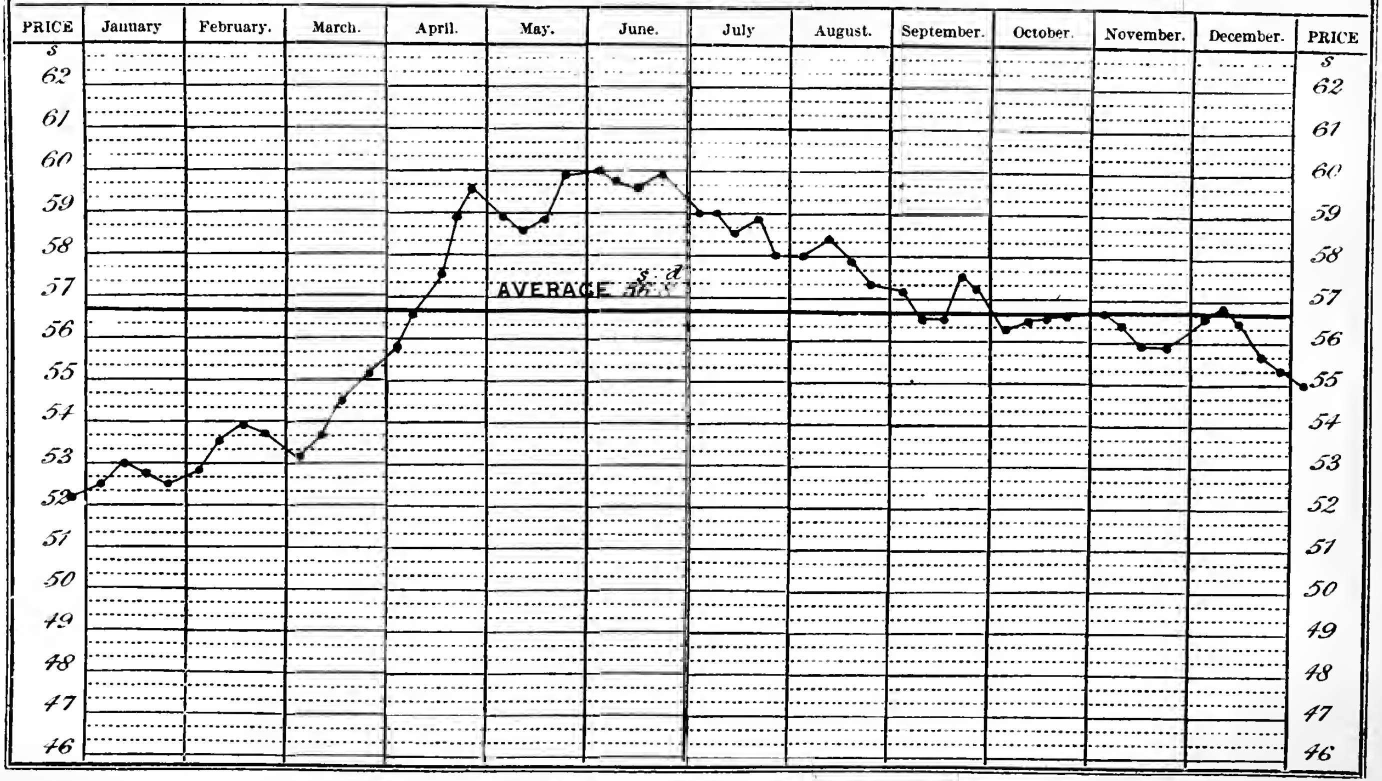
1870.—WEEKLY AVERAGE PRICE OF WHEAT FROM GOVERNMENT RETURNS.



	WHEAT.	BARLEY.	OATS.	BEANS.	PEAS.	MAIZE.	FLOUR AND MEAL.
Average of Year	46 11	34 7	22 10				
	cwts.	cwts.	cwts.	cwts.	cwts.	cwts.	cwts.
Import of United Kingdom	30 901229	7 217 327	10 830 630	1,505 798	1 799 351	16,756 783	4,803,909

Plate G.

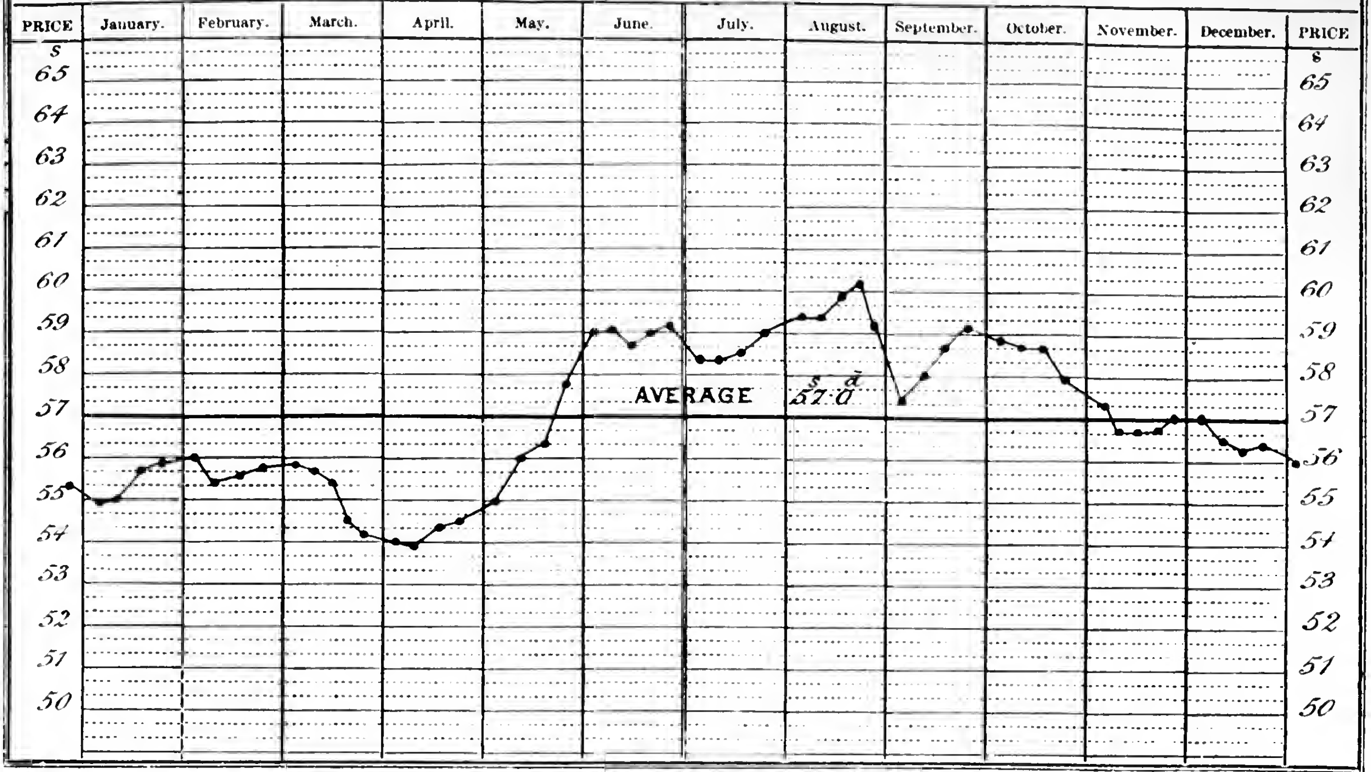
1871.—WEEKLY AVERAGE PRICE OF **WHEAT** FROM GOVERNMENT RETURNS.



	Wheat.	Barley.	Oats.	Beans.	Peas.	Maize.	Flour and Meal.
Average of Year	56·8	36·2	25·2				
Import of United Kingdom	cwts. 39,407,646	cwts. 8,589,059	cwts. 11,007,106	cwts. 2,975,651	cwts. 1,021,950	cwts. 16,832,499	cwts. 3,984,638

Plate H.

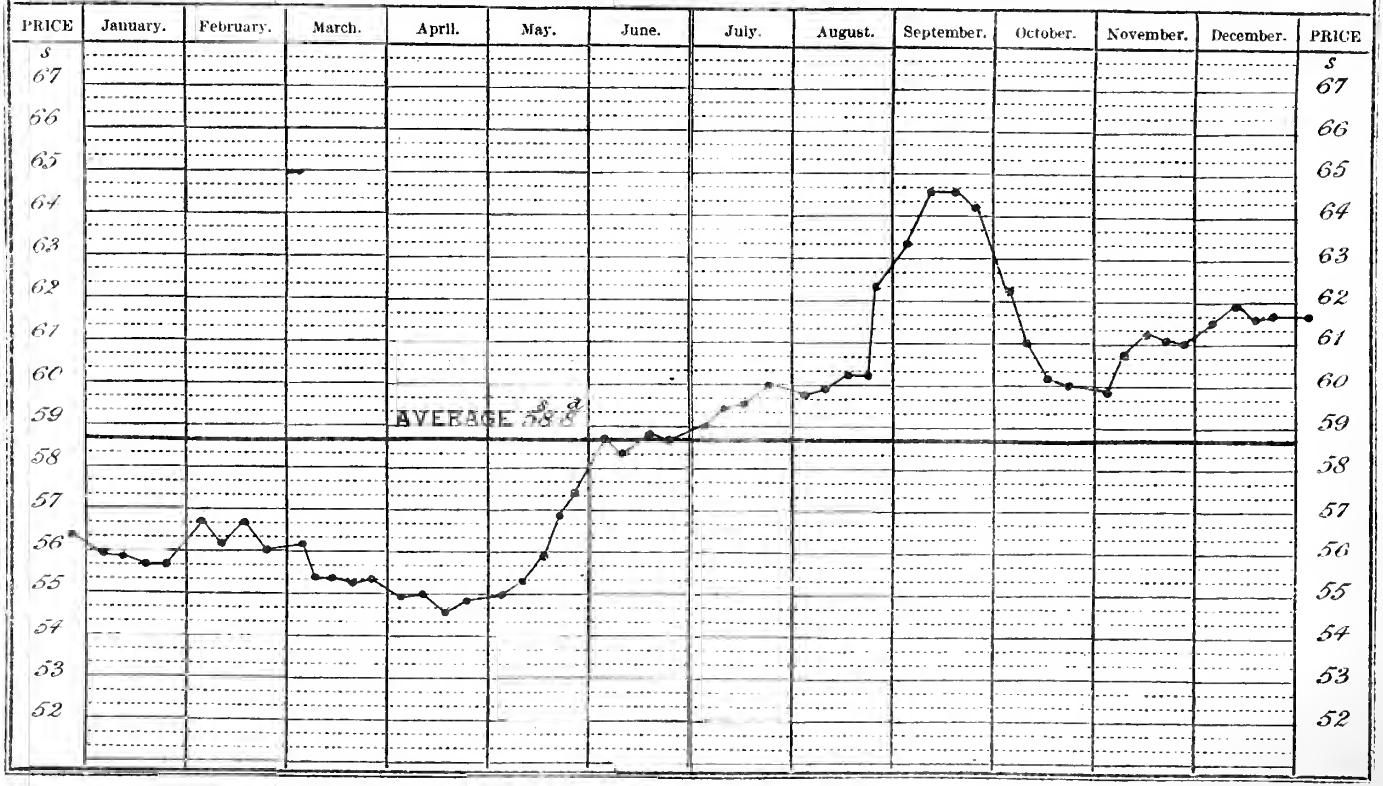
1872.—WEEKLY AVERAGE PRICE OF **WHEAT** FROM GOVERNMENT RETURNS.



	Wheat.	**Barley.**	**Oats.**	**Beans.**	**Peas.**	**Maize.**	**Flour and Meal.**
Average of Year	57 0	37 4	23·2				
	cwts.	cwts.	cwts.	cwts.	cwts.	cwts.	cwts.
Import of United Kingdom	41,990,228	15,078,140	11,567,058	2,937,514	1,290,076	24,563,334	4,396,059

Plate I.

1873 .—WEEKLY AVERAGE PRICE OF **WHEAT** FROM GOVERNMENT RETURNS.



	WHEAT.	BARLEY.	OATS.	BEANS.	PEAS.	MAIZE.	FLOUR AND MEAL.
Average of Year	58·8	40·5	25·5				
Import of United Kingdom	cwts. 43,751,630	cwts. 9,232,485	cwts. 11,922,736	cwts. 2,976,500	cwts. 1,211,068	cwts. 18,768,127	cwts. 6,204,260

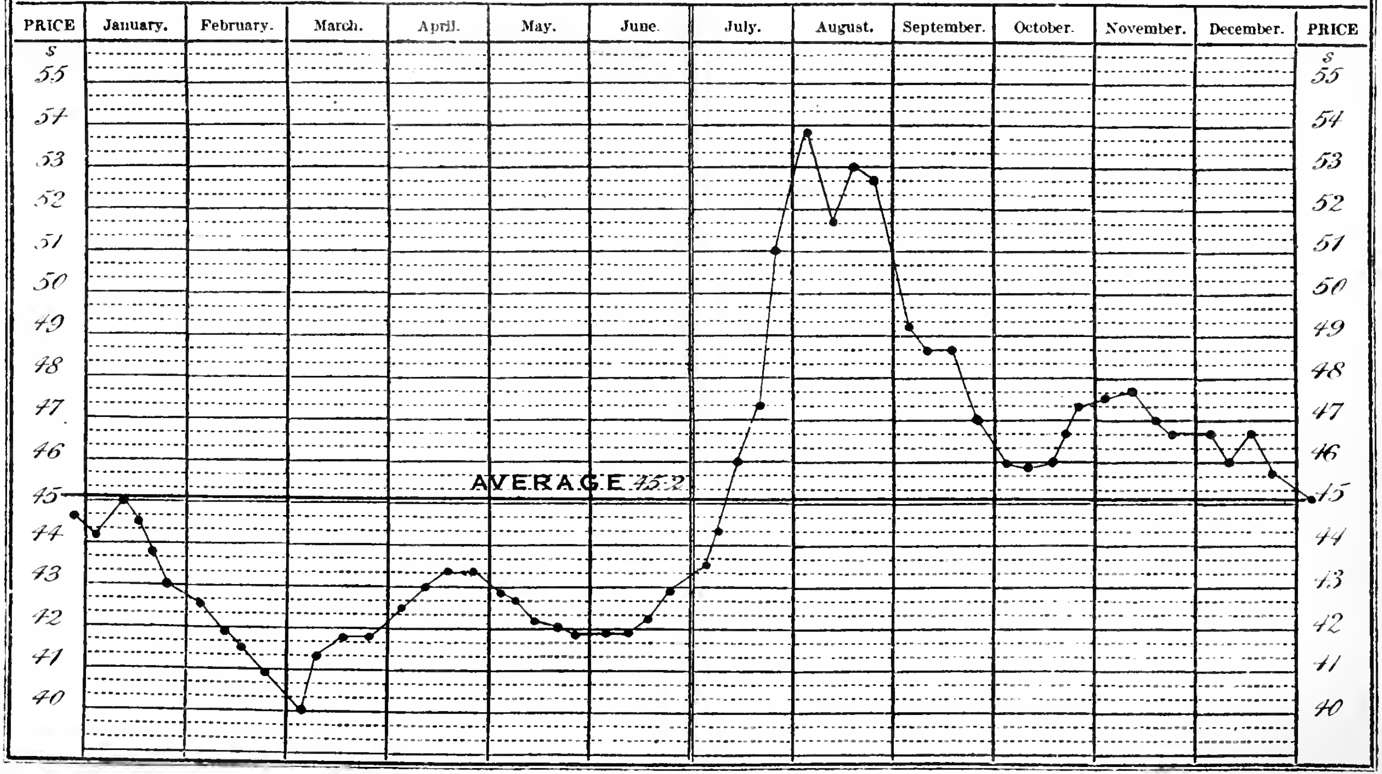
1874 .—WEEKLY AVERAGE PRICE OF WHEAT FROM GOVERNMENT RETURNS.

	WHEAT.	BARLEY	OATS.	BEANS.	PEAS.	MAIZE.	FLOUR AND MEAL.
Average of Year	55 9	44 11	28 10				
Import of United Kingdom	cwts. 11,179,460	cwts 11335,396	cwts. 11,387,768	cwts 2363,151	cwts. 1,808,980	cwts. 17,693,625	cwts. 6229,608

Plate I.

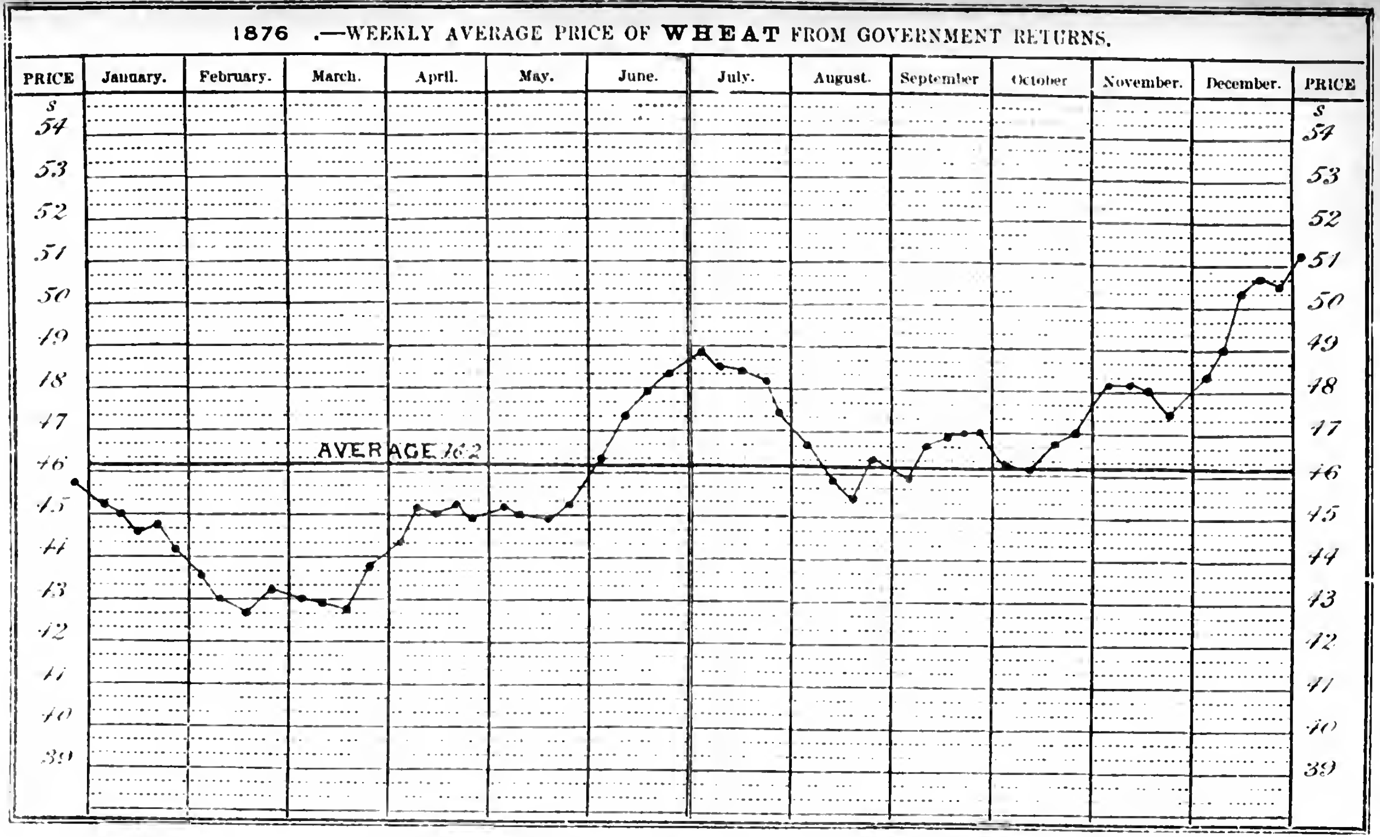
Plate K.

1875.—WEEKLY AVERAGE PRICE OF **WHEAT** FROM GOVERNMENT RETURNS.



	WHEAT.	BARLEY.	OATS.	BEANS.	PEAS.	MAIZE.	FLOUR AND MEAL.
Average of Year	45·2	38·5	28·8				
Import of United Kingdom	cwts. 51,786,393	cwts. 11,049,476	cwts. 12,435,888	cwts. 3,453,371	cwts. 1,603,033	cwts. 20,438,480	cwts. 6,048,689

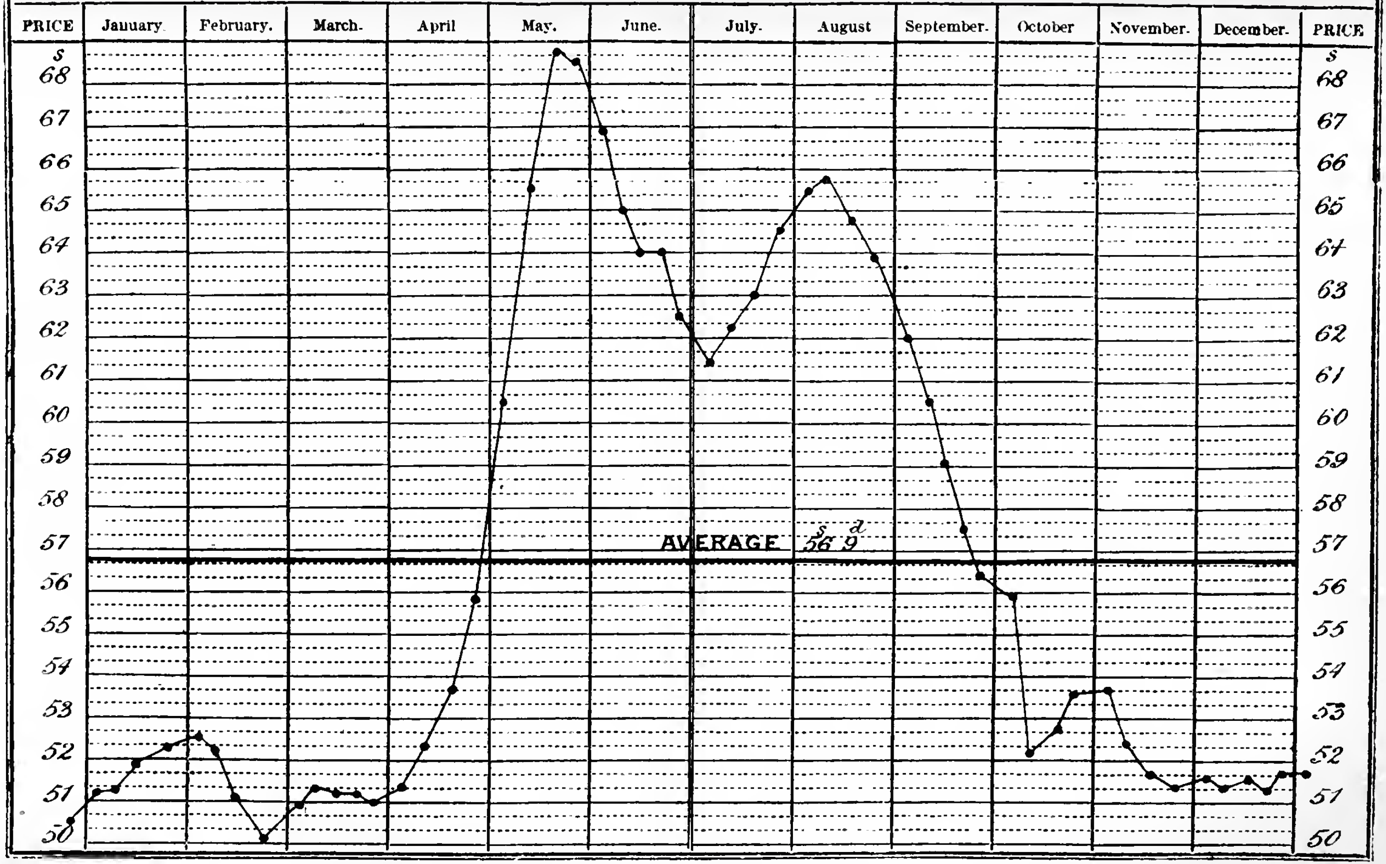
Plate I.



1876.—WEEKLY AVERAGE PRICE OF **WHEAT** FROM GOVERNMENT RETURNS.

	WHEAT.	BARLEY.	OATS.	BEANS.	PEAS.	MAIZE.	FLOUR AND MEAL.
Average of Year	46·2	35·2	26·3				
Import of United Kingdom	cwts. 44,394,152	cwts. 9,770,075	cwts. 11,204,588	cwts. 4,601,206	cwts. 1,609,997	cwts. 39,958,226	cwts. 5,942,540

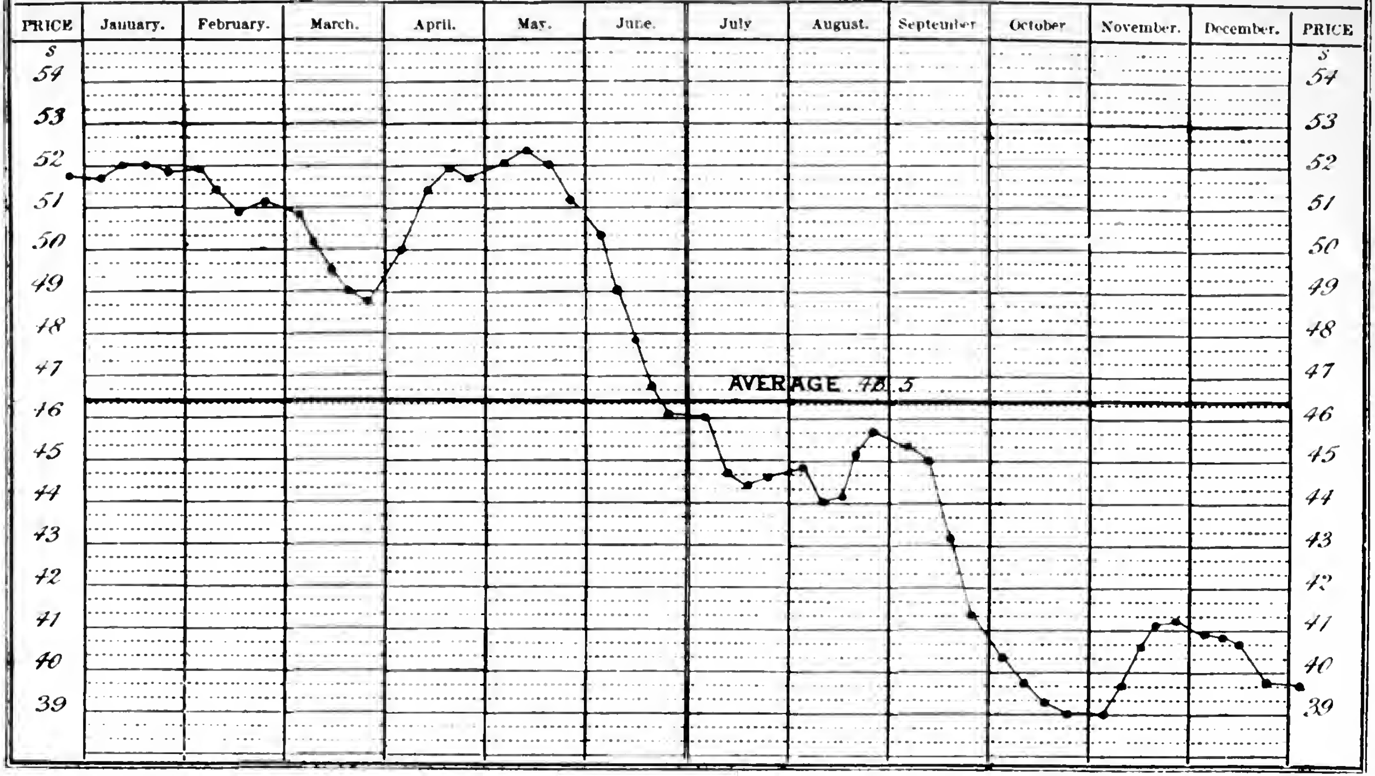
Plate M.



	Wheat.	**Barley.**	**Oats.**	**Beans.**	**Peas.**	**Maize.**	**Flour and Meal.**
Average of Year	56·9	39 8	25 11				
Import of United Kingdom	cwts. 54,162,888	cwts. 12,970,757	cwts. 12.925,604	cwts. 4,573,482	cwts. 1,511,846	cwts. 30,455,681	cwts. 7,369,529

Plate N.

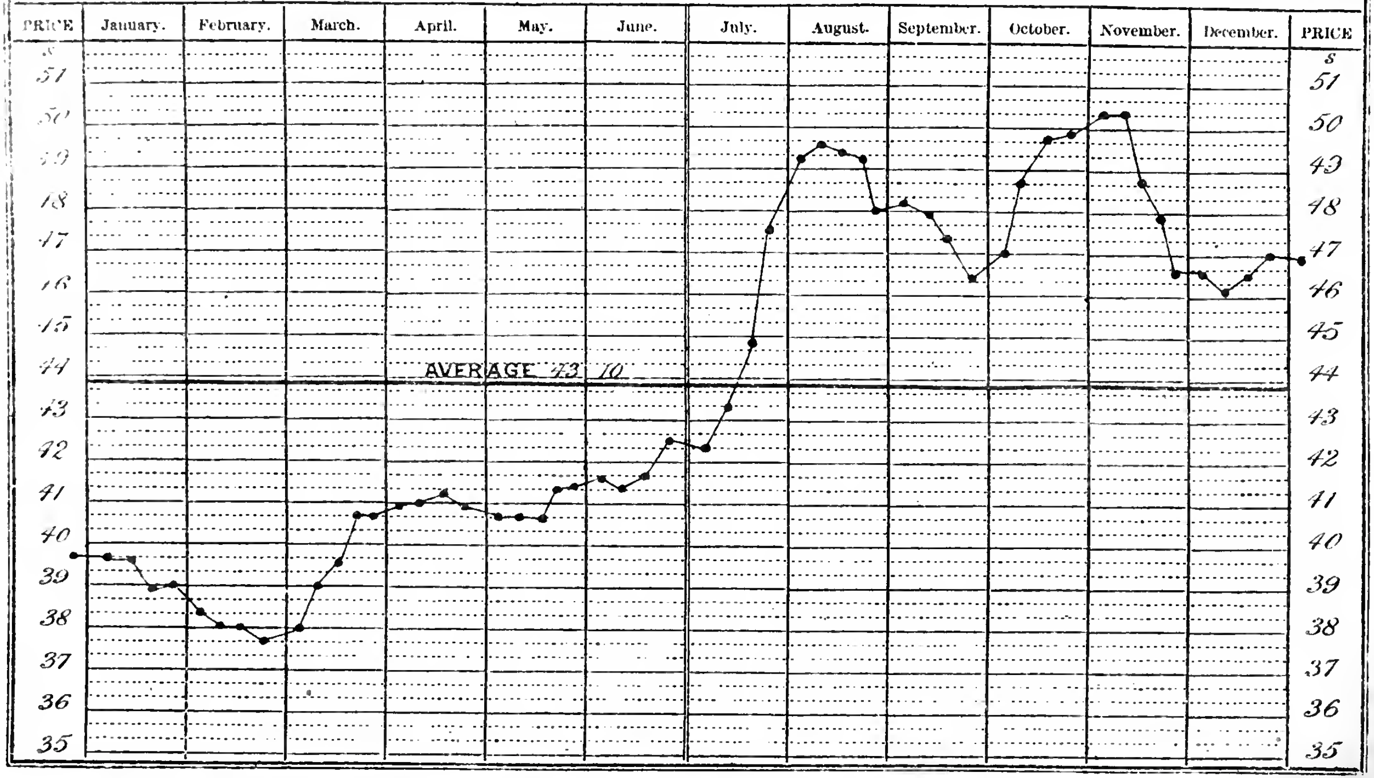
1878.—WEEKLY AVERAGE PRICE OF **WHEAT** FROM GOVERNMENT RETURNS.



	WHEAT.	BARLEY.	OATS.	BEANS.	PEAS.	MAIZE.	FLOUR AND MEAL.
Average of Year	46.5	40.2	24.4				
Import of United Kingdom	cwts. 49,811,643	cwts. 14,162,028	cwts. 12,765,783	cwts. 1,870,508	cwts. 1,804,733	cwts. 41,631,348	cwts. 7,823,999

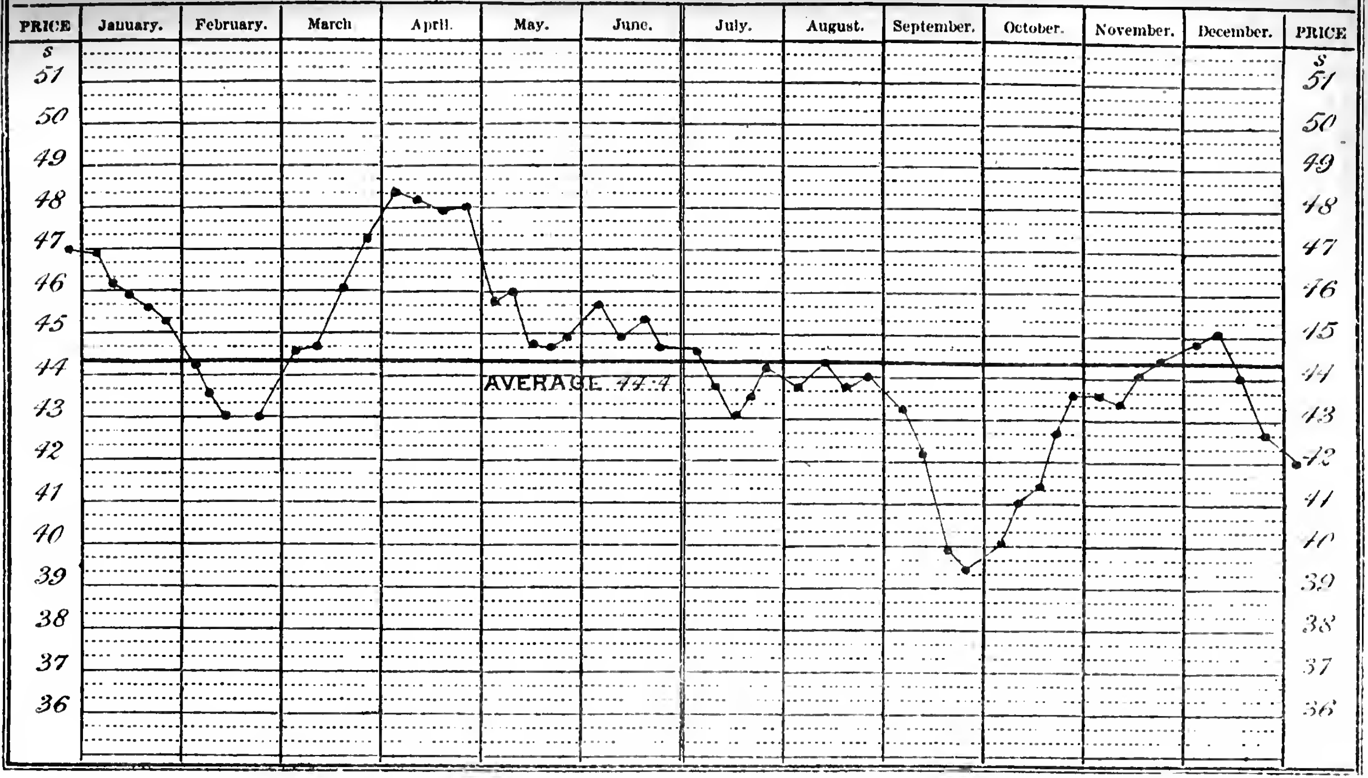
Plate O.

1879 .—WEEKLY AVERAGE PRICE OF **WHEAT** FROM GOVERNMENT RETURNS.



	WHEAT.	BARLEY.	OATS.	BEANS.	PEAS.	MAIZE.	FLOUR AND MEAL.
Average of Year	43.10	34·0	21·9				
	cwts. [illegible]	cwts. 11,581,098	cwts. 13.482,607	cwts. 2,310,101	cwts. 1,916,777	cwts. 36,078,586	cwts. 10.730,558

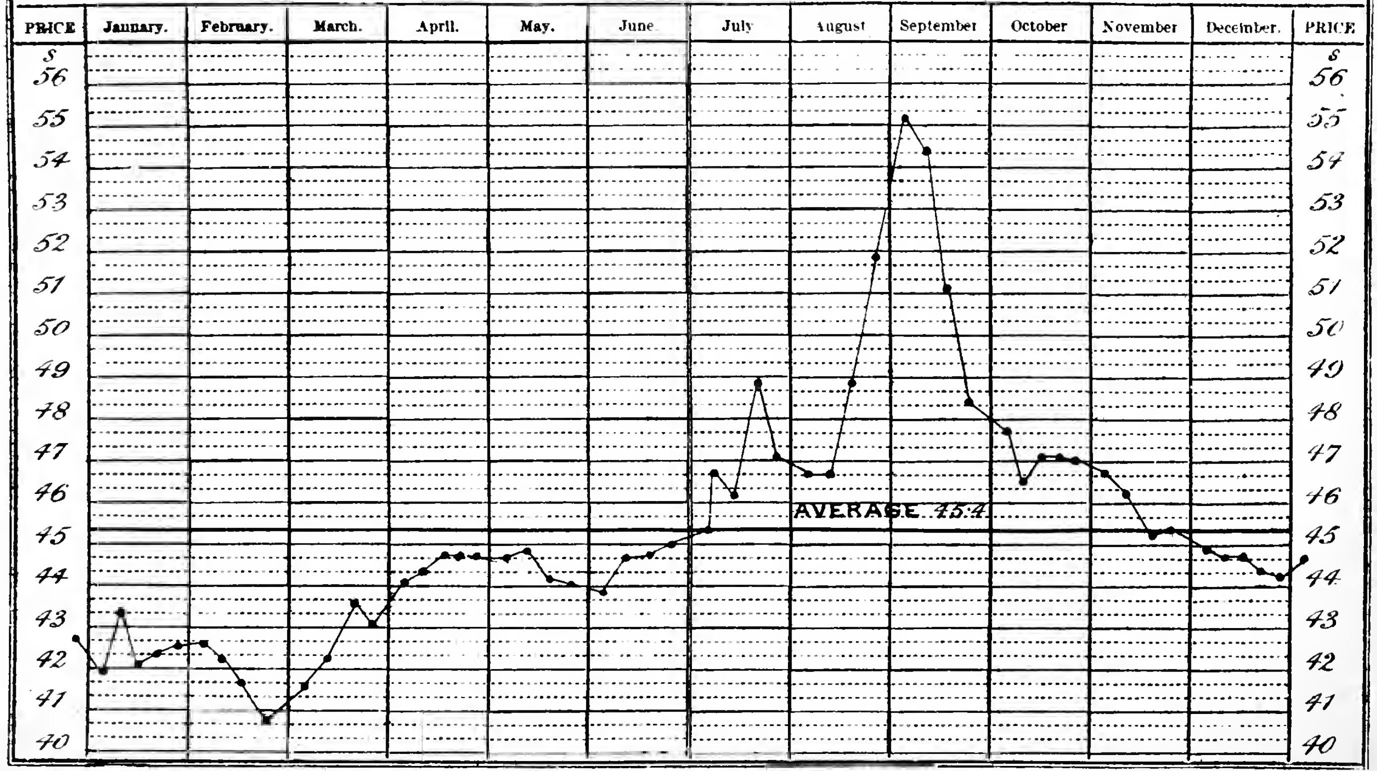
1880.—WEEKLY AVERAGE PRICE OF **WHEAT** FROM GOVERNMENT RETURNS.



	WHEAT.	BARLEY.	OATS.	BEANS.	PEAS.	MAIZE.	FLOUR AND MEAL.
Average of Year	44.1	33.1	23.1				
Import of United Kingdom	cwts. 55,197,304	cwts. 11 685,527	cwts. 13,862,430	cwts. 2,574759	cwts. 2,141,438	cwts. 37,153,658	cwts. 10,590,582

Plate Q.

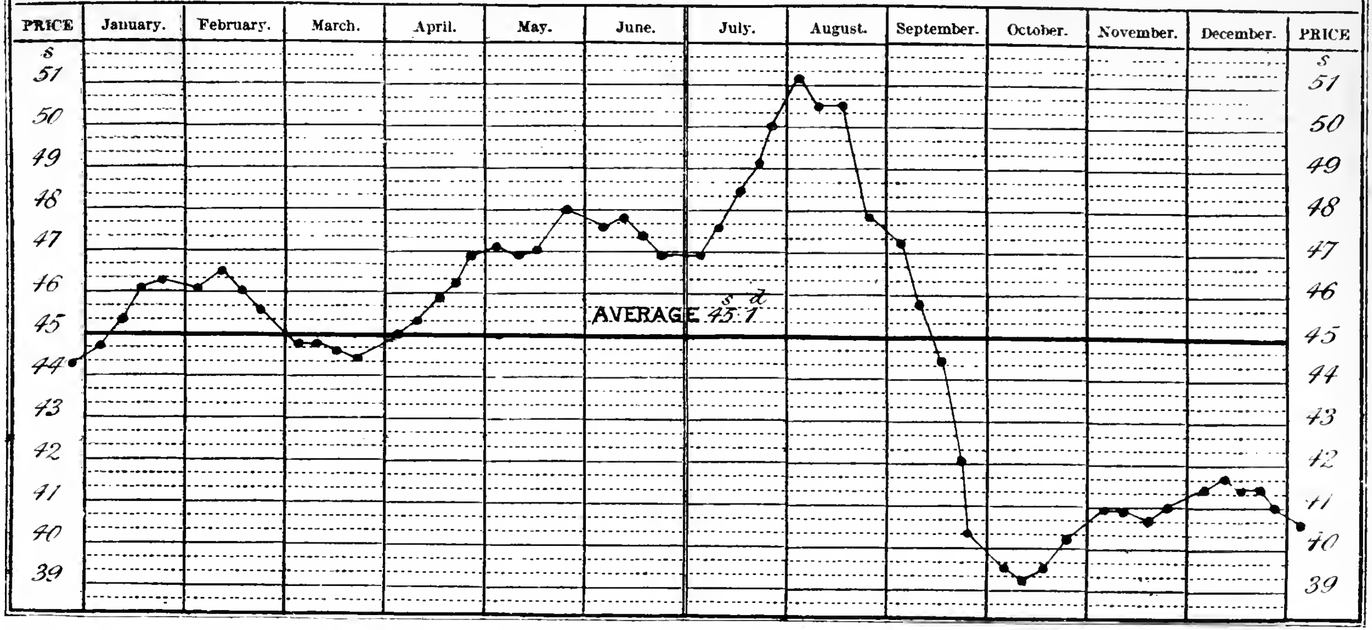
1881.—WEEKLY AVERAGE PRICE OF **WHEAT** FROM GOVERNMENT RETURNS.



	WHEAT.	**BARLEY.**	**OATS.**	**BEANS.**	**PEAS.**	**MAIZE.**	**FLOUR AND MEAL.**
Average of Year	45·4	35·11	21·9				
Import of United Kingdom	cwts. 57,042,669	cwts. 9,811,051	cwts. 10,336,795	cwts. 2,070,199	cwts. 1,972,724	cwts. 33,429,722	cwts. 11,360,410

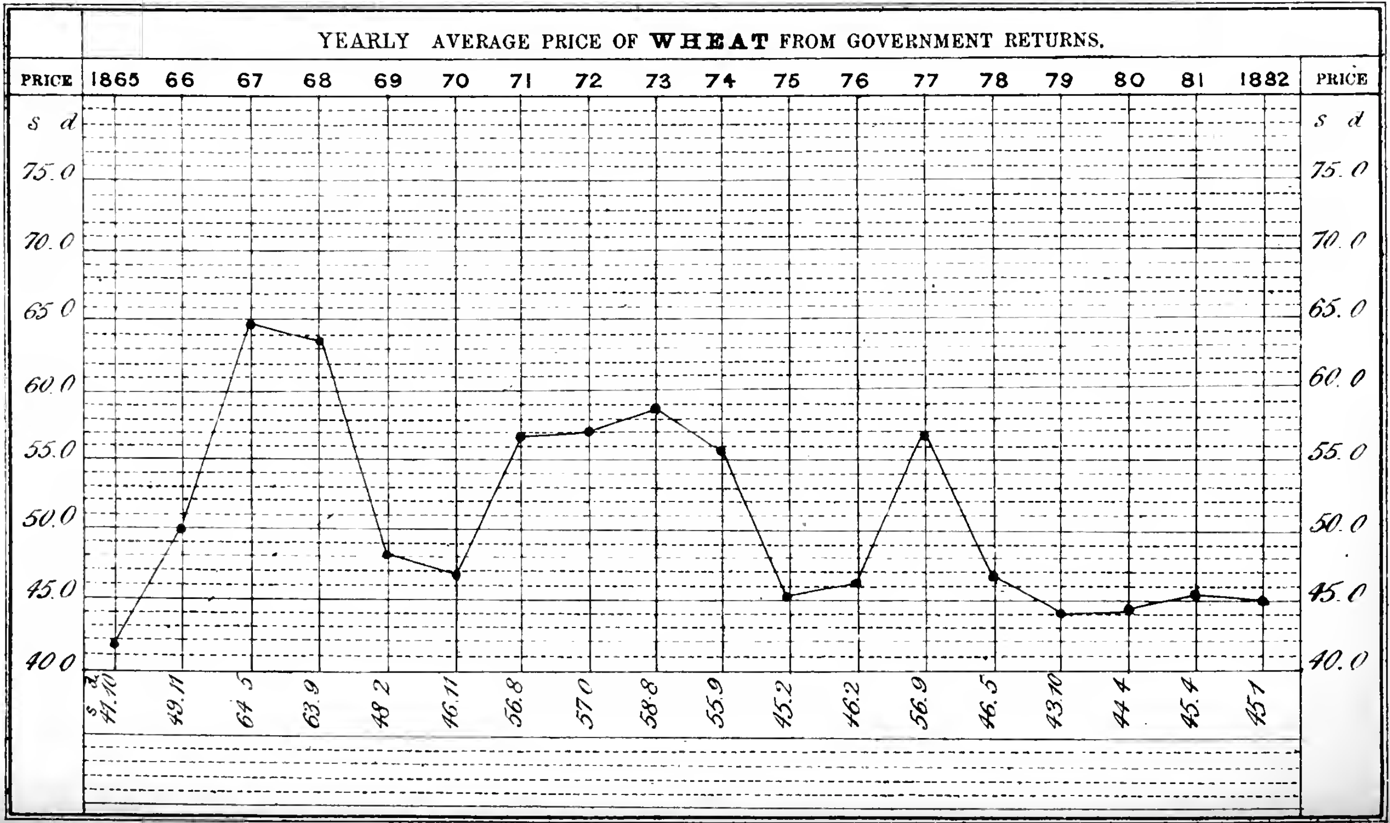
Plate R.

1882.—WEEKLY AVERAGE PRICE OF **WHEAT** FROM GOVERNMENT RETURNS.



	WHEAT.	BARLEY.	OATS.	BEANS.	PEAS.	MAIZE.	FLOUR AND MEAL.
Average of Year	45 1	31 2	21 10				
	cwts.	cwts.	cwts.	cwts.	cwts	cwts.	cwts.
Import of United Kingdom	64,171,622	15,519,850	13,646,151	2,074,293	2,100,197	18,255,285	13,028,705

Plate S.


YEARLY AVERAGE PRICE OF **WHEAT** FROM GOVERNMENT RETURNS.

VIII.—*Report on the Field and Feeding Experiments conducted at Woburn on behalf of the Royal Agricultural Society of England, during the Year* 1882. By Dr. AUGUSTUS VOELCKER, F.R.S., Consulting Chemist to the Royal Agricultural Society.

ONE of the chief troubles in successfully growing wheat or barley for experimental purposes for a number of years in succession on the same field is to keep the land practically free from weeds. In order to accomplish this, it is desirable to plough the land shallow directly after harvest, to drag-harrow it after some time, to fork out any bits of couch which may have been left in the land, and to wage a continuous war against surface weeds by hoeing and hand-weeding, until the wheat or barley is sufficiently advanced in growth to smother the weeds.

By dint of much labour, entailing a good deal of expense, the experimental plots on Stackyard-field have been kept scrupulously clean.

As in former years, Browick wheat, at the rate of 9 pecks per acre, was dibbled in on the 18th, 19th, and 20th of October, 1881, at a cost of 9*s.* per acre. The land was in good condition, and the seed-corn went in well.

The dung required for the experiments on the continuous growth of wheat was made by four bullocks. They were put into the feeding-boxes on the 21st of November, 1881, and taken out on the 13th of December. In the course of three weeks they consumed 2½ cwts. of decorticated cotton-cake, 4 cwts. of maize-meal, 30 cwts. of sliced white turnips, and 5 cwts. of wheat-straw chaff. They were supplied with 6½ cwts. of wheat-straw as litter, cut into chaff of about 2 to 3 inches in length.

The following were the weights of the bullocks when put up, and after three weeks, when they had finished the food required for the production of the required quality of dung:—

	When put up, on Nov. 21, 1881.			When removed, on Dec. 13, 1881.			Gain from Nov. 21 to Dec. 13 (three weeks).		
	cwts.	qrs.	lbs.	cwts.	qrs.	lbs.	cwts.	qrs.	lbs.
Bullock No. 1 weighed	9	0	1	9	1	11	0	1	10
„ No. 2 „	9	2	10	9	3	13	0	1	3
„ No. 3 „	9	0	4	9	2	8	0	2	4
„ No. 4 „	9	1	13	10	0	24	0	3	11
Total weight of 4 Bullocks ..	37	0	0	39	0	0	2	0	0

The bullock No. 4 did remarkably well, increased much more in weight than the others. This bullock gained 95 lbs. in three weeks, and consequently increased in live-weight $31\frac{2}{3}$ lbs. per week; whilst bullock No. 1 in the same period made only 38 lbs., or increased $12\frac{2}{3}$ lbs. per week.

On an average the four bullocks increased in weight at the rate of $18\frac{2}{3}$ lbs. per head per week, or $2\frac{2}{3}$ lbs. per day.

On the 22nd the dung made by the four bullocks was removed from the feeding-boxes and placed into a covered hovel, where it was left until the 26th of January, 1882, when it was weighed before it was carted on the land. It then weighed 29 cwts. 3 qrs. and 18 lbs., and was in a good and fairly rotten condition.

A weighed quantity of dung, calculated to contain nitrogen equal to 100 lbs. of ammonia per acre, was carted on one-half of plot 10 on the 26th of January, and double that quantity, calculated to contain nitrogen equal to 200 lbs. of ammonia per acre, was spread on the same day upon one-half of plot 11.

The mineral manures were sown broadcast on the 15th of November, 1881; and the salts of ammonia and nitrate of soda, diluted with about three times their bulk of dry sand, were applied on the 7th of April by a broadcast manure-distributor.

The following is the composition of the maize-meal which was given to the bullocks in the feeding-boxes:—

Moisture	14·60
Oil	3·40
*Albuminous compounds	9·19
Starch, sugar, and digestible fibre	69·53
Woody fibre (cellulose)	1·93
Mineral matter (ash)	1·35
	100·00
* Containing nitrogen	1·47

The cotton-cake used in the same experiments had the following composition:—

Moisture	7·85
Oil	11·17
*Albuminous compounds	43·25
Mucilage, sugar and digestible fibre	26·21
Woody fibre (cellulose)	4·17
Mineral matter (ash)	7·35
	100·00
* Containing nitrogen	6·92

Of late, decorticated cotton-cake, I find as a rule, contains a good deal less oil than formerly, and for this reason it is not so valuable as it was three or four years ago.

Average Composition of White Turnips used in making the Dung for Permanent Wheat and Barley at Woburn, Dec. 1881.

Water	92·43
*Albuminous compounds	0·81
Sugar, woody fibre, &c.	6·16
Mineral matter (ash)	0·60
	100·00
* Containing nitrogen	·13

The wheat came up well on all the plots, and, owing to the mild winter, grew well and looked healthy and strong on all of them in February.

Towards the end of May the wheat was in a fine growing condition, and scarcely a single weed could then be noticed in the Experimental field, either on the wheat or on the barley plots.

On the 17th of June the wheat began to come into ear, and towards the end of the month bloomed well.

On the 19th of July I took the following notes in the field on the appearance of the crop:—

Plot 1 (unmanured). Wheat thin, and knocked down in places.

Plot 7 (duplicate unmanured plot). Wheat thin, but healthy, knocked about a good deal by wind, rather better than on plot 1.

Plot 2 (ammonia-salts alone). Wheat looks very well.

Plot 3 (nitrate of soda alone). Wheat looks very well, no perceptible difference between plots 2 and 3.

Plot 4 (minerals alone). Slightly better than the unmanured plot 7.

Plot 5 (minerals and ammonia). Much better than plot 2 (ammonia-salts alone); promises to turn out a good crop.

Plot 6 (minerals and nitrate). About the same as plot 5.

Plot 8A (minerals alone, ammonia-salts left out in 1882). Scarcely better than No. 4.

Plot 8B (minerals and ammonia-salts). Wheat remarkably strong and healthy, not knocked down nor mildewed in the least.

Plots 9A and 9B (minerals with and without nitrate of soda). The same condition as in 8A and 8B. No perceptible difference in the appearance of the 8 and 9 plots.

Plot 10A (no dung in 1882). Wheat thin, and a good deal knocked about by rain and wind.

Plot 11A (no dung in 1882). Wheat thin.

Plot 10B (small dose of dung). Wheat somewhat better than on 10A.

Plot 11B (double the quantity of dung). Wheat decidedly better than on plot 10B.

At that time no mildew could be seen on any of the plots nor in the rotation wheat.

The harvest in Stackyard-field commenced on the 14th of August.

The cuttings of the continuous wheat-plots began on the 14th of August and terminated on the 25th.

The wheat was carted and stacked on the 24th of August, 1882. It was threshed in the field by means of a portable threshing-machine on the 26th of October.

As in former years, the straw of each plot was weighed at the time of threshing, in the field; and the corn of each plot was bagged, carefully labelled, and stored in the granary until the 2nd of November, when the gross weight of corn from each plot was taken, and the whole of the produce was measured out, and the weight of each bushel was ascertained. In each case the gross weight agreed within a lb. or 1½ lb. with the weights obtained by adding together the weights of the number of bushels which each plot produced. Although this is a troublesome and rather expensive work, as it takes up much time and requires the assistance of ordinary farm-labourers and trained chemists, accustomed to weigh rapidly and with precision, it is well worth the trouble and expense to secure accuracy by this double check of weighing and measuring the whole produce as well as each bushel of corn.

By leaving the wheat in the stack for some months before threshing it, and again by storing for a week or longer the threshed corn, greater uniformity in the condition of the wheat of variously manured plots is secured, and inaccuracies in the results of the weighed produce are avoided, which not unfrequently are made when corn-crops are threshed out and weighed in the field directly the corn is ready to be stacked.

Table I., on the next page, shows at a glance the treatment of each plot as regards manure, and the results of the harvest in 1882.

On all the different plots the yield of wheat was considerably below that of the preceding year, and the quality of the wheat was somewhat inferior to that of 1881.

It is worthy of observation that in 1882, probably owing to the extremely wet character of the season, the relative proportions of straw to corn were much greater on all the plots than in the preceding year. Thus, to quote only a few examples, the unmanured plot 1 in 1881 yielded 25·7 bushels of dressed corn, and 19 cwts. 2 qrs. and 27 lbs. of straw, whilst the same plot in 1882 produced only 12·3 bushels of wheat, or scarcely half as

TABLE I.—PRODUCE OF CONTINUOUS WHEAT. SIXTH SEASON, 1882.

PLOTS.	MANURES PER ACRE.	PRODUCE PER ACRE.					
		Dressed Corn.			Straw, Chaff, &c.		
		Weight.	Number of Bushels.	Weight per Bushel.			
		lbs.		lbs.	cwts.	qrs.	lbs.
1	Unmanured	705	12·3	57·25	18	1	25
2	200 lbs. ammonia-salts alone, applied in the spring)	1866	32	58·3	31	2	20
3	275 lbs. nitrate of soda (applied in the spring)	1496	26	57·3	32	0	22
4	200 lbs. sulphate of potash, 100 lbs. sulphate of soda, 100 lbs. sulphate of magnesia, 3½ cwts. superphosphate of lime	844	14·9	56·5	18	3	24
5	200 lbs. sulph. potash, 100 lbs. sulph. soda, 100 lbs. sulph. magnesia, 3½ cwts. superphosphate of lime, and 200 lbs. ammonia-salts (in spring)	2098	35·1	59·6	37	3	8
6	200 lbs. sulph. potash, 100 lbs. sulph. soda, 100 lbs. sulph. magnesia, 3½ cwts. superphosphate of lime, and 275 lbs. nitrate of soda (in spring)	1910	32·8	58·8	39	0	21
7	Unmanured	736	13·2	55·5	18	0	16
8A	200 lbs. sulph. potash, 100 lbs. sulph. soda, 100 lbs. sulph. magnesia, 3½ cwts. superphosphate of lime	776	13·3	58	17	2	6
8B	The same minerals as in 8A, and 400 lbs. ammonia-salts	2568	43·5	59	55	0	6
9A	200 lbs. sulph. potash, 100 lbs. sulph. soda, 100 lbs. sulph. magnesia, 3½ cwts. superphosphate of lime	688	12·2	56	18	1	8
9B	The same minerals as in 9A, and 550 lbs. nitrate of soda (in spring)	2112	35·8	58·8	49	2	22
10A	No manure (having received manure as 10B in each of the five preceding seasons)	874	15·6	55·75	19	0	22
10B	Farmyard-manure, estimated to contain nitrogen = 100 lbs. ammonia, made from 672 lbs. decorticated cotton-cake, 1075 lbs. maize-meal, 8064 lbs. turnips, 1344 lbs. wheat-straw, as food; and 1747 lbs. wheat-straw as litter. Weight about 4 tons	952	16·6	57	24	1	
11A	No manure (having received manure as 11B in each of the five preceding seasons)	896	15·3	58·5	20	1	2
11B	Farmyard-manure, estimated to contain nitrogen = 200 lbs. ammonia, made from 1344 lbs. decorticated cotton-cake, 2150 lbs. maize-meal, 16,128 lbs. turnips, 2688 lbs. wheat-straw chaff, as food; and 3494 lbs. wheat-straw as litter. Weight about 8 tons ..	1254	21·6	58	30	3	14

much as in the preceding season, and 18 cwts. 1 qr. and 25 lbs. of straw.

Again, whilst in 1881 plot 2, manured with salts of ammonia without any minerals, yielded nearly 32 bushels of dressed corn, and only 20 cwts. 3 qrs. and 24 lbs. of straw and chaff, the same plot in 1882 produced the same quantity, that is, 32 bushels of dressed wheat, and as much as 31 cwts. 2 qrs. and 20 lbs. of straw and chaff—or nearly one-half more than in 1881.

On comparing the relative proportions of grain and straw on plot 5 (manured with minerals and salts of ammonia) in 1881 and 1882, I find that with 39·1 bushels of dressed corn, 30 cwts. and 13 lbs. of straw were grown in 1881; whereas last year, with 35·1 bushels of corn, 37 cwts. 3 qrs. and 8 lbs. of straw, or about 7½ cwts. more straw, were produced on the same plot. The differences in this respect are specially marked on the plots which were manured with nitrate of soda, with or without minerals.

Thus nitrate of soda alone in 1882 produced 26 bushels of dressed wheat, and the great quantity of 32 cwts. and 22 lbs. of straw; whilst in 1881, only 27 cwts. 2 qrs. and 20 lbs. of straw, and as much as 41 bushels of dressed wheat, were grown on the same plot.

On comparing the yield of corn and straw on plot 6 (manured with minerals and nitrate of soda in 1881 and 1882), I find that in the former year the plot yielded only 36 cwts. 3 qrs. and 19 lbs. of straw, and 45·2 bushels of dressed wheat per acre; whereas last season the same plot produced only 32·8 bushels of dressed corn, and as much as 39 cwts. and 21 lbs. of straw, or several cwts. more straw than was obtained with the larger produce of dressed wheat in 1881.

Without a single exception, all the plots last season yielded much more straw in proportion to corn than in the preceding season. Comparing the plots upon which nitrate of soda was used with those dressed with salts of ammonia, the proportions of straw were greater on the nitrated plots than on those manured with salts of ammonia, and the amount of dressed wheat was greater on the latter than on the plots manured with nitrate of soda.

Altogether, nitrate of soda had a less favourable effect upon the wheat-crop of 1882 than salts of ammonia, either alone or in conjunction with mineral manures.

In 1881, on the contrary, nitrate of soda, either alone or in conjunction with mineral manures, gave better returns than salts of ammonia alone, and than minerals and ammonia-salts. If I am not mistaken, nitrate of soda, when applied in considerable quantities to wheat in a wet and cold season, does not produce as good an effect as salts of ammonia. In such seasons nitrate of soda appears to expend its fertilising powers more in producing straw than corn, and on the whole to be a less beneficial manure for wheat than salts of ammonia. However, it would be dangerous to express too confident an opinion on the relative merits of nitrate of soda and sulphate of ammonia as nitrogenous manures for wheat.

As far as my experience goes, I can only state the fact that in one season a spring top-dressing of nitrate of soda has a better effect upon wheat than sulphate of ammonia, and in another season the reverse is the case, showing clearly how desirable it is to persevere with systematic field experiments, and not to be content with a few haphazard experimental field-trials, which in many cases do more harm than good, if the results obtained are interpreted by an incautious and inexperienced experimenter.

The second unmanured plot (No. 7), with one exception, due to the accidental depredations of the wire-worm, in the previous five years gave a better crop than the first unmanured plot (No. 1), and these two plots have maintained the same character in the sixth season of continuous growth of wheat, when the produce of dressed corn on plot No. 7 was about 1 bushel more than on plot No. 1.

Purely mineral manures, as in former seasons, had but a slight effect on the last season's wheat-crop; and on plot 4 they gave only about 2 bushels more dressed corn than the average produce of the two plots which for the last seven years had not received any kind of manure.

On the other hand, ammonia alone on plot 2 gave 32 bushels of dressed wheat per acre, that is, an increase of about 250 per cent. of dressed corn over the average produce of the two continuously unmanured plots (plots 1 and 7), amounting to 12¾ bushels per acre.

A less favourable but still very marked result was obtained on plot 3, top-dressed in spring with nitrate of soda, and otherwise left unmanured for the last seven years.

The best wheat was grown on plot 5, manured in autumn with minerals, and top-dressed in spring with salts of ammonia. The wheat from this plot weighed 59·6 lbs. per bushel, and the yield per acre was 35 bushels in round numbers. The proportion of straw to corn on this, as on all the other plots in relation to the corn, was unusually and excessively high last season, especially on the nitrate-of-soda plots, as already pointed out.

I need hardly repeat in this Report that the experiments on the continuous growth of wheat and barley which were begun seven years ago are not instituted with a view of giving practical illustrations of profitably growing corn-crops on light land. They were undertaken with the object of throwing light on the intricate and difficult question of the gradual exhaustion of soils by corn-crops. It is hoped that, by studying the special functions of various nitrogenous and mineral manures, in the course of time data will be furnished which will materially help agricultural economists to entertain more correct views on the subject of the unexhausted value of dung and of artificial manures than is the case at present with the majority of agricultural writers, land valuers, land owners, land agents, tenant-farmers, and others interested in this important question.

For the past five years two of the experimental plots, I may remind the reader, were manured with excessively large quantities of mineral and nitrogenous manures. One of these plots, in addition to 3½ cwts. of good mineral superphosphates, 200 lbs. of sulphate of potash, 100 lbs. of sulphate of soda, and 100 lbs. of sulphate of magnesia per acre, applied every year in autumn or early in spring, was top-dressed in spring with 400 lbs. of salts of ammonia per acre; and another plot was similarly dressed with the same minerals and 550 lbs. of nitrate of soda per acre, containing as much nitrogen as the 400 lbs. of ammonia salts on plot 8.

Two other plots were manured every year with good rotten dung. On one of these plots about 4 tons of dung per acre, specially prepared, and estimated to contain 100 lbs. of ammonia per acre, had been applied for the last five years; and on the second (plot 11), double the quantity of dung per acre, calculated to contain 200 lbs. of ammonia, had been used every year.

With a view of determining experimentally to what extent nitrogenous, or readily soluble, manures like nitrate of soda and sulphate of ammonia, applied to corn-crops in the preceding year, were taken up by the plants, and carried off in the crop, or wasted in land drainage, the quarter-acre plots 8 and 9, heavily manured every year with expensive mineral and readily soluble nitrogenous fertilisers, were divided in two equal parts of one-eighth of an acre each. Both halves were dressed with the usual quantity of mineral manures, but only one-half, or one-eighth of an acre, was top-dressed in spring with nitrogenous manures. Plot 8B (one-eighth of an acre) was top-dressed on the 7th of April, 1882, with ammonia-salts, at the rate of 400 lbs. per acre; and plot 9B on the same day was top-dressed with nitrate of soda, at the rate of 550 lbs. per acre.

The two plots Nos. 10 and 11, dunged every year in the previous five seasons, were divided into two equal halves of one-eighth of an acre each. No dung was put upon one-half, and the usual quantity on the second half.

By this arrangement it appears to me possible to ascertain in the course of some years to what extent good farmyard-manure parts with its fertilising properties in a single season; and how many years it will take practically to exhaust the fertilising properties of a definite quantity of good dung of known composition.

The results obtained last season on plots 8, 9, 10, and 11 are most instructive, and Table I., showing the produce of continuous wheat in the sixth season, 1882, is well worthy of an attentive study.

Referring, in the first place, to the plots 8 and 9, manured heavily with mineral and soluble nitrogenous manures, it will be seen that on the half-plots which were merely manured with mineral manures, the produce in corn and straw was not larger than on the plots upon which, for the last seven years, wheat was grown without any manure whatever. Singularly enough, plot 8A yielded almost exactly the same produce as the adjoining continuously unmanured plot 7, and plot 9B almost exactly the same produce as the unmanured plot 1.

Although these plots had been heavily dressed in each of the preceding five seasons with nitrate of soda or with ammonia-salts, the produce was reduced to the level of the continuously unmanured plots as soon as the nitrogenous manures were withheld the next season. The yearly and liberal supply of mineral manures did not raise the produce in wheat, and the results on plots 8A and 9A clearly show that there was no available residue of nitrate of soda or salts of ammonia left in the land from the previous applications of these readily soluble nitrogenous manures.

On the second half of plot 8B, manured with minerals or ammonia-salts, the produce of dressed corn, it will be seen, was 43½ bushels, weighing 59 lbs. per bushel, and that of straw 2 tons 15 cwts. and 6 lbs. The addition of ammonia-salts to the minerals, which alone produced only 13·3 bushels of dressed corn and 17 cwts. 2 qrs. and 6 lbs. of straw, thus more than tripled the wheat-crop.

On plot 9B a similarly large increase was obtained by the application of nitrate of soda. Minerals without nitrate on plot 9A produced only 12·2 bushels of dressed wheat, weighing only 56 lbs. per bushel, and 18 cwts. 1 qr. and 8 lbs. of straw per acre. The same amount of mineral manures, with the addition of 550 lbs. of nitrate of soda per acre, raised the crop to 35·8 bushels of dressed wheat, weighing 58·8 lbs. per bushel, and 49 cwts. 2 qrs. and 22 lbs., or nearly 2½ tons of straw per acre.

It is scarcely needful to state that in actual practice nobody would think of applying to the land such large quantities of ammonia-salts or nitrate of soda as those which were applied to the land on plots 8B and 9B. On these plots very heavy crops of wheat were grown in the five preceding years, considering the light character of the experimental field and the succession of bad seasons; and abnormally large quantities of readily soluble nitrogenous saline manures were applied in the experiments, partly with a view to exhaust the land, if possible, more rapidly than under ordinary conditions, and partly for the purpose of demonstrating the fact that excessive doses of nitrate of soda or salts of ammonia cannot be applied to corn-crops without incurring a great loss.

Turning in the next place to the results which were obtained on plots 10 and 11, it will be seen that on both plots the halves which received no dung for the wheat-crop of 1882, the yield both of corn and straw was greater than on the continuously unmanured plots, or on the plots which were manured with minerals only. Thus plot 10A, dunged in each of the five previous seasons with about 4 tons of good farmyard-manure, but not dunged for the wheat-crop of 1882, 15·6 bushels of dressed corn, and 19 cwts. and 22 lbs. of straw were produced, or about 3 bushels more dressed corn than the average yield of the two continuously unmanured plots 1 and 7; whilst the application of about 4 tons of dung per acre on plot 10B raised the produce of dressed wheat only 1 bushel above the produce of plot 10A, but gave a large increase of straw.

On plot 11A, manured at the rate of about 8 tons of farmyard-manure in the five preceding seasons, but not dunged for the wheat-crop of 1882, practically the same quantity of dressed wheat and about 1 cwt. more straw than on the corresponding plot 10A were obtained; whilst the application of about 8 tons of dung on plot 11B for the crop of 1882 raised the produce of dressed corn to 21·6 bushels, and that of straw to 30 cwts. 3 qrs. and 4 lbs. In comparison with the average yield of the two continuously unmanured plots 1 and 7, the dung on plot 11B gave an increase in round numbers of 9 bushels of corn and 22½ cwts. of straw per acre.

These experiments clearly show that the dung applied on plot 10A and plot 11A in previous years left some, but not a considerable, manure residue in the land, and that this residue apparently was not larger on the plot which was manured previously to 1882 with about 8 tons of dung annually than on the plot which received only half the quantity of the same dung. Future experiments on the dunged plots, it is expected, will show how long and to what extent the manure residue will be perceptible on plots 10A and 11A, which will not be dunged in the succeeding seasons. As far as present experience goes, a smaller amount of nitrogen, in the shape of nitrate of soda or sulphate of ammonia, has a more powerful effect on the produce of wheat in the first season than a much larger amount of nitrogen in the shape of farmyard-manure; but in the case of artificial manures the nitrogen is at once exhausted, while, although there is an available residue of the dung, in all probability a large percentage of it will never be recovered in the successive wheat-crops.

THE EXPERIMENTS ON THE CONTINUOUS GROWTH OF BARLEY.

The mineral manures were sown broadcast on the 14th of March, 1882, and the barley—Chevalier Barley—was sown on all the experimental plots on the 25th of March, 1882, at the rate of 9 pecks per acre.

The nitrate of soda and salts of ammonia, mixed for the sake of better distribution with about three times their bulk of dry sand, were sown by a broadcast manure-distributor on the 27th of April.

Well-rotten farmyard-manure, estimated to contain nitrogen equal to 100 lbs. of ammonia per acre on plot 10B, and 200 lbs. of ammonia per acre on plot 11B, was put on the land on the 26th of January, 1882.

Four bullocks, which made the dung, when put into the feeding-boxes on the 21st of November, 1881, weighed—

	cwts.	qrs.	lbs.
No. 1.	9	1	2
„ 2.	9	0	2
„ 3.	9	1	6
„ 4.	9	2	26
Total weight of four bullocks on the 21st Nov., 1881 ..	37	1	8

In the course of three weeks the four bullocks consumed—

	cwts.	qrs.	lbs.
Decorticated cotton-cake	2	2	0
Maize-meal	4	0	0
White turnips	30	0	0
Wheat-straw chaff	5	0	0

And they were supplied during that period with 6½ cwts. of wheat-straw, cut into chaff about 3 inches long, which was used as litter.

The dung was removed from the feeding-boxes on the 22nd of December, placed in a covered hovel, and allowed to rot until the 26th of January, when it was weighed.

With the consumption of the above-named quantities of food and wheat-straw chaff used as litter, the four bullocks produced 29 cwts. and 25 lbs. of rotten dung.

On the 13th of December, 1881, when the bullocks were removed from the feeding-boxes, their weight was as follows:

				Gain in Live-weight from Nov. 21 to Dec. 13, 1880 (3 weeks).			
	cwts.	qrs.	lbs.	cwts.	qrs.	lbs.	
No. 1. bullock	9	3	5	0	2	3	Total gain in 3 weeks: 2 cwts. 2 qrs. 5 lbs.
„ 2. „	9	3	3	0	3	1	
„ 3. „	10	0	2	0	2	24	
„ 4. „	10	1	3	0	2	5	
Total weight of four bullocks on the 13th Dec., 1881.	39	3	13	2	2	5	

The four bullocks, according to these data, increased in weight at the rate of 95 lbs. per week; or on an average each bullock increased in weight 23¾ lbs. per week, or about 3¼ lbs. per day.

On the 19th of July, 1882, I took in the field the following notes respecting the appearance of the barley on the several plots.

The unmanured plots looked remarkably well, considering that barley had been previously grown on them for five years in succession.

The plots dressed with nitrate of soda, or with salts of ammonia only, appeared about equal, and much better than the unmanured or the dunged plots.

Minerals alone (plot 5). The barley was not stronger than on the unmanured plots, but was lighter in colour, and more manured.

The plots manured with minerals and the smaller quantity of nitrate of soda (plot 6), or with minerals and ammonia-salts (plot 5) were about equal. The barley on both plots was very strong, and the best of the several plots.

On the two dunged plots the barley was not so strong as on the plots which had been top-dressed in spring with nitrate of soda, or with ammonia-salts.

Plot 8A (minerals without ammonia). Barley not much better than on the unmanured plots.

Plot 8B (minerals and large dose of ammonia-salts). Barley down on the ground.

Plot 9A (minerals without nitrate of soda). Not much better than the unmanured plots.

Plot 9B (minerals and large dose of nitrate of soda). Barley very luxuriant, a good deal down on the ground, though scarcely as much as on plot 8B.

The barley was cut on the 21st of August, 1882; and, rain intervening, the cutting was finished on the 25th of August.

It was carted, stacked, and thatched in good condition on the 30th of August, 1882.

It was threshed out in the field on the 15th of November, and the straw weighed at the time of threshing; the corn was weighed and measured on the 23rd of November, when the results embodied in Table II. (p. 222) were obtained.

It will be noticed that in 1882 the plots which in the preceding five years had been annually manured with a heavy dressing of mineral manures and a large dose of ammonia-salts,—or with minerals, and as much as 550 lbs. of nitrate of soda,—per acre, were divided in two, as were also the two dunged plots 10 and 11.

On one-half of the plots 8 and 9 minerals alone were used last season, and the other halves were dressed with minerals and ammonia-salts (plot 8B), and with minerals and nitrate of soda (plot 9B).

On plots 10A and 11A no dung was used, and the plots 10B and 11B were manured with the usual quantity of rotten dung.

The barley-crop on the whole yielded rather better than in the preceding season, and produced a superior quality of corn, weighing from 2 to 4 lbs. more per bushel than the barley grown in the same plots in 1881.

Last season appears to have been more favourable on the Woburn Experimental fields to the growth of barley than to that of wheat.

One of the unmanured plots (plot 1), which had grown five crops of dressed barley in succession before, produced 33·2 bushels of dressed corn, weighing nearly 52 lbs. per bushel, and 20 cwts. 1 qr. and 11 lbs. of clean straw.

The second unmanured plot (plot 7), which generally yields not so well as plot 1, gave 27½ bushels of dressed barley, weighing only 50·2 lbs. per bushel, and 19 cwts. 3 qrs. and 17 lbs. of straw. Plot 1 appears to be naturally more productive than plot 7.

The average produce of the two unmanured plots 1 and 7 in round numbers was 30 bushels of dressed corn and 20 cwts. of straw.

Nitrate of soda without minerals (plot 3) gave an increase, over the average yield of the two unmanured plots, of nearly 20 bushels of barley, and 11½ cwts. of straw.

Ammonia-salts alone (plot 2) also largely increased the barley-crop; but the increase was 5 bushels of dressed corn less than in the adjoining plot 3, which was top-dressed in spring with a quantity of nitrate of soda, containing as much nitrogen as the ammonia-salts, with which plot 2 was top-dressed in spring on the same day on which the nitrate was sown on plot 3.

TABLE II.—PRODUCE OF CONTINUOUS BARLEY. SIXTH SEASON, 1882.

PLOTS.	MANURES PER ACRE.	PRODUCE PER ACRE.					
		Dressed Corn.			Straw, Chaff, &c.		
		Weight.	Number of Bushels.	Weight per Bushel.			
		lbs.		lbs.	cwts.	qrs.	lbs.
1	Unmanured	1723	33·2	51·9	20	1	11
2	200 lbs. ammonia-salts, alone	2309	44·8	51·5	29	2	0
3	275 lbs. nitrate of soda, alone	2594	49·8	52·1	31	2	10
4	200 lbs. sulphate of potash, 100 lbs. sulph. of soda, 100 lbs. sulph. magnesia, 3½ cwts. superphosphate of lime	1203	23·1	52	15	2	24
5	200 lbs. sulph. of potash, 100 lbs. sulph. of soda, 100 lbs. sulph. of magnesia, 3½ cwts. superphosphate of lime, and 200 lbs. ammonia-salts	2590	47·6	54·4	33	3	14
6	200 lbs. sulph. of potash, 100 lbs. sulph. of soda, 100 lbs. sulphate of magnesia, 3½ cwts. of superphosphate of lime, and 275 lbs. nitrate of soda	2743	50·5	54·25	36	0	24
7	Unmanured	1383	27·5	50·2	19	3	17
8A	200 lbs. sulph. of potash, 100 lbs. sulph. of soda, 100 lbs. sulph. of magnesia, 3½ cwts. of superphosphate of lime ..	1998	37·7	52·9	25	0	26
8B	The same minerals as in 8A, and 400 lbs ammonia-salts	2756	52·7	52·3	50	3	18
9A	200 lbs. sulph. of potash, 100 lbs. sulph. of soda, 100 lbs. sulph. of magnesia, 3½ cwts. of superphosphate of lime ..	1988	37	53·7	19	0	20
9B	The same minerals as in 9A, and 550 lbs. of nitrate of soda	3442	66·8	51·5	48	3	14
10A	No manure (having received manure as 10B in each of the five preceding seasons)	2092	39·6	52·8	19	1	20
10B	Farmyard-manure, estimated to contain nitrogen = 100 lbs. of ammonia, made from 672 lbs. decorticated cotton-cake, 1075 lbs. maize-meal, 8064 lbs. turnips, 1344 lbs. wheat-straw chaff, as food; and 1747 lbs. wheat-straw as litter. Weight about 4 tons	2136	40·7	52·4	23	2	12
11A	No manure (having received manure as 11B in each of the five preceding seasons)	2056	38·3	53·75	21	1	18
11B	Farmyard-manure, estimated to contain nitrogen = 200 lbs. ammonia, made from 1344 lbs. decorticated cotton-cake, 2150 lbs. maize-meal, 16,128 lbs. turnips, 2688 lbs. wheat-straw chaff, as food; and 3494 lbs. wheat-straw as litter. Weight about 8 tons ..	2212	41·1	53·8	22	0	22

In conjunction with minerals, nitrate of soda also gave a heavier crop on plot 6 than salts of ammonia and minerals on plot 5, which produced 47½ bushels of barley, weighing 54·4 lbs. per bushel, and 33 cwts. 3 qrs. and 4 lbs. of straw; whilst plot 6 gave 50½ bushels of dressed corn, weighing 54¼ lbs. per bushel, and 36 cwts. and 24 lbs. of straw. Although the same nitrogenous top-dressings were applied to the Experimental wheat-plots, the ammonia-salts last season had a better effect upon wheat than nitrate of soda.

Comparing the produce of plots 8A and 9A with the average yield of the two unmanured plots 1 and 7, it will be seen that 7 bushels more barley was grown on plot 8A, and 7·7 bushels more on plot 9A, than on the average upon the unmanured plots.

In the case of the barley-crop, the large quantities of minerals annually applied to plots 8 and 9 thus appear to have left a residue of available mineral plant-food, which has had a favourable effect upon the sixth barley-crop.

On the other hand, the same minerals applied in the same quantities to the Experimental wheat-plots 8A and 9A, as has been shown before, did not raise the produce in the slightest degree above the yield of wheat on the unmanured plots 1 and 7.

The addition of a large dose of nitrate of soda to the minerals on plot 9B had the effect of largely increasing the barley-crop. On this plot, it will be seen, the heavy crop of nearly 69 bushels of dressed barley and about 49 cwts. of straw was grown per acre.

A very heavy crop was also grown on plot 8B, manured with minerals and ammonia-salts, containing as much nitrogen as the nitrate of soda employed on plot 9B, but the produce of dressed corn on plot 8B was 14 bushels less than on plot 9B.

With regard to the plots 10A and 11A, from which the dung was withheld in 1882, but which had been manured with rotten dung annually for the five previous barley-crops, it appears that the residue of the dung applied in previous years increased the yield of barley in 1882 to the extent of 9·6 bushels on one of the plots, and of 8·3 bushels on the second plot, above the average yield of the continually unmanured plots 1 and 7.

The farmyard-manure which was applied last January on plots 10B and 11B slightly raised the produce of dressed corn above the produce of plots 10A and 11A, which were not dunged in 1882; but the effect of the dung is more manifest in the increase of straw than in corn, especially on plot 11B.

For the present season farmyard-manure has been applied to the 10B and 11B plots both for wheat and barley, and withheld from the corresponding A plots, which course it is hoped will throw some light on the unexhausted manurial properties of the dung which has been applied annually for each of the five previous wheat- and barley-crops.

In concluding this portion of my Report, I would also observe that whilst last season the artificial manures had a better effect upon the barley than the dung, the latter increased the produce of 1881 to a greater extent than in 1882.

THE EXPERIMENTS IN ROTATION.

Rotation No. 1.—1877, seeds; 1878, wheat; 1879, mangolds; 1880, barley; 1881, seeds.

Wheat, 1882.—The seeds (white Dutch clover) were fed-off by sheep, which were taken off the land on the 7th of October. The land was ploughed up at once, and got ready for the wheat (Browick wheat), which was drilled in on the 23rd of October at the rate of 8 pecks per acre on all the four acres under experiment. The mineral manures required for plots 3 and 4 were applied on January 28th, and the top-dressings of nitrate of soda were sown on these plots on the 25th of April.

The wheat germinated well, and in about a fortnight after sowing appeared above ground, and grew well throughout the winter and the early part of the spring.

Towards the middle of June it came into ear, and promised to yield a heavy crop on all the four acres. At that time the wheat on plot 3, top-dressed with nitrate of soda, looked stronger and more luxuriant than that on the remaining three acres. Unfortunately, want of sunshine and excess of rain during the summer months sadly interfered with the ripening of the wheat-crop.

The wheat on the four acres in Rotation was cut on the 14th of August, carted and stacked on the 22nd of August, 1882, and threshed out in the field on the 25th of October. The straw was weighed in the field at the time of threshing, and the corn was kept in the granary in properly labelled bags until the 2nd of November, when it was hand-winnowed, weighed, and measured.

Table III. shows the produce of each of the four acres under experiment.

The quality of the Rotation wheat was rather better on plot 1 (seeds fed-off by sheep, which consumed decorticated cotton-cake) and on plot 2 (seeds fed-off by sheep, having maize-meal as additional food) than on plots 3 and 4, top-dressed in spring with nitrate of soda.

TABLE III.—PRODUCE OF WHEAT (ROTATION No. 1), IN 1882, AFTER SEEDS FED ON THE LAND IN 1881.

Plots of One Acre.		Dressed Corn.						Straw, Chaff, &c.
		Head-Wheat.			Tail-Wheat.			
		Weight.	Bushels.	Weight per Bushel.	Weight.	Bushels.	Weight per Bushel.	
		cwts. qrs. lbs.		lbs.	cwts. qrs. lbs.		lbs.	tons. cwts. qrs. lbs.
1	Seeds fed off by sheep, which consumed 672 lbs. of decorticated cotton-cake ..	22 1 9¼	40·7	61·3	1 0 5½	2·1	55·1	2 10 3 20
2	Seeds fed off by sheep, which consumed 728 lbs. of maize-meal	22 2 8	41·5	60·9	0 3 13½	1·8	53	2 10 0 17·5
3	Seeds fed off by sheep without cake or corn, top-dressed in spring with artificial manures, containing as much nitrogen, potash, phosphoric acid, &c., as 672 lbs. of decorticated cotton-cake	20 3 9	38·7	60·2	1 3 10¾	3·7	54¾	2 16 2 8
4	Fed off by sheep without cake or corn, top-dressed in spring with artificial manures, containing as much fertilising matter as the dung from 728 lbs. of maize-meal ..	23 3 25	44·75	60	0 2 18¾	1·4	51	2 17 1 27½

The wheat on plot 1, it will be seen, weighed 61·3 lbs. per bushel, and on plot 2 nearly 61 lbs., whereas on the two plots top-dressed with nitrate of soda it weighed 1 lb. less per bushel.

On the whole, the quality of the wheat was superior to that in the Rotation Experiments of the preceding year.

On the other hand, the yield of corn was considerably less last season on all the four acres than in 1881, when from 14 to 19 bushels more wheat were grown than last season.

The nitrate of soda on plot 3 appears to have done more harm than good, for the yield of dressed wheat on that plot was less than on any of the remaining three acres.

On all the four acres the quantity of straw reaped was much greater last season than in 1881. Thus plot 1, which in round numbers produced 14 bushels less head-wheat than the corresponding plot in No. 4 Rotation the preceding year, grew 8 cwts. 3 qrs. and 20 lbs. more straw than plot 1 in the Rotation wheat in 1881.

On all the four acres more straw was grown in 1882 than on the four acres of the Rotation wheat of 1881.

Rotation No. 2.—Four acres: 1877, mangolds; 1878, barley; 1879, seeds; 1880, wheat; 1881, mangolds; barley, 1882.

Barley, 1882.—The mangolds grown in 1881 were fed-off on the field in spring; the land was ploughed in the beginning of April, and the barley drilled in on the 22nd of April, 1882. White Dutch clover was sown between the barley in May, no manure was applied to plots 1, 2, and 4. On plot 3 the barley was top-dressed on the 13th of June with 124 lbs. of nitrate of soda, containing one-third as much nitrogen as the manure from 1000 lbs. of decorticated cotton-cake.

With the exception of a small piece of the barley field fed-off last by the sheep, where the barley, owing to the treading of the sheep in wet weather, was backward, the rest of the field grew a splendid crop of barley.

The barley was cut on the 11th of September and carted in good condition, and stacked on the 15th of September.

It was threshed out in the field on the 27th of October, and the corn, after having been stored in the granary, was winnowed, measured, and weighed on the 23rd of November. The results of the harvest are shown in Table IV.

It will be seen that by far the best crop was obtained on the cotton-cake plot, No. 1. This plot produced 47·6 bushels of dressed head-corn, weighing nearly 52 lbs. per bushel, and 1 ton 14 cwts. and 24 lbs. of straw; whilst the maize plot, No. 2, yielded 44·5 bushels of head-corn and 1 ton 13 cwts. 3 qrs. and 27 lbs. of straw, or about 3 bushels less head-corn than the cotton-cake

TABLE IV.—PRODUCE OF BARLEY (ROTATION NO. 2), IN 1882, AFTER MANGOLDS FED ON THE LAND.

PLOTS of One Acre.		DRESSED CORN.										Straw, Chaff, &c.			
		Head-Corn.					Tail-Corn.								
		Weight.			Bushels.	Weight per Bushel.	Weight.			Bushels.	Weight per Bushel.				
		cwts.	qrs.	lbs.		lbs.	cwts.	qrs.	lbs.		lbs.	tons	cwts.	qrs.	lbs.
1	Without artificials (cotton-cake plot) ..	22	0	10½	47·6	51·9	1	2	1½	3 75	45·1	1	14	0	24
2	Without artificials (maize plot)	20	3	19	44·5	52·7	1	1	11	3·6	44·4	1	13	3	27
3	With artificial manure, containing one-third as much nitrogen as the manure from 1000 lbs. decorticated cotton-cake, namely, 124 lbs. nitrate of soda	19	3	5	42·6	52	1	3	70	4	44·3	1	16	1	4
4	Without artificial manure	20	0	25	43·3	52·3	1	0	22	3	44·3	1	13	2	13

plot. Nearly the same weight of corn and straw as on the maize plot was grown on the unmanured plot 4, upon which the clover had been fed-off by sheep which received neither maize nor decorticated cotton-cake as additional food.

The top-dressing of nitrate of soda on plot 3 appears to have done some harm to the barley, for more straw was grown on that plot than on any other of the four acres of the Rotation barley. On this plot the produce of head-corn was 42·6 bushels, or 5 bushels less than on the cotton-cake plot 1, and that of straw was 1 ton 16 cwts. 1 qr. and 4 lbs., or 2 cwts. and 8 lbs. more than on plot 1.

On the whole, the Rotation barley-crop in 1882 was fully as good as in the preceding year.

Rotation No. 3.—1878, seeds; 1879, wheat; 1880, mangolds; 1881, barley.

Seeds, 1882.—The clover—white Dutch—was fed-off by sheep in the course of the growing season. On one acre, 672 lbs. of decorticated cotton-cake were consumed; on the second acre, 728 lbs. of maize-meal; on the third and fourth acres neither cake nor maize was given to the sheep which fed-off the clover on plots 3 and 4. Fresh water was supplied to all the sheep in the field. Forty sheep—ten on each acre—were put on the clover on the 22nd of May; and by the 23rd of June the sheep on plot 3 had eaten down the clover, on plot 4 on the 26th of June, and plots 1 and 2 on the 28th of June. They were weighed before they were put on the Rotation clover, and again when they were taken off. The following results were obtained:—

PLOTS		Increase in Live-weight. lbs.
1.	Fed-off by 10 sheep, each sheep receiving about ½ lb. decorticated cotton-cake per day; 10 sheep on the land 37 days	152
2.	Fed-off by 10 sheep, each sheep receiving about ½ lb. of maize-meal per day; 10 sheep on the land 37 days	120¼
3.	Fed-off by 10 sheep, without other food; 10 sheep on the land 32 days	102¾
4.	Fed-off by 10 sheep, without other food; 10 sheep on the land 35 days	82½

The clover was somewhat immature, and not over-abundant, when the sheep were put upon it for the first time. This explains the greater increase of live-weight of the sheep which consumed cake or corn as additional food.

The sheep which received decorticated cotton-cake made the largest increase in live-weight, and on plot 4 they did the worst. Forty sheep were again put on the clover on the 2nd of July, after having been weighed. They were taken off from plots 1 and 2 on the 31st of July, and from plots 3 and 4 on the 29th of July. When weighed, they gave the following results:—

Plots.		Increase or decrease in Live-weight.
		lbs.
1.	Fed-off by 10 sheep, eating about ½ lb. of decorticated cotton-cake per sheep per day; on land 29 days	+ 53
2.	Fed-off by 10 sheep, eating about ½ lb. of maize-meal per day; on land 29 days	+ 77¾
3.	Fed-off by 10 sheep, without other food; on land 27 days	+ 48½
4.	Fed-off by 10 sheep, without other food; on land 27 days	− 19¼

When the sheep went over the clover the second time the clover was rather hard and bitter, and the sheep trod down a good deal of it, and those which received neither cake nor corn did not do well. The sheep on plot 4, it will be seen, lost weight.

In the interval between the 31st of July and the 14th of September the clover had grown sufficiently to be fed-off, and had formed fairly well-ripened seed; and as the fixed allowance of decorticated cotton-cake and maize had not been consumed, fifteen sheep were put on plot 1, sixteen on plot 2, and six on plot 3, and the same number on plot 4. All the sheep were put on the clover on the 14th of September, and taken off from plots 1 and 2 on the 6th of October, and from plots 3 and 4 on the 7th of October, and weighed, when the following results were obtained:—

Plots.		Increase in Live weight.				
		lbs.		lbs.	ozs.	
1.	Fed-off by 15 sheep, receiving decorticated cotton-cake; on land 22 days	139½	or	9⅘	0	per head.
2.	Fed-off by 16 sheep, consuming maize-meal; on land 22 days	203¾	or	12	11	,,
3.	Fed-off by 6 sheep, without additional food; on land 23 days	47	or	7⅚	0	,,
4.	Fed-off by 6 sheep, without additional food; on land 23 days	52	or	8⅔	0	,,

The following tabular statement gives a summary of the results, and shows the number of sheep fed on each acre, the quantity of purchased food consumed (if any), the number of sheep fed in the field, the number of days they were on the land, and the total increase in live-weight produced:—

Plots.		Increase in Live-weight. lbs.
1.	Fed-off by sheep, with 672 lbs. decorticated cotton-cake; 10 sheep on land 88 days, and 5 sheep 22 days	344½
2.	Fed-off by sheep, with 728 lbs. of maize-meal; 10 sheep on land 88 days, and 6 sheep 22 days	401¾
3.	Fed-off by sheep, without other food; 10 sheep on land 59 days, and 6 sheep 23 days	198¼
4.	Fed-off by sheep, without other food; 10 sheep on land 62 days, and 6 sheep 22 days	115¼

The sheep which received no other food than the white clover, on plots 3 and 4, produced an average increase of 156¾ lbs. per acre; whilst with the addition of 6 cwts. of decorticated cotton-cake, they gained 344½ lbs. in weight, or 187¼ lbs. more than the former. They thus paid well for the expenditure of 6 cwts. of decorticated cotton-cake.

A still more favourable result was obtained on plot 2. On this plot, by the use of 6½ cwts. of maize-meal, the sheep gained 401¾ lbs., and thus produced 245 lbs. more live-weight than on an average per acre without cake or corn.

Last season maize made more meat than decorticated cotton-cake, and the reverse was the case in the corresponding Rotation Experiments in the preceding season.

Rotation No. 4.—Four acres; 1878, mangolds; 1879, barley; 1880, seeds; 1881, wheat.

Swedes, 1882.—In growing mangolds on the four Rotation acres in 1881, some difficulty was experienced in feeding-off the roots on the ground sufficiently early to get the land in fine tilth in time for sowing the succeeding barley-crop; for it is well known that mangolds, unless perfectly ripe, scour sheep, and therefore require to be stored in covered heaps a couple of months, or longer, before they can be eaten by them on the ground with benefit.

Instead of mangolds, it was considered desirable to grow Swedish turnips in 1882, as they may be fed with advantage earlier than mangolds, and enable the land to be prepared earlier than last spring for the barley-crop.

The dung for the swedes was made by eight bullocks; two of which, in addition to 1000 lbs. of mangolds and 1250 lbs. of wheat-straw chaff, consumed 1000 lbs. of decorticated cotton-cake; two others 1000 lbs. of maize-meal as an additional food;

the four remaining bullocks were fed upon mangolds and straw-chaff only.

The bullocks, when put into the feeding-boxes on the 13th of December, 1881, weighed

	cwts.	qrs.	lbs.	
1. Two bullocks ..	19	2	8	—receiving decorticated cotton-cake.
2. ,, ..	20	1	5	—receiving maize-meal.
3. ,, ..	19	3	4	—no corn or cake.
4. ,, ..	19	0	24	— ,,

The bullocks which were fed only upon mangolds and wheat-straw chaff finished the allotted amount of food on the 1st of February, 1882, and the bullocks which consumed decorticated cotton-cake or maize-meal as additional food, on the 28th of January, 1882.

When taken out of the pits on these dates the bullocks weighed:

	cwts.	qrs.	lbs.
1. Two bullocks, which consumed decorticated cotton-cake as additional food	20	2	5
2. Two bullocks, which consumed maize-meal	21	2	4
3. ,, fed without corn or cake	19	1	3
4. ,, ,, ...	19	0	21

The first lot gained 109 lbs. in live-weight; the second lot, 139 lbs.; the third lost 57 lbs.; and the fourth lost 3 lbs.

All the bullocks, before they were put into the feeding-boxes, were fed upon some corn and cake; and when the concentrated food was withheld from four of the bullocks, they went back a good deal at first, as they did not take kindly at once to the plainer food; but gradually they came round, towards the conclusion of the experiment, and if they had been kept longer in the feeding-boxes they probably would have maintained better their original weight. The dung was turned over once, and kept under cover until the 20th of February, 1882, when it was carted on the field in a rotten condition, and subsequently ploughed in.

The mineral manures were applied on the 8th of June, on which date the swedes were sown. The nitrate of soda on plots 3 and 4 was sown by hand round the swedes on the 26th of July, after they had been singled out and had made some progress in growth and had begun to bulb.

The roots were taken up in the second week of December, 1881, topped and tailed, and the whole produce of the four acres (bulbs and tops), was weighed, when the results shown in Table V. were obtained:—

TABLE V.—PRODUCE OF SWEDES, 1882 (ROTATION, NO. 1), AFTER WHEAT.

Plots of One Acre.		Produce per Acre.							
		Roots.				Leaves.			
		tons.	cwt.	qrs.	lbs.	tons.	cwt.	qrs.	lbs.
1	With dung, made from 1350 lbs. straw as litter; 5000 lbs. mangolds; 1250 lbs. wheat-straw chaff, and 1000 lbs. decorticated cotton-cake	17	6	2	4	2	4	1	23
2	With dung, made from 1350 lbs. straw as litter; 5000 lbs. mangolds; 1250 lbs. wheat-straw chaff, and 1000 lbs. of maize-meal	17	1	2	7	2	4	0	3
3	With dung, made from 1350 lbs. straw as litter; 5000 lbs. mangolds; 1250 lbs. wheat-straw chaff; and artificial manure, containing two-thirds as much nitrogen, and the other constituents, of the manure from 1000 lbs. decorticated cotton-cake; namely, 248 lbs. nitrate of soda, 100 lbs. of bone-ash (made into superphosphate), 62½ lbs. sulphate of potash and 65 lbs. sulphate of magnesia	19	13	1	7	2	9	0	3
4	With dung, made from 1350 lbs. straw as litter; 5000 lbs. mangolds; 1250 lbs. wheat-straw chaff; and artificial manure, containing as much nitrogen, and other constituents, as the manure from 1000 lbs. maize-meal; namely, 80 lbs. nitrate of soda, 16¼ lbs. bone-ash (made into superphosphate), 7 lbs. sulphate of potash, and 11 lbs. sulphate of magnesia	18	3	1	6	2	6	0	18

A glance at this tabular statement shows that the heaviest crop was obtained on plot 3, manured with mineral manures equivalent to the mineral fertilising constituents in 1000 lbs. of decorticated cotton-cake, and two-thirds of the nitrogen in that quantity of cake.

The next best crop of swedes was grown on plot 4, manured with the same amount of minerals and nitrogen contained in 1000 lbs. of maize-meal.

On the acre (plot 1) manured with cottoncake-dung, 16 cwts. 2 qrs. and 20 lbs. less roots than on plot 3 were obtained, or 2 tons 6 cwts. 2 qrs. and 21 lbs. less than on plot 3, manured with the larger quantity of minerals and nitrate of soda.

The maize-dung on plot 2 produced 5 cwts. and 7 lbs. less roots than the cottoncake-dung.

EXPERIMENTS ON BARLEY IN LANSOME FIELD.

In 1881 experiments were instituted on 4 acres of this field on Swedish turnips grown with soluble and finely ground phosphatic fertilisers. The following table shows the plan of manuring that was adopted on Lansome-field :—

WOBURN ROOT EXPERIMENTS in 1881 in LANSOME FIELD, CROP SWEDISH TURNIPS (GIBBS' SELECTED PURPLE-TOP), each PLOT ¼ of an ACRE, separated from the rest by paths 2½ feet in width.

No. 1 A.	**No. 2** A.	**No. 3** A.	**No. 4** A.	**No. 5** A.	**No. 6** A.	**No. 7** A.	**No. 8** A.
No manure.	5 cwts. of ground coprolites per acre; cost, 1*l.* per acre.	5 cwts. of dissolved coprolites per acre; cost, 1*l.* per acre.	5 cwts. of Redonda phosphate per acre; cost, 17*s.* 6*d.* per acre.	4 cwts. of precipitated phosphate; cost, 1*l.* per acre.	3 cwts. of bone-meal per acre; cost, 22*s.* 6*d.* per acre.	3 cwts. of dissolved bones per acre; cost, 19*s.* 6*d.* per acre.	3 cwts. of dissolved coprolites and 2¼ cwts. of Peruvian guano per acre; cost, 43*s.* 3*d*, per acre.
No. 5 B.	**No. 6** B.	**No. 7** B.	**No. 8** B.	**No. 1** B.	**No. 2** B.	**No. 3** B.	**No. 4** B.
4 cwts. of precipitated phosphate per acre; cost, 1*l.* per acre.	3 cwts. of bone-meal per acre; cost, 22*s.* 6*d.* per acre.	3 cwts. of dissolved bones per acre; cost, 19*s.* 6*d.* per acre.	9 cwts. of dissolved coprolites and 2½ cwts. of Peruvian guano per acre; cost, 43*s.* 3*d.*	No manure.	5 cwts. of ground coprolites per acre; cost, 1*l.* per acre.	5 cwts. of dissolved coprolites per acre; cost, 1*l.* per acre.	5 cwts. of Redonda phosphate per acre; cost, 7*s.* 6*d.* per acre.

The swedes were fed-off on the land by sheep, with the addition of an equal quantity of cake and corn on each of the ¼-acre plots, at the rate of 4 cwts. of barley-meal and 2 cwts of decorticated cotton-cake per acre.

After ploughing-up the land, weeding, and harrowing, it was in good condition for barley, which was sown on the 5th of May, 1882. The barley came up on the 11th of May, and subsequently there was a strong and even plant on all the plots of

Lansome-field. Towards the end of July the barley looked remarkably healthy and strong, and no appreciable difference could be detected by inspection of the several experimental plots.

The barley was cut on the 5th and 6th of September, and carted and stacked in good condition on the 12th and 13th of September, 1882. It was threshed out on the 14th of November; the straw and chaff were weighed at the time of threshing on the field, and the corn was placed in properly labelled bags in the granary until the 24th of November, when it was winnowed, weighed, and measured, and the following results were obtained:—

PRODUCE of BARLEY in LANSOME FIELD in 1882, after SWEDES fed-off with CAKE and CORN in 1881.

PLOTS ¼ Acre each.	Manures used for Swedes.	Weight of Barley.				Number of Bushels.	Weight per Bushel.	Straw.			
		Tons.	cwts.	qrs.	lbs.		lbs.	Tons.	cwts.	qrs.	lbs.
1 A.	No Manure ..	0	18	1	19	39	53·9	1	8	1	8
1 B.		1	5	1	18	52·6	54·1	2	4	2	1
Mean		1	1	3	18·5	45·8	54	1	16	1	18·5
2 A.	5 cwt. Ground Coprolites, cost 1*l.* per acre ..	1	9	1	6	59·8	54·8	1	17	1	13
2 B.		1	7	2	2	58·9	53·3	2	10	3	7
Mean		1	8	1	18	59·3	54	2	4	0	10
3 A.	5 cwt. Dissolved Coprolites, cost 1*l.* per acre ..	1	2	3	25	47·5	54·1	1	16	2	26
3 B.		1	6	1	6	55·0	53·5	2	7	0	20
Mean		1	4	2	10·5	51·2	53·8	2	1	3	23
4 A.	5 cwt. Redonda Phosphate, cost 17*s.* 6*d.* per acre	1	4	0	12	50·2	53·8	1	17	3	17
4 B.		1	5	3	18	53·2	53·6	2	5	3	19
Mean		1	5	0	1	51·7	53·7	2	1	3	18
5 A.	4 cwt. Precipitated Phosphate, cost 1*l.* per acre ..	0	18	0	2	37	54·6	1	15	1	26
5 B.		1	1	0	6	44	53·5	1	15	1	5
Mean		0	19	2	4	40·5	54	1	15	1	15·5
6 A.	3 cwt. Bone Meal, cost 22*s.* 6*d.* per acre	1	4	0	6	49·5	54·4	1	15	0	18
6 B.		1	3	3	4	50·3	52·9	1	18	3	24
Mean		1	3	3	19	49·9	53·7	1	17	0	7
7 A.	3 cwt. Dissolved Bones, cost 19*s.* 6*d.* per acre	1	2	0	23	46·3	53·7	1	14	1	13
7 B.		1	4	2	26	51·9	53·9	2	3	0	17
Mean		1	3	1	24·5	49·1	53·8	1	18	3	1
8 A.	3 cwt. Dissolved Coprolites and 2½ cwt. of Peruvian Guano, cost 43*s.* 3*d.* per acre	1	2	2	7	47·6	53·0	1	15	2	20
8 B.		1	6	2	17	55·0	54·2	2	1	1	14
Mean		1	4	2	12	51·3	53·6	1	18	2	3

Unfortunately the soil in this field differs somewhat in character and productive powers. With the exception of two plots, those in section B gave a larger crop than the A plots, which experience agrees well with the produce of the preceding crop of swedes on the several plots in 1881.

Thus it will be seen that, whilst the unmanured plot 1A yielded 39 bushels, weighing 53·9 lbs. per bushel, the second unmanured plot 1B produced 52·6 bushels, weighing 54·1 lbs. per bushel, or, in other words, plot 1B produced fully 13½ bushels more barley than plot 1A.

Now it may be laid down as a good rule that, whenever the produce of two unmanured plots in a series of field experiments shows differences as great as the differences between the average yield of the variously manured and unmanured plots, no legitimate conclusion as regards the efficacy and value of the manures employed in the experiments can be drawn from the results obtained in field trials with manures.

I abstain from making any comments on the results of the barley trials in Lansome-field, for the difference in the yield of the unmanured ¼-acres is as great as the difference in the yield of barley on any of the manured and unmanured plots.

My impression is that the natural variations in the productive powers of the four experimental acres in Lansome-field have more to do with the variable harvest-results in 1882 than the manures which were applied to the swede-crop in the preceding year.

IX.—*Annual Report of the Consulting Chemist for* 1882.

THE analytical work done for Members of the Society, for the year beginning the 1st of December, 1881, to the 1st of December, 1882, has been much more extensive than in the preceding year.

During the year terminating December 1, 1881, 1058 samples were sent to the Society's Laboratory for analysis; in the year terminating December 1, 1882, no less than 1403, or 345 more samples than in the preceding year, were sent for analysis by Members of the Royal Agricultural Society. A reference to the appended Summary shows that this large increase is principally due to the analyses of superphosphates, dissolved bones, and similar artificial manures, and of oil- and feeding-cakes. Of the former 100, and the latter 111 more samples, were sent during the last twelve months than in the preceding year.

Also a larger number of samples of Peruvian and fish guanos, nitrate of soda, manure-cakes, and potash-salts were sent for analysis; and the demand for complete soil-analyses and reports has increased, and exceeded by thirteen the number of soil-reports made in the preceding year. Seventy-three soil-analyses, for the greater part accompanied by lengthy reports on the best means of improving the productive powers of land, the reclamation of waste lands, the laying down to permanent pastures, the application of appropriate manures, the course of cropping to be pursued on different soils, were made during the last twelve months; whereas, some five years ago, such reports were but rarely requested from the Consulting Chemist of the Society.

As usual, a number of samples of inferior artificial manures, which had been sold at high prices in comparison with their intrinsic money value, or under wrong or misleading names, as well as of adulterated oilcakes, were received for analysis; but, as the most flagrant cases have already appeared in the Quarterly Reports of the Chemical Committee, no further reference need be made in the present Report to those cases, or to apparently unfair dealings in artificial manures and feeding-stuffs.

Instead of dwelling further on this subject, to which reference is made in almost all my Annual Reports, I would direct attention to some analyses which have been made during the last twelve months, and which embody information that may be of more general interest than the majority of reports, which, however useful to individual applicants, are of no special interest to the agricultural public at large.

Sterile Soil.—A soil from California upon which hardly anything grows, when tested with reddened litmus-paper showed a decidedly alkaline reaction, and the qualitative analysis revealed the presence of more nitric acid and chloride of sodium than is generally found in arable land. Submitted to a complete analysis, the following results were obtained :—

Composition of a Californian Alkaline Soil.

*Soluble organic matter	·75
*Insoluble organic matter	2·44
Oxide of iron	4·48
Alumina	4·54
Carbonate of lime	2·58
Magnesia	1·50
†Nitrate of potash	·17
‡Chloride of sodium	·04
Potash	·81
Soda	·58
Sulphuric acid	traces
Phosphoric acid	·19
Insoluble silicious matter	81·92
	100·00

* Containing nitrogen	·09
Equal to ammonia	·11
† Containing nitric acid	·09
‡ Containing chlorine	·02
Mineral matter soluble in water	49

The soil readily yielded to cold water ½ per cent. of soluble saline mineral matters, consisting of carbonate of soda and potash, chloride of sodium and nitrate of potash.

Besides soluble mineral matter, this soil contained ¾ per cent. of organic matter, soluble in water, which gave a brownish colour to its watery extract. No doubt the free alkalies or alkaline carbonates act upon the organic matter, and produce alkaline humates or ulmates, which have a brown colour, and are soluble in water.

The proportion of phosphoric acid in the soil is fully equal to the average proportion in good soils; and the soil contains abundance of carbonate of lime and, in fact, of all elements of plant-food to meet the requirements of cultivated crops. Its sterility thus is not due to deficiency of plant-food or to the presence of a constituent inimical to vegetation, but to the excess of soluble saline constituents, some of which, in a highly dilute condition, are valuable fertilisers. There is no other plan of reclaiming such sterile soils than to inundate them periodically with fresh water, and gradually to wash out by this means the excess of soluble saline matter. Unfortunately, in places where soils similar in character to this Californian soil occur, a good supply of fresh water cannot be obtained, or the position of the land does not permit of its being irrigated and thoroughly well-drained.

Ensilage.—Mr. Gibson, of Saffron-Walden, recently sent me a sample of green rye, which had been preserved successfully by him in silos. It had the following composition:—

Moisture	72·50
Lactic acid	·80
*Albuminous compounds	1·99
Mucilage, extractive matter, &c.	12·86
Woody fibre (cellulose)	9·72
Mineral matter (ash)	2·13
	100·00

* Containing nitrogen .. .. ·31

Cattle and sheep greedily eat the green food preserved by ensilage, and, judging from all accounts, appear to do well on it. Milch cows, more especially, seem to like ensilaged green food, and to produce abundance of milk.

The sample sent to me by Mr. Gibson was well made and free from all mouldiness, which is apt to make its appearance in badly preserved green food.

It will be seen that the sample of ensilaged rye contained 72½ per cent. of moisture and 27½ per cent. of dry matter.

In all other specimens that have been sent to me at various times, and which were more or less spoiled, and some rendered quite unfit for feeding purposes, I found the proportion of moisture much higher than in well-preserved green food. According to my experience, green food cannot be well preserved in silo, when the proportion of water in it much exceeds 80 per cent.

Very succulent and watery green food often contains from 85 to 90 per cent. of water. Such food must be cut in ½-inch or 1-inch bits, and then be intimately mixed with straw-chaff, varying from 10 to 30 per cent. according to the degree of succulence of the green food which has to be placed into the silos. This is an important element in preserving green food by ensilage. If green rye or oats are allowed to remain in the field until the grain is fully formed, but the kernel is still milky, the proportion of moisture to dry matter in the green rye or oats will not be so large as in green maize or sewage-grass, and the crop will not require the admixture of straw chaff or similar dry substance.

Ordinary grass-crops, or tares and vetches intended for ensilage,* must either be partially made into hay, or, when cut quite green, must be mixed with straw-chaff, or be allowed to become somewhat woody before being put into silos.

Another element in successfully preparing green food by ensilage is the exclusion of air from the compressed food. In pressing green food, a moderate pressure may be applied at first, but, as the partially-compressed green food settles down, the pressure should be increased.

Green food, when well made in silos, has always a more or less acid taste. This is due to the change of a portion of the sugar of the food into lactic acid, an acid which is a good preserver of perishable articles of food, and which also is useful as contributing to the digestibility of coarse vegetable food. Properly ensilaged, green food does not enter into violent fermentation, and the compressed food in the silos does not heat to any considerable extent, nor throw off visibly carbonic acid gas, nor lose much in substance by fermentation.

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* I think it may be useful to draw attention to the fact that the word "*ensilage*" is now used in at least two distinct senses, especially by American farmers. In Europe, when ensilage is spoken of, most people understand that the *process* or *system* is referred to; but in America, and in American writings, the word is quite as often used to designate the *result of the system as applied to green maize*. If a question arose as to any other substance having been preserved in silos, the name of that substance would be prefixed, *e.g.*, Rye-ensilage, Trifolium-ensilage, &c. This is equivalent to our practice in speaking of bread, by which we mean wheaten bread, or, more correctly, bread made with ordinary wheat-flour. In other cases we should say, rye-bread, whole-meal bread, &c.—EDIT.

Ensilage, probably, may be practised with advantage in localities such as the Highlands of Scotland, where the climate is too cold and wet to allow good hay to be made, and where corn-crops often do not ripen properly.

Oats or rye, cut still green and put into silos, in such places would furnish good and wholesome food for stock at times when such food is most wanted.

In most localities in England, ensilage is not likely to become a general practice as in some parts of Germany, France, and America.

Locust-beans.—The pods of locust-beans contain, as is well known, a high percentage of sugar, but comparatively little albumen or similar nitrogenous matter.

Composition of Locust-Beans.

	Pods and Seeds.	Seeds only.
Moisture	14·73	14·11
Oil	62	2·03
*Albuminous compounds	5·62	16·94
Sugar	40·01	..
Woody fibre	5·27	8·81
Mucilage and digestible fibre	30·99	54·50
Ash	2·76	3·61
	100·00	100·00
*Containing nitrogen	·90	2·71

Locust bean-meal is an excellent condimental food, and useful in imparting to straw chaff, or other coarse and unpalatable food, a sweet taste and slightly aromatic smell. Although the pods of locust-beans possess high fattening properties, it would be a mistake to give locust-meal, like bean- or barley-meal, in considerable quantities to fattening beasts or sheep, for the extremely sweet taste of locust-meal makes fattening stock rather too particular in their choice of food, and prevents their eating as much of less palatable but equally nutritious food as it is desirable they should consume.

The seeds in the locust-bean pods do not contain any appreciable amount of sugar, but a good deal of albuminous matter and mucilage. They are very hard, and swell up in water to a great size; and when ground into meal, they are far more digestible and nutritious than their hard condition would appear to warrant.

Alfala Clover-Hay.—A species of clover-hay has been brought under my notice which I have not seen before, under the name of Alfala clover-hay. It had the following composition:—

Moisture	12·60
Oil and chlorophyl	2·74
*Albuminous compounds	8·94
Sugar, gum, &c.	5·07
Crude fibre	62·26
Mineral matter	8·39
	100·00
* Containing nitrogen	1·43

This rather coarse hay contained a large proportion of crude fibre, and was not equal in nutritive qualities to ordinary good clover-hay.

Dari-seed and Millet.—Dari-seed is a species of sorghum, and, like millet-seed, is rich in starch and comparatively poor in albuminoids. A sample of dari-meal and two samples of millet recently analysed by me gave the following results:—

	Dari-seed.	Millet.	
		Crushed.	Whole.
Moisture	12·55	12·85	13·19
Oil	2·93	3·91	3·83
*Albuminous compounds (flesh-forming matters)	10·31	11·25	9·56
Starch, sugar, and digestible fibre	70·43	60·25	57·06
Woody fibre (cellulose)	1·63	7·73	12·51
Mineral matter (ash)	2·15	4·01	3·85
	100·00	100·00	100·00
* Containing nitrogen	1·65	1·80	1·53

At the present time millet is about 24 per cent. cheaper than oats, weight for weight, and hence the sender of the millet was desirous of obtaining an opinion of the comparative feeding value of good oats and millet.

Both dari-meal and millet, it will be seen from the preceding analyses, are rich in starch, but too poor in albuminous or nitrogenous constituents to suit hard-working horses. Millet and dari-meal are better foods for fattening bullocks or for poultry than for working horses, and are decidedly inferior to Indian corn or oats as a food for horses. It is difficult to estimate accurately the comparative value of millet and oats. As far as I can judge, oats of good quality are worth probably 25 per cent.

more than millet of the quality of the samples recently analysed by me.

One of the best meals to mix with dari-meal or millet is bean-meal. Beans contain from 24 to 26 per cent. of albuminous compounds, and are therefore well adapted for supplying the deficiency of these compounds in dari or millet.

The quality of dari-seed varies a good deal.

Middlings, Sharps, and Bran.—As they may be useful for reference, I give recent analyses of these feeding materials:—

	Middlings.	Sharps.	Bran.
Moisture	12·55	12·80	14·55
Oil	3·46	3·90	3·13
*Albuminous compounds	14·68	14·62	13·87
Starch, gum, and digestible fibre	61·63	54·61	51·09
Woody fibre (cellulose)	4·73	9·22	9·61
Mineral matter (ash)	2·95	4·85	5·35
	100·00	100·00	100·00
* Containing nitrogen	2·35	2·34	2·22

As a rule, middlings contain more starch than sharps or bran, and are better food for fattening purposes.

The percentage of ash in bran is usually greater than in middlings or sharps; and it is distinguished from the ash of barley or oats by a much greater amount of alkaline phosphates, which probably is one of the reasons why bran is a very useful addition to the food of milch cows, for I need hardly say that milk is rich in phosphatic constituents.

Composition af a Sample of Malt-Combs.

Moisture	11·54
Oil	1·60
*Albuminous compounds (flesh-forming matters)	26·81
Mucilage, sugar, and digestible fibre	46·35
Woody fibre (cellulose)	8·36
†Mineral matter (ash)	5·34
	100·00
* Containing nitrogen	4·29
† Containing sand	·54

Malt-combs are an excellent and readily digestible food for ewes and for lambs. They may also be given with much advantage to milking-cows. About 2 lbs. of malt-combs added to the food upon which milch cows are fed has been found to increase perceptibly the yield of milk.

The manuring properties of malt-combs are fully equal to those of linseed-cake of fair average composition.

Home-made Malt.—A sample of home-made malt sent by a Member of the Royal Agricultural Society had the following composition:—

Moisture	8·15
Oil	1·67
Glucose	1·88
Starch and dextrin	70·87
*Albuminous compounds	9·81
Woody fibre (cellulose)	5·07
Mineral matters (ash)	2·55
	100·00
* Containing nitrogen	1·57

Russian Linseed-cake.—Good linseed-cake on an average contains from 26 to 28 per cent. of albuminous compounds. In Baltic linseed-cake the proportion of these compounds usually is higher than in cake made from East India linseed; and 30 to 33 per cent. of albuminous compounds is not an exceptional percentage in cake made from St. Petersburg or Riga linseed. The highest proportion which I ever found in linseed-cake amounted to 36·62 per cent., and occurred in a sample of Russian linseed-cake which had the following composition:—

Moisture	11·13
Oil	10·73
*Albuminous compounds (flesh-forming matters) ..	36·62
Mucilage, sugar, and digestible fibre	28·22
Woody fibre (cellulose)	7·91
Mineral matter (ash)	5·39
	100·00
* Containing nitrogen	5·86

This was a pure linseed-cake, remarkably rich in albuminous compounds, and contained a full average percentage of oil. It was sold at 7*l.* 15*s.* per ton, free on rail in London.

Poisoning by White-Lead Paint.—A gentleman who lost several yearling calves sent me a white pasty substance, about 1½ lb. of which was found in the stomach of two yearlings.

The examination of this material showed that it was white-lead paint. Animals appear to be fond of oil-paint, which contains lead, for poisoning cases with lead paints have frequently been brought under my notice. Attention is therefore directed to the danger of leaving about in places accessible to stock white-lead and other paints which often contain lead.

Fish Guano.—Under the name of marine guano, dried and pulverised fish-refuse has been imported from abroad of late in considerable quantities.

Dried fish or marine guano has given much satisfaction to farmers who applied it to cabbages, mangolds, autumn-sown wheat, and all crops for which Peruvian guano is used with advantage as a manure.

Marine guano varies considerably, as will be seen by the subjoined analyses, and should always be bought under a guarantee stating the price per unit of ammonia and of phosphate of lime. During the past season it has been sold at about 16*s.* per unit per cent. of ammonia, and 1*s.* 6*d.* to 2*s.* per unit per cent. of phosphate of lime.

	(FISH GUANO).				Polar Fish Guano.
	169	**326**	**382**	**753**	**762**
Moisture	9·30	8·60	7·80	6·31	9·44
*Organic matter	62·35	54.70	58·30	53·19	62·31
Phosphate of lime	23·55	30·61	28·79	31·58	23·65
Alkaline salts	3·71	4·08	3·56	5·81	4·31
Insoluble silica	1·09	2·01	1·55	3·11	·29
	100·00	100·00	100·00	100·00	100·00
* Containing nitrogen ..	7·10	5·76	5·93	6·94	8·43
Equal to ammonia ..	8·62	6·99	7·20	8·43	10·24

Bats' Guano.—The following analysis represents the composition of bats' guano of the best quality:—

Moisture	13·80
*Organic matter and ammoniacal salts	74·66
(Including nitric nitrogen .. .. .. ·67)	
Phosphate of lime	4·43
†Alkaline salts	6·17
Insoluble siliceous matter	·94
	100·00
* Containing nitrogen (total)	9·97
Equal to ammonia	12·09
† Containing phosphoric acid	2·38
Equal to tribasic phosphate of lime ..	5·19
Total percentage of phosphoric acid ..	4·41
Equal to tribasic phosphate of lime ..	9·62

Bats' guano varies much in composition, and consequently may be worth 11*l.* to 12*l.* a ton, or only 5*l.* to 6*l.* a ton.

The sample to which the preceding analysis refers would not be dear at 11*l.* a ton; for it is a manure which is rich in ready-formed ammonia and nitrogenous organic matter, which are readily decomposed in the soil.

In addition to the nitrogenous organic matters and salts of ammonia, capable of yielding together 12 per cent. of ammonia, this bats'-dung contains some nitrate of potash and soda, and an amount of soluble phosphoric acid in combination with alkalies, corresponding to 5 per cent. of soluble phosphate of lime in round numbers. It is altogether a high-class artificial manure. Unfortunately the supply of good bats' guano is very limited.

Nitrogenous Refuse Manures.—During the past twelve months the importation of high-class Peruvian guanos, rich in ammonia, has greatly decreased in comparison with the imports of former years. The price of high ammoniacal guano has lately risen from 25 to 30 per cent. Sulphate of ammonia, which at present is worth about 20*l.* per ton, is likely to advance in price in spring. Nitrate of soda cannot be used with advantage for certain crops, such as hops, and upon soils upon which more slowly acting nitrogenous manures appear to have better effect. It may therefore be of interest to notice the percentage of nitrogen in some refuse manures, the fertilising value of which mainly, if not entirely, depends upon the amount of ammonia which they are capable of yielding on decomposition in the soil. Besides wool-refuse or shoddy, several samples of skin, hair, feather, and leather-refuse, flock-dust, and dried blood, have been sent for analysis, and the following results have been obtained:—

	Nitrogen	equal to	Ammonia.
Skin-waste	5·67	=	6·88
Leather-dust (white)	3·66	=	4·58
Leather waste (blue)	7·01	=	8·51
Flock-dust	7·62	=	9·25
Feather waste	6·34	=	7·69
Dried blood	10·99	=	13·33

Both the samples of leather-waste were not ordinary tanned leather-waste, but leather prepared without the use of oak-bark, or a tanning material containing tannic and gallic acids. Ordinary leather-waste has but little or no value as a manure, for the combination of tannic acid with skin, which constitutes common shoe-leather, resists the combined decomposing action of moisture and air in the soil, in a remarkable degree. I have kept leather powder even dissolved in a solution of caustic potash for years without eliminating from it appreciable quantities of ammonia, and have never been able to notice any beneficial effect upon grass-land upon which leather-waste had been applied in large quantities. In buying leather-waste, it is of importance to ascertain beforehand whether the refuse is really untanned skin-waste, which is readily decomposed, or common tanned leather-refuse, which has no material value as a manure.

Peat-moss Fibre.—Attention is directed to the nature of peat-fibre as a substitute of straw as litter.

A short time ago a gentleman sent me for analysis a sample of peat-fibre, and requested an opinion as to its adaptability for litter in the place of straw, also its manurial value and power of absorbing water as compared with straw. He likewise wished to know whether the peat-fibre was likely to be injurious in any way to animals lying upon it, and whether the manure produced by its use might injure the crops to which it is applied.

The peat-fibre, a part of which was light brown and another deeper brown-coloured, and very voluminous, had the following composition :—

Moisture	12·80
*Organic matter	85·13
Mineral matter (ash)	2·07
	100·00
* Containing nitrogen	·61
Equal to ammonia	·74

Peat-fibre absorbs water to a much larger extent than straw, and possesses the additional advantage of being an excellent fixer of ammonia, in virtue of the humic acids occurring in the peat. Stables and cowsheds in which peat-fibre is used as litter are sweeter than those in which straw is used for the same purpose.

Peat-fibre, in my judgment, is not injurious to horses or horned cattle that lie upon it, nor do I think that the manure made by its employment can possibly injure the crops to which it is applied. The direct manurial properties of peat-fibre are insignificant, but, as just stated, it is an excellent material for absorbing the urine, and for absorbing and retaining the most valuable constituents of the liquid and solid excrements of cattle or horses.

A Member of the Royal Agricultural Society, who for some time past has used peat-fibre as a substitute for straw, informs me that 1 ton of peat-fibre is equal to nearly 2 tons of straw as litter, and consequently its use effects a considerable saving in the cost of making dung in places where straw cannot be produced in sufficient quantities, or where the straw can be sold at a good price.

A sample of stable-dung, in the production of which German peat-fibre had been used, had the following composition:—

Moisture	70·90
*Organic matter	25·50
Phosphate of lime	·76
Alkaline salts, &c.	1·15
Insoluble siliceous matter	1·69
	100·00
* Containing nitrogen	·56
Equal to ammonia	·68

This dung was equal in value to good rotten farmyard-manure.

The 'Journal' of the Society for 1882 contains the following contributions of mine:—

1. Annual Report for 1881.
2. Quarterly Reports to Chemical Committee.
3. Report on the Field and Feeding Experiments conducted at Woburn during the year 1881.
4. Field Experiments on Swedish Turnips with soluble and finely ground Phosphatic Fertilizers.
5. Experiments in Warren Field, Crawley-Mill Farm, Woburn, on the Manurial value of various Phosphatic Fertilizers.

The wheat-crops in the Rotation Experiments at Woburn yielded from 5 to 5½ quarters of good wheat, weighing about 61 lbs. per bushel, and 2½ to 2¾ tons of straw.

The yield of corn in 1882 was less by about 14 bushels per acre than in the preceding year, and on the other hand, the Rotation wheat produced from 8 to 11 cwts. more straw in 1882 than in 1881.

The Rotation Barley Field in 1882 yielded as well as in the preceding year, and gave rather a better sample of barley, weighing 2 lbs. more per bushel than in 1881. The best and largest produce in barley was obtained on the acre manured in previous years with dung made by feeding sheep or bullocks with decorticated cotton-cake.

In Warren Field the clover, which promised well in the autumn and the early part of winter, suffered greatly from continuous rains, and the imperfectly drained state of the field. The field, moreover, was very foul, and the mild winter and plentiful rain in spring encouraged the growth of surface weeds to such an extent, that the clover crop was spoiled more or less on the several plots.

Warren Field has been thoroughly drained during the past autumn, and been much improved thereby.

The Roots (swedes) in the Rotation Experiments at Woburn were a fine, even, and in all respects satisfactory crop.

The experimental barley in Lansome Field yielded on an average about 6 quarters per acre of good barley, weighing from 53½ to 54 lbs. per bushel, and about 2 tons of straw.

In the course of the year I paid twelve visits to the Experimental fields at Crawley-Mill Farm.

Analyses made for Members of the Royal Agricultural Society from 1st December, 1881, *to* 1*st December*, 1882.

Feeding-cakes	423
Superphosphates, dissolved bones, and compound manures	382
Guanos	96
Soils	73
Waters	72
Bones	68
Nitrate of soda	36
Limestones, chalk, and minerals	35
Refuse manures	32
Feeding-meals	29
Wool-dust and shoddy	24
Manure rape-cake	22
Kainite	18
Fish guano	16
Corn, hay, malt-dust	11
Soot	12
Sulphate of ammonia	10
Milk, cheese, butter	10
Compound feeding-cakes	6
Poisons	5
Dried blood	4
Sewage manures	4
Cattle spices	4
Miscellaneous samples	11
Total	1403

X.—*Quarterly Reports of the Chemical Committee*, 1882.

March, 1882.

1. Mr. Grosvenor Hodgkinson, Balderton, Newark-upon-Trent, sent a sample of manure, described as dissolved bones, which on analysis was found to have the following composition:—

Moisture	16·95
*Organic matter	28·20
Phosphate of lime	7·35
Carbonate of lime, oxide of iron and alumina, common salt, &c.	44·20
Insoluble siliceous matter	3·30
	100·00
* Containing nitrogen	1·53
Equal to ammonia	1·86

This manure, it will be seen, contained no soluble phosphate of lime, and only $7\frac{1}{3}$ per cent. of insoluble phosphate of lime, and consequently cannot properly be called dissolved bones.

It contained much carbonate of lime, common salt, and organic refuse matters, and was scarcely worth 2*l.* 10*s.* per ton.

The manure was offered for sale as Pure Dissolved Bones at 6*l.* 15*s.* per ton, but in consequence of the preceding unsatisfactory analysis, no order was given.

2. Mr. M. Savidge, Sarsden Lodge Farm, Chipping Norton, sent for analysis half a cotton-cake, marked "pure," taken from a lot of two tons, and informed Dr. Voelcker at the same time that his cattle, which had been eating cotton-cake with roots all the winter, from some cause or other, refused to eat the cake from the two ton lot, a sample of which was sent for analysis.

This cake contained in 100 parts—

Moisture	11·40
Oil	4·07
*Albuminous compounds	19·31
Mucilage, sugar, and digestible fibre	29·33
Woody fibre (cellulose)	19·87
Phosphate of lime and magnesia	3·50
Carbonate of lime	3·71
Sulphate of lime	4·87
Alkaline salts, &c.	1·93
Insoluble siliceous matter	2·01
	100·00
* Containing nitrogen	3·09

These results show that the cake is poorer in oil and albuminous compounds than good undecorticated cotton-cake, and that it is not a pure cake, inasmuch as it is mixed with carbonate of lime and sulphate of lime (gypsum). Altogether the cake contained about 10 per cent. more mineral matter than occurs in pure undecorticated cotton-cake.

In reply to the usual inquiries, Mr. Savidge informed Dr. Voelcker on February 27th, that he bought the cotton-cake last November, from an agent at Banbury, at 6*l.* 5*s.* per ton, delivered at Chipping Norton Junction, that he made a claim of 4*l.* upon the two tons (which has been allowed), and that he would endeavour to obtain the name of the manufacturer and further particulars as soon as possible.

JUNE, 1882.

Dr. Voelcker reported the following cases:—

1. Mr. Henry Cook, Sussex Farm, Deepdale, Lynn, ordered 40 to 50 tons of Black Sea rape-cake at 5*l.* 2*s.* 6*d.* from agents, who bought the cake from manufacturers in Hull. Each cake, Mr. Cook informed me, had "pure" branded on one side, but as he did not like the appearance of the cake, he sent me a sample for analysis, and took only 10 tons of it.

The following is the composition of the sample sent by Mr. Cook:—

Moisture	10·01
*Organic matter	66·21
Phosphate of lime and magnesia	4·24
Alkaline salts, containing phosphoric acid ·66	2·96
Insoluble siliceous matter (sand)	16·58
	100·00
* Containing nitrogen	3·37
Equal to ammonia	4·09

Besides rape, the cake contained apparently a large proportion of small weed seeds, the siftings of oily seeds, and dirt and sand. In my judgment the cake was very dear at 5*l.* 2*s.* 6*d.* per ton, for I would not give 3*l.* 3*s.* for it.

2. The following is the composition of a sample of Manure Rape-cake, sent to me by Mr. H. Sheringham, South Creake, Fakenham, Norfolk.

Moisture	8·11
*Organic matter	52·14
Phosphate of lime and magnesia	3·35
Carbonate of lime	4·25
Insoluble siliceous matter	32·15
	100·00
* Containing nitrogen	2·74
Equal to ammonia	3 32

The cake was greatly adulterated with sand and earthy matters, and in my judgment was not worth more than about 3*s.* 3*s.* per ton.

On the 22nd of May, 1882, Mr. Sheringham wrote:—

"DEAR SIR,—I received your analysis of the rape-cake on Saturday. I am glad to say I have not bought any of the cake, as I waited for your report before doing so, and have now laid it before the merchant of whom I obtained the sample; he is very much annoyed that the cake should be so different from what it was represented to him to be, and he is in communication with the manufacturers about it. The merchant brought the cake at 4*l.* 15*s.* in *Hull*, and it is *branded pure*.—Yours faithfully.

"H. V. SHERINGHAM."

Subsequently Mr. Sheringham sent me another sample of rape-cake, accompanied by the following letter:—

"S. Creake, Fakenham, May 26th, 1882.

"DEAR SIR,—A copy of the analysis I sent to the crushers of the manure rape-cake, and they have requested a cake to be sent to the Hull borough analyst, before they will acknowledge anything wrong. This was sent yesterday, but a portion of the *same* cake I reserved, and have forwarded it on by rail to-day to your address. I should feel more satisfied to have your report on the *same* cake, to stand against theirs. The merchant that sold me the cakes is determined to have justice done, and is on the point of taking legal steps in the matter.—I am, sir, yours respectfully.

"H. V. SHERINGHAM.

"Dr. Voelcker."

On analysis of the second sample, the following results were obtained:—

Moisture	8·55
*Organic matter	64·35
Phosphate of lime	2·85
Carbonate of lime, &c.	4·90
Insoluble siliceous matter (sand)	19·35
	100·00
* Containing nitrogen	3·24
Equal to ammonia	3·93

The second sample, it will be seen, was not so bad as the first, still it is far from being a pure rape-cake.

Mr. Sheringham informs me that he ordered 5 tons of Black Sea rape-cake, at 5*l.* 10*s.* per ton, on the 10th of May, 1882, from an agent who bought the cake from the manufacturers in Hull. The vessel was loaded at Hull, and the cakes were branded "Pure" (with the manufacturers' initials).

After receipt of analysis, Mr. Sheringham complained to the vendor, who forwarded the complaint to the manufacturer, and the result was that the agent obtained redress at 20*s.* per ton, which he returned to all purchasers of the cargo of cakes.

Had these cakes been made from pure seed, the analysis would in all probability have been identical; but in cases where an admixture of sand, weed-seeds, or siftings have been allowed, there may be great variations in the quality of particular cakes taken from the same bulk; as the sand, weed-siftings, &c., are seldom equally distributed throughout the whole of the make.

Attention was called to the impurity of Black Sea rape-cakes in my Annual Report, 1878, vol. xv., p. 350 of the 'Journal.'

3. Rape-cakes and some kinds of feeding-cakes occasionally contain so much wild mustard-seed as to become positively poisonous when eaten by stock in considerable quantities. A case in point has lately been brought under my notice by Mr. George Laing, Wark, Coldstream, who, on the 13th of April, wrote as follows:—

> "Wark, Coldstream, N.B., April 13th, 1882.
>
> "Sir,—To-day I send you by post a sample of feeding-cake for analysis. It is called by the maker 'Sweet Rape-cake,' and is said to be made of rape, locust-beans, and meal. About ten days ago I began to give some two-year-old store cattle one small feed of it per day, they getting a small feed of turnips in the morning, and as much oat-straw as they would eat. After they had had three feeds of the cake, one of them was found dead in the yard close to the water-trough, and other two were very ill, one of which died after a day's illness, and the other got better. None of the others (there were 50 of them) seemed to be affected in any way. Each one of the three cattle that were taken ill were in different yards, and the weight of cake laid down for each beast was under 1½ lbs. I expect that the three cattle must have eaten more than their share of the cake, but even if they had eaten, say 5 lbs., I don't think they should have died from the effects if the cake is good and digestible. I shall be much obliged if you will give me a full analysis of the cake, and your opinion as to its suitability as a feeding-stuff for store cattle. I may say that since stopping giving the 'Sweet-Rape-cake' the cattle have all been perfectly healthy.—Yours faithfully,
>
> "Geo. Laing.
>
> "Dr. Augustus Voelcker, London."

On analysis, this sweet rape-cake had the following composition:—

Moisture	13·43
Oil	5·26
*Albuminous compounds (flesh-forming matters)	13·31
Mucilage, sugar, and digestible fibre	48·43
Woody fibre (cellulose)	14·23
Mineral matter (ash)	5·34
	100·00
* Containing nitrogen	2·13

This cake, I found, contained a good deal of wild mustard, and I have no doubt cattle eating rather much of the cake will be injuriously affected by the pungent essential oil of mustard, which is gradually developed in the intestinal canal. Judging from similar cases, I consider it highly probable that the animals which Mr. Laing lost died from inflammation of the intestines.

4. A case of artificial manure of extravagant price was submitted to the Committee, which is not published because the manure was not sold by analysis—but the makers, in a letter of justification, refer to their agents' commissions as an important element in the price of the manure. The Committee feel that this question of commission to agents is one which consumers and honest manufacturers ought to set their faces against most strongly. The Committee have good reason to know that the worse the manure, the higher frequently is the commission paid, and that this is often as much as from 10 to 20 per cent. of the price of the manure.

5. A sample of manure, said by the makers to be a blood and bone manure, was sent to me by Mr. R. M. Knowles, Colston Bassett, Bingham, Notts. The manure was sold at 4*l.* per ton in bags at the works.

On analysis, the following results were obtained :—

Water	29·49
*Organic matter	22·85
Phosphate of lime	2·21
Sulphate of lime	9·81
Oxide of iron, &c.	6·86
Siliceous matter	28·78
	100·00
* Containing nitrogen	1·06
Equal to ammonia	1·29

This is a poor manure. I would rather have two tons of good rotten dung than one ton of this stuff: I need not say, therefore, that 4*l.* is a most extravagant price for this so-called blood and bone manure.

On receipt of my report, Mr. Knowles wrote to the makers, making a very strong complaint. The makers replied that there must be a mistake somewhere, and enclosed the subjoined report and analysis, which differs essentially from the results which I obtained in the analysis of the samples sent to me by Mr. Knowles.

"GENTLEMEN,—Below please find results of our analysis of the second sample of manure which you handed to us on the 16th inst.

Moisture	20·09
*Organic matter	39·25
Sulphate of lime	8·14
Alkaline salts	1·13
†Mineral matter	31·39
	100·00
* Containing nitrogen equal to ammonia ..	5·032
† Containing phosphoric acid	8·060

"The approximate value of the manure per ton calculated from these percentages is as follows:—

		£.	s.	d.
Organic matter	39·25 at 10*s.* per ton	19	12	6
Sulphate of lime	8·14 „ 30*s.* „	12	4	2
Phosphoric acid	8·06 „ 40*l.* „	322	8	0
Alkaline salts	1·14 „ 2*l.* „	2	5	2
Ammonia	5·03 „ 80*l.* „	402	8	0
		£758	17	10
		£7	11	9

"This manure is very good value for 7*l.* per ton, and should work well without either requiring the addition of superphosphate or ammonia salts."

This case clearly illustrates the propriety of buying artificial manures on the strength of a definite analytical guarantee. In many instances which have come under my notice, favourable reports and analyses are presented to buyers of inferior manures which often are not worth the cost of cartage to any distance; and the only safeguard against imposition in buying manures is not to be led astray by unguaranteed analyses and reports, but to demand an analytical guarantee, and subsequently, on delivery of the manure, to have an analysis made which will show whether or not the dealer or manufacturer has fulfilled his part of the contract.

6. Mr. E. C. Clarke, Manor House, Haddenham, Oxon, sent me a sample of so-called shoddy, which, on analysis, was found to contain only 2·29 per cent. of nitrogen, and to contain hardly any wool-refuse; it was full of weed-seeds, dirt, and warehouse sweepings. In reply to the usual application for vendor's name and address, Mr. Clarke wrote:—

"The party who supplied me with the so-called shoddy will take it all back and pay carriage; so have decided not to trouble more about it."

7. The following is the composition of a sample of manure, wrongly called bone-dust, sent by Mr. R. Gill, Keele Estate Office, Newcastle, Staffordshire:—

Moisture	24·61
*Organic matter	20·09
Phosphate of lime	1·94
Oxide of iron and alumina	9·04
Alkaline salts and magnesia (chiefly sulphate of soda)	13·27
Sulphate of lime	16·04
Insoluble siliceous matter	15·01
	100·00
* Containing nitrogen	1·17
Equal to ammonia	1·42

The manure which Mr. R. Gill sent me, under the name of bone-dust, is not bone-dust, but a poor refuse manure, for which I should be sorry to have to pay 30*s.* per ton.

No further information was obtained from Mr. R. Gill.

8. Mr. A. Warde, West Farleigh, Kent, bought a sample of dried blood, guaranteed to contain 10 per cent. of ammonia, at 10*l.* per ton.

On analysis, only 7½ per cent., or 2½ per cent. less ammonia than the guaranteed percentage, were found, for which deficiency an allowance of 2*l.* 10*s.* per cent. was made by the vendors. I append Mr. Warde's letter.

"The Lane House, Brandesburton, Hull, Yorkshire, June 5th, 1882.

"Dear Sir,—Your letter has been sent to me here. I shall not be at home before the 15th or 16th. I bought the manure from an agent of the manufacturers, living at Tunbridge Wells, but cannot remember his name; it was guaranteed to me to contain 10 per cent. of ammonia, and as it did not contain it, one quarter of the price was allowed. Now, although the allowance was made, there was great neglect somewhere; and if I had not have had the manure analysed I should have lost 50*s.* per ton. I cannot send you the correspondence, and I may say there was no hesitation on the part of the manufacturers in allowing the amount claimed, and they expressed their regret; but, nevertheless, there was the manure sent out with 25 per cent. less ammonia than it ought to have contained.—Believe me, yours truly,

"A. Warde.

"Dr. Voelcker."

9. Mrs. Prescott, Birches Farm, Tenbury, Herefordshire, sent me a sample of manure, of which she bought two tons, believing it to be sulphate of ammonia. On analysis, the sample was found to contain only 14·29 per cent. of ammonia. Good commercial sulphate of ammonia contains not less than 24 per cent. of ammonia, or 10 per cent. more than the sample analysed for Mrs. Prescott. Assuming ammonia to sell at 16*s.* per unit per cent., the sample sent by Mrs. Prescott is worth 8*l.* per ton less than good commercial sulphate of ammonia. At the rate of 16*s.* per unit of ammonia, the sample sent by Mrs. Prescott is worth about 11*l.* 4*s.* per ton, and is certainly far too dear at 16*l.* a ton. In this case the maker issued two circulars with identical testimonials, in the one calling the manure " . . . . sulphate of ammonia," and in the other " . . . . ammonia manure;" the material was invoiced as ammonia manure, and sold without a guarantee.

DECEMBER, 1882.

Dr. Voelcker reported the following cases:—

1. A sample of dissolved bones, sent by Mr. Robert Tinniswood, Rose Bank, Carlisle, on analysis gave the following results:—

Moisture	19·61
*Organic matter	18·89
Phosphate of lime	11·98
Sulphate of lime	32·37
Oxide of iron and alumina, magnesia, alkaline salts, &c.	11·42
Insoluble siliceous matter	5·73
	100·00
* Containing nitrogen	·84
Equal to ammonia	1·02

This manure, it will be seen, contained no soluble phosphate of lime, only 12 per cent. of insoluble phosphates, and not quite 1 per cent. of nitrogen, which was present mainly in the form of shoddy.

Such a manure should not be sold under the name of dissolved bone.

It was sold at 7*l.* 10*s.* per ton on credit, or at 6*l.* per ton for cash, but was scarcely worth 3*l.* per ton.

The name and address of the vendor of this manure was not given by Mr. Tinniswood.

2. A sample of inferior, or adulterated, nitrate of soda, sent by Mr. Jas. Swinnerton, Cauldwell, Burton-on-Trent, had the following composition:—

Moisture	2·81
Chloride of sodium	9·75
Other impurities	·31
Pure nitrate of soda	87·13
	100·00

This nitrate was sold at 15*l.* 10*s.* per ton at a time when the wholesale price of nitrate of soda was quoted in Liverpool at 12*l.* 15*s.* per ton.

Good nitrate of soda usually contains not less than 95 per cent. of pure nitrate. The sample sent to me by Mr. Jas. Swinnerton would be worth 14*l.* 4*s.* per ton, supposing good nitrate of soda to be worth 15*l.* 10*s.* per ton, which latter price, however, is fully 2*l.* per ton more than nitrate of soda could be bought for at the time in the retail manure market.

3. Mr. Swinnerton also sent me a sample of turnip manure, which had the following composition :—

Moisture	11·70
*Organic matter and water of combination	20·62
Monobasic phosphate of lime	5·37
Equal to tribasic phosphate of lime (bone phosphate) rendered soluble by acid	(8·40)
Insoluble phosphates	14·70
Sulphate of lime, alkaline salts, and magnesia	38·91
Insoluble siliceous matter	8·70
	100·00

* Containing nitrogen	·89
Equal to ammonia	1·08

This manure, which was sold at 7*l.* 10*s.* per ton, less 5 per cent. for cash, would not be cheap at 4*l.* 4*s.*

No information was given by Mr. Swinnerton respecting the vendors of the nitrate of soda and the turnip manure.

4. Mr. Faunce de Laune sent me a sample of artificial manure, which he informed me was bought by a tenant at 9*l.* per ton.

This manure had the following composition :—

Moisture	21·30
*Organic matter	26·25
Phosphate of lime	9·60
Sulphate of lime, &c.	26·40
Insoluble siliceous matter	16·45
	100·00

* Containing nitrogen	1·35
Equal to ammonia	1·64

A manure containing as little phosphate of lime and ammonia as the sample which Mr. de Laune sent me is not worth more than 3*l.* a ton.

In reply to the usual inquiries, Mr. de Laune says :—

> "I think it advisable at present not to report the name of the firm from whom I sent the artificial manure, as the two tenants are so extremely adverse, and the second one has written a second letter to say he made a mistake, and that it was 3*l.* instead of 9*l.* he was going to pay. It is very difficult to unearth these people, and it does not do to get wrong."

5. The following is the composition of a sample of guano, which was sent for analysis by Mr. C. P. Noel, Bell Hall, near Stourbridge :—

Moisture	11·18
*Organic matter and ammoniacal salts	19·15
Phosphate of lime	21·16
†Alkaline salts, &c.	13·83
Insoluble siliceous matter	34·68
	100·00

* Containing nitrogen	3·96
Equal to ammonia	4·81
† Containing phosphoric acid	1·86
Equal to tribasic phosphate of lime	4·05
Total percentage of phosphoric acid	11·55
Equal to tribasic phosphate of lime	25·21

This guano, it will be noticed, contains no less than one-third its weight of useless siliceous matter (stones and sand). I consider the sample to be worth scarcely 8*l.* 15*s.* per ton; it is an imposition to ask 13*l.* a ton for such a guano.

Mr. Noel informed me that three tons of the guano had been bought at 13*l.* 5*s.* per ton by Mr. Joseph Patten, of Manor Farm, Bilbroughton, Worcestershire, from a manure company; but, as the manure turned out very bad, the company allowed back 6*l.* 5*s.* per ton.

Dr. Voelcker also reported several cases in which, under the name of Black-Sea Rape-cake, inferior manure-cake had been sold, which principally consisted of the siftings of oily seeds, and, in addition to a variety of weed-seeds, contained much sand and dirt.

XI.—*Annual Report of the Consulting Botanist for* 1882. By W. CARRUTHERS, F.R.S.

INCREASED attention has been paid to the conditions under which permanent pastures can be best laid down. The memoir by Mr. De Laune, published in the Society's 'Journal' in the spring of this year, and the action of the Seeds' Committee in recommending purchasers of seeds to require a guarantee according to a published standard, have quickened the interest in this important subject.

I have had to deal with numerous inquiries as to the grasses which constitute existing pastures, and I have examined and tested more than 160 samples of grass seeds on behalf of Members of the Society.

The standard recommended by the Society was fixed from a consideration of the actual results of my examinations of seeds carried on for many years. The germinating value may no doubt be, under exceptional harvesting conditions, lower than the percentage fixed, without any blame being due to the seedsman; but the farmer who has to use the seed should be made aware of this, for if it does not affect the price per pound he has to pay, it must affect the quantity he sows when he has decided what proportion the different grasses shall hold in his mixture. The best seeds bought at a fair price should be better than the recommended standards. As a matter of fact, during the past year, only a very few samples of those seeds, for which a standard of 90 per cent. germinating power was recommended, fell below that standard. These seeds include cereals, green crops, clovers, and Timothy grass. One sample of barley, which looked well, failed to germinate more than 14 per cent., and on dissection I found that the embryos were dead. No doubt the seed, originally good, had been kept so long that the germinating power had been almost entirely destroyed. The clovers considerably surpassed the standard, with the exception of one parcel of alsike, which gave only 48 per cent. of germinating grains.

Only two samples of fox-tail were better than 20 per cent. of germinating grains, the moderate standard recommended for this grass. One sample, looking well to the eye, had only eight seeds capable of germinating in the 100. This grass is almost always collected before it is ripe. The seed grower thus secures a bulkier crop, for the seeds of fox-tail easily separate from the stalk as they ripen, and are lost to the collector. The purchaser also gets the white silvery colour in the unripe seeds, which is so much desired. But in getting the desired colour, he gets chiefly chaff. It would be infinitely better if a darker and heavier seed were selected, for this would be found to germinate 80 or 90 per cent., or even more.

The two large-seeded fescues, meadow fescue and tall fescue, I have found to be generally adulterated with rye-grass; yet three samples of tall fescue, and one of meadow fescue, I found entirely free from these seeds. The proportion of rye-grass seed varied from 10 to 50 per cent. One sample offered as meadow fescue contained scarcely a single seed of that grass, but was composed mainly of rye-grass, with some seeds of cocksfoot, crested dogs-tail, and Yorkshire-fog. The presence of so large a proportion of rye-grass is a very serious defect in the great majority of samples of meadow fescue. And the price paid for the adulterated seed should be taken into account. The price quoted for rye-grass in seedsmen's catalogues of this season is 5*d.* or 6*d.* per lb., and for either of the fescues 1*s.* 4*d.* or 1*s.* 6*d.* In a field of ten acres laid down with the mixture recommended by Mr. De Laune * the quantity of fescues would be 90 lbs., the price of which at 1*s.* 6*d.* would be 6*l.* 15*s.* If, however, 50 per cent. of this seed were rye-grass, the price ought to be 4*l.* 10*s.* And it should be remembered that the merchant who sells fescue, half of which is rye-grass, at 1*s.* per lb., gets the same profit as the merchant who charges 1*s.* 6*d.* per lb. for pure fescue. The buyer should fully realise this. The seeds of the two grasses are so alike in form, size, and weight, that few are able to detect the presence of the rye-grass. My observations lead me to believe that few dealers are aware of its presence in their samples. Fescue seed is largely imported from Germany, and is mixed with the cheaper seed of rye-grass before it reaches the merchant in England. I have reason to believe that large quantities of rye-grass grown in the north of Ireland are annually exported to Germany to be employed in adulterating these fescues. It is important to the purchaser that he should be able to distinguish between the two seeds, and this can easily be done with the naked eye, or at any rate with the help of a small pocket lens. In both grasses several seeds are produced in each

Fig. 1.—*Rye-grass.*

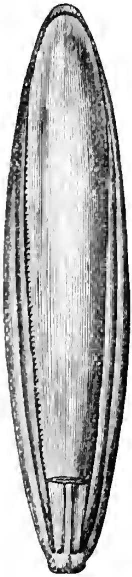
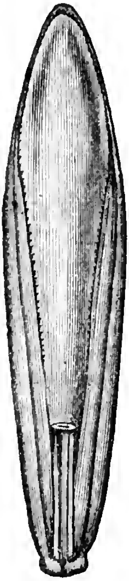


Fig. 2.—*Meadow Fescue.*



Both figures ten times the natural size.

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* 'Journal of the Royal Agricultural Society,' 1882, p. 261.

spikelet ; in separating from each other when they are threshed or gathered, each seed breaks off at its base from the supporting stalk, and there consequently remains in the inner concave surface of the seeds, the short stalk of the seed that was produced above it on the spikelet. This short stalk supplies a ready means of certainly distinguishing the two seeds, for in the two fescues of which I am speaking it is slender and cylindrical, nearly equal in diameter throughout its length, and having the upper articulating surface slightly expanded, while in the rye-grass the stalk gradually increases upwards, so as to have a somewhat triangular shape, and it is truncated, without any expansion at the apex.

Sheep's fescue I have found largely adulterated with the seeds of *Molinia cærulea*, a grass found in moors all over Britain, but of no value as a pasture grass. It is rejected both by cattle and sheep. This worthless grass or weed is largely used for adulterating the smaller seeds. A sample of crested dog's-tail which passed through my hands contained 50 per

Figs. 3 and 4.—*Crested Dog's-tail.* Figs. 5 and 6.—*Cocksfoot.*
Fig. 7.—*Molinia Cærulea.*

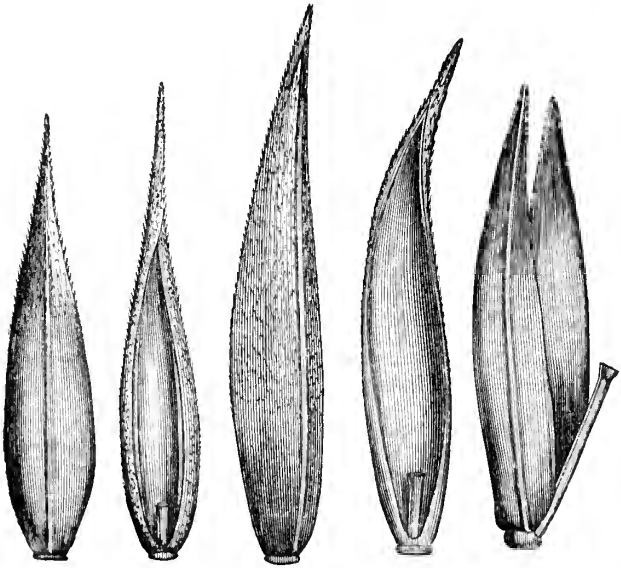

Fig. 3. Fig. 4. Fig. 5. Fig. 6. Fig. 7.

All figures ten times the natural size.

cent. of *Molinia*. The seeds of sheep's fescue, cocksfoot, and crested dog's-tail are so very different, both in form and colour, from *Molinia*, that it is hard to believe that any purchaser could be deceived by the mixture. The presence of *Molinia* in the smaller seeds, and of rye-grass in the larger, is due to the intentional and deliberate action of some parties engaged in the seed trade, with the view of making larger profits. I have no reason for supposing that this is done by any connected with the trade in Britain. But as we necessarily depend for a large quantity of our grass seed on foreign growers, I have little doubt that the worthless seeds are introduced before the seeds reach England. Good and pure seeds are, however, to be obtained in the foreign markets. The best samples—in trueness to species, freedom from weeds, and high percentage of germination—that have passed through my hands during the year have been foreign samples. It is greatly to be desired, then, that the buyers employed by the trade should be able to detect the presence of adulteration in samples offered to them. The remedy for these deliberately introduced impurities is in the hands of the trade. No excuse can be accepted for a house selling a mixture, under a specific name, containing 30, 40, or 50 per cent. of a worthless grass, or rather an injurious weed, which they have bought as that particular species, when a little knowledge and a little care would show them the true nature of the mixture.

There are impurities present in almost all seeds, from the presence of other grasses and weeds in the fields where the seeds have been grown. These seldom amount to 5 per cent. They may be got rid of by the cleaning machines, which are now used by the best houses. But these accidental impurities do not deserve the condemnation that the deliberate adulteration for gain to the dealer, and great loss to the farmer, demands.

On the other hand, the farmer should realise that a good seed can be obtained only by paying a fair price. The sowing on his farm worthless grasses and injurious weeds, which must spoil his pasture and take years and labour to eradicate, is to be avoided, and it should not be regarded with more favour, because the mixture is bought *cheap*, at 6*d*. or 8*d*. the pound. Such a mixture is dear at any price. The cheque to the dealer does not cover the cost. As long as the produce is found in his meadows the cost is being added to. If the farmer requires a cheap mixture he must expect a worthless one. A strongly recommended and largely advertised mixture which I examined was found to consist of:—Rye-grass, 40 per cent.; fescues, 23 per cent.; meadow-grass, 11 per cent.; foxtail, 8 per cent.;

sweet vernal, 7 per cent.; cocksfoot, 6 per cent.; fiorin, 3 per cent.; Yorkshire-fog, 2 per cent.

The number of the different kinds in one hundred grass seeds of the mixture recommended by Mr. De Laune, already referred to, would be:—fiorin, 22; foxtail, 16; cocksfoot, 16; fescues, 15; cat's-tail, 12; rough meadow-grass, 12; and crested dog's-tail, 7.

Only by selecting the species of grasses to be used, purchasing them separately, and paying for them a fair price, can a good mixture be secured. Two samples of mixtures supplied to Members as the mixtures recommended by the Society were composed of the same species as the mixture now given, and nearly in the same proportions.

In some grasses the purchase of shelled seeds would prevent much disappointment and loss. I have had sent to me a sample of shelled fiorin, which germinated almost 100 per cent. Several samples in the condition in which this seed is generally purchased had more than half the bulk composed of empty chaff. A sample of *Poa aquatica* offered to a Member of the Society contained 75 per cent. of chaff.

Two samples of fiorin were considerably ergotted. I am convinced, from the inquiries frequently made to me about injuries to stock, produced by ergot, that the danger from this powerful parasite in pastures is not fully realised.

I have prepared for the Education Committee a series of six diagrams exhibiting the principal grasses to be selected and avoided in laying down pastures, giving magnified representations of their seeds, the diseases of wheat, potato, and clover. I trust they may be useful to the Members of the Society.

I also prepared for the Journal Committee a paper on Mildew on Wheat, which was published in the last number of the Society's 'Journal.' I have repeatedly visited the farm at Woburn in connection with the experiments being carried on there as to the life of several of the more common natural and, so-called, artificial grasses.

The uncertainty as to the duration of the life of cultivated clovers, led to the resolution of the Council to test this by actual experiment on the farm, and further, to determine what species or varieties of red clover had the longest life. In natural pastures two red clovers are found—*Trifolium pratense* and *Trifolium medium*. To the first belong the names red clover and broad clover, and to the other, marl clover, zigzag clover, and cowgrass. But the application of these common names has been very irregular and uncertain. In Morton's 'Cyclopædia,' under the article "Trifolium," Mr. Bentham, in the more strictly scientific portion, gives cowgrass as the English name of *Trifolium medium;* whereas Mr. Gorrie, in the practical section of the same article, makes it the popular name of *Trifolium pratense*, and specially of the variety of the species called *perenne.* The name properly belongs, I believe, to *Trifolium medium*, but the seed sold under the name of cowgrass is that of *Trifolium pratense*, the same species as red clover. I have never been able to discover any of the seed of *Trifolium medium* in commerce. This, which is the true cowgrass, is certainly a longer-lived plant than the other. Its roots are creeping, and its stem takes a fresh turn at every leaf, giving it a zigzag appearance. The produce is said to be less than that of red clover. Though it may not be of equal value in alternate husbandry, it would, perhaps, be a more important ingredient in permanent pasture than the common species.

Similar experimental plots have been sown with rye-grasses, for the purpose of determining the duration of their lives.

In both clovers and rye-grasses the half of each plot is prevented from seeding by being cut when the flowers appear, a course equivalent, as far as the plant is concerned, to what takes place in pastures on which a full amount of stock is placed. The other half is allowed to go to seed before it is cut, care being taken to prevent any seed being shed on the plot. The plant is thus allowed to carry on its year's life to the natural end; and the result of this part of the experiment will show whether the different species and varieties are, in the proper sense, perennial, that is, whether the same plant ripens its seed for several successive years.

The experiments are carried on in duplicate, the one set being in light sandy soil, the other in the heaviest land available on the farm.

Some plots of the more valuable pasture grasses have been sown alongside these experimental crops.

XII.—*The late* C. E. Amos, *C.E., formerly Consulting Engineer to the Society.* By Sir B. T. Brandreth Gibbs, Vice-President of the Society.

Although the primary object of the following brief Memoir is to trace the connection of the late Charles Edwards Amos, C.E., with the Royal Agricultural Society of England during the period he acted as its Consulting Engineer, it would be manifestly incomplete if it did not contain some prefatory notice of his early biography. It is, however, unnecessary to go into any minute details, as these have already been given in a pamphlet that has recently appeared. It will therefore be sufficient here to state that he was born at March, in the Isle of Ely, in 1805, being the son of Mr. Jonas Amos, by Sarah, daughter of Mr. Edward Sharpe, millwright, of that town. He was the eldest of a family of eight children. Shortly after his birth his family removed to Wildmore-Fen, Lincolnshire, where his father became farm-manager to a Mr. Clements; but the subject of this Memoir remained with his grandfather, by whom he was sent to school; and although this portion of his education was not comprehensive, his innate love of figures soon began to show itself. He was prevented, however, by the bad state of the roads and of the river Walthan in those days from continuing regular attendance at school, and thus in his boyhood spent many hours in his grandfather's factory, where he imbibed that predilection for practical mechanics which distinguished him in after-life. He became for a time engaged in farming operations, and when about twelve years old lived on the farm of his father's uncle, Mr. Edwards, from whom he acquired some useful knowledge of agricultural affairs. His father shortly after accepted the post of farm-manager to Mr. Wm. Bacon, at Upwell. Here the future agricultural consulting engineer went through all the practical operations of the farm, became thoroughly acquainted with agricultural implements, and obtained a knowledge which proved so valuable, not only to himself, but to agriculture generally in later years. For two years he was engaged on the farm of Admiral (then Captain) Morris, of Elm.

At the age of about eighteen he apprenticed himself to Mr. John Wilkinson, millwright and machine-maker at Elm. In this position, which he held for about four years, he became thoroughly acquainted with the construction of windmills and sluice-work, threshing-machines, and other mechanism incidental to a country business and an agricultural district.

At twenty-two he entered a factory at Ramsey. This business was almost exclusively confined to fen-work, the draining of fens being mainly done by the use of windmills. Finding this class of machinery too limited, and the work too monotonous, for his aspirations, he decided to increase his study of mechanics, and entered the works of Mr. John Clark, of Houghton, Hunts, where he gained additional experience in the construction of corn-mills, water-wheels, windmills, and tannery and brewing implements. He was subsequently engaged to superintend the construction of steam-engines and other machinery for paper-making, and had to execute not only various novelties and improvements, but also to design fresh mechanism for the Hatfield Paper Mills belonging to Mr. Creswick, whose engineer he eventually became.

In 1834 he married the only surviving daughter of the late Mr. James Chapman, of Hatfield. He afterwards undertook the superintendence and completion of steam-engines and other gear for Mr. Dives' corn-mills at Battersea. In this work he utilised the principle of "expansion" in working steam-engines, which, although already known, was not much practically employed. The engine appears to have been a success, several of the constructive details being in advance of the day. Among others whose attention this engine attracted was Mr. James Easton, with whom he eventually, in 1836, entered into partnership. In 1858 the sons of both principals entered the firm.

The foregoing is a condensed epitome of Mr. Amos's general career previous to his connection with the Royal Agricultural Society of England in 1848, when Messrs. Easton and Amos were appointed its Consulting Engineers, on the understanding that one of them should personally attend the Society's Country Shows. This duty devolved on Mr. Amos, who commenced his duties at the York Meeting in the July of that year. He was subsequently assisted in conducting the trials by the sons of Mr. Easton, and by his own son, James C. Amos, and upon many occasions by his friend the late Mr. Appold.

Up to 1847, Mr. Josiah Parkes, C.E., had acted partly in the capacity of a Judge of Machinery and partly as Consulting Engineer. He had during his period of office sought to encourage any farm machinery which showed the germ of future usefulness; but so much progress had been made in agricultural machinery and implements, between the Oxford Meeting in 1839 and the York Meeting in 1848, that it became absolutely necessary to subject them to more vigorous tests than had hitherto been applied to determine their actual and relative value.

The result of Mr. Amos's action in this direction became manifest at the first Meeting which he attended. The Report on the Show bore testimony to the improvements introduced, and, whilst suggesting the still further development of them, recorded the benefits obtained by the use of a machine for testing the working of steam-engines and the amount of draught of threshing-machines, chaff-cutters, &c., under the control of Mr. Amos, who was thus early recognised as the Society's "able and zealous Consulting Engineer."

The above was written, perhaps, chiefly in reference to an adaptation of what was called the Prony Brake, a Dynamometer (which was subsequently greatly improved *), and which showed the working power of steam-engines. At its very first stage of working, the opportunity, and indeed almost the necessity, for Mr. Amos to show his energy and exercise his practical skill, in addition to his scientific attainments, became evident. The Brake, as already stated, had not become so perfect as in the form it assumed in after years. It then required the incessant application of manual regulation to secure the engine performing its due amount of duty. The operator who was put to this work was not capable of performing it with the precision necessary to ensure fairness to each exhibitor. The energy of Mr. Amos was equal to the occasion, and was instantly brought into play. Stripping off his coat and rolling up his shirt-sleeves, he worked the adjusting screw with his own hands for hours, being almost saturated to the skin with the soft soap and water of which the lubricator then employed was composed. He continued this until a suitable working engineer, unconnected with any of the exhibitors, could be obtained from the neighbourhood. Having myself witnessed this characteristic incident, I cannot refrain from alluding to it as an example of the manner in which Mr. Amos was ready for any emergency which unexpectedly presented itself amidst the numerous trials that had to be made under sometimes almost insurmountable difficulties, and within the very limited time that could be devoted to the trials of the ever-increasing quantity of machinery that year after year flowed to the Society's Shows. The Dynamometer was improved for the Norwich Show in 1849, and the result the next year proved the value of the dynamometrical tests. The consumption of coal of an engine then was 11·5 lbs. per horse-power per hour; the following year 7·7 lbs., an improvement of upwards of 30 per cent.; and two years later it was reduced to 4·66 lbs.

Mr. Amos also invented for the Norwich Show a Dynamometer for the trials of winch-driven implements. For this he received the special honour of being presented with the Society's large Gold Medal.

The following year an apparatus was brought into use for ascertaining the power consumed by threshing-machines worked by horse-gear.† The result was important, inasmuch as it

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* It is but justice to state that the Brake was afterwards improved by Messrs. Clayton and Shuttleworth, who introduced a metal brake-wheel with wood friction-blocks and oil as the lubricator. Credit is also specially due to a Mr. Balk, who was in the establishment of Mesrs. Ransomes and Sims. He invented an automatic means of controlling the brake by using differential levers attached to the ends of the brake straps, thus dispensing with the brakes-man. Mr. Appold, F.R.S., also contributed some improvements.

† See Society's 'Journal,' vol. xi., p. 479.

showed that some of these driven by four horses required three-horse-power to drive them when empty, thus accomplishing but 25 per cent. of real work.

At the Lincoln Show, in 1854, he introduced a rotary Dynamometer to indicate the power consumed by any machine driven by steam—practically recording the varying stress on the driving-belt from the steam-engine or other prime mover. This was used in the trials of Fowler's four-furrow steam-plough, and on the early forms of steam-ploughing apparatus; but most notably at the great experiments in steam-ploughing on the land of the late Mr. Fisher Hobbs, at Boxted Lodge, in connection with the Society's Chelmsford Meeting of 1856. The arrangement of this apparatus has thus been shortly described by his son, Mr. James C. Amos, who took an active part, assisting in these the first important recorded trials of steam-cultivation:—"The special arrangement adopted, viz., a double windlass working a hauling-rope over transversing anchors, enabled the Dynamometer to be placed between the windlass itself and the engine."

The above experiments seem to form a marked epoch in the progress of steam-ploughing, and attracted much attention not only in this, but in other countries. I retain pleasing recollections of this occasion, and of assisting in both timing the experiments and in checking the calculations, duties which were rendered doubly agreeable by the interest which Mr. Amos evinced in obtaining the final result.

At this same Meeting Mr. Amos brought out an adaptation of Bentall's Dynamometer for ascertaining the power consumed by horse-ploughs, the alteration being a fresh arrangement, making the working parts much more simple, thus diminishing the chances of error.

For the Newcastle Show, in 1864, a Dynamometer was constructed to test the draught of steam-ploughs, cultivators, and similar implements. By this the actual stress on the steel-wire rope was recorded. This was an important machine, and was described by Mr. Amos himself in the Society's 'Journal' (vol. i. New Series, p. 204). In addition to the foregoing, some minor apparatus were arranged by him for the Society, to mark the stress on plough-anchors and for other purposes.

From the foregoing brief summary it must be evident that both the agricultural and engineering world would have been much indebted to Mr. Amos's talents if they had been devoted to Dynamometers alone; but he stopped not here, for his inventions embraced other branches of engineering and mechanics. The idea of the double-engine system of steam-ploughing appears to have originated in Mr. Amos's mind; for he had matured a scheme years before the steam-engine was thus used, and which was to have been introduced at the joint expense of himself and Lord St. John. He patented improvements in the Appold Pump for the reclamation and draining of fen-land, used not only in this country, but on West Indian sugar estates; in reclamations in Holland; in the dockyard at Portsmouth, and elsewhere.

It may be only an act of justice to enumerate a few of the principal public works and other matters which have been benefited by his industry and skill, such as general hydrostatics; the theory of the flow of water through very long mains, and the working out of rules as to the influence of varying land contour and main contour upon such flow; the supply of towns; the Government waterworks in Trafalgar Square. He was connected with the arrangement of the hydraulic machinery for raising the tube structures of the Conway and Britannia bridges, which were placed in the hands of the firm by his friend Robert Stephenson in 1846–50; the erection of the Royal Albert Bridge at Saltash; the arrangement of the cable-laying machinery for the old Atlantic cable in 1857, and employed on H.M.S. 'Agamemnon' and the U.S. frigate 'Niagara.' He was the originator of the system of placing the paying-out drums in duplicate, so as to form a self-fleeting windlass, a principle which he had employed some years before in the Rhyl swivel bridge on the Chester and Holyhead Railway. The dynamometer for the Atlantic expedition was also entirely due to Mr. Amos, and this system has been almost universally employed in succeeding submarine telegraph expeditions. He introduced some special features in the machinery for the ship-elevator at the Thames Graving Dock, Victoria Docks.

In conjunction with Mr. Francis, manager of the Penrhyn Slate Quarries, he patented a peculiar form of three-cylinder hydraulic engine, actuated by the fall from the Lake Ogwen, working a set of deep-well three-throw pumps, draining the lower adits of the mine; also a machine for dressing slates, used first at Penrhyn, and since largely in other slate-quarries; also he made improvements in machinery for the manufacture of lead pipes, in conjunction with Mr. Hanson, of Huddersfield.

Mr. Amos formed one of the knot of engineers who, snatching a few hours as often as their own avocations permitted, assisted Mr. Brunel and Mr. Scott-Russell with suggestions for the ultimately successful launch of the 'Great Eastern' steamship, the firm of Eastons and Amos having lent all the hydraulic presses, jacks, &c., which they could command. In addition to his engineering business, he was at one period of his life a large paper-maker.

He was often engaged as a witness in cases of disputed patent right and other vexed mechanical questions; also as an arbitrator on such matters. He was a member of the Institute of Civil Engineers; of the Institute of Mechanical Engineers, and a member of its Council; also of the Council of the Royal Agricultural Society of England, and a member of the Société des Agriculteurs de France. He conducted the dynamometrical trials of the agricultural machinery shown in the Great International Exhibition of 1851 in Hyde Park, was a juror at the Paris Exhibition of 1855, and the Universal Exhibition in 1862 at South Kensington. He acted as English delegate to the Agricultural Show at Paris, 1856. He was invited to attend the Universal Agricultural Exhibition of Sweden and Norway, held at Göthenburg in 1871, and received from the Sovereign, Carl XV., the Cross of the Order of Vasa; also various diplomas and medals were awarded to him. In addition to his official duties in connection with the Royal Agricultural Society of England, his assistance was frequently invited by various Agricultural Societies in England. On his retirement from the office of Consulting Engineer to the Royal Agricultural Society of England, he was elected its Honorary Consulting Engineer.

He was a Freemason exalted to the Royal Arch degree in the Grove Chapter, and installed a Knight Templar in the Grove Encampment in 1866.

In 1866 both the senior partners of the firm of Eastons and Amos retired.

Having become a widower, he in 1860 married the daughter of Mr. E. Porter, of Moore Critchell, Dorset, and leaves a family by each wife. His eldest son, James C. Amos, was associated with him in the firm of Eastons and Amos, the second son being the head of an engineering firm at Hull, and the third studying for the profession of engineer. He also leaves several daughters. He died on the 12th of August, 1882, at his residence at Clapham, in the seventy-seventh year of his age.

The foregoing condensed Memoir gives but a sketch of the rise, step by step, of the late Charles Edwards Amos in his professional career, and of the invaluable services which he rendered to the cause of agricultural mechanics, a branch to which he always evinced a particular liking, no doubt the result of early associations. It is evident that it was the combination of agricultural knowledge with practical and theoretical engineering that specially fitted him for the important position of Consulting Engineer to the Society, an office which he filled with so much credit to himself, so much to the satisfaction of the

Society, and with such advantage not only to the agriculturists of the country, but it may confidently be added to the manufacturers of implements generally. He was ever ready with a word of advice, and many a suggestion for improvements was voluntarily given by him. He always showed himself to be a man of strict impartiality, holding the balance justly amidst the keenest competition between exhibitors, to whom the results of the trials were often of momentous importance. He possessed a naturally genial temperament, and rendered the few minutes of relaxation that could be allowed to intervene amidst the almost incessant work of the trial-days at the Society's Shows, doubly acceptable to his colleagues by some amusing anecdote or appropriate *bon-mot.*

Of his natural talent it is unnecessary to relate more here. It was, as an Italian would say, *in fronte scritto*, for seldom would a phrenologist be able to point to one with a more massive brow, or one whose intellectual faculties were more fully developed. In my capacity of Honorary Director of the Shows, having worked with the subject of this Memoir during the entire period of Mr. Amos's official connection with the Society, and also the Universal Exhibitions both in London and Paris, I cannot refrain from bearing testimony to the merits of one whom I shall ever recollect as a valued colleague, who conferred great and lasting benefits on agriculture, and therefore on the country at large.

XIII.—*The late Joseph Shuttleworth.*

The late Chairman of the Showyard Contracts Committee of this Society was born on the 12th of July, 1819, at the village of Dogdyke, near Lincoln, at which place his father carried on the business of a boat-builder. On leaving school, at fourteen years of age, he commenced learning his father's trade, and about two years later was sent to take the management of a second boat-building yard belonging to him, near the Stamp End Locks, at Lincoln, on a piece of ground which formed part of the present Stamp End Works. Even at this early period of his life the subject of this Memoir is said to have displayed more than average ability, energy, and pluck; and subsequently the Lincoln boat-yard was turned over to him and a Mr. Godwin. At that time Mr. Nathaniel Clayton had established himself, in a small way, as an iron-founder, on premises adjoining those of the young boat-building firm; and after a little while—in the year 1842—he was joined by Mr. Shuttleworth.

Neither of the partners possessed much capital, but both became skilled in the use of all the tools and appliances required in their trade, and were gifted with rare powers of energy, industry, and perseverance,—qualities which laid the foundation of an enterprise that has become the most extensive of the kind in the kingdom, and whose manufactures are in use almost throughout the civilised world.

The late Mr. Shuttleworth, although not without inventive faculties, could not be said to be endowed with the peculiar and rare genius of "the born inventor." He possessed in a remarkable degree a perception of the proper proportion of parts, which was intuitive; and also, when a number of plans were placed before him, his discernment in selecting the best method for accomplishing the object was equally remarkable. His judgment in mechanical matters was singularly quick and unerring, hence the few mistakes made in the productions sent out from Stamp End. Both Mr. Clayton and the late Mr. Shuttleworth were thorough men of business, and possessed great judgment in mechanical matters; but in the conduct of their business Mr. Shuttleworth devoted himself more to the mechanical department of their operations, leaving the commercial matters to his partner.

The original site of their Works, which now cover nearly fourteen acres of ground, was a plot of land about one and a half acres in extent, of which one acre was under water during the greater part of the year; but the remaining half-acre sufficed for the wants of the firm in its early days; and by means of an excellent system the partners made the most of their resources, taking especial pains, from the first, that no work calculated to bring discredit ever left their foundry. Consequently, their failures were few. The first important contract undertaken by Messrs. Clayton and Shuttleworth was for the Minningsby Boston Waterworks, a contract which not only placed them in possession of welcome capital, but which, in consequence of its highly successful execution, brought them additional orders.

Although Clayton and Shuttleworth cannot claim to be the inventors of the portable steam-engine, they are fairly entitled to rank among the most successful improvers of this class of farm machinery; and the same remark may be applied to the steam threshing-machine. The list of prizes won by the firm at the Shows of the Royal Agricultural Society will ever redound to their honour. In the year 1839, Messrs. Tuxford, of Boston, had prepared plans for a combined engine and threshing-machine, but it was not actually constructed until 1842. At the Society's Show at Liverpool in the previous year, 1841, a portable engine, manufactured by the Disc Steam Engine

Company, of Birmingham, was shown by Messrs. Ransomes, of Ipswich; and in October of the same year a 6-horse portable engine, made by Messrs. Howden, of Boston, was exhibited at the Show of the Lincolnshire Agricultural Society. Four years later, in September 1845, Messrs. Clayton and Shuttleworth produced their first portable engine (8-horse power). In the next year they turned out two engines, each of 2-horse power, and in the following year eight engines of the aggregate power of seventy-three horses.

Messrs. Clayton and Shuttleworth exhibited in the Showyard of the Royal Agricultural Society for the first time at Norwich, in 1849; and they succeeded in carrying off the highest awards —a position which they retained at most of the subsequent competitions in which they participated. At the last-mentioned date, however, the portable engine had still to undergo manifold improvements before it could find favour in the eyes of farmers. As a matter of historical interest, it is worth while to give here some further figures, which will serve to indicate the progressive demand for the portable steam-engine. Up to 1847, as has been already stated, the number manufactured by the Stamp End firm could almost be represented by the fingers of both hands; but so rapidly did their utility become recognised, that in 1851 this firm alone sold no less than 140 of these machines. In the following year the sales numbered 243; in 1853 they had grown to 293, next year to 363, and in 1855 to 491. At the present time Clayton and Shuttleworth have sent out from their works upwards of 19,000 portable steam-engines, an average of close upon 600 per annum for the whole thirty-three years during which they have been engaged in their manufacture. Mr. Shuttleworth's firm, however, did not by any means confine their attention to the construction of steam-engines, their name being equally well and widely known as manufacturers of threshing-machines, of which their total output is stated at no less than 17,000 since 1849, when this addition to the work of their factory was entered upon. It should also be noted that to Clayton and Shuttleworth belongs the credit of introducing a machine for finishing grain for market, they having exhibited one at Lewes, in 1852, before a prize had been offered. They have also earned a just reputation for their portable grinding-mills, straw and hay elevators, self-feeding apparatus, and drum-guards, all of which have been rewarded with "Royal" honours.

Their works at Lincoln are admitted by qualified judges to be most perfectly organised; and the rule with which the firm started on their commercial career, to employ only the best material and secure the most perfect workmanship, has been judiciously and rigidly maintained. In addition to their headquarters at Lincoln, Messrs. Clayton and Shuttleworth have a large establishment at Vienna, where over 200 hands are employed, as well as smaller works at Pesth, besides offices at London and Liverpool.

Owing to the influence of the Stamp End Works upon the city of Lincoln, it has grown to be the chief centre of the agricultural engine trade. In Lincoln itself three other large works have sprung up, besides a number of smaller ones; the population has increased threefold, and, to quote a local paper, "the city has advanced as rapidly in material wealth and prosperity as it has done in population." All this is traceable mainly to the works of Messrs. Clayton and Shuttleworth.

But apart from business relationships, Mr. Shuttleworth was alike active and useful. For years he held a seat on the Town Council of Lincoln, and in 1858–9 he occupied the post of chief magistrate. He was associated, too, with the Volunteer movement, having been first elected Ensign, and subsequently appointed to the positions of Lieutenant and Captain. He was a Justice of the Peace, and Deputy-Lieutenant of the county. In 1881 he was elected High Sheriff of Bedfordshire, in which county he had erected a residence. Years ago he took a prominent part in the reconstruction of the Metropolitan Railway, of which he was a Director at the time; and up to the period of his decease, he was a Director of the Great Northern Railway Company, as well as the Sutton Bridge Dock Company, the Agricultural Hall Company, and a member of the Council of the Royal Agricultural Society. In every one of these undertakings he took a deep and practical interest; seldom indeed was he missing from his post. On the Council of the Society he served for upwards of a quarter of a century, having been elected in 1856. His services as Chairman of the Showyard Contracts Committee were especially valuable, and on all matters involving large expenditure of money his advice was ever appreciated by his colleagues. He also acted as Steward of Stock at the Country Meetings, 1875–8.

The local charities found in him a generous benefactor. He was endowed with singular tact; was courteous, kind, modest and friendly in disposition and demeanour; an upright man in all his dealings; one who set a high value upon his honour.

In Mr. Shuttleworth was presented a remarkable instance of how a man, whose early education had been neglected, may by taking pains make up the deficiency. His letters formerly gave evidence of slender educational advantages, but so close had been his observation, that of late years his letters were quite models of composition. A neighbouring landowner—a man of refinement—on being told that Mr. Shuttleworth had not had the advantages of education in early life, replied, "I should never have supposed this, for his letters were those of a gentleman, and so correctly expressed." Another friend writes that "he was manly and Englishman-like, never pushing or obtrusive; never obtruding his business; on the other hand, rather pleased than otherwise if it became the subject of conversation. He was, so far as I saw, kind and gentle. I never really grasped any salient feature of character—in manner he suggested 'I know exactly my own place and position. I respect myself—and respecting myself, and knowing my position, I, relatively and in like manner, know and respect you.' One principle of his only I recall; he said, 'If I want anything, my invariable rule is this: I enquire which firm is most famous for any particular production, and I send my order accordingly.'"

Nearly thirty years ago Mr. Shuttleworth formed the desire to possess an estate and a home in Bedfordshire, in which county he had been in the habit of staying with his friend, Mr. James Howard, M.P. About twenty years ago the Colworth property, now owned by Mr. Magniac, M.P., came into the market and was advertised for sale. Mr. Shuttleworth accordingly went to inspect the picturesque spot, close to the Sharnbrook Station on the Main Midland Line, and at once formed a resolution to become the purchaser. Finding, however, that Mr. Magniac, sen., who had long occupied Colworth as tenant, was so greatly beloved by his neighbours and all the people about him, and that he was anxious to become the owner, Mr. Shuttleworth said to his friend Mr. Howard, upon his return, "much as I should like the place, I shrink from the idea of disturbing so good a man;" and he added, "after having partaken of Mr. Magniac's hospitality I think it only right that I should inform him of my decision not to bid against him." The late Mr. Magniac told a friend that of all who had visited Colworth on the same errand, Mr. Shuttleworth was the only one who had had the civility and kindness to inform him of his decision. This incident, though simple in itself, throws a light upon the innate goodness of Mr. Shuttleworth, who all through life displayed a similar gentlemanly feeling—and this in a variety of ways.

In 1861 he acquired by purchase the estate of Hartsholme, in the neighbourhood of Lincoln, on which he erected a stately mansion. Ten years later he purchased of the late Lord Ongley the manor of Old Warden, in Bedfordshire, and from that time this estate appeared to be the great hobby and pleasure of his life. A considerable portion of his time was spent upon it, and he was unsparing in money and personal trouble in carrying out extensive improvements. Although he did not come into absolute possession until three years after entering upon ownership, soon after completing the purchase he altered and enlarged one of the farm-houses, and thither he repaired whenever his numerous engagements permitted. Here it was that he settled in his mind the whole scheme for the mansion which he subsequently erected, and for the development of the entire property. Amongst other things, he built a new village school, improving here and enlarging there the cottages on the estate.

The appended statement by one who had a close acquaintance with Mr. Shuttleworth, will be read with interest as giving a further insight into his character :—

"On coming into possession of the house and gardens he at once had the buildings razed to the ground, and proceeded to erect on the same site a princely mansion. Throughout the work, even to the minutest parts, he never failed to cause the very best materials and workmanship to be selected: it was characteristic of him to be *thorough* in all he undertook. Nothing was too trivial to engage his attention. Whatever the cost might be, he would invariably select whatever he considered best adapted for the object in view.

"He had a great love for building, and for improving everything about him, and he either entirely rebuilt or remodelled every homestead, as well as replaced with model cottages of the most approved and picturesque design most of the old tenements for the labourers.

"Mr. Shuttleworth had great taste and knowledge of architectural details; some of the old cottages in the village were of an Old English style, though greatly dilapidated; he had many of these entirely cased with half timber-work, feeling, as he often said, that though they were costly, he had as much pleasure in looking at them as at some favourite picture on his walls.

"He had a great love for pleasure-gardens, and a most cultivated acquaintance with landscape-gardening. His gardens were very extensive, and were so planted and arranged that the trees and shrubberies were cheerful and effective all the year round. He held that great sanctity attached to a tree, and would never consent to the felling of any tree unless it injured another, and then it was a grief to him to order it to be cut down. He was continually improving and enlarging the shrubberies, and would have everything kept in the most complete and orderly manner all the year round. No part of the buildings or grounds was ever permitted to be untidy, all must at all times be kept fresh and bright.

"It was a characteristic of Mr. Shuttleworth that he would never consent to patch up or repair anything unless it could be made as good as new; if this could not be carried out, he would have it removed root and branch, and an entirely new arrangement made.

"He spent money most liberally, doing all sorts of work for the benefit of his tenants without any charge to them; and he made so many improvements and embellishments in the village of Old Warden, that, picturesque as it always has been, he left it one of the most beautiful in the county, with its ivy-covered and half-timbered cottages, sloping grassy banks kept at all times neatly trimmed and cared for; its fine holly hedges, pretty church, and most perfectly kept churchyard, all this paid for by himself. To these works he devoted all his spare time, and it will be easily understood what a great loss his death has been to the whole neighbourhood."

Mr. Shuttleworth was twice married—first to a sister of his friend and partner Mr. Clayton, and secondly to a daughter of Lieut.-Col. Ellison, of Boultham Hall, who survives him. By his first wife he leaves two sons, Alfred and Frank; the former, having been brought up to the business from youth, became a partner in the firm of Clayton and Shuttleworth, and the latter is a major in the army. The immediate cause of death was congestion of the lungs, which developed inflammation of the heart and other complications, and on the 25th of January, in his sixty-third year, he passed peacefully and quietly away.

XIV.—*The Natural History of the Liver-Fluke and the Prevention of Rot.* By A. P. Thomas, M.A., F.L.S., Balliol College, Oxford; Professor of Natural Science in the University College, Auckland, New Zealand.

Liver-rot, although so destructive a disease, is a preventible one.

The object of the present paper is to give a popular account of the results of a research into the natural history of the parasite which causes the liver-rot of the sheep and a number of other animals. This research, which has now been completed, was undertaken by me on behalf of the Royal Agricultural Society of England in June 1880; and the progress of the investigation has been already reported in two papers * contributed to the 'Journal' of the Society. A short account of the completed research appeared in 'Nature' for October 19th, 1882,

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* "Report of Experiments on the Development of the Liver-Fluke," vol. xvii., 1881, April, p. 1; Second Report, vol. xviii., 1882, Oct., p. 439.

and a detailed account intended for scientific readers was published in the 'Quarterly Journal of Microscopical Science' for January 1883. To this last-named paper I may refer any reader who desires to learn the details of the development of the liver-fluke. The present paper is only intended to give the outlines of the life-history of the fluke in such a way as to enable the farmer and the general reader interested in agricultural matters to understand how the parasite is propagated through successive generations, how the sheep incurs the disease by taking in the young fluke with its food, and, lastly, the various methods of preventing the spread of so destructive a disease. Technical terms will therefore be purposely avoided.

For the sake of convenience the subject is divided into the following parts:—

I.—Nature of the Disease.
II.—Life-history of the Liver-fluke.
III.—Prevention of the Rot.

PART I.—NATURE OF THE DISEASE.

The Rot, liver-rot, fluke disease, coathe, or bane, are all names given to one and the same disease. It is sometimes known as the sheep-rot, since amongst our domesticated animals the sheep is by far the most frequent victim. Very many other animals that eat grass or herbs are, however, subject to the disease, including cattle, deer, horses, pigs, rabbits, hares, kangaroos, camels, &c.; and even man himself is occasionally attacked.

Liver-rot has been known and dreaded from very early times; it was so well known in Shakspeare's day that an allusion to it occurs in his writings. It is unnecessary for me to enter here into a history of the disease; for this I may refer to Professor Simonds's paper.*

Many theories have been suggested as to the cause of the disease, several of them being very far from the truth. It is really a parasitic disease, and is caused by the presence, in the bile-ducts of the liver of the diseased animal, of large numbers of a flat worm, known as the liver-fluke (called by zoologists *Fasciola hepatica*, or less correctly, *Distoma hepaticum*). The liver-fluke has the shape of a privet-leaf, or of a small sole; it is pale brown or of a flesh-colour, and is about an inch or an inch and a third in length, and in breadth about half its own length. At one end is a narrower projecting portion, which may be compared to the short thick stem of the leaf;

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* "The Rot in Sheep." London, John Murray, 1880. See also 'Journal of the Royal Agricultural Society,' Second Series, vol. xvi. Part I., 1880, p. 121.

this is the head-part, and at its tip is placed the mouth in the middle of a small sucker or sucking-cup, by which the fluke can attach itself. At the point where the head joins the flat body and on the lower surface is a second sucker—the ventral sucker.

The liver-rot caused by these flukes is always common in certain districts of England, and it has been estimated that the average annual loss of sheep in the United Kingdom amounts to no less than 1,000,000. The rot also occurs almost all over the world, extending to Egypt, Australia, Tasmania, and North and South America, and is nearly or sometimes quite as destructive in these countries as in the British Isles. Professor Leuckart estimates the average loss per annum in Central Europe alone at 1,000,000 head.

But a series of wet seasons always increases the prevalence of the disease. At such times it spreads to districts which are ordinarily quite free from it. The year 1879 was one of a succession of wet seasons, and the losses during the end of that year and the following spring amounted to no less than 3,000,000 sheep. In his Report to the 'Journal of the Royal Agricultural Society'* Mr. Finlay Dun estimates that the same number of sheep died or were sacrificed from rot during the following year. As this is equivalent to the loss during each year of about one-tenth of the total number of the sheep in the United Kingdom, and represents the loss of six or eight millions sterling † per annum, the serious nature of the epidemic will be only too readily seen. Such a loss would be most grievous at any time, but was especially so at a time of bad seasons and wide-spread agricultural depression.

A portion of the loss falls of course upon the consumer, as is shown by the increase in the price of mutton. Furthermore, the quality of a portion of the supply which comes to the market is necessarily poor.

When the disease had spread so widely and had became so exceedingly destructive, it was doubly necessary that we should bestir ourselves and try all possible preventive means.

But what were the right measures of prevention? Here, unfortunately, was the great difficulty. Nothing exact had been found out as to the way in which the fluke entered the sheep, and we had to contend against an insidious enemy who was invisible to us, to strike blindly and in the dark.

In this state of uncertainty it was a matter of national

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* Second Series, vol. xvii. p. 141.

† It is very difficult to ascertain the real loss in money, as rotten sheep are frequently sold for food, though at a considerable loss. But in very many instances the animals were sold merely for the price of the skins.

importance that the whole question should be investigated, in order that it might, if possible, be discovered what were the proper preventive measures to be employed. The Council of the Royal Agricultural Society therefore provided the funds needful to procure costly but indispensable apparatus and material. The investigation thus originated began in the summer of 1880, and was brought to a successful close in the autumn of 1882.

What was really known in 1880 came very briefly to the following. The liver-rot was a parasitic disease due to the presence in the bile-ducts of the livers of the diseased animals of great numbers of liver-flukes. Animals were liable to contract the rot when allowed to graze on low-lying, wet, or ill-drained lands, and especially on ground subject to floods.

So much was clearly proved. In addition, it was believed by men of science, from what was known of the animals most nearly related to the liver-fluke, that there were larval forms inhabiting some snail or slug, and that the larvæ were subsequently taken up by the sheep when grazing. Some had suggested water-snails, others land-snails or slugs, and numerous attempts to solve the question had been made by various eminent zoologists; but all had proved fruitless, and, notwithstanding its great practical importance, the problem remained unsolved.

Now, however, the mystery has been cleared up, and I will proceed to explain it in order, step by step, so that I may afterwards show how and where preventive measures are to be applied.

PART II.—THE LIFE-HISTORY OF THE LIVER-FLUKE.

Before giving the life-history of the liver-fluke, it will be well for me to explain a wonderful peculiarity in the manner of the multiplication and spread of the animals belonging to the group of Flat worms of which the liver-fluke is a member. The fully grown adults live as parasites in some kind or other of backboned animal, such as a sheep, and there multiply by producing eggs. Each of the eggs gives rise to an animal, which is never like its parent, never does become like it, and never lives where its parent lives. It enters some snail or slug, and there grows and multiplies, not in the common way by producing eggs, but by giving rise to germs within itself. Calling the animal which is hatched out of the egg the first generation, these germs will form the second. There may be a third and a fourth, or even more generations in the snails, all these arising in the same way as germs; but at length a form arises which is destined to leave the snail in some way or other, to be swallowed by the back-boned animal with its food, then grow much in size, become adult, and reproduce itself by eggs.

The snail or slug which harbours the first, second, and following generations is called the intermediate host, the back-boned animal being the ultimate or final host, and there is thus a constant alternation of one generation living its adult life in the back-boned animal, and of one or more generations in the snail or slug. This is an example of what naturalists call an *alternation of generations.*

In the case of the liver-fluke there are at least two generations which live the whole of their adult lives in the particular snail which has now been clearly proved to serve as the intermediate host of the fluke. The third generation arises as a germ in the snail, and whilst still a minute larva passes in the manner explained below into the sheep. That is to say, supposing we start with the fluke as it is found in the sheep, its child does not grow up into an animal like the parent, nor does the grandchild do so. Both child and grandchild look very different from the true liver-fluke, and live in the snail; but the great-grandchild, forming the third generation, does, as a rule, grow up into a true liver-fluke and live in the sheep.

Wonderful as this may seem to any one who has not studied the marvels of animal life, the fact of alternate generation has been established beyond all doubt, not merely for the liver-fluke, but also for numerous other forms of life, which, however, do not at present concern us.

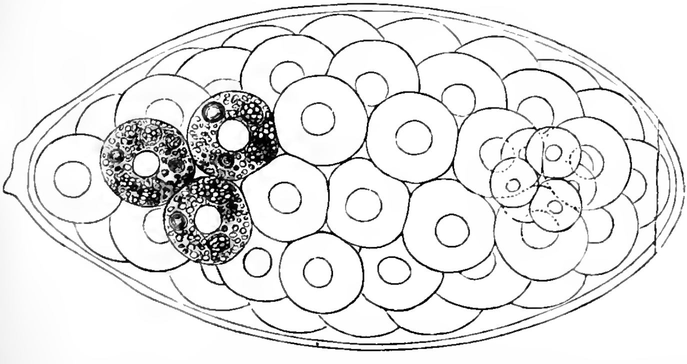
The Eggs of the Liver-Fluke.—The adult fluke, whilst living in the bile-ducts of the sheep or other rotten animal, produces vast numbers of eggs. The bile-ducts (popularly known as the *pipes*) become large, and their walls thick, owing to the presence of the parasites. The bile contains numbers of eggs too small to be separately recognised by the naked eye, but which are nevertheless present in such quantities that they give it a dark colour. In some of the small ducts where the eggs have not been washed away by the bile, they may be present in such enormous numbers as to form a stiff dark-brown mass, looking like fine wet sand, and completely blocking up the inside of the duct.

The eggs are very minute indeed, being only $\frac{1}{200}$th of an inch in length; but they may be rendered visible to the naked eye by placing some of the dark-brown contents of the bile-ducts into a glass-vessel with water and shaking it up. On now holding the vessel up to the light, the tiny eggs will be seen as brownish specks suspended in the water. If they are very numerous, they will colour the water a light brown, or may even give it a dark coffee-colour. They are a little heavier than water, so that if the vessel is allowed to stand for an hour or two all the eggs will fall to the bottom, and leave the water colourless.

The number of eggs produced by each fluke is very large, and its fertility has been underrated. In one case I obtained 7,000,000 eggs from the gall-bladder of a single sheep suffering from the rot, and as the liver contained about 200 flukes, this gives an average of 37,000 eggs to each fluke. And these eggs were found in the gall-bladder alone; the liver must have contained at least as many more, and eggs had been passed copiously by the sheep for many months. The number of eggs produced by a single fluke may be safely estimated at half a million, a number more easily spoken of than realised.

It is very important that we should know more about the egg, for it forms the starting-point of new generations. But to know more about the egg, it is necessary to see it highly magnified by means of the microscope. Figure 1 shows an egg thus seen. It is an oval body, with a transparent shell, which allows the contents to be distinguished. One end is a little rounder and blunter than the other, and shows a line marking off a rounded portion which forms a lid to the rest of the shell. A little below the lid is a small round mass, which is the present condition of the first generation or animal which will ultimately be developed from the egg. The remaining contents of the egg are simply a store of food for the benefit of this animal.

Fig. 1.



Egg of the Liver-fluke examined shortly after it was taken from the liver of a sheep. At the right-hand end of the shell may be seen the line marking off the lid, and a little to the left, the embryo in a very early stage of development. The embryo is surrounded by round masses which serve as food: they are all of them granular, but only three at the left hand side have been fully drawn. Magnified 680 times. (Original.—A. P. T.)

So long as the egg remains within the body of the sheep no further change takes place.

Under natural conditions, however, the eggs of the fluke are washed away by the bile into the intestine, and, passing through the intestine uninjured, are at length distributed wherever the droppings of the infected animals fall. If they fall on to wet or marshy ground, or are washed by rain into ditches, ponds, or brooks, further changes occur, and in each egg is formed the first generation or animal, which we may term the *embryo*, so long as it is in the young condition.

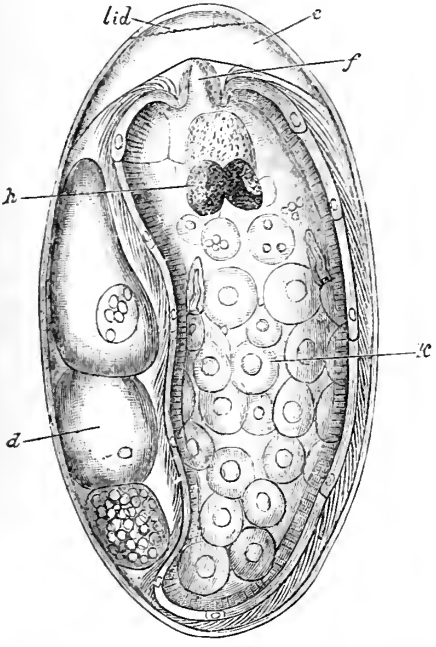
Not only moisture, but also a certain degree of warmth is required for the growth of the embryo within the egg. A temperature of about 74° to 78° Fahr. is the most favourable, and then the embryo is formed in about two or three weeks; with less warmth, progress is slower, and with an average temperature of 60° the growth occupies two or three months. Whilst the temperature is very much below this, as in winter time, the egg does not change at all. It will be seen, therefore, that the embryo will not hatch out in the winter time, and that eggs which fall into suitable places at this season will only be hatched out as the warm weather comes on at the end of spring or beginning of summer.

But all eggs do not hatch out in the same time; a certain number are hatched out on every successive day for some weeks or even months, and at the end of this time some of the eggs may remain in the same condition as when just taken from the liver. No explanation can be found in the eggs themselves of the very variable time required for the growth of the embryo, but the fact is of much practical importance, for *eggs scattered over any damp ground may render it dangerous for a long period.*

Figure 2 shows a fluke-egg at the time when the embryo is fully formed within the shell, and is ready to hatch out. The embryo lies curved on itself at one side of the egg, and on the other side are the remains of the food with which it was originally provided. The head-end of the embryo is directed towards the end of the egg which has the lid; and between the embryo and the lid is a cushion, or pad of stiff jelly-like substance. It will be seen that the surface of the body is covered with what look like hairs (still more plainly seen in the free embryo, Fig. 3). They are not really hairs, but can be moved; they are known as cilia, and it is by their means that the embryo swims, for they act as so many paddles in propelling it through the water.

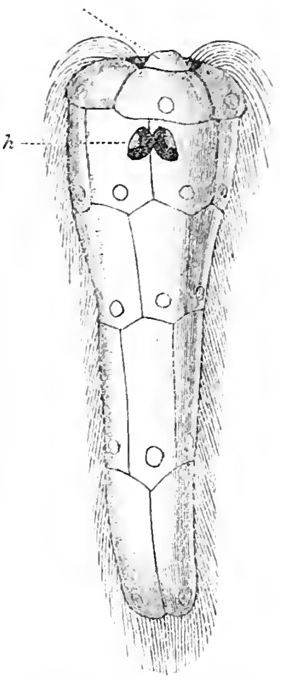
Let us watch the embryo as it hatches out. It moves within the egg, the movements becoming more marked, until at last, the body being stretched out suddenly to its full length, so much pressure is brought to bear against the lid that it flies open as if moved by a spring. The cushion of jelly-like substance pours out, the embryo thrusts the forepart of its body out of the shell, the cilia (or paddles) begin to move as soon as the water touches them, and the animal, after a short struggle, succeeds in drawing the whole of its body through the narrow opening of the shell, and glides away with ease and rapidity through the water.

Fig. 2.



Egg of the fluke containing an embryo ready to hatch out: *d*, remains of food; *e*, a cushion of jelly-like substance; *f*, boring-tool of the embryo; *h*, eye-spots; *k*, germinal cells. Magnified 680 times. (Original.—A. P. T.)

Fig. 3.



An embryo as it appears when swimming in the water; *f*, boring-tool; *h*, eye-spots. Magnified 500 times. (Original.—A. P. T.)

Figure 3 shows the embryo as it appears when swimming freely through the water. This figure is of course very highly magnified; its real size is so minute that it can only just be detected by the naked eye, even under the most favourable circumstances. It has a conical shape—that is to say, it is not unlike a sugar-loaf in form—and it is about $\frac{1}{200}$ of an inch in length. The broader end is always directed forwards, and in its centre is a short peg-like projection, which is used as a boring-tool, and can either be drawn in or thrust out. The whole surface of the animal, with the exception of the projection just mentioned, is covered with the long hair-like paddles or cilia, by means of which it swims, with the boring-tool drawn in, swiftly and restlessly through the water. It is exceedingly interesting to watch it speeding through the water; it is wonderfully active; sometimes it goes rapidly forwards, revolving upon itself like a top, just twisting a little from side to side, as if searching for something. At other times, by curving its body, it sweeps round in circles, or, curving itself yet more, spins round and round the same spot, without moving from it.

Towards the front end of the embryo are two black marks (Fig. 3, *h*); they have the shape of two half-moons placed back to back. These are very simple eyes, and though they cannot give the embryo the power of seeing very distinctly, yet they render it very sensitive to light, and are no doubt of very much help to it in searching for its new home.

When the embryo, in moving through the water, comes in contact with any object, it pauses for a moment, and feels about, as if trying to discover its nature; and if not satisfied, it darts off hastily again. But if the object be the particular kind of water-snail known as *Limnæus truncatulus*, it at once tries to bore into it. This snail is a very common one; but it is so small that it usually escapes notice, and hence it has no common or popular name. More will be said about it further on (p. 292). Under ordinary circumstances, the boring-tool in the head of the embryo (*f*, Fig. 3) is short and blunt, but as soon as the animal begins to bore, it becomes longer and more pointed. The embryo spins round and round on itself, just as the handle of a gimlet is turned, the hair-like paddles working vigorously, and pressing the little embryo against the surface of the snail. The pressure is increased by the body of the embryo being alternately drawn together and then suddenly stretched out. As the boring-tool sinks further into the substance of the snail it becomes longer and longer, until at length it reaches five times its original length (see Fig. 4), and the substance of the snail is forced apart as if by a wedge; and a gap is thus made through which the embryo squeezes its way into the snail.

Figure 4 shows the embryo whilst in the act of boring into a snail; only a very small portion of the snail's body has been drawn.

It may be interesting for me to state briefly how the further development of the embryo within the snail was traced. Very large quantities of eggs were collected from the livers of rotten sheep, and hatched out in water. The embryos were then transferred to vessels of water containing many different kinds of snails, and their behaviour watched. When it was discovered that the embryos bored into the particular kind of snail called *Limnæus truncatulus*, large numbers of this kind were got. Embryos of the liver-fluke were allowed to bore their way into them, and then they were dissected at definite intervals—some, three, six, or twelve hours later, others on each successive day, until the whole history was traced. In this way the changes passed through by the animals found in the snail could be followed step by step, and the relation of the different generations proved beyond any possibility of doubt.

Fig. 4.

Embryo of Liver-fluke boring into a snail. Only a very small part of the snail, has been drawn. Magnified 370 times. (Original.--A. P. T.)

The embryo of the liver-fluke will not bore into all snails alike; the only other kind of snail into which I have found it enter at all is the one called *Limnæus pereger*. But it is only into the very youngest and smallest snails of this kind that the embryo will force its way, and even these do not afford a suitable place for its further growth, for every embryo that succeeds in entering perishes at an early stage.

The embryo seems to know by instinct the right kind of snail. Thus I have placed large numbers of freshly-hatched embryos in a small vessel of water containing *Limnæus truncatulus* and several other kinds of fresh-water snails; and on subsequently examining them all, have found the specimens of *Limnæus truncatulus* to contain as many as fifty or more fluke-embryos each, whilst the other kinds of snails were entirely free from them.

The natural place for the further growth of the embryo is either in or near the lung of the snail. Once safely lodged in the suitable position, the embryo undergoes a great change of form. It is now settling down to a sluggish parasitic life. It no longer needs the paddles to propel it through the water, and they are therefore thrown off. It no longer needs eyes to help it to find its way about, for it scarcely stirs in the snail, and so they get indistinct, and may at length be altogether lost. The form of the body is also changed, and, instead of being like a sugar-loaf in shape, it becomes oval.

Figure 5 shows the animal whilst the change is taking place.

Figure 6 shows it as soon as the change is completed. We need a name by which to distinguish this first generation in

Fig. 5.

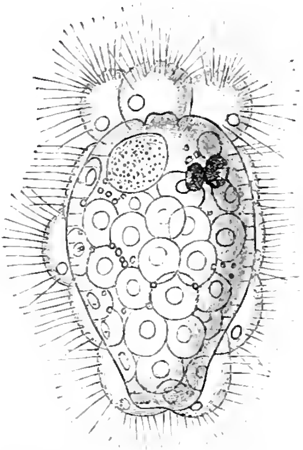


Fig. 6.

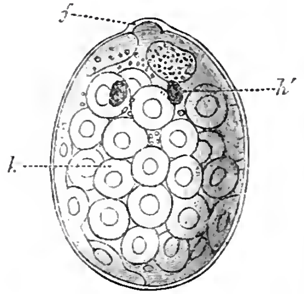
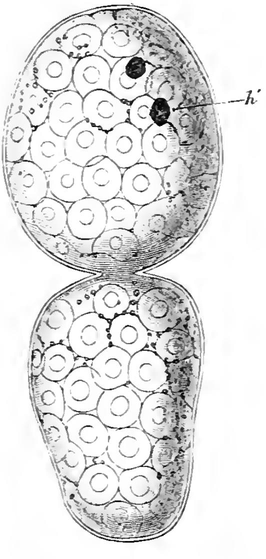


Fig. 5, on the left, shows the change of the embryo into sporocyst just after it has entered the snail. Fig. 6, on the right, shows a young sporocyst produced by the change of the embryo: *f*, boring-tool; *h′*, eye-spots disappearing; *k*, germinal cells. Magnified 500 times. (Original.—A. P. T.)

the snail, and so will call it by its English name *sporocyst*, which simply means a bag of germs. This is literally what it becomes as it grows inside the snail, its host. It lives entirely at the expense of the juices of the snail, and the rapidity of its growth depends upon the warmth of the season. In ordinary July weather it will reach its full length of $\frac{1}{40}$ of an inch by the end of the first fortnight. In colder weather, however, growth is much slower; and in winter time very little progress is made, even in three or four months.

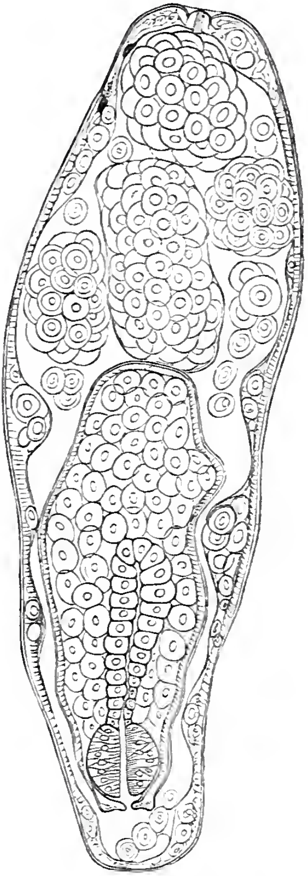
Figure 8 shows a full-grown sporocyst; it contains about half-a-dozen germs of different sizes. They are round at first, then they get longer, and finally take the outward shape of a sack. At the lower part of the figure is one which is just ready to hatch out, lying with its head directed downwards. This belongs to the second generation; it will be seen that it is different from the sporocyst, and it is called a *redia*, after the celebrated anatomist Redi. As soon as the young redia is ready to leave, it breaks its way through the wall of the parent; the wound formed by its forcing its way through immediately closes up, and the remaining germs continue to grow. In this way each sporocyst produces about half a score of rediæ. But there is yet another way in which the sporocyst multiplies, namely, by the division of one sporocyst into two across the middle, as shown in Fig. 7. This is worthy of mention here, as it causes a still greater increase in the number of the parasites within the snail.

Fig. 7.



A young sporocyst dividing into two: *h'*, eye-spots disappearing. Magnified 500 times. (Original.—A. P. T.)

Fig. 8.



A full-grown sporocyst (the first generation) of the Liver-fluke. It contains several germs in different stages of growth. The largest, at the lower end, has assumed the characters of a redia. Magnified 230 times. (Original.—A. P. T.)

Let us return to the rediæ which compose the second generation. Figs. 9 and 10 (p. 288) show two free rediæ; the former is nearly half grown, and the latter is adult. The rediæ are much more active than their parents, and migrate from the lung into the other organs of the snail, and particularly into the liver,

Fig. 9.

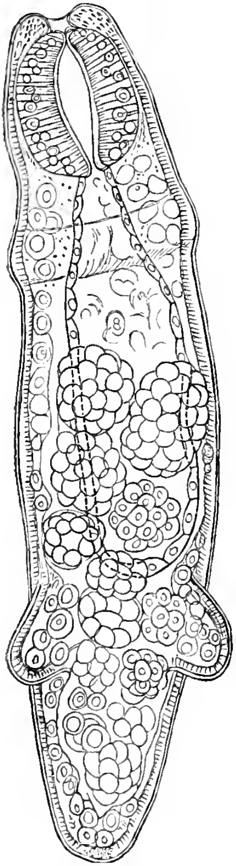


Fig. 9.—A young redia (second generation) of the Liver-fluke, with the contents forming into germs of the third generation. Magnified 230 times.’,(Original. —A. P. T.)

Fig. 10.

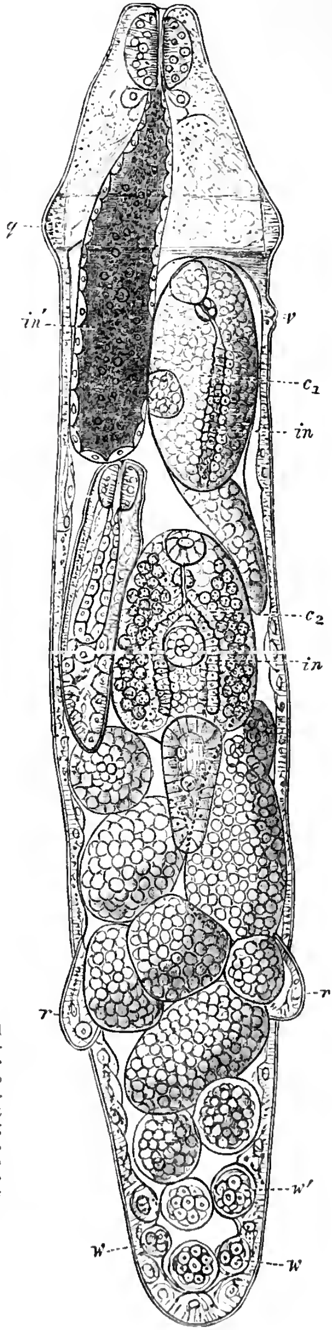


Fig. 10.—A full-grown redia (second generation) of the Liver-fluke. It contains a large number of germs of the third generation. Two of these are so far advanced that they show the characters of the tailed larva or cercaria. It contains also on the left hand a young redia. c^1 and c^2, the two cercariæ; *in*, intestine of cercaria; *w*, w^1, germs in a very early stage; *r*, *r*, the processes which serve as feet; in^1, the intestine of redia; *v*, the birth-opening by which the cercariæ leave. Magnified 120 times. (Original.—A. P. T.)

upon which they feed. A redia differs from a sporocyst, its parent, in several points. The most important difference is that the former has a mouth and an intestine (Fig. 10, *in′*) shaped like a bottle, whereas the sporocyst has none. Its habits are more active; towards its hind end are two short projections (Fig. 10, *r*), which serve as legs of a very simple kind, and prevent the animal from slipping backwards as it moves through the body of its host.

If an infected snail which has a clean and transparent shell be chosen, the rediæ may be watched by the aid of the microscope as they move inside the living snail.

In forcing their way through the body of the snail the parasites necessarily do a great deal of harm; so much indeed, that in my experiments in the laboratory I found very few snails live many weeks after infection. In fact, the fluke-disease is, in the laboratory at least, more destructive to the snail than it is to the sheep.

Within the redia are found germs, the third generation, which at first are very like those produced in the sporocyst. But later on we see that each germ becomes an animal shaped like a tadpole, with a flat oval body and long slender tail. This animal is usually called a *cercaria*, the name simply meaning that the animal has a tail.

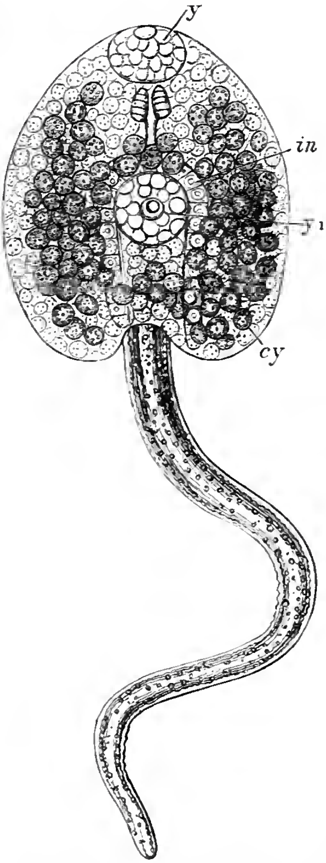
An adult redia, such as is shown in Fig. 10, may grow to the length of one-sixteenth of an inch. It contains about a score of germs in all the different stages of growth; there are usually two or three so far advanced that they have become tadpole-shaped and are ready to come forth. They escape from the parent by a special opening (*v*. Fig. 10), and then crawl or wriggle their way out of the snail.

Now these tadpole-like animals are destined to enter the sheep and there become true liver-flukes, and I shall have to show how they get inside it.

When the snails infested with the above-described forms of the liver-fluke are kept in an aquarium, the cercariæ or tadpole-shaped larvæ may occasionally be found swimming about in the water in a very lively manner. Fig. 11 (p. 290) shows a free cercaria as it appears when swimming. It has a flat oval body about $\frac{1}{90}$ of an inch in length, with a tail more than twice as long. There are two suckers (*y* and *y′*) corresponding to those of the adult fluke, and at the sides of the body are many granules arranged in rounded masses (*cy*).

The free-swimming life of the cercaria never seems to last long, for on coming in contact with the sides of the aquarium or the water-plants contained in it, the little animal soon comes to rest, draws its body up into a round ball, and exudes from the whole of its surface a gummy substance containing many granules (see Fig. 12), which are the same as those already described as forming masses at the sides of the body of the free cercaria. The tail meanwhile is wagged violently, and before long a more vigorous movement throws it off altogether. The gummy substance hardens on exposure, and the body of the cercaria is thus enclosed in an envelope which protects it from injury.

Fig. 11.



A free cercariæ (third generation) of the Liver-fluke as it is seen when swimming in the water: y, y^1, the two suckers corresponding to the suckers of the adult fluke; *in*, intestine; *cy*, the rounded masses at the sides of the body which provide the material for the formation of the cyst or envelope. Magnified 160 times. (Original.—A. P. T.)

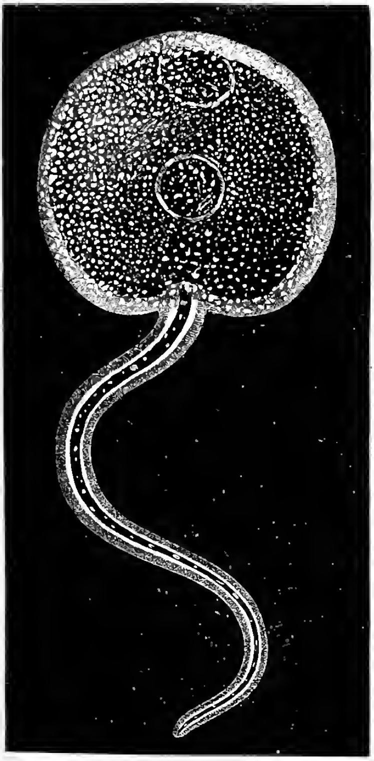
These envelopes are termed cysts (the word cyst meaning a bladder). They are snowy-white, and numbers of them may be found adhering to the walls of the aquarium in which the infected snails are kept, or attached to the dark-green leaves of the water-plants.

If the snails are crawling on the margin of a ditch or over a damp field, the cercariæ on leaving the snail at once proceed to form their envelopes or cysts at the bottom of the grass, and so attach themselves to the stalks, or leaves, near the roots.

Fig. 12 shows a cercaria in the act of forming its cyst, and Fig. 13, which is less highly magnified, shows three fully-formed cysts adhering to a portion of a grass-stalk. As even the latter figure is magnified to ten times the actual size of the object, the minute size of the cysts will be easily appreciated. They are really only one-hundredth of an inch across.

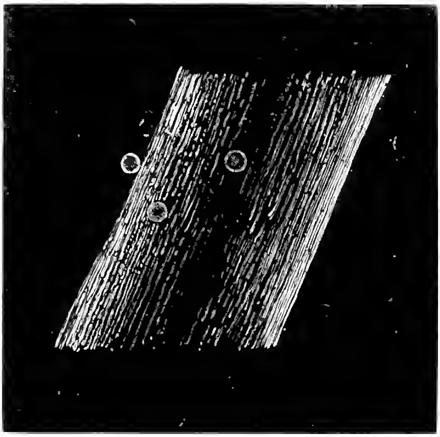
These cysts are the form in which the liver-fluke is swallowed by the sheep, and the animals within them are young flukes. They remain adherent to the grass until the time comes when they are picked up by the sheep feeding on the ground. They may be compared to the pupæ or chrysalides of insects. It must, however, be remembered that whilst the perfect animals emerge from the chrysalides of insects of their own accord as soon as they are ready to do so, and live a free-winged existence, the animals will only come forth from the cysts of the liver-fluke when the grass or plant to which they were attached has been swallowed by some sheep or other suitable animal. If the cysts are not so swallowed within a few weeks, the young flukes which they contain will perish.

Fig. 12.



A cercaria in the act of forming its cyst or envelope. Magnified 160 times. (Original.—A. P. T.)

Fig. 13.



Three cysts of the Liver-fluke attached to a portion of grass-stalk. Each cyst contains a young fluke, which remains quiet until the cysts are swallowed with the grass by a sheep when grazing. Magnified 10 times. (Original.—W. H. J.)

The number of cercariæ descended from a single fluke-egg cannot be less than 200, and is sometimes much larger. For the rediæ forming the second generation, instead of producing cercariæ, may, and perhaps as a rule do, give rise to another generation of daughter-rediæ resembling themselves, and these then produce cercariæ. When this is the case, a single fluke-egg may give rise to more than a thousand cercariæ. It will be seen, therefore, that not only does the race of the liver-fluke multiply and increase abundantly in the sheep by producing myriads of eggs, but that there is a further and great increase of the forms within the snail. If only the greatest degree of ordinary increase were reached, a single fluke might give rise to more than a hundred million descendants in the next generation, of liver-flukes proper, inhabiting the sheep. But, fortunately for farmers, the chances are enormously against any such disastrous increase.

The habits of Limnæus truncatulus.—The habits of the snail *Limnæus truncatulus*, which serves as an intermediate host (see p. 280), are of much importance, for they show how the snail is likely to become infected with the larval forms of the liver-fluke, and also how the cysts are distributed in places where they have a good chance of being picked up by the sheep.

Limnæus truncatulus (Figs. 19, 20, p. 302) is a fresh-water snail, with a brown spiral shell; it is very common, and has a very wide distribution over the world. It is very small, its shell never reaching more than half an inch in length, whilst it is usually much smaller, a common variety in England scarcely ever measuring so much as a quarter of an inch. Owing to its small size it often escapes notice, or is taken for the young of some other kind of snail, so that it has no popular name. Two or three of the kinds of snails most closely allied to *L. truncatulus* (for instance, *Limnæus pereger*) may occasionally crawl out of the water for short distances; but in *Limnæus truncatulus* itself, the habit is so much more strongly developed, that the snail should be termed amphibious. Indeed it is oftener found out of the water than in it. When kept in an aquarium it quits the water, and as often as it is put back, insists on crawling out again, so long as the necessary strength remains. It is said to breed upon the mud on the banks of ditches. Although so common, it is often very difficult to find, no doubt owing to its minute size and its habit of wandering from the water.

As showing how much this snail lives out of the water, it may be interesting to give my own observations. I have related in a former paper that I was quite unable in 1881 to get *Limnæus truncatulus* for my experiments, nor did I succeed in doing so until July of the following year, when there were floods on the river Isis near Oxford. The waters brought this snail down in vast multitudes, probably from its breeding haunts in marshy places up the river. It was extremely abundant, so numerous indeed, that a single sweep of a small hand-net repeatedly gave me more than 500 examples, and this was in a ditch where the year before I could not obtain a single *L. truncatulus*. All along the margins of the ditches the ground was covered by them, and they were found abundantly on the flooded ground.

On returning three weeks later to the same ditch I was unable to find a single example alive in the water. As I had not sufficient leisure on this visit to examine the ground near the ditch, I returned for the purpose of doing so eight days later. There had been dry weather since the flood, but early that morning heavy rain had fallen, and I found numbers of specimens of *L. truncatulus* on the gravel of a path near the ditch, and these seemed to have crawled out of the grass when revived by the rain. At the roots of the grass, all along the margin of the ditch, others were found in abundance. Some few shells were quite empty, but the majority contained the dried remains of the snail, which had shrunk far back into the spire of the shell. Most of these appeared to be quite dead, but were, however, merely dormant, for on placing them in water the tissues imbibed moisture and assumed their natural bulk; and after a few hours the snails had regained their full activity, and were seemingly none the worse for their prolonged drying up.

To test the power of resisting drought possessed by the snail, I collected a number of specimens, and placed them in an open vessel on a shelf in a dry laboratory, in a position where the sun fell upon them for an hour or so daily. I found that rather more than half of them withstood twenty-six days of this treatment, and some few revived after more than six weeks. That the snails can live on moist ground, quite away from any quantity of water, for considerable periods, is sufficiently proved by the fact that I have kept them alive for eleven weeks on moist grass and moss, even when infested with the larval forms of the liver-fluke.

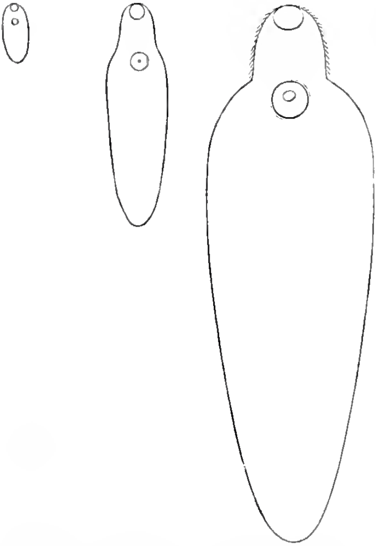
It is clear, therefore, that the kind of snail under consideration may be brought in great quantities by floods, and may be left on the fields when the waters pass away. The snails thus left continue to wander and feed, so long as the bottom of the grass remains moist. Their numbers are recruited from surrounding ditches and streams. Even on land *which is not liable to floods this snail may exist in large quantities*, having crawled from the ditches, ponds, streams, and marshy spots, through the moist grass. A drought may render the snail dormant, but, unless continued too long, it revives at the first shower of rain.

If there are fluke-eggs on the ground, the embryos hatched out of these will gain entrance to the *Limnæus truncatulus* living in wet places. Owing to the habit which this particular snail has of living so much out of the water, either on the banks of ditches, or further away towards the centre of the fields if they are damp enough, the cercariæ (the larval forms destined to enter the sheep) will, on leaving their host, form their cysts on the grass in the places where they will have the best chance of being transferred to the sheep grazing on the ground.

Man himself sometimes serves as host to the liver-fluke, and in this case the cysts containing the young flukes are probably eaten with watercress.

Growth and Duration of Life of the Fluke in the Sheep.—From observations which I need not describe here, as they have been given in a former Report,* it appears probable that at least six weeks elapse from the time the fluke is swallowed by the sheep before the parasite becomes adult and begins to produce eggs. A very great increase in bulk occurs, for when the young fluke is introduced it is perhaps only $\frac{1}{80}$th of an inch in length, whereas the adult fluke reaches an inch or an inch and a third. A change occurs also in the form of the body, as will be seen from Figs. 14, 15, 16, and 17; it is due to the more rapid growth of the hind part of the body, which contains the reproductive organs (Fig. 18).

Figs. 14, 15, 16.



Three young flukes from the liver of a sheep to show the change in form during growth. All are magnified 7½ times. Fig. 14 (on the left) represents the smallest fluke I have ever found in a sheep; it was only $\frac{1}{24}$ of an inch in length. Fig. 15 (in the centre) shows the shape of a fluke $\frac{1}{8}$ of an inch long, and Fig. 16 (on the right) shows a fluke which has reached $\frac{1}{3}$ of the full length of the adult animal. (Original.—A. P. T.)

Of great practical importance is the question how long the fluke remains alive within the sheep. For it will depend upon the length of this period whether or not it is worth while trying to keep the infected animals alive until the life of the fluke has reached its natural limit.

The liver-fluke is supposed by some to pass out of the sheep at the beginning of summer. If this were the case, its life would not last more than three-quarters of a year. Gerlach states that the fluke always passes out in the months of June and July, but Pech † says that he has seen flukes pass out from rotten

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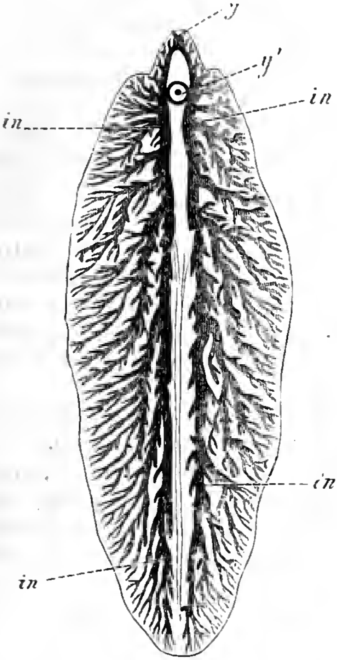
* 'Journal of the Royal Agricultural Society,' 1881, p. 25.

† 'Der Thier-arzt,' 1873, p. 87.

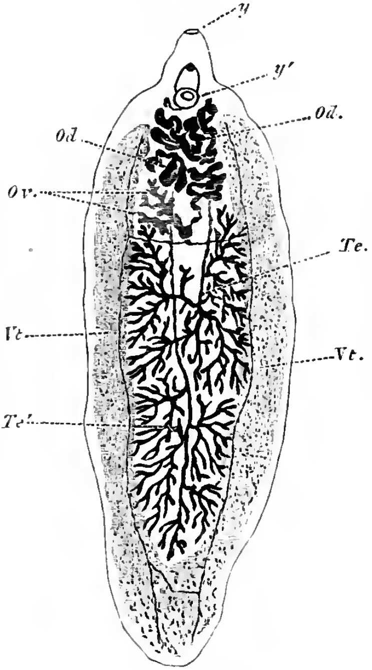
sheep in autumn and winter, and suggests that they may have lived in the sheep more than a year. I have examined the droppings of sheep in June, sent by the kindness of a veterinary surgeon, which were asserted to contain dead flukes, but the so-called flukes proved on microscopic examination to be masses of discoloured mucus. From my own observations I am able to say that the flukes do *not* always pass out from the sheep in the summer time. There is no time of the year when sheep-livers, containing flukes which are clearly several months old, cannot be obtained. In a former Report * a case was described in which the flukes within a sheep were proved to have lived for a longer period than one year. The animal took the rot in

Fig. 17.



An adult fluke showing the branched digestive tract: *y*, the oral; *y'*, the ventral sucker; *in*, the branched intestine. In the centre, between the two main branches of the intestine, lies the chief trunk of the water-vessel. Twice the natural size. (Original.—W. H. J.)

Fig. 18.



Another view of an adult fluke, showing the reproductive organs: *y*, the oral; *y'*, the ventral sucker; *Od*, the oviduct; *Ov*, the ovary; *Vt*, the vitellarium or gland that forms the granular yolk-cells surrounding the embryo in the egg; *Te*, the anterior; *Te'*, the posterior testis; their ducts run forwards. The generative opening is in front of the ventral sucker. Twice the natural size. (Original.—W. H. J.)

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* 'Journal of the Royal Agricultural Society,' 1881, p. 26.

the autumn of 1879, and when it was killed on the 18th of December, 1880, its liver was found to be still full of flukes.

Summary of the Life-History.—The adult fluke in the liver of the sheep produces enormous numbers of eggs, which are distributed with the droppings of the sheep. If these eggs have moisture and a suitable degree of warmth, they continue to live, and in each is formed an *embryo.* The embryo leaves the egg and swims in search of the particular snail, *Limnæus truncatulus*, within which its future life and growth takes place. The embryo bores into the snail, and then grows into the form which is called a *sporocyst.* The sporocyst gives rise to the second generation. This generation is known as *redia.* The rediæ in turn produce the third generation, which has the form of a tadpole, and is called *cercaria.* The cercariæ quit the snail, and enclose themselves in envelopes or cysts, which are attached to the grass. When the grass to which the cysts adhere is eaten by the sheep, or other suitable host, the young liver-fluke comes out of the cyst and takes up its abode in the liver of its host, and the fatal circle is thus completed.

It will be seen, therefore, that the fluke-disease is a disease which alternates between a particular snail and the sheep. A sheep cannot take the infection *directly* from another sheep, nor can one snail take it *directly* from another snail. The sheep, by spreading the eggs of the fluke, gives the infection to the snail, and the snail in turn, by harbouring and distributing the cercariæ, conveys the infection to the sheep.

PART III.—THE PREVENTION OF ROT.

Now that we have followed the whole of the life-history of the parasite, and know where it is to be found and to be fought, at all the stages of its varied existence, we are in a position to discuss the important practical bearings of the question. We may therefore proceed with the consideration of the preventive measures, which, if carefully carried out, will, it is believed, enable us to reduce the losses to a comparatively insignificant amount; and eventually, if all farmers will combine their efforts, totally stamp out the disease, so that it may become altogether a thing of the past.

Let me first state the conditions necessary for the existence of liver-rot, as proved by the foregoing research, and discuss the measures which will prevent the conditions being satisfied, and therefore prevent the disease itself; and lastly give a summary of the preventive measures.

The conditions necessary for the existence of liver-rot in any given locality are as follows:—

1. There must be fluke-eggs on the ground.
2. There must be wet ground or water during the warmer weather for the eggs to hatch in.
3. A particular snail called *Limnæus truncatulus* must be present.
4. Sheep or other animals must be allowed to feed on the same ground, without proper precautions being taken.

If any one of these conditions remains unsatisfied there can be no fluke-disease or liver-rot in the locality. Let us consider these conditions in detail.

1*st Condition. There must be fluke-eggs on the ground.*—We have already seen that the fluke whilst in the liver of the sheep, rabbit, or other animal, produces vast quantities of minute eggs, and that these pass into the intestines and are distributed in myriads wherever the droppings fall. So that wherever fluked sheep are kept, there we shall have fluke-eggs.

In some districts the fluke is always to be found, though in dry seasons it may become scarce. Still a few exist, and these are quite sufficient to keep up the breed until a wet season occurs, when, under the favourable influence of moisture, they increase so rapidly as to produce a devastating outbreak.

But the fluke disease may appear in quarters where it was previously unknown, and surprise is frequently expressed at the way in which it suddenly breaks out in isolated flocks. The infection, however, may be introduced in many ways. Eggs may be brought in manure; or adhering to the feet of men, horses, or dogs; or they may be conveyed by running water, and especially by floods. Rabbits and hares, too, have much to answer for in distributing the parasite. The same account is given everywhere of the way in which rabbits suffer from rot, and in some neighbourhoods about Oxford they were almost exterminated by it in 1879–80. I have received on several occasions fluked rabbits, and have known them to contain each as many as forty or fifty flukes. Wherever they go, and they often wander far from home, the eggs of the fluke are distributed in their droppings. In a case where infection had suddenly broken out in an isolated flock of sheep at Wytham, near Oxford, I was able to show that the rabbits from the neighbouring woods had introduced the disease.

So wonderfully fertile is the liver-fluke that, if every egg were safely hatched out and the full average multiplication in the snail were attained, a single rotten sheep might pass enough eggs to eventually give the rot badly to all the sheep in England, some thirty millions in number. Fortunately the chances are very greatly against any flukes being reared from any particular egg. Still we must do all we can to increase these adverse chances, and must begin the prevention of rot by waging a war of extermination against the eggs. If we can destroy or, better still, render impossible the production of nine out of every ten fluke-eggs which are annually scattered in England, we shall so mitigate the rot, that instead of a sheep being infested with two or three hundred flukes, it will on the average contain only twenty or thirty. Now whilst two or three hundred flukes would destroy a sheep, twenty or thirty will do comparatively little harm.

The production of fluke-eggs may of course be prevented by killing the sheep as soon as it is known that it is suffering from the rot. Extreme as this measure may seem to some, if the sheep are at all badly rotted it will prove the most economical in the end, especially if the disease is discovered at an early stage. It is better to lose a little at the outset than to run the risk of having finally to sell the sheep for little more than the price of the skin. The quality of the meat will be only slightly deteriorated at first, and there will then be no objection to its use for food. But as the disease advances, the meat will become less and less wholesome, and at last become totally unfit for human consumption.

There is no cure known for the rot, for the fluke inhabits the liver, an organ which can only be reached through the blood, and it is impossible to prescribe any drug which will harm the fluke without harming the sheep at the same time. It is quite true that if the sheep does not contain too many flukes, it may recover when the natural life of the fluke comes to an end, provided its strength is kept up by a liberal diet. But the life of the fluke may last so long (see pp. 294–5), that even if this method prove successful, it will be very costly, and it is scarcely worth while making the attempt, unless the sheep be of a specially valuable breed, or unless there is reason to believe that it contains only a small number of flukes. If the owner decides to try to keep the infected flocks, they should not be allowed to remain on wet ground, for then the fluke-eggs would have a favourable place for hatching, and the result might be a harvest of death reaped in the following season.

If rotten sheep are kept at all, let them be placed on dry ground, where the eggs cannot meet with the moisture necessary for their development, and where there is no chance of their being washed into ditches, ponds, or streams. A brook may easily carry the eggs down with its current to land lying at a lower level.

If there is reason to suspect that a flock of sheep is attacked with liver-rot, either one of the most suspicious-looking should be killed, and its liver examined for flukes; or if a microscope is available, the point will be more readily decided by taking a very small quantity of the droppings of the sheep on the point of a penknife, mixing it with a little water on a glass-slide, and examining for fluke-eggs. If the animal contains many flukes, even so small a quantity of the droppings will show several eggs, easily recognized as eggs on account of their perfectly definite shape and yellowish-brown colour. This method of course will only serve to prove the presence of the flukes when the disease has been taken for some time, for the fluke does not begin to produce eggs until it has been in the sheep some six weeks.

The manure of fluked animals must never be placed on wet ground. If the sheep are kept in a yard, the manure should be collected, and a little coal-tar oil may be added to prevent the development of the eggs; or it should be kept for a considerable time before it is spread on the fields. The livers of rotten sheep should be destroyed, for they contain enormous numbers of eggs; perhaps the simplest way of getting rid of them will be to bury them deep. When livers are not very much injured by the fluke, they are often given to dogs, and there is no great objection to this, *provided they be well cooked first.* Otherwise, if they are given in a raw state, the contained eggs will pass uninjured through the dog, and be distributed by it.

2nd Condition. There must be wet ground or water during the warmer weather for the eggs to hatch in.—If the eggs of the liver-fluke are to be hatched, they must be in water, or at least be kept moist, during some weeks of warm weather, or even for some months if the temperature be lower. If the eggs are once thoroughly dried, their vitality is destroyed, the side of the shell being usually crushed in.

Ground is often, with reference to the rot, spoken of as "sound," or, on the contrary, as "rotting." When the droppings containing fluke-eggs fall on to a field, the rain will distribute the eggs over the surface, washing them down to the roots of the grass. If the soil is light and sandy or porous, the ground will be "sound," for the water will filter into the earth, leaving the eggs on the surface, where they will get dried, and so be destroyed. If, on the other hand, the soil is heavy and clayey, so that the rain-water does not sink into the earth, but flows along the surface, the ground is "rotting." For, as the water flows over the surface, it carries the fluke-eggs along with it, and deposits them in ditches, holes, marshy places, furrows where the water stands, all of them places where the eggs will hatch.

The obvious remedy for this evil is to drain the land thoroughly and efficiently, and this will not only do much to prevent the rot, but will have the further advantage of greatly improving the herbage.

Where it is not practicable to drain the land at once, either salt or lime may be scattered over the surface. Both these substances will destroy the embryos of the fluke, and at a later period the cysts when attached to the grass. And, still further, they will destroy the snails which serve as hosts to the intermediate forms of the liver-fluke. The freedom from rot of sheep feeding on salt-marshes is well-known, and is now shown to be due to the poisonous action of the salt on the embryos, sporocyst, redia, cercaria, and cyst, and to its similar action on *Limnæus truncatulus* itself.*

Even a weak solution of salt in water (containing only $\frac{3}{4}$ per cent. of salt) proves fatal to this snail. Dressings of salt have the advantage over lime in not spoiling the grass for immediate use, whereas lime will do so. It may, however, at times be better for the land itself that lime should be applied. It will be for the farmer to decide which dressing should be used.

It is naturally of much importance that the salt, or lime, should be distributed at the right time of the year, when fluke-germs and snails are present in the greatest numbers. The snail buries itself in mud, or soil, in the winter-time, and owing to the cold no embryos are hatched out at that time. If the weather be warm in April, it is possible that a few may be hatched out towards the end of the month, but they will not be numerous. In May, however, greater numbers will be hatched, and still more in June and July. These two months are the time of the year when the snails are most liable to be infected. As more eggs are distributed through the whole of the summer by fluked animals, it is clear, of course, that the production of embryos, though in less numbers, will continue from August until the time when the development is checked by autumnal cold.

Even under the most favourable circumstances it will be seven weeks before the cercariæ are formed within the snail so as to be ready for transference to the sheep. Animals may take the rot as early as June, but this is not of frequent occurrence. In July, however, the germs or cysts on the grass become more numerous, though still comparatively scarce. In August more will be found, but it is in the months of September and October that they are most numerous. These are the most dangerous months. The Northumberland farmers hold that the end of

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* It may be worth noting that water-cress should be steeped in salt and water before it is eaten, so as to guard against any possible infection from adhering cysts of the liver-fluke.

October is the most fatal time for their district. In November the germs are less numerous, and rot is less frequently taken, though there are one or two instances in which the disease has been clearly proved to have been taken as late as the beginning of December.

Some farmers are inclined to place the dangerous period earlier in the year, dating from the time of a flood in June or July. It may be quite correct to attribute the outbreak to the flood, but the date of the flood may simply be the time when the snails are infected, and not when the sheep take the rot. The cercariæ would probably be matured some two months later, so that the true date of the infection of the sheep would be August or September.

In the case of snails which become infected late in the year, the different generations will not have time to grow, multiply and become mature before the cold of the closing year drives the snail into its winter quarters, and suspends for the time the life of the parasites. It is a question of some interest whether the snail and its included parasites can together survive the winter and complete their growth in the following spring. If the parasites are numerous or are far advanced, the snail is so much weakened that, fortunately for us, it will probably succumb to the rigours of the winter. But there can be little doubt that some few will retain their vitality throughout the winter, and with the return of milder weather a fresh start will be made, and that at length the forms destined to be transferred to the sheep will be matured. Some of the cases of early infection in June are probably due to parasites which have survived the winter in the snail.

June and July are then the principal but not the only months in which we are to wage war against the embryos; the latter part of August, September and October, are the months in which especially to destroy the germs on the grass ready for transference to the sheep.

3rd Condition. A particular snail called Limnæus truncatulus must be present.—There seems to be only one snail in England * which can serve as host to the intermediate forms

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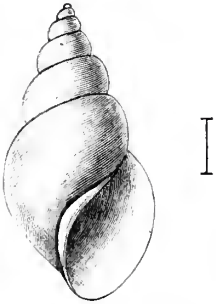
* The snail *L. truncatulus* has a very wide distribution, being found, according to Dr. Gwyn-Jeffreys, throughout Europe, in North Asia, Morocco, Algeria, Madeira, and (doubtfully) Guatemala. The liver-fluke, however, has a much wider distribution, and it follows that there must be in certain countries, supposing *L. truncatulus* to be *really* absent, another snail which can replace it as host. Thus the fluke is found in the United States, where *L. truncatulus* is said not to occur, though several other kinds of snails belonging to the genus *Limnæus* are found. In Australia the fluke occurs both in sheep and in human beings. *L. truncatulus* is stated not to exist there, but eleven kinds of *Limnæi* are recorded. It is probable that in both these countries some other species of *Limnæus* serves as host.

of the liver-fluke. Consequently, wherever this snail is absent there can be no liver-rot, and if we could succeed in exterminating it, we should render it impossible for the disease to exist in England.

Fig. 19.



The snail, *Limnæus truncatulus*, which serves as host to the sporocyst, redia, and growing cercaria of the Liver-fluke. The drawing is magnified, and the true length is shown by the line at its side. (Original—A. P. T.)

Fig. 20.

Limnæus truncatulus, of natural size. (A. P. T.)

The snail, however, is small, and hence difficult of detection, so that all we can hope to do is to limit its numbers in any given locality. There are several ways in which this may be done. First of all, the land should be well drained. I have known an instance in which *Limnæus truncatulus* was found in a small boggy place towards the middle of a field, and was there the means of propagating the fluke. When, however, the marshy place was drained, the snail disappeared from the ground, and with it the fluke-disease. A dressing of lime or salt will, as already mentioned, destroy the snails, and, if applied to the ground for this purpose, it should be scattered especially on or near any marshy places, or along the margins of ditches, ponds, or streams, out of which the snail will naturally crawl.

A flood may bring the snail down in quantities, and scatter it broadcast over fields which were previously free from it (see p. 292). The snails may be infected before they are brought down by the flood, and infection be thus introduced into new areas; or they may become infected subsequently, if there are eggs on the ground. They are drifted everywhere. Flooded land should therefore have the salt or lime scattered over the whole of its surface when the waters have gone down.

4th Condition. Sheep or other animals must be allowed to feed on the same ground, without proper precautions being taken.—If any ground is likely to give the rot to sheep, the simplest plan would, of course, be not to allow them to graze upon it, but to keep them on drier and safer land. But such advice would seem a mockery in certain districts, where all the land is more or less unsound. A great deal of such ground would probably be found to be heavy, and in urgent need of drainage. But it must always be remembered that even a sound porous soil may become dangerous in a season of excessive wet, if it lies so low that it becomes clogged with water which cannot be carried off fast enough by the rivers, or if it is flooded.

If it is necessary to send sheep on to dangerous ground, great care should be exercised in observing the following precautions:—

Salt or lime may be scattered on the surface at the proper season, to destroy the germs, as already explained.

Salt should also be used in another way. It has long been known that salt is a preventive when given to the sheep with their food, but many farmers have been slow to use it. There are two reasons for its action. First, it acts injuriously upon the germs of the liver-fluke which may be swallowed; and secondly, it improves the general health of the sheep, enabling them to digest the germs better. In addition to the salt, dry food should be given, as this will, by keeping them in good health, greatly improve their chance of digesting the young flukes. If the salt be mixed with the dry food, each sheep is more likely to secure its proper proportion, and no more, than if lumps of rock-salt are simply put down for the sheep to lick when they please. Care must, however, be taken that breeding-ewes do not get too much.

It will scarcely be necessary to give salt to them after November, so far as this particular purpose is concerned, for there will then be very few of the germs or cysts about on the grass.

In this connection may be mentioned an experiment recently tried by Mr. T. P. Heath, veterinary officer for Exeter and Devon, and published in the 'Western Morning News' for Oct. 14th, 1882. It is especially valuable on account of its definite and exact nature. No sheep had been kept in safety on or near Mr. Heath's farm within living memory. A number of unaffected sheep were selected, and divided into two flocks. One flock was kept as all other farmers' sheep are kept; to each sheep of the other flock was given a quarter of an ounce of common salt, well mixed with half a pint of oats every day that they fed on the *permanent pastures.* Whilst they were feeding on turnips, vetches, &c., this corn and salt allowance was entirely dispensed with. All the sheep were killed in summer.

The half fed with corn and salt were quite sound; the other half had flukes in their livers, so that they could not have been kept through another winter. Mr. Heath had no cause of complaint with his speculation, as the subject of his experiment realised a profit of about 50*s.* per head, and the cost of corn and salt did not exceed 3*s.* each.

Sheep must not be allowed to graze too closely, for they are then specially liable to take the rot. Not only does close-grazing imply that food is scanty, and that the health, and therefore the digestive power, of the sheep is likely to suffer in consequence, but the sheep will pick up more fluke-germs. The snail, in crawling about in the grass, keeps, as a rule, at the bottom, close to the roots; the cercariæ accordingly, on leaving the snail and proceeding to form their cysts or envelopes, will attach themselves to the stalks of grass or other plants, close to the ground. Hence the closer the sheep grazes, the more of these cysts it is likely to pick up. There are many instances on record, and I have myself met with others, in which "hog-jawed" sheep, which are unable to graze closely, have escaped infection when all the rest of the flock have been rotted. The special liability of sheep to the fluke seems in some measure to be due to the fact that it can graze more closely than any other domestic animal.

Summary of Preventive Measures.—I may now give a summary of the preventive measures which have been suggested above.

1. All eggs of the liver-fluke must be rigorously destroyed; manure of rotten sheep, or other rotten animal, must not be put on wet ground.
2. If sheep are rotten, let them be sent to the butcher at once, unless they are specially valuable and are not badly fluked. If kept, they must not be put on to wet ground.
3. Care must be taken to avoid introducing eggs of the fluke, either with manure, or with fluked sheep, or in any other way. Rabbits and hares must not be allowed to introduce the eggs.
4. All heavy or wet ground must be thoroughly drained.
5. Dressings of lime or salt should be spread over the ground at the proper seasons to destroy the embryos, the cysts of the fluke, and also the snail which acts as host.
6. Sheep must not be allowed to graze closely, for the more closely they graze, the more fluke-germs will they pick up.
7. When sheep are allowed to graze on dangerous ground, they should have a daily allowance of salt, and a little dry food.

If all farmers will unite in carrying out the above preventive measures, suggested by the knowledge of the life-history of the parasite, there is no reason why the fatal ravages of the destructive fluke should not be so restricted that the losses would at once be reduced to a comparatively trifling amount. There is at present one obstacle in the way of the total extermination of the fluke. So long as rabbits and hares have free liberty to convey the infection from one district to another, there will always be a danger of a fresh outbreak in places where the fluke had for the time been driven out. And for rabbits in a state of nature we cannot adopt preventive measures in the same way that we can for domesticated animals, so that on wet waste lands the breed of flukes may be constantly kept up. Very much, however, may be effected by united action; and if the preventive measures which are now suggested are strictly carried out by all, we shall hear no more of disastrous outbreaks of the sheep-rot, and something at least will have been effected towards raising the fortunes of British agriculture.

In concluding, I desire once more to express my thanks to all the gentlemen who have so readily and courteously assisted my investigations upon their fields. It gives me much pleasure to take this opportunity of thanking Dr. Acland for kindly permitting me to use the Sanitary Laboratory of the Oxford Museum for my experiments, and Professor Moseley for kindly placing all apparatus in the Anatomical Department at my disposal.

To my friend Mr. W. Hatchett-Jackson, Natural Science Lecturer of St. John's College, Oxford, I am especially indebted, for he has most kindly come to my aid when prevented by my departure for New Zealand from revising the present paper, and has, by undertaking the revision of the proofs of both figures and text, and by making for me some additional drawings, rendered its earlier publication possible.

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Royal Agricultural Society of England.

1883.

President.

The Duke of RICHMOND and GORDON, K.G., *Goodwood, Chichester, Sussex.*

Trustees.

Year when Elected.	
1879	H.R.H. The Prince of Wales, K.G., *Marlborough House, Pall Mall,* S.W.
1855	Acland, Sir Thomas Dyke, Bart., M.P., *Killerton, Exeter, Devonshire.*
1857	Bridport. General Viscount. *Cricket St. Thomas, Chard, Somersetshire.*
1861	Dent, J. D., *Ribston Hall, Wetherby, Yorkshire.*
1863	Kingscote, Colonel, M.P., *Kingscote, Wotton-under-Edge, Gloucestershire.*
1868	Lichfield, Earl of, *Shugborough, Staffordshire.*
1854	Macdonald, Sir Archibald Keppel, Bt., *Woolmer Lodge, Liphook, Hants.*
1860	Marlborough, Duke of, K.G., *Blenheim Park, Oxford.*
1839	Portman, Viscount, *Bryanston, Blandford, Dorset.*
1856	Powis, Earl of, *Powis Castle, Welshpool, Montgomeryshire.*
1858	Rutland, Duke of, K.G., *Belvoir Castle, Grantham, Leicestershire.*
1861	Wells, William, *Holmewood, Peterborough, Northamptonshire.*

Vice-Presidents.

Year when Elected.	
1873	Bedford, Duke of, K.G., *Woburn Abbey, Bedfordshire.*
1861	Cathcart, Earl, *Thornton-le-Street, Thirsk, Yorkshire.*
1839	Chichester, Earl of, *Stanmer Park, Lewes, Sussex.*
1867	Devonshire, Duke of, K.G., *Holker Hall, Lancashire.*
1847	Eversley, Viscount, *Heckfield Place, Winchfield, Hants.*
1848	Gibbs, Sir Brandreth, 13, *Pelham Crescent, South Kensington,* S.W.
1858	Kerrison, Sir Edward C., Bart., *Brome Hall, Scole, Suffolk.*
1872	Lathom, Earl of, *Lathom Hall, Ormskirk, Lancashire.*
1848	Lawes, Sir John Bennet, Bart., *Rothamsted, St. Albans, Herts.*
1852	Richmond and Gordon, Duke of, K.G., *Goodwood, Chichester, Sussex.*
1859	Vernon, Lord, *Sudbury Hall, Derby.*
1855	Wynn, Sir Watkin Williams, Bart., M.P.,*Wynnstay, Ruabon, Denbighshire.*

Other Members of Council.

Year when Elected.	
1881	*Allender, G. Mander, *Solna, Roehampton, Surrey,* S.W.
1877	Arkwright, J. Hungerford, *Hampton Court, Leominster, Herefordshire*
1880	*Ashworth, Alfred, *Tabley Grange, Knutsford, Cheshire.*
1875	*Aylmer, Hugh, *West Dereham, Stoke Ferry, Norfolk.*
1871	*Bowen-Jones, J., *Ensdon House, Montford Bridge, R.S.O., Salop.*
1874	*Chandos-Pole-Gell, H., *Hopton Hall, Wirksworth, Derbyshire.*
1883	Clay, Charles, *Walton Grange, Wakefield, Yorkshire.*
1882	*Coxon, John, *Freeford Farm, Lichfield, Staffordshire.*
1860	Druce, Joseph, *Eynsham, Oxford.*
1871	Egerton (of Tatton) Lord, *Tatton Park, Knutsford, Cheshire.*
1882	Emlyn, Viscount, M.P., *Golden Grove, Carmarthen, S. Wales.*
1873	*Evans, John, *Uffington, Shrewsbury, Salop.*
1876	*Feversham, Earl of, *Duncombe Park, Helmsley, Yorkshire.*
1879	Foster, Samuel P., *Killhow, Carlisle, Cumberland.*
1875	Frankish, William, *Limber Magna, Ulceby, Lincolnshire.*

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* Those Members of the Council whose names are prefixed by an asterisk retire by rotation in July, but are eligible for re-election in May.

Year when Elected.	
1881	Gilbey, Walter, *Elsenham Hall, Essex.*
1879	*Gorringe, Hugh, *Kingston-by-Sea, Brighton, Sussex.*
1874	Hemsley, John, *Shelton, Newark, Notts.*
1876	*Howard, Charles, *Biddenham, Bedford.*
1878	Howard, James, M.P., *Clapham Park, Bedfordshire.*
1869	*Leeds, Robert, *Keswick Old Hall, Norwich.*
1874	Lindsay, Colonel Sir R. Loyd, M.P., *Lockinge Park, Wantage, Berkshire.*
1881	*Little, Herbert J., *Coldham Hall, Wisbech, Cambridgeshire.*
1865	*Lopes, Sir Massey, Bart., M.P., *Maristow, Roborough, Devon.*
1874	*Martin, Joseph, *Highfield House, Littleport, Isle of Ely, Cambridgeshire.*
1880	Moreton, Lord, M.P., *Tortworth Court, Falfield, R.S.O., Gloucestershire.*
1879	Neville, Robert, *Butleigh Court, Glastonbury, Somersetshire.*
1857	*Pain, Thomas, *Audley's Wood, Basingstoke, Hants.*
1881	*Parker, Hon. Cecil T., *Eccleston, Chester.*
1861	Randell, Charles, *Chadbury, Evesham, Worcestershire.*
1875	*Ransome, Robert Charles, *Ipswich, Suffolk.*
1867	*Ravensworth, Earl of, *Ravensworth Castle, Durham.*
1871	Rawlence, James, *Bulbridge, Wilton, Salisbury, Wilts.*
1869	*Ridley, Sir M. White, Bart., M.P., *Blagdon, Cramlington, Northumberland.*
1875	*Russell, Robert, *Horton Court Lodge, Dartford, Kent.*
1874	Sanday, George Henry, *Wensley House, Bedale, Yorkshire.*
1878	Sheraton, William, *Broom House, Ellesmere, Salop.*
1874	*Spencer, Earl, K.G., *Althorp, Northampton.*
1882	Stafford, Marquis of, M.P., *Trentham Hall, Stoke-upon-Trent, Staffs.*
1875	Stratton, Richard, *The Duffryn, Newport, Monmouthshire.*
1883	Sutton, Martin J., *Westwood House, Tilehurst, near Reading.*
1881	Thorold, Sir John H., Bart., *Syston Park, Grantham, Lincolnshire.*
1874	Turbervill, Lieut.-Col. Picton, *Ewenny Priory, Bridgend, South Wales.*
1845	*Turner, George, *Great Bowley, Tiverton, Exeter, Devonshire.*
1871	*Turner, Jabez, *Norman Cross, Yaxley, Huntingdonshire.*
1871	*Wakefield, William H., *Sedgwick, Kendal, Westmoreland.*
1882	Warren, Reginald Augustus, *Preston Place, Arundel, Sussex.*
1870	Whitehead, Charles, *Barming House, Maidstone, Kent.*
1865	*Wilson, Jacob, *Chillingham Barns, Alnwick, Northumberland.*
1878	Wise, George, *Woodcote, Warwick.*

Secretary and Editor.

H. M. JENKINS, 12, *Hanover Square, London*, W.

Consulting Chemist—Dr. Augustus Voelcker, F.R.S., 12, *Hanover Square*, W.
Consulting Botanist—W. Carruthers, F.R.S., F.L.S., *Central House, Central Hill, Norwood*, S.E.
Consulting Veterinary Surgeon—Professor James Beart Simonds, *St. John's Villa, Ryde, Isle of Wight.*
Honorary Consulting Entomologist—Miss E. A. Ormerod, F.M.S., *Dunster Lodge, Spring Grove, Isleworth.*
Veterinary Inspectors—The Officers of the Royal Veterinary College.
Consulting Engineer—W. Anderson, 3, *Whitehall Place*, S.W.
Surveyor and Superintendent of Works—Wilson Bennison, 62, *Ashley Road, Crouch Hill*, N.
Consulting Surveyor—George Hunt, *Evesham, Worcestershire.*
Seedsmen—Thomas Gibbs and Co., *Down Street, Piccadilly*, W.
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 the Council whose names are prefixed by an asterisk retire by rotation in July, but are eligible for re-election in May.

STANDING COMMITTEES FOR 1883.

Finance Committee.

Kingscote, Colonel (Chairman).
Bridport, General Viscount.
Ridley, Sir M. White, Bt.
Frankish, W.
Randell, Charles.

House Committee.

Chairman of Finance Committee (Chairman)
The President.
Bridport, General Viscount.
Gibbs, Sir Brandreth.
Randell, C.
Wilson, Jacob.

Journal Committee.

Cathcart, Earl (Chairman).
Ridley, Sir M. White, Bt.
Thorold, Sir John H., Bt.
Bowen-Jones, J.
Chandos-Pole-Gell, H.
Dent, J. D.
Frankish, W.
Hemsley, J.
Howard, J.
Little, H. J.
Ransome, R. C.
Turbervill, Lieut.-Col.
Wells, W.
Whitehead, Charles.

Chemical Committee.

Wells, William (Chairman).
Bedford, Duke of.
Vernon, Lord.
Emlyn, Viscount.
Lawes, Sir J. B., Bt.
Macdonald, Sir A. K., Bt.
Arkwright, J. H.
Bowen-Jones, J.
Dent, J. D.
Howard, C.
Little, H. J.
Neville, R.
Turbervill, Lieut.-Col.
Voelcker, Dr. A.
Wakefield, W. H.
Warren, R. A.
Whitehead, Charles.

Seeds and Plant-Diseases Committee.

Whitehead, Charles (Chairman).
Vernon, Lord.
Thorold, Sir J. H., Bt.
Gibbs, Sir Brandreth.
Arkwright, J. H.
Bowen-Jones, J.
Carruthers, W.
Frankish, W.
Little, H. J.
Parker, Hon. C. T.
Turbervill, Lieut.-Col.
Voelcker, Dr.

Veterinary Committee.

Egerton, Lord (Chairman).
Bridport, General Viscount.
Moreton, Lord.
Stafford, Marquis of.
Gibbs, Sir Brandreth.
Ridley, Sir M. White, Bt.
Thorold, Sir J. H., Bt.
Allender, G. M.
Ashworth, A.
Brown, Professor.
Fleming, George.
Foster, S. P.
Harpley, M. J.
Kingscote, Colonel.
Parker, Hon. C. T.
Robertson, Professor.
Sanday, G. H.
Sanderson, Dr. J. Burdon.
Simonds, Professor.
Stratton, R.
Wakefield, W. H.
Wilson, Jacob.

Stock-Prizes Committee.

Wilson, Jacob (Chairman).
Bridport, Gen. Viscount.
Emlyn, Viscount.
Moreton, Lord.
Gibbs, Sir Brandreth.
Arkwright, J. H.
Ashworth, A.
Aylmer, H.
Chandos-Pole-Gell, H.
Coxon, John.
Frankish, W.
Gilbey, Walter.
Gorringe, H.
Hemsley, J.
Howard, C.
Martin, J
Pain, T.
Parker, Hon. C. T.
Randell, C.
Sanday, G. H.
Sheraton, W.
Simonds, Prof.
Stratton, R.
Turner, George.
Wakefield, W. H.
Wise, G.
The Stewards of Live Stock.

Implement Committee.

Hemsley, J. (Chairman).
Bridport, Gen. Viscount.
Vernon, Lord.
Moreton, Lord.
Thorold, Sir J. H., Bt.
Gibbs, Sir Brandreth.
Allender, G. M.
Anderson, W.
Ashworth, A.
Bowen-Jones, J.
Frankish, W.
Gorringe, H.
Howard, C.
Howard, J.
Martin, J.
Neville, R.
Parker, Hon. C. T.
Ransome, R. C.
Sanday, G. H.
Sheraton, W.
Stratton, R.
Turbervill, Lieut.-Col.
Turner, Jabez.
Wilson, Jacob.
The Stewards of Implements.

General York Committee.

Dent, J. D. (Chairman).
Bridport, Gen. Viscount
Feversham, Earl of.
Moreton, Lord.
Ravensworth, Earl of.
Vernon, Lord.
Ridley, Sir M. White, Bt.
Gibbs, Sir Brandreth.
Ashworth, A.
Aylmer, H.
Booth, J. B.
Bowen-Jones, J.
Chandos-Pole-Gell, H.
Duncombe, Admiral the Hon. A.
Foster, S. P.
Frankish, W.
Gorringe, H.
Hemsley, J.
Howard, C.
Kingscote, Colonel.
Neville, R.
Parrington, T.
Randell, Charles.
Sanday, G. H.
Sheraton, W.
Stephenson, Marshall.
Turbervill, Lieut.-Col.
Wakefield, W. H.
Wells, W.
Whitehead, Charles.
Wilson, Jacob.
The Lord Mayor of York.
The Town Clerk of York.

Show-Yard Contracts Committee.

Randell, Charles (Chairman).
Gibbs, Sir Brandreth.
Allender, G. M.
Frankish, W.
Hemsley, J.
Howard, C.
Ransome, R. C.
Sanday, G. H.
Stratton, R.
Wilson, Jacob.

Committee of Selection.

Cathcart, Earl (Chairman).
Ridley, Sir M. W., Bt.
Bowen-Jones, J.
Chandos-Pole-Gell, H.
Foster, S. P.
Wakefield, W. H.

And the Chairmen of the Standing Committees.

Education Committee.

Moreton, Lord (Chairman).
Thorold, Sir J. H., Bt.
Bowen-Jones, J.
Carruthers, W.
Dent, J. D.
Kingscote, Colonel.
Little, H. J.
Parker, Hon. Cecil T.
Turbervill, Lieut.-Col.
Voelcker, Dr.

Dairy Committee.

Vernon, Lord (Chairman).
Bridport, Gen. Viscount.
Macdonald, Sir A. K., Bt.
Thorold, Sir J. H., Bt.
Allender, G. M.
Bowen-Jones, J.
Chandos-Pole-Gell, H.
Kingscote, Colonel.
Neville, R.
Parker, Hon. C. T.
Stratton, R.
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 7th, 1882.

REPORT OF THE COUNCIL.

During the year 1882 the number of Governors and Members of the Society has been increased by the election of 4 Governors and 453 Members, and diminished by the death of 11 Governors and 267 Members, the resignation of 149 Members, and the removal of 163 Members by order of the Council.

The Society now consists of

80 Life Governors,
71 Annual Governors,
2919 Life Members,
4869 Annual Members,
19 Honorary Members,

making a total of 7958, and showing a decrease of 164 during the year 1882.

The Council have lost two of their oldest and most valued Members since the last Annual Meeting in May, namely, Lord Chesham, one of the Trustees of the Society, and Mr. C. E. Amos, a Member of the Council, and for many years the Consulting Engineer of the Society.

The vacancy reported at the Annual Meeting as having been caused by the death of Mr. Aveling has been filled by the election of Mr. John Coxon, of Freeford Farm, Lichfield, the vacancy in the list of Trustees by the election of Mr. Dent, and the existing vacancy is still under the consideration of the Council.

The half-yearly statement of accounts to the 30th of June last has been examined and certified by the auditors and accountants of the Society, and has been published in the 'Journal' for the information of Members of the Society. The funded capital of the Society remains the same as at the Annual Meeting in May, namely, 18,423*l.* 1*s.* 9*d.* New Three per Cents., and the balance of the current account in the hands of the Society's bankers on the 1st instant was 3220*l.* 0*s.* 2*d.*

The success of the Reading Meeting was seriously interfered with by the wet weather during the first two days, but, owing to the fine weather on the three following days, the Meeting did not entail a much greater loss than can be covered by the surplus of the Society's ordinary income over its expenditure.

The persistent rain during the week preceding the Show, which continued almost incessantly for some time afterwards, made the competition for Mr. Martin J. Sutton's Prize "for an efficient and economical method of Drying Hay or Corn-crops artificially" a very laborious and costly proceeding. As none of the machines entered for Trial were capable of making hay in wet weather or of drying corn efficiently, the award of the Prize was withheld. A complete Report on this competition, written by Mr. W. C. Little, one of the Judges, was published in the last number of the 'Journal.'

The Trials of Cream Separators in competition for the Gold Medals offered were marred in consequence of an injunction in Chancery having been applied for against the Society, as well as against the Exhibitors of some of the competing machines. Although the application was not successful, it caused some of the competitors to withdraw the implements which they had entered for Trial. The Judges, however, were enabled to award the Gold Medal in the Class for Separators to be worked by Horse-power.

The offer for special Prizes for an efficient portable Straw-compressing and Binding-machine, to be worked in conjunction with a Threshing-machine, and for the best Milking-machine, to be tested during six consecutive months, produced no competition. The same result followed the offer of the Gold Medal for the most efficient and economical Apparatus for excavating Field-drains. The Council have resolved to repeat the offer of a special Prize for a Straw-compressing and Binding-machine for competition at the York Meeting.

The Prizes offered by the Reading Local Committee for the best-managed Farms in Berkshire, or situated within 20 miles of the Town Hall of Reading, produced a good entry in the Class of large Farms, but only one in that of small Farms. The Report of this competition, written by Mr. J. H. Blundell, one of the Judges, was published in the last number of the 'Journal.'

In conjunction with the York Local Committee, the Council have decided to offer Prizes for Farms in the County of York in three Classes, and they are glad to report that nineteen entries have been made.

The Council have decided to increase the number of Classes of Live Stock, and the amount of money to be offered for competition next year, as compared with the Reading Prize-sheet, in consequence of the geographical situation and the agricultural importance of the County of York. They have been liberally seconded by the York Local Committee and the Yorkshire Agricultural Society, who have jointly offered Prizes in numerous classes for Horses:—Hunters, Hackneys, Ponies, Harness Horses, Coach Horses, and Clevelands—as well as for Shorthorn Families, Dairy Cattle, and Wensleydale Sheep, together with Champion Prizes for Shorthorn males and females. The Hereford Herd-book Society have offered Prizes for Hereford Families. The Council have decided to offer Prizes for "Shire" Horses as distinguished from "Agricultural," in the old sense of that term; for Welsh, Ayrshire, Galloway, and Polled Angus or Aberdeen Cattle; and for Border Leicester, Cheviot, and Black-faced Mountain Sheep.

The Council have accepted with thanks the offer of a member of the Society to give Prizes for small Dairies as follows:—

(*a*) For the best equipped Dairy suitable for a farm on which not more than twenty milch cows are kept, and where the principal object is Butter-making, 50*l*.

(*b*) For the best equipped Dairy suitable for a farm on which not more than twenty milch cows are kept, and where the principal object is Cheese-making, 50*l*.

They have also decided to erect and equip in the York Showyard a Working Dairy similar to that at Carlisle, to be worked by the Society.

The Council have decided that the York Meeting shall commence on Monday, July 16th, and close on the following Friday evening.

The Council have received an invitation from the Mayor and Corporation of Shrewsbury to hold the Show of 1884 on the racecourse near that town, and a Committee of Inspection has been appointed to examine the site and other accommodation offered by the authorities.

The number of samples sent to the Society's Laboratory for analysis during the past year has exceeded by 345 that of the year preceding, and amounts this year to 1403. The experiments at Woburn have not only been continued as in previous years, but have been extended, with a view to test the longevity of certain Clovers and Grasses, and of determining whether low-priced barley can be economically used as food for stock.

The Veterinary work of the Council has been of unusual magnitude and importance during the past year. Three very important investigations have been progressing on behalf of the Council, namely, (1) the investigations into the Life-history of the Liver-Fluke of Sheep, by Mr. Thomas, of Balliol College, Oxford, who proposes to give as complete and as simple an account of his researches as the nature of the subject permits in the next number of the 'Journal;' (2) an investigation into the possibility of preventing the different forms of Anthrax by inoculation with cultivated Virus, by Dr. Roy, at the Brown Institution; (3) Experiments as to the possibility of mitigating the severity of attacks of Foot-and-mouth Disease, and of lessening the danger of infection and the susceptibility of animals, which have been undertaken by Professor Robertson, the Principal of the Royal Veterinary College.

The following gentlemen have been appointed Veterinary Surgeons to the Society, in addition to the officers of the Royal Veterinary College:—Mr. C. Stephenson, Newcastle; Mr. J. S. Carter, Bradford; Mr. W. Lewis, Crewe; Mr. D. Gresswell, Louth; Mr. W. F. Garside, Royal Agricultural College, Cirencester; Mr. T. J. Merrick, Northampton; Mr. G. A. Banham, Cambridge; Mr. Wm. Moir, Cardiff; Mr. W. Penhall, Barnstaple; Mr. T. D. Broad, Bath; Mr. Wm. Bromley, Lancaster; and Mr. Osborn Hills, Leamington. The following are the terms and conditions of the appointments:—

Members may obtain the attendance of the Veterinary Surgeon in any case of disease by paying his travelling expenses (which include railway fares, and 1s. per mile if by road, including the return journey), and the cost of his visit, which will be at the following rate, viz.:—

	£	s.	d.
When the whole day is occupied	1	10	0
When half a day or less is occupied	0	15	0
Personal consultation with Veterinary Surgeon ..	0	10	0
Consultation by letter	0	5	0
Post-mortem examination and report thereon	1	0	0

A return of the number of applications from members of the Society during each half year is required from each Veterinary Surgeon.

The Council desire to draw the attention of the Members of the Society to the paper by Professor Brown, "On the Dentition of the Animals of the Farm as indicative of Age." They propose to republish this in the form of a pamphlet, and are considering the re-issue of the illustrations in the form of diagrams.

The Council have already issued at a cheap rate a series of six diagrams of injurious insects which have been prepared by Miss Ormerod, the Honorary Consulting Entomologist to the Society; and they have under consideration a series illustrating the crops, weeds, and vegetable parasites of the Farm, which have been prepared by Mr. Carruthers, the Consulting Botanist.

The Council have offered a Prize of 20*l.* for the best and simplest plan of keeping Farm Accounts, to include a register of all field operations, breeding, feeding, &c. Forty-seven candidates have competed, and the award of the Prize is at present under the consideration of the Judges.

The Council regret to state that numerous cases of the transfer of Tickets of admission to the Showyard, chiefly by Exhibitors' servants, have this year been brought before them; and they have found it necessary, in order to check an evil which appears to be growing, to enact that in future a fine of 1*l.* in each case of transfer or misuse shall be levied upon the person or firm who is responsible for the proper use of the Ticket.

Two entries have been received for the Prizes offered in 1879 for the best new varieties of Seed Wheat produced since that date, and arrangements have been made to have their merits tested in different parts of the kingdom.

Thirty candidates were entered for examination for the Society's Junior Scholarships from the following Schools:—Aspatria Agricultural and Commercial School, 1; Bedford County School, 4; Devon County School, 2; Surrey County School, 22; Public School, Gersa, near Watten, Cathness, 1.

The following candidates, arranged in order of merit, have gained Scholarships of 20*l.* each:—

Surrey County School	F. H. Purchase.
Devon County School	T. R. Potbury.
Bedford County School	J. W. Twinberrow.
” ” ”	J. D. Twinberrow.
Surrey County School	J. H. Reeves.
Bedford County School	H. L. Jenkins.
” ” ”	C. G. F. Thonger.
Surrey County School	S. N. E. O'Halloran.
” ” ”	V. W. Low.

By Order of the Council,

H. M. JENKINS,

Secretary.

Royal Agricultural Society of England.

1883.

DISTRIBUTION OF MEMBERS OF THE SOCIETY AND OF MEMBERS OF COUNCIL.

DISTRICTS.	COUNTIES.	NUMBER OF MEMBERS.	NUMBER IN COUNCIL.	MEMBERS OF COUNCIL.
A.	BEDFORDSHIRE	122	3	Duke of Bedford, V.P.; C. Howard; James Howard.
	BUCKINGHAMSHIRE	106		
	CAMBRIDGESHIRE	98	2	J. Martin; H. J. Little.
	ESSEX	243	1	W. Gilbey.
	HERTFORDSHIRE	149	1	Sir J. B. Lawes, V.P.
	HUNTINGDONSHIRE	47	2	Jabez Turner; W. Wells, T.
	MIDDLESEX	425	1	Sir Brandreth Gibbs, V.P.
	NORFOLK	308	4	H.R.H. the Prince of Wales, T. Earl of Leicester; Hug Aylmer; Robert Leeds.
	OXFORDSHIRE	140	2	Duke of Marlborough, T.; J Druce.
	SUFFOLK	156	2	Sir E. C. Kerrison, V.P.; R. C Ransome.
		1794	18	
B.	CUMBERLAND	201	1	S. P. Foster.
	DURHAM	158	1	Earl of Ravensworth.
	NORTHUMBERLAND	157	2	Sir M. White Ridley; Jaco Wilson.
	WESTMORELAND	70	1	W. H. Wakefield.
		586	5	
C.	DERBYSHIRE	224	2	Lord Vernon, V.P.; H. Chando Pole-Gell.
	LEICESTERSHIRE	102	1	Duke of Rutland, T.
	LINCOLNSHIRE	204	2	W. Frankish; Sir J. H Thorold.
	NORTHAMPTONSHIRE	134	1	Earl Spencer.
	NOTTINGHAMSHIRE	177	1	J. Hemsley.
	RUTLAND	14		
		855	7	

DISTRIBUTION OF MEMBERS OF THE SOCIETY—*continued.*

ISTRICTS.	COUNTIES.	NUMBER OF MEMBERS.	NUMBER IN COUNCIL.	MEMBERS OF COUNCIL.
D.	BERKSHIRE	165	2	Sir R. Loyd Lindsay; Martin J. Sutton.
	CORNWALL	53		
	DEVONSHIRE	115	3	Sir T. D. Acland, T.; Sir M. Lopes; G. Turner.
	DORSETSHIRE	71	1	Viscount Portman, T.
	HAMPSHIRE	165	3	Viscount Eversley, V.P.; Sir A. K. Macdonald, T.; T. Pain.
	KENT	402	2	R. Russell; C. Whitehead.
	SOMERSETSHIRE	164	2	Visct. Bridport, T.; R. Neville.
	SURREY	180	1	G. M. Allender.
	SUSSEX	176	4	Earl of Chichester, V.P.; Duke of Richmond and Gordon, V.P.; H. Gorringe; R. A. Warren.
	WILTSHIRE	112	1	J. Rawlence.
		——1603	— 19	
E.	YORKSHIRE	409	5	Earl Cathcart, V.P.; Earl of Feversham; J. D. Dent, T.; G. H. Sanday; Chas. Clay.
F.	GLOUCESTERSHIRE	214	2	Lord Moreton; Col. Kingscote, T.
	HEREFORDSHIRE	103	1	J. H. Arkwright.
	MONMOUTHSHIRE	44	1	R. Stratton.
	SHROPSHIRE	371	3	John Evans; J. Bowen-Jones; W. Sheraton
	STAFFORDSHIRE	271	3	Earl of Lichfield, T.; Marquis of Stafford; John Coxon.
	WARWICKSHIRE	199	1	George Wise.
	WORCESTERSHIRE	165	1	C. Randell.
	SOUTH WALES	171	2	Viscount Emlyn; Lt.-Col. Picton Turbervill.
		——1538	— 14	
G.	CHESHIRE	214	3	Lord Egerton; A. Ashworth; Hon. Cecil T. Parker.
	LANCASHIRE	292	2	Duke of Devonshire, V.P.; Earl of Lathom, V.P.
	NORTH WALES	191	2	Earl of Powis, T.; Sir W. W. Wynn, V.P.
		—— 697	— 7	
SCOTLAND		128		
IRELAND		100		
CHANNEL ISLANDS		13		
FOREIGN COUNTRIES		101		
MEMBERS WITHOUT ADDRESSES		80		
HONORARY MEMBERS		19		
		—— 441		

ROYAL AGRICULTURA

Dr.

HALF-YEARLY CASH ACCOUN

	£	s.	d.	£	s.	d.	£	s.
To Balance in hand, 1st July, 1882:—								
Bankers	2,171	5	5					
Secretary	31	9	8					
				2,202	15	1		
At Deposit				2,000	0	0		
							4,202	15
To Income:—								
Dividends on Stock				268	17	3		
Interest on Deposit				22	12	7		
Subscriptions:—								
Governors' Life Composition	40	0	0					
Governors' Annual	30	0	0					
Members' Life-Compositions	665	0	0					
Members' Annual	770	2	0					
				1,505	2	0		
Establishment:—								
Rent				100	0	0		
Journal:—								
Sales	81	1	0					
Advertisements	121	14	3					
Sale of Pamphlets	9	13	9					
				212	9	0		
Chemical:—								
Laboratory Fees..				195	8	9		
Veterinary:—								
Balance of Payments to Brown Institution not expended..	1	5	0					
Professional Fees	10	12	0					
				11	17	0		
Farm Inspection:—								
Prizes given by Reading Local Committee	175	0	0					
Entry Fees for 1883	37	0	0					
				212	0	0		
Education:—								
Insect Diagrams				13	2	5		
Total Income				..	..	..	2,541	9
To Reading Meeting				..	..	..	13,221	4
							£19,965	8

BALANCE-SHE

LIABILITIES.	£	s.	d.	£	s.	d.	£	s.
To Capital:—								
Surplus, 30th June, 1882				25,566	10	11		
Less surplus of Expenditure over Income during the Half-year, viz.:—								
Expenditure	3,579	5	2					
Income	2,541	9	0					
				1,037	16	2		
				24,528	14	9		
Deduct half-year's interest and depreciation on Country Meeting Plant				200	8	9		
							24,328	
To Reading Meeting:—								
Excess of Receipts over Expenditure							389	1
							£24,718	1

QUILTER, BALL, CROSBIE, GLEGG & WELTON, *Accountants.*

OCIETY OF ENGLAND.

OM 1ST JULY TO 31ST DECEMBER, 1882.

CR.

	£ s. d.	£ s. d.	£ s. d.
xpenditure:—			
stablishment:—			
Salaries, Wages, &c.	805 0 0		
House:—Rent, Taxes, Repairs, &c.	324 0 2		
Office:—Printing, Postage, Stationery, &c.	201 6 4		
		1,330 6 6	
ournal:—			
Printing and Stitching	670 1 0		
Postage and Delivery	180 0 0		
Literary Contributions	168 13 0		
Advertising	7 3 6		
Woodcuts	116 17 6		
		1,142 15 0	
hemical:—			
Salaries	377 10 0		
Apparatus and Chemicals	30 7 7		
Petty Payments	25 0 0		
		432 17 7	
Veterinary:—			
Professional Fees		16 17 6	
Botanical:—			
Consulting Botanist's Salary		50 0 0	
Education:—			
Advertising	12 18 6		
Scholarships	80 0 0		
Diagrams of Insects	120 0 0		
		212 18 6	
Farm Inspection:—			
Prizes	175 0 0		
Judges	175 5 1		
		350 5 1	
Sundries		43 5 0	
Total Expenditure		.. .. ..	3,579 5 2
Stock:—			
Purchase of £1486 19*s.* 6*d.* New 3 per Cents.		.. .. ..	1,500 0 0
Reading Meeting		13,326 11 3	
York Meeting		709 7 4	
			14,035 18 7
Balance in hand, 31st December:—			
Bankers		818 9 8	
Secretary		31 14 8	
			850 4 4
			£19,965 8 1

ST DECEMBER, 1882.

ASSETS.	£ s. d.	£ s. d.
y Cash in hand	850 4 4	
y New 3 per Cent. Stock 19,910*l.* 1*s.* 3*d.* cost*	19,177 17 1	
y Books and Furniture in Society's House	1,451 17 6	
y Country Meeting Plant	2,528 14 9	
		24,008 13 8
At Debit of York Meeting	.. .. ..	709 7 4
		£24,718 1 0

* *Value at* 101 = 20,109*l.* 3*s.* 3*d.*

Mem.—The above Assets are exclusive of the amount recoverable in respect of arrears of Subscription to 31st Dec., 1882, which at that date amounted to 1322*l.*

Examined, audited, and found correct, this 5th day of March, 1883.

FRANCIS SHERBORN, } *Auditors on behalf of the Society.*
A. H. JOHNSON,

ROYAL AGRICULTURA

Dr.

Yearly Cash Accou

	£ s. d.	£ s. d.	£ s.
To Balance in hand, 1st Jan. 1882:—			
Bankers	. .	562 9 0	
Secretary	. .	25 9 2	
			587 18
To Income:—			
Dividends on Stock	. .	539 9 1	
Interest on Deposit Account	. .	22 12 7	
Subscriptions:—			
Governors' Life Composition	130 0 0		
Governors' Annual	300 0 0		
Members' Life-Compositions	1,520 0 0		
Members' Annual	4,684 4 0		
		6,634 4 0	
Establishment:—			
Rent	. .	200 0 0	
Journal:—			
Sales	155 16 9		
Advertisements	252 6 8		
Sale of Pamphlets	9 13 9		
		417 17 2	
Chemical:—			
Laboratory Fees	. .	369 11 9	
Veterinary:—			
Balance of payments to the Brown Institution not expended	1 5 0		
Professional Fees	13 4 6		
		14 9 6	
Education:—			
Sale of Insect Diagrams	. .	13 2 5	
Farm-Inspection:—			
Prizes given by the Reading Local Committee	175 0 0		
Entry Fees for 1883	37 0 0		
		212 0 0	
Sundries	. .	2 0 0	
London Exhibition	. .	45 4 0	
Derby Meeting	. .	233 14 1	
Reading Meeting	. .	20,557 13 1	
Total Income	. .	. .	29,261 1
			£29,849 1 0

SCIETY OF ENGLAND.

M 1st January to 31st December, 1882. Cr.

	£	s.	d.	£	s.	d.	£	s.	d.
xpenditure :—									
stablishment:—									
Salaries, Wages, &c.	1,601	13	4						
House: Rent, Taxes, &c.	875	5	11						
Office: Printing, Postage, Stationery, &c.	458	14	9						
				2,935	14	0			
urnal :—									
Printing and Stitching	1,232	13	0						
Printing Advertisements	47	18	6						
Postage and Delivery	380	0	0						
Advertising	32	13	1						
Literary Contributions	267	13	0						
Wood Engravings	133	3	6						
Printing Pamphlets	10	15	0						
				2,109	16	1			
hemical:—									
Salaries	816	0	0						
Apparatus and Chemicals	51	14	0						
Petty Payments	30	0	0						
				897	14	0			
eterinary:—									
Prizes and Medals	47	12	0						
Fees to Examiners	22	2	3						
Professional Fees	29	11	6						
On Account of Investigations	200	0	0						
				299	5	9			
Botanical :—									
Consulting Botanist's Salary	100	0	0						
Seeds	5	12	4						
				105	12	4			
Education :—									
Fees to Examiners	36	15	0						
Printing and Advertising	69	4	6						
Scholarships	80	0	0						
Prizes	25	0	0						
Diagrams of Insects	120	0	0						
				330	19	6			
Farm Inspection :—									
Prizes	175	0	0						
Judges	175	5	1						
Advertising	49	8	3						
				399	13	4			
Sundries	. .			25	6	8			
Subscriptions (paid in error) returned	. .			4	0	0			
London Meeting	. .			50	14	6			
Derby Meeting	. .			92	16	0			
Reading Meeting	. .			19,538	12	0			
York Meeting	. .			709	7	4			
Total Expenditure	. .			. .			27,499	11	6
Stock:—									
Purchase of £1486 19*s.* 6*d.* New 3 Per Cents.	. .			.			1,500	0	0
Balance in hand, 31st Dec. 1882 :—									
Bankers	. .			818	9	8			
Secretary	. .			31	14	8			
							850	4	4
							£29,849	15	10

RECEIPTS.

	£	s.
Subscription from Reading	2,000	0
Admissions to Show Yard by Payment	5,334	6
Admissions by Season Tickets	243	6
Admissions to Stand at Horse Ring	295	6
Admissions to Dairy	39	15
Sale of Catalogues	619	1
Entries in Implement Catalogue	375	0
Advertisements in Stock Catalogues	223	6
Implement Exhibitors' Payment for Shedding	4,279	10
Non-Members' Fees for entry of Implements	210	0
Fees for entry of Live-Stock, &c.	548	5
Fees for Horse Boxes and Stalls	175	0
Premium for Supply of Refreshments	300	0
Premium for Cloak Rooms, Lavatories, &c.	60	0
Fines for Non-Exhibition of Live-Stock	125	10
Reference Number Fines	2	2
Sales of Butter	3	12
Trials of Haydryers, &c.—Sales of Barley, 288l. 1s. 7d.; Hay, 88l. 3s.; Sledges and Sweeps, 6l.	382	4
	£15,222	12

EXPENDITURE.

	£	s.	d.	£	s.	d.
how YARD WORKS:—						
By Timber and Joinery	4,284	15	5			
„ Ironmongery, 127*l.* 8*s.* 2*d.*; Hurdles, 137*l.* 6*s.* 8*d.*	264	14	10			
„ Bricks and Cement and Bricklayers	45	5	6			
„ Paints, Oils, Glass, &c.	62	13	3			
„ Canvas, 1334*l.* 10*s.* 8*d.*; Felt, Baize, &c., 118*l.* 4*s.* 10*d.*	1,452	15	6			
„ Railway Charges, &c., 241*l.* 2*s.* 11*d.*; Horse Hire, 68*l.* 11*s.* 6*d.*	309	14	5			
„ Coals, 18*l.* 3*s.* 9*d.*; Insurance, 15*l.* 15*s.*	33	18	9			
„ Postage and Stationery, 38*l.* 13*s.* 6*d.*; Hire of Furniture, 5*l.* 1*s.*	43	14	6			
„ Sundries	53	12	11			
„ Wages	1,324	3	1			
„ Superintendent of Works—Salary and Expenses	553	2	7			
„ Depreciation of Plant	421	14	5			
				8,850	5	2
Per Contra:—						
By Sale of Materials	2,600	0	0			
„ Work for Exhibitors and Purveyors	1,063	9	4			
„ Local Committee for Platforms and Trial Fields	79	16	9			
				3,743	6	1
				5,106	19	1
udges.—Implements, 72*l.*; Stock, 281*l.* 19*s.* 1*d.*				353	19	1
ngineers, 143*l.* 11*s.* 5*d.*; Assistants and Labourers, 59*l.* 14*s.* 4*d.*				203	5	9
nspectors.—Veterinary, 76*l.* 6*s.*; Shearing, 18*l.* 6*s.* 8*d.*				94	12	8
Police.—Metropolitan				429	2	3
lerks and Assistants:—Bankers', 23*l.* 2*s.*; Secretary's and Stewards', 80*l.* 5*s.* 6*d.*				103	7	6
Foremen and Assistant-Foremen				93	16	2
Yardmen, Grooms, Foddermen, Labourers, &c.				193	2	4
Money Takers and Money Changer, 38*l.* 6*s.* 6*d.*; Doorkeepers, 41*l.* 5*s.*				79	11	6
Stewards' Expenses, 160*l.* 17*s.* 1*d.*; Assistant-Stewards, 48*l.* 0*s.* 6*d.*				208	17	7
Lodgings for Stewards, Implement Judges, and other Officials				219	9	0
Refreshments and Allowances				170	10	0
atalogues.—Implements, 337*l.* 8*s.* 1*d.*; Stock, 281*l.* 17*s.*; Awards, 24*l.* 9*s.* 11; Plan of Yard, 25*l.*; Packing and Carriages, 12*l.* 16*s.*; Commission on Sales, 41*l.* 12*s.* 6*d.*				723	3	6
Printing, 575*l.* 7*s.* 10*d.*; Advertising and Bill Posting, 669*l.* 4*s.* 11*d*				1,244	12	9
Postage, Telegrams, Stationery, Carriage, &c.				105	2	1
Repairs, Insurance, and Carriage of Testing Machinery				54	18	1
Dairy:—Hire of Engine, 35*l.* 12*s.*; Steaming Pans, 3*l.*; Tank, 3*l.* 10*s.*; Coals, 3*l.* 7*s.* 5*d.*; Belting, 10*l.* 11*s.* 3*d.*; Milk, 51*l.* 0*s.* 5*d.*; Shafting, Pulleys, Chains, and other Iron Work, 21*l.* 6*s.*; Petty Payments, 3*l.* 0*s.* 5*d.*				131	7	6
Horse and Carriage Hire				85	16	0
Official Luncheon, &c.				52	18	6
Journeys previous to Show, 7*l.* 19*s.* 8*d.*; Official Staff, 32*l.* 13*s.* 4*d.*				40	13	0
Hay, 222*l.*; Straw, 326*l.* 0*s.* 6*d.*; Green Food, 177*l.* 19*s.* 6*d.*; Insurance, 1*l.* 5*s.*; Advertising for Tenders, 5*l.* 6*s.* 2*d.*				732	11	2
Fire Engines and Extincteurs, 21*l.* 11*s.*; Hire of Chairs, 16*l.* 5*s.* 5*d.*; Hire of Harmonium, 1*l.* 1*s.*				38	17	5
Telegraph Extension, 3*l.* 2*s.* 3*d.*; Hire of Boys, 7*l.* 6*s.*; Gratuities, 2*l.* 15*s.*				13	3	3
Rope, 2*l.* 10*s.*; Brushes, Chloride of Lime, Washing, Soap, &c., 3*l.* 0*s.* 7*d.*				5	10	7
Horse Standard, 2*l.* 15*s.* 4*d.*; Veterinary Medicines, Newspapers, and Sundries, 7*l.* 12*s.* 6*d.*				10	7	10
Bee Exhibition				30	0	0
Rosettes, 17*l.* 17*s.* 3*d.*; Medals, 5*l.* 8*s.*				23	5	3
Stock Prizes*				3,013	0	0
Trials of Haydryers, &c.—Grass, 428*l.* 4*s.*; Barley, 444*l.* 9*s.* 3*d.*; Judges, 275*l.* 10*s.* 7*d.*; Engineers, 42*l.*; Assistant Steward, 75*l.* 12*s.*; Foreman, 28*l.* 0*s.* 9*d.*; Labour, 242*l.* 3*s.* 8*d.*; Police, 19*l.* 13*s.* 9*d.*; Surveyor, 13*l.* 2*s.* 6*d.*; Lodgings, 36*l.* 5*s.* 6*d.*; Refreshments, 86*l.*; Carriage Hire, 60*l.* 9*s.* 6*d.*; Horse Hire, 249*l.* 17*s.* 6*d.*; Hire of Engines and Drivers, 85*l.* 3*s.* 6*d.*; Carriage of Reapers, 7*l.*; Carriage of Haymakers and damage, 21*l.* 14*s.* 7*d.*; Sledges and Sweeps, 12*l.*; Rakes and Forks, 6*l.* 7*s.* 3*d.*; Sacks, 9*l.* 12*s.*; Coals, 15*l.* 14*s.* 9*d.*; Straw, 21*l.* 15*s.* 6*d.*; Thatching and Fencing, 33*l.* 12*s.* 11*d.*; Thermometers and sundry small implements, 7*l.* 17*s.* 6*d.*; Canvas, &c., 8*l.* 7*s.* 1*d.*; Carriage, 7*l.* 5*s.* 10*d.*; Sundries, 3*l.* 2*s.* 1*d.*				2,241	2	0
				£15,803	1	10
By Balance				19	10	3
				£15,822	12	1

* Exclusive of 677*l.* given by the Reading Local Committee, 75*l.* given by two Members of Council, and 30*l.* by the Hereford Herd Book Society.

MEMORANDA.

Address of Letters.—The Society's office being situated in the postal district designated by the letter W, Members, in their correspondence with the Secretary, are requested to subjoin that letter to the usual address.

General Meeting in London, May 22nd, 1883, at 12 o'clock.

Annual Excursion to Woburn, Thursday, June 7th. For particulars apply to the Secretary previous to June 6th, after which no tickets will be issued.

Meeting at York, July 16th, 1883, and four following days.

General Meeting in London, December, 1883, at 12 o'clock.

Monthly Council (for transaction of business), at 12 o'clock on the first Wednesday in every month, excepting January, September, and October: open only to Members of Council and Governors of the Society.

Adjournments.—The Council adjourn over Passion and Easter weeks, when those weeks do not include the first Wednesday of the month; from the first Wednesday in August to the first Wednesday in November; and from the first Wednesday in December to the first Wednesday in February.

Office Hours.—10 to 4. On Saturdays, 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, Camden Town, N.W.—(A statement of these privileges will be found on page xix in this Appendix.)

Chemical Analysis.—The privileges of Chemical Analysis enjoyed by Members of the Society will be found stated in this Appendix (page xx).

Botanical Privileges.—The Botanical and Entomological Privileges enjoyed by Members of the Society will be found stated in this Appendix (page xxiii).

Subscriptions.—1. Annual.—The subscription of a Governor is £5, and that of a Member £1, due in advance on the 1st of January of each year, and becoming in arrear if unpaid by the 1st of June. 2. For Life.—Governors may compound for their subscription for future years by paying at once the sum of £50, and Members by paying £10. Governors and Members who have paid their annual subscription for 20 years or upwards, and whose subscriptions are not in arrear, may compound for future annual subscriptions, that of the current year inclusive, by a single payment of £25 for a Governor, and £5 for a Member.

Payments.—Subscriptions may be paid to the Secretary, in the most direct and satisfactory manner, either at the Office of the Society, No. 12, Hanover Square, London, W., or by means of post-office orders, to be obtained at any of the principal post-offices throughout the kingdom, and made payable to him at the Vere Street Office, London, W.; but any cheque on a banker's or any other house of business in London will be equally available, if made payable on demand. In obtaining post-office orders care should be taken to give the postmaster the correct initials and surname of the Secretary of the Society (H. M. Jenkins), otherwise the payment will be refused to him at the post-office on which such order has been obtained; and when remitting the money-orders it should be stated by whom, and on whose account, they are sent. Cheques should be made payable as drafts on demand (not as bills only payable after sight or a certain number of days after date), and should be drawn on a London (not on a local country) banker. When payment is made to the London and Westminster Bank, St. James's Squaro Branch, as the bankers of the Society, it will be desirable that the Secretary should be advised by letter of such payment, in order that the entry in the banker's book may be at once identified, and the amount posted to the credit of the proper party. No coin can be remitted by post, unless the letter be registered.

New Members.—Every candidate for admission into the Society must be proposed by a Member; the proposer to specify in writing the full name, usual place of residence, and post-town, of the candidate, either at a Council meeting, or by letter addressed to the Secretary. Forms of Proposal may be obtained on application to the Secretary.

⁂ Members may obtain on application to the Secretary copies of an Abstract of the Charter and Bye-laws, of a Statement of the General Objects, &c., of the Society, of Chemical, Botanical, and Veterinary Privileges, and of other printed papers connected with special departments of the Society's business.

Members' Veterinary Privileges.

I.—Visits of a Professor of the Royal Veterinary College.

1. Any Member of the Society who may desire professional attendance and special advice in cases of disease among his cattle, sheep, or pigs, should apply to the Secretary of the Society, or to the Principal of the Royal Veterinary College, Camden Town, London, N.W.

2. The remuneration of the Veterinary Surgeon or a visiting Inspector will be 2*l.* 2*s.* each day as a professional fee, and the charge for personal expenses, *when such have been incurred*, which will in no case exceed one guinea per diem. He will also be allowed to charge the cost of travelling to and from the locality where his services may have been required. These charges may, however, in cases of serious or extensive outbreaks of contagious disease, be reduced or remitted altogether, so far as the Members of the Society are concerned, at the discretion of the Council, on such step being recommended to them by the Veterinary Committee.

3. The Consulting Veterinary Surgeon or visiting Inspector, on his return, will report to the Member, and, through the Principal of the Royal Veterinary College, to the Veterinary Committee, in writing, the results of his observations and proceedings with reference to the disease; which Report will be laid before the Council.

4. When contingencies arise to prevent a personal discharge of the duties, the Principal of the Royal Veterinary College may, subject to the approval of the Veterinary Committee, name some competent professional person to act in his stead, who shall be remunerated at the same rate.

II.—Consultations without Visit.

Personal consultation with Veterinary Inspector	10*s.* 6*d.*
Consultation by letter	10*s.* 6*d.*
Post-mortem examination, and report thereon	21*s.*

A return of the number of applications from Members of the Society during each half-year is required from the Consulting Veterinary Surgeon.

III.—Admission of Diseased Animals to the Royal Veterinary College, Camden Town, N.W.; Investigations and Reports.

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 following terms, viz. by paying for the keep and treatment of cattle 10*s.* 6*d.* per week each animal, and for sheep and pigs, 3*s.* 6*d.* per week.

2. A detailed Report of the cases of cattle, sheep, and pigs treated in the Infirmary of the College, or on Farms in the occupation of Members of the Society, will be furnished to the Council quarterly; and also special reports from time to time on any matter of unusual interest which may come under the notice of the Officers of the College.

IV.—Visits of Provincial Veterinary Surgeons.

The following Veterinary Surgeons have been appointed, at different centres in England and Wales, for the purpose of enabling Members of the Society to consult them with regard to the diseases of cattle, sheep, and pigs.

Mr. C. Stephenson, Sandyford Villa, Newcastle-on-Tyne.
Mr. Joseph Carter, 38, Great Horton Road, Bradford.
Mr. Walter Lewis, 1, South St., Nantwich Road, Crewe.
Lincolnshire District (vacant).
Mr. W. F. Garside, Royal Agricultural College, Cirencester.
Mr. T. J. Merrick, Northampton.
Mr. G. A. Banham, Downing Street, Cambridge.
Mr. Charles Moir, Cardiff.
Mr. Wm. Penhale, Barnstaple.
Mr. Thomas D. Broad, Broad Street, Bath.
Mr. Wm. Bromley, Lancaster.
Mr. Osborn Hills, 1, 3, 5, and 7, South Parade, Leamington.

Members may obtain the attendance of a Provincial Veterinary Surgeon in any case of disease by paying his travelling expenses (which include railway fares, and 1*s.* per mile if by road, including the return journey), and the cost of his visit, which will be at the following rate, viz.:—

	£	*s.*	*d.*
When the whole day is occupied	1	10	0
When half a day or less is occupied	0	15	0
Personal consultation with Veterinary Surgeon	0	10	0
Consultation by letter	0	5	0
Post-mortem examination and report thereon	1	0	0

A return of the number of applications from Members of the Society during each half year, embodying a statement of those cases which may be of public interest, is required from each Provincial Veterinary Surgeon. These half-yearly reports should reach the Secretary by the end of May and November respectively.

By Order of the Council,

H. M. JENKINS, *Secretary.*.

Members' Privileges of Chemical Analysis.

(*Applicable only to the case of Persons who are not commercially engaged in the manufacture or sale of any substance sent for Analysis.*)

The Council have fixed the following rates of Charges for Analysis to be made by the Consulting Chemist for the *bonâ-fide* and sole 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 (if any), must be paid to him by Members at the time of their application:

No.		
1.	—An opinion of the genuineness of bone-dust or oil-cake (each sample)	2*s.* 6*d.*
2.	—An estimate of the value (relatively to the average samples in the market) of sulphate and muriate of ammonia and of the nitrates of potash and soda	5*s.*
3.	—An analysis of guano; showing the proportion of moisture, organic matter, sand, phosphate of lime, alkaline salts and ammonia, and an estimate of its value, provided the selling price of the article to be analysed be sent with it	10*s.*
4.	—An analysis of mineral superphosphate of lime for soluble phosphates only, and an estimate of its value, provided the selling price of the article to be analysed be sent with it	5*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, and an estimate of its value, provided the selling price of the article to be analysed be sent with it ..	10*s.*
6.	—An analysis, showing the value of bone-dust or any other ordinary artificial manure, provided the selling price of the manure to be analysed be sent with it	10*s.*
7.	—An analysis of limestone, showing the proportion of lime	7*s.* 6*d.*
8.	—An analysis of limestone, showing the proportion of lime and magnesia	10*s.*
9.	—An analysis of limestone or marls, showing the proportion of carbonate, phosphate, and sulphate of lime and magnesia, with sand and clay	10*s.*
10.	—Partial analysis of a soil, including determinations of clay, sand, organic matter, and carbonate of lime	10*s.*
11.	—Complete analysis of a soil	£3
12.	—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; and an opinion of its feeding and fattening or milk-producing properties	10*s.*
13.	—Analysis of any vegetable product	10*s.*
14.	—Analysis of animal products, refuse substances used for manures, &c.	from 10*s.* to £1
15.	—Determination of the "hardness" of a sample of water before and after boiling	5*s.*
16.	—Analysis of water of land-drainage, and of water used for irrigation	£1
17.	—Analysis of water used for domestic purposes	£1 10*s.*
18.	—Determination of nitric acid in a sample of water	10*s.*
19.	—Examination of Viscera for Metallic poison	£2 2*s.*
20.	—Examination of Viscera complete, for metals and alkaloids	£5 5*s.*
21.	—Personal consultation with the Consulting Chemist. (The usual hours of attendance, Monday excepted, will be from 11 to 2, but to prevent disappointment, it is suggested that Members desiring to hold a consultation should write to make an appointment) ..	5*s.*
22.	—Consultation by letter	5*s.*
23.	—Consultation necessitating the writing of three or more letters ..	10*s.*

The Laboratory of the Society is at 12, Hanover Square, London, W., to which address the Consulting Chemist, Dr. Augustus Voelcker, F.R.S., requests that all letters and parcels (postage and carriage paid) from Members of the Society, who are entitled to avail themselves of the foregoing Privileges, should be directed.

GUIDE TO THE PURCHASE OF ARTIFICIAL MANURES AND FEEDING STUFFS.

Feeding Cakes.

1. *Linseed-cake* should be purchased as "Pure," and the insertion of this word on the invoice should be insisted upon. The use of such words as "Best," "Genuine," &c., should be objected to by the purchaser.

2. *Rape-cake for feeding purposes* should be guaranteed "Pure" and purchased by sample.

3. *Decorticated Cotton-cake* should be guaranteed "Pure," and purchased by sample.

4. *Undecorticated Cotton-cake* should be guaranteed "Pure," and purchased by sample.

N.B.—All feeding cakes should be purchased in good condition, and the guarantee of the vendor should be immediately checked by a fair sample (taken out of the middle of the cake) being at once sent for examination to a competent analytical chemist. The remainder of the cake from which the sample sent for examination had been taken should be sealed up in the presence of a witness, and retained by the purchaser for reference in case of dispute.

Artificial Manures.

1. *Raw or Green Bones or Bone-dust* should be purchased as "Pure" Raw Bones guaranteed to contain not less than 45 per cent. of tribasic phosphate of lime, and to yield not less than 4 per cent. of ammonia.

2. *Boiled Bones* should be purchased as "Pure" Boiled Bones guaranteed to contain not less than 48 per cent. of tribasic phosphate of lime, and to yield not less than 1¾ per cent. of ammonia.

3. *Dissolved Bones* are made of various qualities, and are sold at various prices per ton; therefore the quality should be guaranteed, under the heads of *soluble* phosphate of lime, *insoluble* phosphate of lime, and nitrogen or its equivalent as ammonia. The purchaser should also stipulate for an allowance for each unit per cent. which the dissolved bones should be found on analysis to contain less than the guaranteed percentages of the three substances already mentioned.

4. *Mineral Superphosphates* should be guaranteed to be delivered in a sufficiently dry and powdery condition, and to contain a certain percentage of *soluble* phosphate of lime, at a certain price per unit per cent., no value to be attached to *insoluble* phosphates.

5. *Compound Artificial Manures* should be purchased in the same manner and with the same guarantees as Dissolved Bones.

6. *Nitrate of Soda* should be guaranteed by the vendor to contain from 94 to 95 per cent. of pure nitrate.

7. *Sulphate of Ammonia* should be guaranteed by the vendor to contain not less than 23 per cent. of ammonia.

8. *Peruvian Guano* should be sold under that name, and guaranteed to be in a dry and friable condition, and to contain a certain percentage of ammonia.

N.B.—Artificial manures should be guaranteed to be delivered in a sufficiently dry and powdery condition to admit of distribution by the drill. A sample for analysis should be taken, not later than three days after delivery, by emptying several bags, mixing the contents together, and filling two tins holding about half a pound each, in the presence of a witness. Both the tins should be sealed, one kept by the purchaser for reference in case of dispute, and the other forwarded to a competent analytical chemist for examination.

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 oz. of the well-mixed sample, and send it to 12, Hanover Square, London, W., by post: or place the mixed manure in a small wooden or tin box, which may be tied by string, but must not be sealed, and send it by post. If the manure be very wet and lumpy, a larger boxful, weighing from 10 to 12 oz., should be sent either by post or railway.

Samples not exceeding 4 oz. in weight may be sent by post, by attaching two penny postage stamps to the parcel.

Samples not exceeding 8 oz., for three postage stamps.

Samples not exceeding 12 oz., for four postage stamps.

The parcels should be addressed: Dr. Augustus Voelcker, 12, Hanover Square, London, W., and the address of the sender or the number or mark of the article be stated on parcels.

The samples may be sent in covers, or in boxes, bags of linen or other materials. No parcel sent by post must exceed 12 oz. in weight, 1 foot 6 inches in length, 9 inches in width, and 6 inches in depth.

SOILS.—Have a wooden box made 6 inches long and wide, and from 9 to 12 inches deep, according to the depth of soil and subsoil of the field. Mark out in the field a space of about 12 inches square; dig round in a slanting direction a trench, so as to leave undisturbed a block of soil with its subsoil from 9 to 12 inches deep; trim this block or plan of the field to make it fit into the wooden box, invert the open box over it, press down firmly, then pass a spade under the box and lift it up, gently turn over the box, nail on the lid and send it by goods or parcel to the laboratory. The soil will then be received in the exact position in which it is found in the field.

In the case of very light, sandy, and porous soils, the wooden box may be at once inverted over the soil and forced down by pressure, and then dug out.

WATERS.—The water, if possible, should be sent in a glass-stoppered Winchester half-gallon bottle, which is 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 oz., should be sent enclosed in small linen bags, or wrapped in paper. Postage 2*d.*, if under 4 oz.

OILCAKES.—Take a sample from the middle of the cake. To this end break a whole cake into two. Then break off a piece from the end where the two halves were joined together, and wrap it in paper, leaving the ends open, and send parcel by post. The piece should weigh from 10 to 12 oz. Postage, 4*d.* If sent by railway, one quarter or half a cake should be forwarded.

FEEDING MEALS.—About 3 oz. will be sufficient for analysis. Enclose the meal in a small linen bag. Send it by post.

On forwarding samples, separate letters should be sent to the laboratory, specifying the nature of the information required, and, if possible, the object in view.

H. M. JENKINS, *Secretary.*

Members' Botanical and Entomological Privileges.

The Council have fixed the following Rates of Charge for the examination of Plants, Seeds, and Insects for the *bonâ fide* use of Members of the Society, who are particularly requested when applying to the Consulting Botanist, or to the Honorary Consulting Entomologist, to mention the kind of examination they require, and to quote its number in the subjoined Schedule. The charge for examination must be paid at the time of application, and the carriage of all parcels must be prepaid.

I. BOTANICAL.

No.		
1.	—A report on the purity, amount and nature of foreign materials, perfectness, and germinating power of a sample of seeds	5*s.*
2.	—Detailed report on the weight, purity, perfectness, and germinating power of a sample of seeds, with a special description of the weeds and other foreign materials contained in it	10*s.*
3.	—Determination of the species of any weed or other plant, or of any epiphyte or vegetable parasite, with a report on its habits, and the means of its extermination or prevention	5*s.*
4.	—Report on any disease affecting the farm crop	5*s.*
5.	—Determination of the species of a collection of natural grasses found in any district of one kind of soil, with a report on their habits and pasture value	10*s.*

N.B.—*The above Scale of Charges is not applicable in the case of Seedsmen requiring the services of the Consulting Botanist.*

II. ENTOMOLOGICAL.

6.	—Determination of the species of any insect, worm, or other animal which, in any stage of its life, injuriously affects the farm crops, with a report on its habits and suggestions as to its extermination	2*s.* 6*d.*

INSTRUCTIONS FOR SELECTING AND SENDING SAMPLES.

In sending seed or corn for examination the utmost care must be taken to secure a fair and honest sample. If anything supposed to be injurious or useless exists in the corn or seed, selected samples should also be sent.

In collecting specimens of plants, the whole plant should be taken up, and the earth shaken from the roots. If possible, the plants must be in flower or fruit. They should be packed in a light box, or in a firm paper parcel.

Specimens of diseased plants or of parasites should be forwarded as fresh as possible. Place them in a bottle, or pack them in tinfoil or oil-silk.

All specimens should be accompanied with a letter specifying the nature of the information required, and stating any local circumstances (soil, situation, &c.) which, in the opinion of the sender, would be likely to throw light on the inquiry.

Parcels or letters containing seeds or plants for examination (Carriage or Postage prepaid) must be addressed to Mr. W. CARRUTHERS, F.R.S., Central House, Central Hill, Norwood, S.E.

Parcels or letters containing insects, or plants apparently infested with insects, sent for examination, must be addressed to Miss ORMEROD, F.M.S., Dunster Lodge, Isleworth.

The Council give notice that the following is the standard which is adopted by the Consulting Botanist in his examination of seeds:—

1. That the bulk be true to the species ordered.

2. That it contain not more than five per cent. of seeds other than the species ordered.

3. That the germinating power shall be, for cereals, green crops, clovers, and timothy grass, not less than 90 per cent.; for fox-tail, not less than 20 per cent.; and for other grasses not less than 70 per cent.

The Council recommend that purchasers should require a guarantee in accordance with this standard. They also strongly recommend that the purchase of prepared mixtures should be avoided, and that the different seeds to be sown should be purchased separately.

H. M. JENKINS, *Secretary.*

THE

JOURNAL

OF THE

ROYAL AGRICULTURAL SOCIETY

OF ENGLAND.

SECOND SERIES.

VOLUME THE NINETEENTH.

PRACTICE WITH SCIENCE.

LONDON:
JOHN MURRAY, ALBEMARLE STREET.
1883.

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, LIMITED, STAMFORD STREET
AND CHARING CROSS.

CONTENTS OF VOLUME XIX.

SECOND SERIES.

APPENDIX.

DIRECTIONS TO THE BINDER.

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

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

Wheat Tables for the years 1865 to 1882 to follow page 208.
Table IV. to face page 536.
Table VII. to face page 542.

JOURNAL

OF THE

ROYAL AGRICULTURAL SOCIETY OF ENGLAND.

XV.—*New Determinations of Ammonia, Chlorine, and Sulphuric Acid, in the Rain-Water collected at Rothamsted.* By Sir J. B. Lawes, Bart., LL.D., F.R.S.; J. H. Gilbert, Ph.D., LL.D., F.R.S.; and R. Warington.

Contents.

In a Report recently made in this 'Journal,' "On the Amount and Composition of the Rain and Drainage-Waters collected at Rothamsted" (vol. xvii., 1881, p. 241), an account was given of various investigations on the composition of the rain-water collected in the large rain gauge at Rothamsted. These investigations embraced determinations of ammonia made at Rothamsted in 1853–4; determinations of ammonia and nitric acid by Professor Way in the rain of 1855 and 1856; determinations of total solid matter, hardness, organic carbon and nitrogen, ammonia, nitric acid, and chlorine, made by Dr. Frankland in samples of rain collected in 1869–70; and lastly, determinations of chlorine made at Rothamsted in 1877–80. We have now to give a further account of work carried on in the same direction.

The Ammonia in Rain.

It will be recollected that a considerable difference was shown to exist between the results of the earlier and later determinations of ammonia. The earliest Rothamsted determinations,

TABLE I.—The DAILY RAINFALL, and the AMOUNT of NITROGEN as AMMONIA per MILLION of RAIN, from June 22, 1881, to January 5, 1882.

Date of Collection.	Rainfall, Dew, or Snow.	Nitrogen as Ammonia per Million.	Direction of Wind.
1881	Inches.		
June 22	0·023	0·350	S.
,, 23	0·061	0·329	W.
,, 25	0·001	..	S.
,, 26	0·177	0·156	S.W.
,, 27	0·015	..	S.
,, 28	0·092	0·576	W.
,, 29	0·001	..	W.
July 6	0·304	0·700	S.W.
,, 7	0·169	0·268	N.W.
,, 8	0·001	..	S.W.
,, 9	0·087	0·309	W.
,, 10	0·013	0·604	S.W.
,, 12	0·004	..	S.
,, 13	0·004	..	S.W.
,, 16	0·015	2·676	N.W.
,, 20	0·034	2·368	N.W.
,, 22	0·006	..	S.
,, 23	0·030	1·688	S.W.
,, 24	0·124	0·384	S.W.
,, 25	0·020	1·112	S.W.
,, 27	0·014	1·441	S.W.
,, 28	0·007	..	S.W.
,, 29	0·286	0·117	N.W.
,, 31	0·492	0·120	S.
Aug. 1	0·152	0·100	S.
Whole Month	1·762	0·380	
Aug. 2	0·029	0·721	N.W.
,, 5	0·004	2·141	S.
,, 9	0·923	0·104	W.
,, 10	0·006	0·824	S.W.
,, 11	0·042	0·576	S
,, 12	0·165	0·141	S.E.
,, 13	0·600	0·166	W.
,, 14	0·026	0·247	N.W.
,, 16	0·070	0·371	S.W.
,, 17	0·090	0·257	W.
,, 18	0·245	0·120	W.
,, 19	0·302	0·103	S.E.
,, 20	0·030	0·782	S.W.
,, 22	0·285	0·453	S.W.
,, 23	0·018	1·235	E.
,, 24	0·675	0·244	S.W.
,, 25	0·094	0·313	S.
,, 26	0·615	0·131	S.W.
,, 27	0·211	0·233	W.
,, 29	0·062	0·272	S.
1881	Inches.		
Aug. 30	1·000	0·070	W.
,, 31	0·310	0·206	N.
Sept. 1	0·015	1·400	N.
Whole Month	5·817	0·183	
Sept. 2	0·014	0·721	N.W.
,, 3	0·012	0·947	N.W.
,, 4	0·018	0·782	N.
,, 5	0·004	..	N.E.
,, 6	0·460	0·144	S.W.
,, 7	0·098	0·247	N.W.
,, 8	0·015	0·535	S.W.
,, 11	0·017	1·153	N.
,, 12	0·024	1·071	N.W.
,, 13	0·046	0·398	S.W.
,, 14	0·007	1·235	W.
,, 15	0·004	1·482	S.E.
,, 16	0·005	1·565	W.
,, 17	0·007	5·490	S.
,, 18	0·011	3·129	S.
,, 19	0·067	0·391	S.W.
,, 20	0·007	1·976	S.E.
,, 21	0·276	0·239	E.
,, 22	0·011	0·700	W.
,, 23	0·292	0·425	N.E.
,, 25	0·737	0·098	S.W.
,, 26	0·006	0·439	S.W.
,, 27	0·005	0·885	S.W.
,, 28	0·006	0·906	N.W.
,, 29	0·008	1·647	E.
,, 30	0·007	2·635	E.
Oct. 1	0·007	2·471	N.
Whole Month	2·171	0·306	
Oct. 2	0·011	1·400	N.E.
,, 3	0·007	1·318	N.E.
,, 4	0·004	1·894	N.E.
,, 5	0·007	1·647	N.E
,, 6	0·022	0·885	W.
,, 7	0·038	1·647	N.W.
,, 8	0·303	0·211	N.W.
,, 9	0·149	0·466	N.W.
,, 10	0·012	0·782	W.
,, 11	0·005	0·659	S.W.
,, 12	0·021	0·604	S.W.
,, 13	0·114	0·384	W.

TABLE I. (*continued*).—The DAILY RAINFALL, and the AMOUNT of NITROGEN as AMMONIA per MILLION of RAIN, from June 22, 1881, to January 5, 1882.

Date of Collection.	Rainfall, Dew, or Snow.	Nitrogen as Ammonia per Million.	Direction of Wind.
1881	Inches.		
Oct. 14	0·769	0·085	S.W.
,, 15	0·008	..	W.
,, 16	0·004	0·343	N.
,, 17	0·006	0·313	E.
,, 18	0·008	1·647	E.
,, 20	0·004	0·659	N.E.
,, 21	0·280	0·247	S.E.
,, 22	0·032	1·647	E.
,, 23	0·982	0·312	E.
,, 24	0·150	0·214	E.
,, 25	0·020	0·453	N.E.
,, 26	0·029	0·329	N.E.
,, 27	0·013	0·604	N.E.
,, 28	0·015	0·713	N.W.
,, 29	0·006*s*	0·844	N.W.
,, 30	0·017*f*	0·556	N.W.
,, 31	0·010*f*	0·618	S.E.
Whole Month }	3·046	0·307	
Nov. 2	0·037*s*	0·988	S.E.
,, 3	0·064	0·288	S.E.
,, 4	0·293	0·494	S.E.
,, 5	0·137	0·181	S.W.
,, 6	0·031	0·412	W.
,, 7	0·011	0·467	S.E.
,, 8	0·018	4·255	S.E.
,, 9	0·005	4·941	S.E.
,, 10	0·005	4·392	S.W.
,, 12	0·060	0·321	S.W.
,, 13	0·007	1·071	N.W.
,, 14	0·005	1·976	N.W.
,, 16	0·011	1·318	S.W.
,, 17	0·432	0·124	S.W.
,, 18	0·015*f*	0·535	S.
,, 19	0·051	0·371	S.E.
,, 20	0·041	1·235	S.W.
,, 21	0·186	0·165	S.W.
,, 22	0·169	0·216	S.W.
,, 23	0·008	0·316	S.W.
,, 24	0·035	0·288	S.W.
,, 25	0·643	0·119	S.E.
,, 26	0·347	0·132	S.E.
,, 27	0·713	0·043	S.W.
,, 28	0·006	0·115	S.W.
1881	Inches.		
Nov. 29	0·015*f*	0·247	S.W.
,, 30	0·009*f*	1·071	S.E.
Dec. 1	0·121	0·302	S.E.
Whole Month }	3·475	0·239	
Dec. 2	0·166	0·357	S.W.
,, 3	0·022	0·508	S.E.
,, 4	0·008*f*	1·318	S.E.
,, 5	0·062	0·275	S.
,, 6	0·194	0·103	S.E.
,, 7	0·536	0·070	S.W.
,, 8	0·012*f*	0·259	S.
,, 9	0·044	0·362	W.
,, 10	0·004*f*	2·471	N.E.
,, 11	0·076*s*	0·577	N.W.
,, 12	0·110	0·494	N.W.
,, 13	0·086	0·329	N.W.
,, 14	0·011*f*	..	N.W.
,, 15	0·260	0·300	S.E.
,, 16	0·213	1·400	S.
,, 17	0·342	0·196	S.W.
,, 18	1·252	0·058	N.
,, 19	0·005*f*	0·137	S.W.
,, 20	0·366	0·099	S.W.
,, 21	0·424	0·079	S.W.
,, 22	0·007	0·309	S.W.
,, 23 }	0·018*f*	1·029	N.
,, 24 }			S.E.
,, 26	0·031	0·590	S.W.
,, 27	0·002	..	S.W.
,, 28	0·010	1·771	S.W.
,, 29	0·005	1·853	S.W.
,, 31	0·112	0·346	S.E.
1882			
Jan. 1	0·005	1·281	S.W.
Whole Month }	4·383	0·230	
Jan. 2	0·184	0·118	S.W.
,, 3	0·290	0·124	S.W.
,, 4	0·013*f*	0·357	N.W.
,, 5	0·134	0·172	S.W.

in the colder months (October to January) of the period, we find that the deposits below 0·04 inch show on an average a considerable preponderance of ammonia in the warmer months, while several of the small groups of heavier rainfalls show a preponderance of ammonia in the colder months. That the atmosphere is far richer in ammonia in summer than in winter is undoubted: but it by no means follows that a summer rainfall should always contain more ammonia than a winter rainfall of similar amount, both occurring under similar conditions as to previous washing of the air. If the atmosphere was at the same temperature at both seasons this would indeed necessarily be the case, but with a fall of temperature the rain becomes capable of taking up a larger proportion of the atmospheric ammonia. The proportion of ammonia in rain should theoretically be highest when, by a sudden change of temperature, a cold aqueous deposit is formed in a previously warm atmosphere; such conditions occur with changes of wind from south to north, or when dew is deposited on a clear night following a warm day.

The influence which the direction of the wind has on the proportion of ammonia present in rain can only be very partially studied from the data before us. The difference in the influence of warm and cold winds is apparently similar to that already noticed as characterising the seasons of summer and winter. The smaller aqueous deposits are, as a rule, distinctly richer in ammonia with a south wind, but the same effect is not perceptible in the case of the heavier rainfalls.

Dr. Frankland had called attention to the possible contamination of the rain-water from impurities on the surface of the rain-gauge. During the present series of determinations all bird-marks were wiped off as soon as noticed, their occurrence being at the same time recorded. It is difficult to perceive any connection between these marks and the proportion of ammonia in the rain. Without going into detail, it may be mentioned that these marks were most abundant from August 1 to 8, and that during the whole of September and December not one was noticed.

In Table II. will be found a summary of the results obtained from the analyses of the daily samples of rain; the rainfalls are grouped according to quantity. The average composition of each group of rainfall, and the general average at the foot of the Table, are calculated so as to represent the composition of the waters if mixed together. Thus, if the whole rainfall of the period had been united in one volume, it would have contained 0·248 of nitrogen as ammonia per million of water. The other average compositions given in this Report will be calculated in

TABLE II.—The AVERAGE AMOUNT of NITROGEN as AMMONIA in DAILY RAINFALLS of different QUANTITY, from June 22, 1881, to January 5, 1882.

Groups of Rainfall.	Number of Examples.	Average Quantity of each Rainfall.	Nitrogen as Ammonia, per million.		
			Average.	Highest.	Lowest.
		Inches.			
Below ·01 inch	35	0·006	1·536	5·491	0·115
From ·01 to ·02 inch	27	0·014	1·141	4·255	0·247
From ·02 to ·04 inch	19	0·028	0·924	2·368	0·247
From ·04 to ·06 inch	5	0·045	0·571	1·235	0·362
From ·06 to ·08 inch	8	0·065	0·359	0·577	0·272
From ·08 to ·10 inch	6	0·091	0·338	0·576	0·247
From ·10 to ·20 inch	18	0·151	0·232	0·494	0·100
From ·20 to ·30 inch	11	0·266	0·360	1·400	0·117
From ·30 to ·40 inch	7	0·325	0·229	0·700	0·099
From ·40 to ·70 inch	9	0·542	0·138	0·244	0·070
From ·70 to 1·00 inch	5	0·825	0·138	0·312	0·043
Above 1·00 inch	2	1·126	0·063	0·070	0·058
	152	0·142	0·248	5·491	0·043

a similar manner, unless the contrary is stated. It will be noticed that several small deposits were left unanalysed during the earlier part of the investigation. If we assume for these the composition proper to their quantity and season, the average composition of the whole rainfall from June 22 to January 5, amounting to 21·645 inches, becomes 0·254 of nitrogen as ammonia per million of water.

2. *Ammonia in Monthly Rainfalls.*—A mixed sample, representing the rainfall of each month, has been regularly prepared by placing in a carboy a fixed proportion (1 gallon for every inch) of the rainfall of each day. In June 1881 determinations of ammonia were commenced in these monthly mixtures, and have now been continued for rather more than two years, each mixture being analysed as soon as possible after the termination of the month of collection. A considerable number of monthly mixtures of rain-water, made previously to June 1881, were also analysed in this month; these samples were in many cases of considerable age when analysed. All the analyses of monthly mixtures will be found in Table III. (p. 321); the results relating to old samples are separated by a thick black line from those obtained by the analysis of fresh samples.

It is clear that the determinations in the monthly mixtures can only be of value if the ammonia originally in the rain remains unaltered till the analysis of the mixture can be made. In our former Report it was assumed that the ammonia in rain-water would diminish on keeping, that it would, in fact, probably be nitrified. We must thus in the first place consider what evidence we have as to the permanence of ammonia in the rain-water samples.

From the daily analyses of rain-water already given, the composition of the water for each month, July to December 1881, has been calculated, correction being made for the few rainfalls left unanalysed. The calculated composition of the monthly mixtures is compared below with their actual compositions when the mixture was completed; and further, with the results of an analysis of these mixtures made in December 1882.

Month (1881).	Nitrogen as Ammonia, per million of Rain.		
	Calculated from daily Determinations (corrected).	Determined in Mixture at end of Month.	Re-analysis, Dec. 1882.
July	0·399	0·618	0·638
August	0·183	0·178	0·172
September	0·309	0·350	0·288
October	0·309	0·214	0·255
November	0·239	0·237	0·226
December	0·234	0·196	0·175
Numerical Mean.. ..	0·279	0·299	0·292

On looking at these figures it appears that the ammonia in the rain-water possesses considerable permanence; in one or two cases only is there any distinct diminution of ammonia by keeping, while in the case of the July water a considerable rise has taken place. Further re-analyses of old samples of rain-water, which we need not give in detail, show that a considerable diminution of ammonia by keeping is rare, and the increase of ammonia more common. In fifteen monthly mixtures of rain-water the mean alteration in composition during 1 to 1½ year was, in fact, from 0·457 to 0·478 of nitrogen as ammonia per million of water. The rise in ammonia, which is observed in some of these cases, is probably due to the decomposition of the nitrogenous organic matter contained in the rain. That the ammonia in rain should be apparently so little liable to nitrification will probably excite surprise; it must be recollected, however, that the rain-water in question contains a very distinct amount of lead in solution, derived from the gauge in which it is collected, and this is very probably fatal to the life of the nitrifying organism.

In Table III. the means calculated from the determinations in

TABLE III.—The AMOUNT of various MONTHLY RAINFALLS, and the AMOUNTS of NITROGEN as AMMONIA per MILLION of RAIN, and per ACRE, 1878–83.

MONTH.	1878.	1879.	1880.	1881.	1882.	1883.	Mean.	
							June, 1881, to May, 1883.	1878 to 1883.
				RAINFALL—INCHES.				
January	..	2·849	0·550	1·139	1·572	3·304	2·438	1·883
February	..	3·799	2·901	3·705	2·020	4·344	3·182	3·354
March ..	0·977	1·183	1·128	..	1·566	0·885	1·225	1·148
April ..	4·093	2·790	2·161	0·997	3·925	1·477	2·701	2·574
May ..	..	3·481	0·742	1·376	2·068	1·886	1·977	1·911
June ..	..	5·551	1·966	1·633	3·926	..	2·780	3·269
July ..	..	..	5·261	1·762	2·087	..	1·925	3·037
August ..	..	..	..	5·817	2·075	..	3·946	3·946
September	1·462	3·131	5·858	2·171	2·287	..	2·229	2·982
October ..	..	0·815	5·939	3·046	6·517	..	4·782	4·079
November	..	..	..	3·475	3·443	..	3·459	3·459
December	..	0·823	3·472	4·383	3·283	..	3·833	2·990
Total ..	..	..	..	..	34·798	..	34·477	34·632
				NITROGEN AS AMMONIA, PER MILLION OF RAIN.				
January	..	0·219	0·495	0·659	0·422	0·213	0·280	0·320
February	..	0·298	0·371	0·467	0·227	0·199	0·208	0·314
March ..	0·357	0·638	0·371	..	0·313	0·856	0·507	0·483
April ..	0·466	0·617	0·881	0·604	0·319	0·576	0·389	0·533
May ..	..	0·470	1·276	0·631	0·535	0·412	0·476	0·557
June ..	..	0·384	0·508	0·412	0·445	..	0·436	0·425
July ..	..	..	0·309	0·618	0·503	..	0·556	0·413
August ..	..	..	..	0·178	0·453	..	0·250	0·250
September	0·576	0·412	0·160	0·350	0·401	..	0·377	0·318
October	..	0·988	0·165	0·214	0·254	..	0·241	0·251
November	..	..	..	0·237	0·137	..	0·187	0·187
December	..	1·038	0.162	0·196	0·360	..	0·266	0·289
Average	..	..	..	..	0·343	..	0·316	0·340
				NITROGEN AS AMMONIA, IN LBS. PER ACRE.				
January	..	0·141	0·062	0·170	0·150	0·159	0·155	0·136
February	..	0·256	0·243	0·391	0·104	0·196	0·150	0·238
March ..	0·079	0·171	0·095	..	0·111	0·171	0·141	0·125
April ..	0·432	0·389	0·431	0·136	0·283	0·192	0·238	0·311
May ..	..	0·370	0·214	0·196	0·250	0·176	0·213	0·241
June ..	..	0·482	0·226	0·152	0·395	..	0·274	0·314
July ..	..	..	0·368	0·246	0·238	..	0·242	0·284
August ..	..	..	..	0·234	0·213	..	0·224	0·224
September	0·191	0·292	0·212	0·172	0·208	..	0·190	0·215
October	..	0·182	0·222	0·147	0·375	..	0·261	0·232
November	..	..	..	0·186	0·107	..	0·147	0·147
December	..	0·193	0·127	0·194	0·267	..	0·231	0·195
Total ..	..	..	..	..	2·701	..	2·466	2·662

monthly mixtures are arranged in two columns; one including only recent analyses, in which the ammonia was determined shortly after the completion of each mixture; the other including also the analyses of older samples, not analysed till June 1881. The average amount of nitrogen as ammonia in the freshly analysed samples is 0·316, and in the whole series of samples 0·340 per million.

The ammonia is thus somewhat higher when the determinations in the old samples are included in the average, a result which perfectly agrees with what has just been stated as to the increase in the quantity of ammonia by keeping.

In Table IV. the whole of the determinations in monthly mixtures are grouped according to the quantity of the rainfall, and the results for the summer months (April to September) are given separately from those of the winter months (October to March).

TABLE IV.—The AVERAGE AMOUNT of NITROGEN as AMMONIA in MONTHLY RAINFALLS of different QUANTITY, in SUMMER, WINTER, and the WHOLE YEAR.

Groups of Rainfall.	Summer Months.				Winter Months.				Whole Year.			
	Examples.	Mean Rain-fall.	Nitrogen as Ammonia.		Examples.	Mean Rain-fall	Nitrogen as Ammonia.		Examples.	Mean Rain-fall.	Nitrogen as Ammonia.	
			Per Million.	Lbs. per Acre.			Per Million.	Lbs. per Acre.			Per Million.	Lbs. per Acre.
		In.		lbs.		In.		lbs.		In.		lbs.
Below 1 inch ..	2	0·87	·890	·175	5	0·81	·750	·137	7	0·83	·792	·148
1 to 2 inches.. ..	7	1·65	·527	·197	5	1·32	·468	·139	12	1·51	·506	·173
2 to 3 inches.. ..	7	2·23	·537	·272	3	2·59	·278	·163	10	2·34	·451	·239
3 to 4 inches.. ..	4	3·62	·410	·335	8	3·44	·263	·205	12	3·50	·314	·248
Above 4 inches ..	5	5·32	·287	·346	4	5·30	·206	·247	9	5·31	·251	·302
	25	2·80	·423	·268	25	2·69	·296	·180	50	2·74	·361	·224

The gradual decrease in the proportion of ammonia per million of rain as the rainfall of the month becomes greater, is plainly shown by these figures; the quantity of ammonia brought down per acre nevertheless rises with each increase in the quantity of rainfall; but, taking the figures for the whole year, it requires the rainfall to be increased about sixfold, in order to double the quantity of ammonia contributed to an acre of land.

The higher proportion of ammonia in summer, and the larger quantity contributed per acre in the rainfall of this season, is very evident, and requires no comment.

We have now described the results afforded by the new determinations of ammonia in rain. The analyses of daily rainfalls, extending over rather more than six months, have yielded an average of 0·254 of nitrogen as ammonia per million of rain. Determinations in fresh monthly mixtures, extending over two years, have given an average of 0·316; and determinations in fifty monthly mixtures, rather more than half consisting of old collections, an average of 0·340 of nitrogen as ammonia per million of rain.

It is quite evident that the results now obtained, while they agree well with those given by Frankland's analyses, are much lower than those furnished by the earlier analyses made at Rothamsted, or by Professor Way. Can there be any error in the recent determinations tending to deficiency? Professor J. W. Mallet has lately called attention to the necessity of supplying the condenser with ice-cold water when distilling ammonia, if loss is to be avoided. Thus, when distilling 1 milligram of ammonia from 500 cubic centimeters of water in the ordinary way, he found a loss of 14·5 per cent., and when distilling 0·5 milligram, a loss of 7 per cent., the temperature of the distillates being 27° to 28° C. The temperature of our distillates may in summer time be as high as the point just named; there seem, however, no grounds for supposing that an appreciable loss of ammonia has occurred. In the first place, the quantity of ammonia in the retort has not exceeded 0·1 milligram, and has therefore been much below that mentioned by Professor Mallet. Further, in a determination made in June with a supply of iced water, the distillate having a temperature of 11° C., there was no appreciable difference in the amount of ammonia found from that obtained in a determination made in the ordinary way with a distillate at 25° C.

The evidence thus points to the conclusion that the early determinations of ammonia in rain erred on the side of excess. The method employed at Rothamsted in 1853–4 is given in detail in the Report of the British Association for 1854. The method used by Way in 1855–6 is described in the volume of this 'Journal' for 1856, p. 159. To enter upon a full discussion of these methods would lead us into chemical details unsuited to the present paper. It may be stated, however, that in both cases the ammonia was determined alkalimetrically, a method admittedly less delicate than the more modern Nessler process. Again, it has been stated by Schloesing, that by the use of a glass condenser the distillate may acquire alkali from the glass, and it is obvious that, so far as this may have happened, the effect would be to give high results by the alkalimetric method. There is also the further question whether a larger proportion of the nitrogenous organic matter was not converted into ammonia, and determined as such.

Assuming, then, the new determinations to be substantially correct, what estimate can be given of the amount of combined nitrogen annually furnished by the rain at Rothamsted?

If we take the results of the daily determinations during six months, June to December 1881, as representing half a year, then the nitrogen as ammonia supplied in the rain in the course of one year will amount to 2·374 lbs. per acre. If we take the results furnished by the analyses of fresh monthly mixtures during two years, the annual amount becomes 2·466 lbs. per acre. If the analyses of old monthly mixtures are included, the quantity of nitrogen as ammonia becomes 2·662 lbs. per acre per annum. The quantities shown by these three methods of estimation agree well together, but the first will probably most nearly represent the ready formed ammonia supplied by rain; we have learnt, indeed, that in the case of the Rothamsted rain-water, collected in a leaden gauge, the quantity of ammonia tends to increase with the age of the water, a part of the organic nitrogenous matter present in the rain doubtless undergoing decomposition, ammonia being produced.

The two series of determinations of nitric acid in Rothamsted rain, made by Way and by Frankland, have been described in the earlier Report. Way's results of two years' (1855–6) analyses of rain, gave a mean of 0·12 of nitrogen as nitric acid per million of water; equal to 0·75 lb. of nitrogen per acre for the years in question. Frankland, using a more modern method of analysis, found a nearly similar proportion of nitric acid in rain-water. The numerical mean of 34 determinations in rain, excluding dew, gave 0·14 of nitric nitrogen, while the average amount in 28 rainfalls of which the quantity was known, was 0·149 of nitric nitrogen per million of water. If we reckon the present average rainfall at Rothamsted (about 29 inches) on the latter estimate, the quantity of nitrogen as nitric acid annually supplied in the rain becomes nearly 1·0 lb. per acre. The total nitrogen as ammonia and nitric acid is thus about 3·3 lbs. per acre per annum.

We have yet to take account of the nitrogenous organic matter present in rain-water. The mean quantity of nitrogen in organic combination found by Frankland in 69 samples of Rothamsted rain was 0·19 per million of water, while the average amount in the mixed rainfall of 56 collections of known quantity was 0·165 per million. Taking the last-named estimate, and with an assumed rainfall of 29 inches, the quantity of nitrogen as organic matter annually contributed in the rain becomes 1·08 lb. per acre. In the case of Frankland's analyses, however, the samples of rain-water were of some age, and a part of the organic nitrogen had doubtless become ammonia.

Bearing this fact in mind, we may probably take 4·5 lbs. per acre as the best estimate we can at present give of the total combined nitrogen annually supplied in the Rothamsted rainfall. This is only about two-thirds as much as the earlier results indicated as due to ammonia and nitric acid alone; but it is not improbable that, in their case, a larger proportion of the nitrogen of the nitrogenous organic matter was converted into ammonia, and estimated as such, than in the recent determinations.

In addition to the combined nitrogen carried down from the atmosphere in rain, we have to consider any gain to the soil or to the crop by direct absorption of ammonia or nitric acid from the air. As far as any gain from the atmosphere to the plant itself is concerned, there is very little direct experimental evidence on the point, but such as is available would lead to the conclusion that its amount is practically immaterial. As to the amount of gain by absorption by the soil, there is, unfortunately, no direct or satisfactory evidence at command. From such evidence as does exist, we are disposed to conclude that with some soils the amount will probably be greater, and with others less, than that supplied by the rainfall.

THE CHLORINE IN RAIN.

Determinations of chlorine in monthly mixtures of rain-water have been carried out at Rothamsted since June 1877; the results obtained up to the close of 1880 were published in the previous Report on Rain and Drainage. The determinations have been continued by means of the volumetric method before described, further experience with this method showing that it gave results almost identical with those obtained by the gravimetric method.

We need not discuss in detail the results obtained in individual months, which will be found in Table V. (p. 326), but turn at once to the columns showing the mean results of the six years' observations.

In the account given of the earlier results of this investigation it was pointed out that the winter rainfall was far richer in chlorine than the summer rainfall; we are now able to take a step further, and show the general character with respect to chlorine of each month in the year. The minimum amount of chlorine occurs in the rain of July. In August and September there is a distinct but not a very large increase in quantity. In October and November a great rise occurs, the quantity of chlorine contained in the rain being three times as large as during the two preceding months. After this period of maximum there is a fall,

TABLE V.—The MONTHLY RAINFALL, and the AMOUNT of CHLORINE in the RAIN, during SIX YEARS, 1877–83.

MONTH.	1877.	1878.	1879.	1880.	1881.	1882.	1883.	Mean.
RAINFALL—INCHES.								
January ..	..	1·750	2·849	0·550	1·139	1·572	3·304	1·861
February ..	..	1·804	3·799	2·901	3·705	2·020	4·344	3·096
March ..	..	0·977	1·183	1·128	2·153	1·566	0·885	1·315
April	..	4·093	2·790	2·161	0·997	3·925	1·477	2·574
May	..	4·976	3·481	0·742	1·376	2·068	1·886	2·422
June	1·435	2·505	5·551	1·966	1·633	3·926	..	2·836
July	3·284	0·656	4·244	5·261	1·762	2·087	..	2·882
August ..	2·596	4·976	6·558	1·069	5·817	2·075	..	3·849
September..	1·529	1·462	3·131	5·858	2·171	2·287	..	2·740
October ..	1·950	2·987	0·815	5·939	3·046	6·517	..	3·542
November..	5·159	4·545	0·814	2·919	3·475	3·443	..	3·393
December ..	2·279	1·601	0·823	3·472	4·383	3·283	..	2·640
Total ..	18·232	32·332	36·038	33·966	31·657	34·769	11·896	33·150
CHLORINE PER MILLION OF RAIN.								
January ..	..	2·91	3·04	3·20	10·00	1·70	3·00	3·53
February ..	..	0·50	1·83	3·20	3·45	2·50	2·25	2·41
March ..	..	4·00	5·80	2·90	1·95	3·75	8·85	4·04
April	..	0·55	1·67	1·73	3·20	2·60	1·60	1·71
May	..	0·91	1·40	3·43	2·38	1·60	1·40	1·46
June	1·95	1·48	0·80	2·47	1·63	0·80	..	1·27
July	0·24	4·31	0·80	0·64	0·67	1·60	..	0·86
August ..	0·95	1·16	0·85	1·30	0·53	1·68	..	0·94
September..	1·73	2·28	1·05	0·97	0·75	1·15	..	1·17
October ..	3·40	2·58	2·65	3·00	4·20	2·28	..	2·91
November..	1·97	1·83	9·38	2·95	2·70	4·30	..	2·89
December ..	1·96	3·00	5·75	1·70	1·80	1·60	..	2·09
Average	1·64	1·64	1·75	2·01	2·32	2·15	2·73	1·99
CHLORINE IN LBS. PER ACRE.								
January ..	..	1·15	1·96	0·40	2·58	0·60	2·24	1·49
February ..	..	0·20	1·57	2·10	2·89	1·14	2·21	1·69
March ..	..	0·88	1·55	0·74	0·95	1·33	1·77	1·20
April	..	0·51	1·05	0·85	0·72	2·31	0·53	1·00
May	..	1·03	1·10	0·58	0·74	0·75	0·60	0·80
June	0·63	0·84	1·01	1·10	0·60	0·71	..	0·82
July	0·18	0·64	0·77	0·76	0·27	0·76	..	0·56
August ..	0·56	1·31	1·26	0·31	0·70	0·79	..	0·82
September..	0·60	0·75	0·74	1·29	0·37	0·60	..	0·73
October ..	1·50	1·74	0·49	4·03	2·89	3·36	..	2·34
November..	2·29	1·88	1·73	1·95	2·12	3·35	..	2·22
December ..	1·01	1·09	1·07	1·34	1·79	1·19	..	1·25
Total ..	6·77	12·02	14·30	15·45	16·62	16·89	7·35	14·92

but the chlorine remains high throughout the winter months, the diminution towards the summer period not commencing till April. The rain of March has yielded the highest proportion of chlorine per million of water, but this is partly due to the small rainfall of the month. Rather more than two-thirds of the annual supply of chlorine is contributed by the winter months.

In the next Table the chlorine determinations in 72 monthly rainfalls are grouped according to the amount of the rainfall, and according to the season of the year.

TABLE VI.—The AVERAGE AMOUNT of CHLORINE in MONTHLY RAINFALLS of different QUANTITY, in SUMMER, WINTER, and the WHOLE YEAR.

Groups of Rainfall.	Summer Months.				Winter Months.				Whole Year.			
	Examples.	Mean Rain-fall.	Chlorine.		Examples.	Mean Rain-fall.	Chlorine.		Examples.	Mean Rain-fall.	Chlorine.	
			Per Million.	Lbs. per Acre.			Per Million.	Lbs. per Acre.			Per Million.	Lbs. per Acre.
		In.		lbs.		In.		lbs.		In.		lbs.
Below 1 inch ..	3	0·80	3.58	0·65	6	0·81	5·76	1·06	9	0·81	5·04	0·92
1 to 2 inches	10	1·56	1·74	0·61	9	1·52	3·46	1·19	19	1·54	2·55	0·89
2 to 3 inches	9	2·30	1·40	0·73	7	2·59	2·65	1.55	16	2·43	1·98	1·09
3 to 4 inches	5	3·55	1·25	1·01	8	3·44	2·82	2·20	13	3·48	2·20	1·74
Above 4 inches ..	9	5·26	0·81	0·96	6	5·15	2·23	2·59	15	5·22	1·37	1·61
	36	2·88	1·21	0·79	36	2·64	2·84	1·70	72	2·76	1·99	1·24

The results do not fall into a very regular series. It would appear that in summer the supply of chlorides is very limited, for a large increase in the rainfall is attended with but little rise in the quantity of chlorine brought upon an acre. In winter, on the other hand, the supply of chlorides in the atmosphere is so constantly renewed, that an increased rainfall results in a considerable addition to the supply per acre. The rather wide irregularities in the composition of the groups of rainfall for the whole year, are principally due to the different proportion of summer and winter months which enters into the various groups.

The large excess of chlorides found in winter rain is probably due in great measure to the chlorides volatilised during the combustion of fuel; the excess in question is too uniform to be dependent chiefly on the action of strong winds blowing from the sea; it is also remarked in calm months as well as in stormy weather. Exceptionally high results are, however, probably due to storms. When we turn to the nice gradations observed among the summer months, it is difficult not to believe that the temperature of the air has some influence on the results.

In the more rarified atmosphere of summer, gaseous diffusion will probably be more active, while the power of transporting minute solid particles will be diminished.

It is difficult to ascertain the influence which the direction of the wind has had on the composition of a monthly rainfall; a partial study has been made of the data at our disposal, but with no definite result.

The amount of chlorine annually contributed by the rain to the land at Rothamsted has amounted to 14·92 lbs. per acre on an average of six years; this amount is equal to 24·59 lbs. of pure common salt, an amount of chlorides greater than that which is contained in most farm-crops. It was pointed out in the previous Report that the chlorine determinations in the rain agreed with those made in the drainage-waters from the three drain-gauges, containing unmanured and uncropped soil. During the six years now in question, the average quantity of chlorine annually found in these drainage-waters has amounted to 15·30 lbs. per acre.

THE SULPHURIC ACID IN RAIN.

An attempt has been made during the last two years to determine the amount of sulphuric acid contained in the rain at Rothamsted. The investigation has been attended with several difficulties, and the question cannot as yet be considered as satisfactorily answered; the results are nevertheless of interest.

As it was feared that the rain furnished by the large rain-gauge would not be suitable for determinations of sulphuric acid, partly from the presence of lead in the water, and partly from the possible oxidation of sulphur in the vulcanised caoutchouc tube conducting the rain to the measuring cylinders, an independent collection of rain was made for the purpose of the present investigation. The new collector consisted simply of a large glass funnel, placed in a bottle, which was sunk up to its shoulder in the ground in the neighbourhood of the large rain-gauge. The rain was allowed to accumulate in the bottle, and was removed at the end of each month. The water thus collected was apt to contain insects in summer time.

At the Rothamsted Laboratory no attempt has been made to determine the amount of sulphuric acid present in the rainfall of each month; the determinations have been made in mixed samples of water representing the rainfall of the six summer and of the six winter months. Approximate determinations of sulphuric acid in forty monthly mixtures of rain-water collected in the large gauge at Rothamsted have, however, been made by Dr. W. J. Russell, who is at present investigating the chemistry of rain.

The method of determination at Rothamsted has been to concentrate about 15 lbs. of rain in a glass retort, adding a little hydrochloric acid at the last; then filtering, precipitating the sulphuric acid with chloride of barium in the usual manner, and collecting and weighing the precipitate. Working in this manner, four mixed samples of rain-water, representing the fall during two summers and two winters, have given the following results. The sulphuric acid is reckoned as anhydride (SO_3).

Table VII.—The Amount of Sulphuric Acid in the Rainfall of the Six Summer and Six Winter Months of Two Years, 1881-3.

Period of Collection.	Rainfall.	Sulphuric Acid.			
		Per Million of Rain.		In Lbs. per Acre.	
		Rain from Glass Funnel.	Rain from Large Gauge.	Rain from Glass Funnel.	Rain from Large Gauge.
	Inches.			lbs.	lbs.
April to September, 1881 ..	13·76	2·64	3·97	8·2	12·4
October to March, 1881-2 ..	15·86	2·29	3·66	8·2	13·1
April to September, 1882 ..	16·37	2·67	4·15	9·9	15·4
October to March, 1882-3 ..	21·78	2·15	3·99	10·6	19·7
Average per annum ..	33·89	2·41	3·95	18·5	30·3

It will be noticed at once that the rain-water furnished by the large gauge has yielded considerably more sulphuric acid than that collected in glass vessels only. There can be little doubt that the former results are in excess of the truth. Dr. Russell informs us that in his experience vulcanised caoutchouc is a constant source of sulphuric acid. We will confine our attention, therefore, to the results shown by the rain-water collected in the glass funnel.

The sulphuric acid (SO_3) contained in the rain-water collected in glass vessels has averaged in two years 2·41 per million of water, amounting to 18·5 lbs. per acre per annum. This quantity would appear to be about sufficient for the demands of ordinary cereal crops, though unequal to the requirements of turnips.

The distribution of the sulphuric acid in the different seasons is apparently quite distinct from that of chlorine. Of the latter, two-thirds of the annual amount was furnished by the winter months; while the sulphuric acid is pretty equally distributed in summer and winter, according to the analyses of rain from the large rain-gauge, and rather preponderates in the summer, according to the results from the glass-funnel collections. It is quite possible, however, that the latter results may err somewhat on the side of excess in summer time, owing to evaporation taking place in the collecting-bottle. A part of the sulphuric acid in the Rothamsted rain will be due to coal-smoke, and a still smaller portion derived from sea-spray. The considerable amount of sulphuric acid found in the summer rain points, however, to a further source, most active during high temperatures. This indication is quite in accordance with the opinion held by Dr. Angus Smith, that the sulphuric acid in rain is largely derived from the products of the decay of animal and vegetable matter, which is of course most active in the warmer months.

Before leaving the subject, we may notice that the proportion of chlorine to sulphuric acid in sea-water is stated at about 100 : 12; while the proportion in the winter rain at Rothamsted has been 100 : 78, and in the summer rain 100 : 194.

SUMMARY OF RESULTS.

1. 152 analyses of rain, snow, dew, and hoar-frost, representing the daily collections from June 22, 1881, to January 5, 1882, gave an average of 0·248 of nitrogen as ammonia per million of water; the extremes observed were 5·491 and 0·043. The variations are dependent on the richness of the atmosphere in ammonia, and on the quantity of the rainfall, the smaller deposits containing the most ammonia.

2. Analyses during two years of fresh monthly mixtures of rain gave an average of 0·316 of nitrogen as ammonia per million. Analyses of fifty monthly mixtures, a considerable number of them old, gave a mean of 0·340. The rain collected in the leaden gauge at Rothamsted generally tends to increase in ammonia by keeping. The rainfall of summer is generally richer in ammonia than that of winter.

3. The nitrogen as ammonia annually supplied by rain per acre, reckoned from the daily determinations of six months, is 2·374 lbs.; from the analyses during two years of fresh monthly mixtures, 2·466 lbs.; from the analyses of fifty monthly mixtures, many of them old, 2·662 lbs. The nitrogen as nitric acid is apparently, from Frankland's and Way's results, about 1·0 lb. per acre, and the nitrogen, as organic matter, a similar quantity. The total combined nitrogen in the annual rainfall at Rothamsted would thus be about 4·5 lbs. per acre.

4. Six years' determinations of chlorine in monthly mixtures of rain give an average of 1·99 per million of water, or 14·92 lbs. per acre, equal to 24·59 lbs. of pure common salt. Two-thirds of the chlorides fall in the six winter months, October to March.

The minimum quantity falls in July; the maximum in October and November.

5. Determinations of sulphuric acid in the rain of two years have given a mean of 2·41 per million (reckoned as anhydride), or 18·5 lbs. per acre per annum. The sulphuric acid occurs in nearly equal quantity in summer and winter.

XVI.—*The Nitrogen as Nitric Acid, in the Soils and Subsoils of some of the Fields at Rothamsted.* By Sir J. B. LAWES, Bart., LL.D., F.R.S., J. H. GILBERT, Ph.D., LL.D., F.R.S., and R. WARINGTON.

CONTENTS.

IN the previous Report in this 'Journal,' "On the Amount and Composition of the Rain and Drainage-Waters collected at Rothamsted" (xvii. [2] 241, 311; xviii. 1), an account was given of the quantities of nitrates and chlorides found in the drainage-waters from the uncropped and unmanured soils forming the three soil drain-gauges at Rothamsted. An account was also given of the amount of nitrates, chlorides, and other constituents found in the drainage-waters from the variously manured plots in Broadbalk Wheat-field. Various important conclusions were drawn from these analyses of drainage-waters, and especially from the amount of nitrates present, which varied greatly according to the cropping and manuring of the land. We now propose to proceed a step further, and describe the results which have been obtained by actual determinations of nitrates in soils of various history.

The matter at our disposal embraces miscellaneous determinations of nitrates and chlorides in various soils on the Rothamsted Farm, both fallow and cropped; and also a series of determinations of nitrates and chlorides in the soils of the variously manured plots of the Experimental Wheat and Barley fields. The examination of these soils has, in the great majority of cases, been confined to the depth of 27 inches from the surface. Of the amount of nitrates or chlorides which may be present in the lower depths of the subsoil, under various circumstances, we have as yet but little information. In the present paper attention will be confined to the amounts of nitrates found in the soils.

METHOD OF SOIL-SAMPLING, AND OF ANALYSIS.

The samples of soils have, with few exceptions, been taken in the manner first adopted at Rothamsted in 1856, and uniformly employed since, though not hitherto described in this 'Journal.' A rectangular tube, made of stout sheet iron, 6 inches square and generally 9 inches deep, having a strong rim outside its upper edge, is driven into the soil until the upper edge is level with the surface of the land. The contents of the tube are carefully removed without disturbing its position, and constitute the sample of the first 9 inches of soil. If a sample of the second 9 inches is to be taken, the empty iron tube is covered with a lid, and the soil surrounding it cleared away down to the level of its lower edge; the tube is then again driven into the soil, till its upper edge is at the level which its lower edge previously occupied; the contents of the tube are now a sample of the second 9 inches of the soil. By proceeding in this way samples may be taken to any desired depth. An iron tube 12 inches square is sometimes used for taking a sample of the surface soil when this is covered with vegetation.

By this method of sampling the soil and subsoil are obtained in their true proportion. The samples taken also represent a known area and depth of soil; the results of their analysis consequently admit of comparison with each other; the constituents found can also be reckoned into pounds per acre. It is much to be desired that the taking of soil-samples with the spade should be entirely discarded. Samples so obtained represent variable depths and no definite area, and they can only by accident include the true proportion of soil and subsoil; the results of their analysis are consequently of little value for purposes of comparison or calculation.

Both surface-soil and subsoil being more or less irregular, it is always necessary to take samples from several places in the same plot or field. The samples of the surface-soil are, as a rule, kept separate, a mixed sample being made of a part only, and the remainder reserved for reference or separate analysis. The samples of subsoil are generally at once mixed. Each sample is weighed in the field as soon as collected; it is then broken into small pieces, spread on trays, and dried in a stove-room at a temperature of about 55° C. (131° F.). The soil when dried is further pulverised; all stones retained by a sieve with $\frac{1}{4}$-inch meshes are removed, and all visible roots; the remaining soil is then finely powdered, and stored in bottles for analysis. The stones, roots, and fine soil obtained from the original sample are all weighed.

The immediate drying of the soil is absolutely necessary, if it is desired to ascertain the quantity of nitrates present in the land from which the sample was taken, as the production of nitrates takes place with considerable rapidity in a moist soil freely exposed to air. The soil must not, however, be dried at too high a temperature, or loss of nitrates may occur.*

To ascertain the quantity of nitrates present in the soil, 200 to 400 grams of the finely-powdered soil are extracted with water on a vacuum filter. The nitric acid is determined in the watery extract by a modification of Schloesing's method, the details of which have been described elsewhere.†

HISTORY OF THE SOILS EXAMINED.

It will be convenient to bring together under one head the necessary descriptions of the various soils in which nitric acid has been determined. All the fields we have to mention form part of the Rothamsted Farm. The soil is in every case a more or less heavy loam, with flints; having a deep clay subsoil, resting on chalk. In one instance only was the chalk reached at the depth of 6 feet. Samples were in every case taken from several places in the field or plot, and the analyses made on mixtures of these samples.

Little Hoos Field.—Sampled September 26–29, 1877. This field is not part of the strictly experimental land. In 1877 the crop was barley, in half of which clover had been sown. The division of the field we are here concerned with had grown cereal crops for eleven years, the last nine crops being barley. During the last seven years the annual manuring consisted of superphosphate, with 2 or $2\frac{1}{2}$ cwts. of nitrate of sodium. Samples of soil were taken in four places from each division of the field; the sampling was carried to the depth of 54 inches.

Agdell Field.—Sampled September 24–25, 1878, and September 8, 1882. In this field systematic experiments upon the ordinary four-course rotation have been conducted since 1848. We are only here concerned with two divisions of the field, representing respectively the highest and lowest condition

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* 'Trans. Chem. Soc.' 1882, p. 351.

† Ibid. pp. 345, 351.

of the soil. In the first division the turnips are manured with 200 lbs. of ammonium-salts (equal parts sulphate and chloride), 2000 lbs. rape-cake, 3½ cwts. superphosphate (200 lbs. bone-ash and acid), 300 lbs. sulphate of potassium, 200 lbs. sulphate of sodium, and 100 lbs. sulphate of magnesium. The turnips are fed on the land, and the three following crops are unmanured. In the second division the turnips are manured with 3½ cwts. of superphosphate only, and are carted off the land; all the following crops are unmanured. In 1878 each division of the field was half in beans and half in fallow. Samples of soil were taken both from the bean land, and from that left as bare fallow through the summer; each plot was sampled in three places, but only to the depth of 18 inches.

In 1882 the soil bearing the fully-manured rotation was again sampled; it was then half in clover and half in fallow. The clover-land, and that under bare fallow, were each sampled in three places, to the depth of 27 inches.

Hoos Field.—1. *Wheat and Fallow.*—Sampled September 28, 1878, and March 29, 1881. The experiment with alternate wheat and fallow, both unmanured, has been in progress since 1851. Samples of soil were taken in September 1878, from three places, to the depth of 18 inches, both on the wheat and fallow land. In March 1881, the wheat land was again sampled in five places, to the depth of 27 inches.

2. *Clover-land.*—Sampled March 29, 1881, and July 26–31, 1882. This portion of the field has been devoted to experiments with clover since 1849; but, owing to the repeated failure of the crop, the land has very frequently been in the condition of bare fallow; one crop of wheat and three of barley have also been taken. The five plots from which samples of soil were taken in 1881 had been manured either with superphosphate; or with the sulphates of potassium, calcium, and magnesium, with chloride of sodium; or with mixtures of these manures; but they had received no nitrogenous manure since the commencement of the experiment in 1849. In March 1881, single samples of soil were taken from each plot to the depth of 27 inches. The analyses were made on a mixture of the five samples.

In July 26–31, 1882, samples of soil were taken from two portions of two of the above five plots. The two portions with which we are at present concerned grew respectively Bokhara clover (*Melilotus leucantha*), and white clover (*Trifolium repens*). Both of the plots had been manured with the sulphates of potassium, calcium, and magnesium, and chloride of sodium, with superphosphate; no nitrogenous manure had been applied.

Samples of soil were taken from two places on each plot to the depth of 54 inches.

3. *Barley-land.*—Sampled February 24 to March 7, 1882. A large part of Hoos Field has been continuously cropped with barley since 1852. Particulars as to the manures applied, and the produce obtained on those plots with which we are at present concerned, will be found in Table I. The "mixed mineral manure" consists of superphosphate, with the sulphates of potassium, sodium, and magnesium. The ammonium-salts are a mixture of equal parts sulphate and chloride. The manures are all ploughed-in in the spring, before sowing the barley. The samples of soil were taken between February 24 and March 7, 1882, from four places on each plot, to the depth of 27 inches.

TABLE I.—MANURING and ANNUAL PRODUCE PER ACRE of certain Plots in HOOS BARLEY FIELD.

LOT.	MANURING.	Average Produce, 30 years, 1852–81.		Produce, 1881.	
		Dressed Corn.	Total Produce (Corn and Straw).	Dressed Corn.	Total Produce (Corn and Straw).
		Bushels.	lbs.	Bushels.	lbs.
1 o.	Unmanured	$17\frac{7}{8}$	2150	$17\frac{7}{8}$	1609
2 o.	Superphosphate	23	2604	$19\frac{1}{4}$	1822
3 o.	Sulphates of Potassium, Sodium, Magnesium	$19\frac{7}{8}$	2296	$17\frac{1}{8}$	1709
4 o.	Mixed Mineral Manure	$24\frac{1}{4}$	2753	$17\frac{7}{8}$	1770
1 A.	200 lbs. Ammonium-salts	$30\frac{3}{4}$	3612	$33\frac{1}{8}$	3249
2 A.	" Amm.-salts, and Superphosphate	$44\frac{7}{8}$	5368	$43\frac{5}{8}$	4195
3 A.	" " , and Sulp.Pot., Sod., Mag.	$33\frac{1}{2}$	4023	$37\frac{3}{8}$	3776
4 A.	" " , and Mixed Minerals ..	$44\frac{1}{2}$	5534	$42\frac{5}{8}$	4392
1 AA.	275 lbs. Nitrate of Sodium	$34\frac{1}{8}$	4147	$34\frac{7}{8}$	3762
2 AA.	" Nit. Sod., and Superphosphate ..	$46\frac{7}{8}$	5784	$43\frac{1}{4}$	4141
3 AA.	" " , and Sulph Pot., Sod., Mag.	$34\frac{7}{8}$	4421	$36\frac{5}{8}$	4152
4 AA.	" " , and Mixed Minerals ..	$47\frac{1}{8}$	6007	$47\frac{1}{4}$	5114
1 c.	1000 lbs. Rape-cake	$43\frac{1}{4}$	5243	$41\frac{1}{2}$	4576
2 c.	" " , and Superphosphate ..	45	5515	48	5240
3 c.	" " , and Sulph.Pot., Sod., Mag.	$41\frac{1}{2}$	5168	$40\frac{1}{2}$	4417
4 c.	" " , and Mixed Minerals ..	$45\frac{1}{2}$	5661	45	4778
7^1	Unmanured (Farmyard-manure, 1852–71)	$34\frac{1}{4}$*	4020*	$29\frac{7}{8}$	3063
7^2	14 tons Farmyard-manure	49	6040	$53\frac{3}{4}$	5707

* Average produce of 10 years (1872-81) without manure.

Clay Croft and Foster's Field.—Sampled October 3–4, 1881. These two fields are under the ordinary cultivation of the farm. The preceding cropping in each case had been—barley with guano in 1880, barley with superphosphate and nitrate of sodium in 1879, wheat with nitrate in 1878. Foster's Field had received dung in 1877; Clay Croft being at the same time fallow. Both fields were in bare fallow when sampled. Samples were taken in each case from three places, to a depth of 27 inches.

Broadbalk Field.—Sampled October 10–18, 1881. This field has been continuously cropped with wheat since 1843–4; the manuring and average produce of the plots with which we are concerned at present will be found in Table II. The "mixed mineral manure" and the "ammonium-salts" are similar to those applied to the barley in Hoos Field. The ammonium-

TABLE II.—MANURING and ANNUAL PRODUCE per ACRE of certain Plots in BROADBALK WHEAT-FIELD.

PLOT.	MANURING.	Average Produce, 1852–81.		Produce, 1881.	
		Dressed Corn.	Total Produce (Corn and Straw).	Dressed Corn.	Total Produce (Corn and Straw).
		Bushels.	lbs.	Bushels.	lbs.
2	14 tons Farmyard-manure	33½	5696	30¼	4274
3	Unmanured	13⅛	2108	13¾	2009
4	Unmanured	14	2228	12⅝	1591
5 A	Mixed Mineral Manure	15⅛	2394	12¾	1715
6 A	200 lbs. Ammonium-salts and Mixed Minerals	23⅜	3954	21⅜	2928
7 A	400 lbs. ,, ,, ,,	32¼	5710	27¼	4007
8 A	600 lbs. ,, ,, ,,	36⅛	6778	32½	5255
9 A	550 lbs. Nitrate of Sodium and Mixed Minerals	36⅛	6903	35½	5911
9 B	550 lbs. Nitrate of Sodium, alone	23⅜	4293	22¾	3241
10 A	400 lbs. Ammonium-salts, alone	20½	3450	18¼	2465
10 B	400 lbs. Ammonium-salts, alone	23⅛	3923	19¾	2658
11 A	400 lbs. Amm.-salts, and Superphosphate ..	26⅛	4387	22	3020
12 A	,, ,, , Superphos. Sulp. Sodium	31¼	5326	25⅝	3409
13 A	,, ,, , Superphos. Sulph. Potass.	31	5472	28⅝	4056
14 A	,, ,, , Superphos. Sulph. Mag.	31⅝	5465	28⅝	4015
15 A	,, ,, , Mixed Minerals (1) ..	30⅝	5289	25½	3452
16 A	Unmanured since 1865	(2) 14⅜	2356	13⅜	1720
17 A	Mixed Mineral Manure (3)	(4) 15½	2549	13⅞	1752
18 A	400 lbs. Ammonium-salts (3)	(5) 29½	5145	31½	4437
19	1700 lbs. Rape-cake (6)	28½	4758	24¾	3353

(1) For 1872, and previously, 400 lbs. Sulphate of Ammonium, with Mixed Minerals.

(2) Average produce of 17 years, 1865–81, without Manure; previously manured with 800 lbs. Ammonium-salts and Mixed Minerals.

(3) The Manures on these two Plots alternate each year.

(4) Average produce of Mineral Manure, alternating with Ammonium-salts.

(5) Average produce of Ammonium-salts, alternating with Mineral Manures.

(6) For 1878, and previously, 300 lbs. Sulphate of Ammonium, 500 lbs. Rape-cake, with Superphosphate prepared with Hydrochloric Acid.

salts and nitrate of sodium are applied as a top-dressing in March. On Plot 15 the ammonium-salts have since 1878 been ploughed or harrowed-in in autumn. The farmyard-manure and rape-cake are also applied in autumn. During twelve seasons, 1868–79, the straw of the preceding crop was returned to the land in the form of chaff in the A division of Plots 5, 6, 7, 8, 11, 12, 13, 14, and on 17 or 18, according to which of the two received mineral manure only. On Plot 15A the straw was returned during six seasons, 1874–9. The effect of the straw on the produce has been very small. Further particulars of the manuring will be found in the previous Report. The samples of soil were taken between October 10 and 18 from six places on each plot, to the depth of 27 inches. In most cases in which a plot consists of two "lands," only the A division was sampled.

Geescroft Field.—Sampled April 9–13, 1883. This field has been cropped with beans since 1847, but in the later years the produce has much fallen off, and wet seasons have so interfered with the cultivation that the experiment has been discontinued. Since 1870, small crops of beans have been obtained in 1874, 1875, 1877, and 1878; and the usual manures have been applied in 1875, 1876, and 1878. In 1879, 1880, and 1881 the land was ploughed several times, but no seed sown. In 1882 the land was ploughed in February; grass-seeds were sown in September, which failed. In April 1883, samples of soil were taken from most of the plots, in two or four places, and in some instances to the depth of 72 inches.

THE NITROGEN AS NITRATES IN SOILS OF VARIOUS HISTORY.

In the previous Report the three drain-gauges at Rothamsted, containing uncropped and unmanured soil, were described, and the results of the systematic analysis of the drainage-waters during the last four years were given. We are now able to give the mean results of six years, May 1877 to April 1883. The nitrogen as nitrates has averaged, in the case of the soil 20 inches deep, 42·5 lbs.; in that of the soil 40 inches deep, 36·1 lbs.; and in that of the soil 60 inches deep, 41·9 lbs. per acre per annum. The mean of the three results is 40·2 lbs. This quantity will represent the mean annual production in the soils in question, if we assume that no loss of nitrates by reduction has taken place. The soils of the drain-gauges cannot, however, at present be taken as representing land in good agricultural condition. The soils have undergone no tillage during 13 years, saving the small disturbance resulting from the removal of weeds; they were also subjected to loss of nitrogen by oxidation and drainage for seven years before the systematic examination of the drainage-waters commenced. It is thus extremely probable that the annual production of nitrates was larger in the earlier history of the soils than at present, and the results of the earlier analyses of the drainage-waters, given in the previous Report, support this conclusion.

One fact is plainly shown by the monthly analyses of the drainage-waters from the soil-drain-gauges, namely, that nitrification is far most active in summer-time. The drainage-waters are at their minimum strength in the spring months. It is generally in July that the first great increase in the proportion of nitrates is observed. As the process of nitrification has been shown to be greatly favoured by a rise in temperature up to 98° Fahr. (37° C.), we may assume that it is most active during the months of July and August, if the rain is sufficient to keep the soil in a moist condition.

In Tables III., IV., VI., and VIII. are given the quantities of nitrogen as nitrates which have been found in various soils and subsoils on the Rothamsted Farm. The previous history of these soils has been already described. We will first consider the results yielded by uncropped land.

1. *Nitrates in Fallow Land.*

In Table III. (Nos. 1, 2, 7, 3), we have determinations of nitric acid in four soils in fair agricultural condition, which had been cultivated as bare fallow during the summers of 1878, 1881, and 1882. The samples of soil were taken in September or October, before any considerable loss of nitrates by autumn drainage had taken place. In these four soils the nitrogen as nitrates amounts respectively to 58·8 lbs., 56·5 lbs., and 59·9 lbs. per acre in the first 27 inches, and to 48·8 lbs. in the first 18 inches from the surface. When no excess of rain has fallen during the summer months, the nitrates in a fallow soil are chiefly found in the first nine inches, where nitrification principally occurs; but if much rain has fallen, especially in the later summer months, the nitrates are found at a lower level, and a part will have passed below the depth (27 inches) to which the soils were sampled. The Agdell fallow in 1882 is an example of the former, while the fallows in Clay Croft and Foster's Field in 1881 are examples of the latter conditions of season. In 1882 only 0·11 inch of water passed through the 20-inch drain-gauge in the two months preceding soil-sampling; but in 1881, 3·58 inches passed.

Table III.—The Quantity of Nitrogen as Nitrates found in Fallow and Cropped Land variously manured.

No.	Previous Cropping and Manuring.	Nitrogen as Nitrates in Lbs. per Acre.			
		First Nine Inches.	Second Nine Inches.	Third Nine Inches.	Total.
	Clay Croft Field: sampled October 3, 1881.				
1	Fallow (ordinary cultivation)	16·4	26·5	15·9	58·8
	Foster's Field: sampled October 3, 1881.				
2	Fallow (ordinary cultivation)	14·6	24·6	17·3	56·5
	Agdell Field: sampled September 24–25, 1878.				
3	Fallow (Rotation fully manured)	30·0	18·8	not taken	48·8
4	Beans ,, ,, ,, ...	12·1	8·4	,,	20·5
5	Fallow (Rotation, superphosphate only)	22·3	14·0	,,	36·3
6	Beans ,, ,, ,,	7·2	3·3	,,	10·6
	Agdell Field: sampled September 8, 1882.				
7	Fallow (Rotation fully manured)	40·1	14·3	5·5	59·9
8	Clover ,, ,, ,, ...	11·4	4·8	3·4	19·6
	Hoos Field: sampled September 28, 1878.				
9	Fallow (unmanured land)	28·5	5·2	not taken	33·7
10	Wheat ,, ,, ...	2·6	trace	,,	2·6
	Hoos Field: sampled March 29, 1881.				
11	Wheat (unmanured land)	7·5	3·6	3·4	14·5
12	Clover (superphosphate and alkalies) ..	12·3	8·4	18·2	38·9

It is obvious that the quantity of nitrate found in a soil at the end of a summer's fallow does not represent the whole quantity of nitrate formed in the soil in the course of a year; a part of this has been already removed by drainage, and has passed into the subsoil. The experiments at Rothamsted afford some means of estimating this loss by drainage. The fallows we have just mentioned followed crops of barley. We may assume that in July, after the blooming of the barley, the soils to the depths in question contained little or no nitrate, and that from this time forward the formation of nitrate was more or less active. The first running of the drain-pipes in Broadbalk Wheat-field informs us when drainage may be supposed to have commenced in the soils in question. The composition of the drainage-water from Plot 6 in the same wheat-field will furnish a very moderate estimate of the strength of this drainage-water through the autumn and winter months, while the measured drainage from the drain-gauges will give a fair estimate of its quantity. After March 1, the mean amount of nitrate passing away in the drainage from the 20 and 40-inch drain-gauge soils will furnish a low estimate of the loss suffered during the spring and summer months. These estimates lead to the following figures:—

	Season 1880–1.	Season. 1881–2.
	Lbs.	Lbs.
Nitrogen as nitrates in drainage, August to February ..	17·0	19·0
,, ,, March to Sept. or Oct. ..	14·8	7·6
,, in soil, September or October	57·7*	59·9
Total production of nitrogen as nitrates	89·5	86·5

* Mean of the quantities found in Clay Croft and Foster's fields.

It may be fairly urged that these estimates of the quantity of nitrates formed per acre during a season of bare fallow must err on the side of excess, as they assume the existence of absolutely no nitrate in the soil at the commencement of the fallow, and also take no account of any drawing up of nitrates from the subsoil during dry weather, by which some of the previous loss to the upper layers may be recovered. On the other hand, the estimates of the loss by drainage are intentionally kept extremely moderate. On the whole, the evidence at our command leads to the conclusion that the quantity of nitrates produced in one of the Rothamsted soils in good agricultural condition, cultivated as bare fallow, will be equal to about 80 lbs. of nitrogen per acre. The time available for nitrification in a season of fallow is, however, greater than a year; it actually amounted to about 15 months up to the time of soil-sampling in the season 1880–1, and to about 14 months in 1881–2. Of the quantity of nitrates produced in extremely dry seasons we have as yet no experience.

We have spoken above of the effect of bare fallow in soils in good agricultural condition. In Table III. (Nos. 5 and 9) will be found determinations of nitrates in two soils of very low agricultural condition, which had been cultivated as bare fallow in 1878. The quantity of nitrogen as nitrates found was respectively 36·3 lbs. and 33·7 lbs. per acre, to the depth of 18 inches only. Both amounts are smaller than those found to the same depth in soils in good agricultural condition. The richness of the soil in nitrifiable matter has thus a great influence on the quantity of nitrate produced.

The fallow soils we have just mentioned were many of them very free from weeds, and none were very foul. In ordinary practice the land to be fallowed is often so foul that the nitric acid formed during the first summer and autumn will be taken up by the weeds as fast as it is produced. When, as is often the case, such land is not ploughed till the following spring, the loss of nitrates by drainage will be far smaller than on clean land.

Some further determinations of nitrates in uncropped soil will be found in Table IV. The previous history of Geescroft Field has been already given (p. 337). The surface soil of the plot formerly manured with farmyard-manure is rich in nitrogen, and compares perfectly in this respect with the farmyard-manure plots in Broadbalk Wheat-field and Hoos Barley-field. The soils of the other plots are very low in nitrogen, and in a decidedly impoverished condition. During the summer of 1882, the land was without a crop. It was ploughed and harrowed in February, and then left untouched till September, when it was again harrowed and rolled, and grass-seeds sown, which failed. The samples of soil were taken on April 9–13, 1883.

TABLE IV.—The QUANTITY of NITROGEN as NITRATES, in LBS. PER ACRE, in CROPPED and UNCROPPED LAND, VARIOUSLY MANURED.

	Little Hoos. Sept. 1877.	Hoos Field, July 1882.		Geescroft Field, April 1883, uncropped land, previously Beans.			
	Barley. Nitrate and Superphos.	Bokhara Clover. Mineral Manure.	White Clover. Mineral Manure.	No Manure.	Formerly Mineral Manure.	Formerly Nitrate and Minerals.	Formerly Farmyard-Manure.
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
1st, 9 inches	15·7	3·4	8·6	4·2	3·5	3·3	13·6
2nd, 9 inches	1·1	1·0	3·0	5·4	6 7	6·0	8·7
3rd, 9 inches	1·1	0·6	1·9	4·7	5·1	4·2	7·3
4th, 9 inches	1·4	1·0	3·1	2·7	2·6	3·9	8·4
5th, 9 inches	1·2	0·8	4·4	3·2	1·7	1·9	4·4
6th, 9 inches	1·4	1·7	5·3	2·2	1·4	2·2	2·0
7th, 9 inches	not sampled	not sampled	not sampled	3·0	1·1	1·5	1·7
8th, 9 inches				3·6	1·3	1·7	4·0
Above 27 ins.	17·9	5·0	13·5	14.3	15·3	13·5	29·6
Below 27 ins.	4·0	3·5	12·8	14·7	8·1	11·2	20·5
Total ..	21·9	8·5	26·3	29 0	23·4	24·7	50·1

Samples of soil taken at this time of the year, after the autumn and winter rains, seldom contain large quantities of nitrates near the surface. In the soils of Hoos Barley-field, sampled in March 1882 (Table VIII.), the nitrogen as nitrates amounted on the permanently unmanured plot to 15·7 lbs. in the first 27 inches; in the plots receiving only ash-constituents, to 18·3–23·5 lbs.; in the farmyard-manure plot to 44·1 lbs.; and in that which had received farmyard-manure for twenty years, but not for the last ten years, to 37·5 lbs. per acre. Compared with these quantities, the 14·3 lbs. found in the first 27 inches of the unmanured land in Geescroft, and the 29·6 lbs. in the plot formerly receiving farmyard-manure, are perhaps what we might expect, seeing that the drainage during the autumn and winter of 1882–3 was considerably greater than that of the previous year.* What, however, has become of the very considerable quantities of nitric acid which must have been produced in these soils during the last four years, in each of which the land was without a crop, and was frequently ploughed? How is it that larger quantities of nitrates are not found in the subsoil?

It is in the soil of the plot which was formerly heavily dressed with farmyard-manure that we should expect to find the largest accumulation of nitrate. This plot lies, however, near to the hedge green, and in taking the samples of soil, elm-roots were found down to the fifth nine inches from the surface: it is possible, therefore, that in this case the nitrates had been more or less removed from the subsoil. Omitting this plot from consideration, the facts furnished by the remaining plots still seem to point to a disappearance of nitrates in the subsoil. With the evidence at our command as to the production of nitrates in other exhausted soils at Rothamsted, we can hardly estimate the annual production of nitric acid in the soils in question as equal to less than 30 lbs. of nitrogen per acre. Taking even the excessive amounts of drainage shown during the last few years by the drain-gauges, the water percolating downwards from such a soil will contain an average of at least 7·5 parts of nitrogen as nitric acid per million of water. The field being pipe-drained at a depth of 3–4 feet, the quantity of water passing downwards will be diminished, but it is a question whether its average strength can be reduced thereby. Now the soil and subsoil of the unmanured plot in which nitrates were determined contained an average of 800,000 lbs. of water per acre in each nine inches of depth. We should

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* The drainage shown by the 60-inch drain-gauge during seven months, August to February 1881–82, amounted to 12·515 inches; and in eight months, August to March 1882–83, to 17·514 inches.

expect, therefore, on the above suppositions, to find about 6·0 lbs. of nitrogen as nitrate in each depth of the soil, or 48 lbs. in all. A glance at the figures shows at once that a considerably smaller quantity is actually present in each of the three plots, and that the deficiency is most marked in the lower layers of the subsoil. It is a question, therefore, whether the nitrates produced in the surface soil have not suffered partial reduction in the lower layers of the clay subsoil; but the evidence on the point is confessedly very incomplete.

2. *Nitrates in Land growing Cereal Crops.*

In the previous Report it was shown that nitrates are always found in the drainage-waters of Broadbalk Wheat-field during the winter months. It was also shown that a large proportion of the ammonium-salts applied as manure is speedily nitrified after their application to the land. A good example of the latter fact is afforded by the analyses of the drainage-waters of Plot 15 (see Table V., p. 346), to which 400 lbs. of ammonium-salts per acre were applied on October 27.

It was further stated in the previous Report, that as the development of the wheat-crop proceeds, the assimilation of nitrates by the growing plant becomes so active, that in summer nitrates are not found in the drainage-waters of many of the plots in the Experimental Wheat-field. The plots which exhibit for a time a drainage free from nitrates are those which receive no nitrogenous manure, or which receive 200–400 lbs. of ammonium-salts with all the ash-constituents required by the crop. In a season very favourable to early growth, as 1882, the nitrates may disappear from the drainage-waters of the unmanured plots by the end of April; while in a very unfavourable season, as 1879, the disappearance may not occur till the beginning of June. The nitrates disappear from the drainage of Plot 6, receiving 200 lbs. of ammonium-salts with ash-constituents, soon after their disappearance from the drainage of the unmanured plots. On Plots 7 and 13, with 400 lbs. of ammonium-salts and the necessary ash-constituents, the disappearance of the nitrates from the drainage-waters is later, and small quantities may continue to be found for some time.

The quantity of nitrates which disappears from the soil in early summer is in some cases truly astonishing. In the case of the plots receiving a spring-dressing of ammonium-salts it may apparently amount to more than the quantity of nitrogen found in the crop at harvest. It must be recollected, however, that the crop as harvested does not represent the whole plant—the roots, stubble, some of the lower leaves, and shed corn, being left behind in the soil. We must also take into account the presence of weeds, which doubtless actively assimilate the nitrates of the soil. It is possible, however, that when ammonium-salts are applied as a top-dressing in spring the whole of the ammonia does not rapidly change into nitrates, either from actual loss as ammonia, or from the presence of conditions unfavourable to rapid nitrification. It will be recollected that the calculations given in the previous Report (Table LI.) showed a considerable annual deficiency of nitrogen where 400 lbs. of ammonium-salts were applied in the spring, but none on Plot 15, where the salts were ploughed-in in the autumn.

To return from this necessary digression. The facts stated above point to the conclusion that in the case of land growing cereal crops, no nitrates, or very small quantities only, will be found in the first 27 inches of soil by the end of June, excepting in those cases where the quantity of nitrates in the soil has been greater than the crop has had power to appropriate.

The assimilation of nitrogen by a cereal crop practically ceases when blossoming is completed; from this point onward, therefore, nitrates may begin again to accumulate in the soil. If sufficient rain falls to keep the surface moist, we may expect nitrates to appear in the soil towards the end of July, or in August, and the soil at harvest may contain nitrates which a month previously had no existence. After harvest, if sufficient rain occurs, and especially if the land is ploughed, nitrification will actively continue. We may suppose that generally the maximum contents of nitrates will be reached about the end of September, and that from this time the quantity in the upper layers of the soil will in most cases tend to diminish, production being checked by the fall in temperature, while the removal of nitrates by drainage will in most seasons then become active.

The foregoing sketch of the course of change of the nitrates in a soil cropped with wheat or barley is founded mainly on the evidence furnished by the analyses of the drainage-waters. We have now to consider the evidence afforded by the analysis of the soils.

In Table III. (No. 10) will be found a determination of nitrates in the soil of a poor wheat-stubble in Hoos Field. The wheat had been grown, in alternation with fallow, for many years without manure. The crop was cut on Aug. 13, 1878; it yielded 19¾ bushels of dressed corn. The soil was sampled on Sept. 28. The first 18 inches of soil contained only 2·6 lbs. of nitrogen as nitrates. We have in the same Table (No. 11) a second determination of nitrates in the same soil, made in March 1881. The wheat-stubble of the previous year had been left unploughed up to the time of sampling. The nitrogen as nitrates was now 11·1 lbs. per acre in the first 18 inches, and 14·5 lbs. in the first 27 inches of soil.

In Table IV. we have a determination of nitrates in a barley-stubble in Little Hoos Field. The land had grown 9 crops of barley in succession with artificial manures alone, chiefly nitrate of sodium and superphosphate. The crop was cut on Aug. 14–21, 1877; it amounted to 48 bushels. The samples of soil were taken Sept. 26–29. The land had not been ploughed at the time of sampling. The nitrogen in the form of nitrates is here 15·7 lbs. per acre in the first 9 inches. It seems improbable that this nitrate was a residue of the 2½ cwts. of nitrate of sodium (44 lbs. of nitrogen) applied as manure; the greater part of it had more probably been produced in the soil since Midsummer, especially as the rainfall in July and August was considerable. On a duplicate plot in the same field, in which clover had been sown with the barley, only 6·1 lbs. of nitrogen as nitrates were found in the first 9 inches of soil. The young clover had thus evidently continued to take up nitrates from the soil after the growth of the barley had ceased. The chief interest of the experiment centres, however, in the analyses of the subsoil, which in this case was sampled to an unusual depth. The insignificant amount of nitrate found—only 6·3 lbs. of nitrogen per acre in 45 inches of subsoil—presents a vivid picture of the exhaustion of soil-nitrates which may take place during the growth of a vigorous cereal crop.

We turn now to Broadbalk Wheat-field. A plan of this field, showing the position of the plots, and the system of drain-pipes, has been given in the previous Report. Samples of soil were taken from many of the plots in October 1865, and in some of these nitric acid was determined in the following year by Dr. Pugh's method. The quantity of nitric acid found was large; but as the soils had been stored in a moist condition, nitrification had probably taken place after the collection.

The plots of Broadbalk Field were again sampled in October 1881. The manuring of the field, the average produce of each plot, and the produce of the particular harvest (1881), after which the soil was sampled, have been already given in Table II. From the end of March to the end of July the weather had been decidedly dry. The wheat was cut on Aug. 8–11. Immediately after followed a deluge of rain, amounting in the whole month to 5·817 inches. The crop was not carted till Aug. 29–Sept. 1, and was greatly damaged. In September the rainfall was 2·171 inches. The land was scarified in the beginning of the month, and ploughed towards the end of it. The samples of soil were taken between October 10 and 18, the sampling being interrupted by heavy rain on the 14th. The land was again ploughed and harrowed on October 27–29, and wheat drilled on all the plots.

Before calling attention to the quantity of nitrates found in the soils of the different plots at the time of sampling, it will be well to consider the evidence afforded by the composition of the drainage-waters collected during the same season. The drains in Broadbalk Field are from 2 feet to 2 feet 6 inches below the level of the land; whilst the nitrates have been determined in the soil to approximately the same depth, namely, 27 inches. The composition of the drainage-waters will be found in Table V. The thick black line shows the interval, October 10–18, in which the samples of soil were taken.

TABLE V.—The NITROGEN as NITRATES, in the DRAINAGE-WATERS of the PLOTS in BROADBALK WHEAT-FIELD, from March 1881 to January 1882.

PLOT.	March 5, 6, 7, Mixed.	August 30.		Sept. 25.	Oct. 14.	Oct. 23.	Nov. 25.	Nov. 27.	Dec. 7.	Dec. 17, 18, 20, 21, Mixed.	Jan.
		A.M. 6·30.	P.M. 2–3.								
NITROGEN AS NITRATES PER MILLION OF WATER.											
2	5·1	..	..	..	..	..	18·9*	7·1	..	5·8	..
3 & 4	3·4	1·2	0·9	4·7	6·3	8·7	5·4	7·0	5·1	4·1	3·5
5	3·6	1·5	1·4	6·0	8·1	9·5	6·0	7·3	6·3	5·0	3·9
6	3·9	..	1·9	7·0	12·3	13·3	8·5	8·8	7.8	6·2	6·2
7	3·9	..	4·1	..	..	18·5	9·8	11·7	10·9	7·3	7·2
8	5·3	..	..	..	..	23·0	17·1	18·2	16·8	11·2	10·2
9	5·2	..	..	..	..	21·8	12·3	..	13·8	9·4	10·0
10	5·9	20·3	16·1	20·6	21·0	16·2	11·2	14·5	14·0	9·3	9·1
11	5·4	9·0	6·8	10·7	12·6	19·6	12·6	14·9	13·7	9·4	9·4
12	4·8	..	2·3	7·2	9·3	15·2	10·5	11.6	10·2	7·6	7·4
13	4·5	..	2·4	..	9·0	14·5	9·8	11·1	9·3	6·8	6·5
14	5·1	..	..	..	..	15·0	9·7	12·1	9·4	6·8	6·7
15	11·6	..	..	..	..	13·1	66·6†	40·5	34·8	26·4	22·4
16	3·1	..	0·3	..	7·4	8·6	5·1	6·3	4·1	3·4	2·9
17	3·9	1·0	0·4	8·8	9·6	10·7	5·4	6·8	5·6	4·1	3·7
18	3·9	..	..	..	..	11·6	7·5	9·0	7·1	5·6	4·9
19	12·1	..	..	..	..	14·9	19·6‡	19·2	10·0	15·6	..

* Farmyard-manure applied Oct. 27. † Ammonium-salts applied Oct. 27.
‡ Rape-cake applied Oct. 28.

The last running of the drains preceding the harvest of 1881 occurred on March 7. The top-dressings of ammonium-salts, and of nitrate of sodium (see Table II.), were applied to their respective plots on March 12. No running of the drain-pipes occurred till after harvest, on Aug. 30.

The drain-pipes of Plots 3&4, 5, 16, and 17, receiving no nitrogenous manure, all ran on Aug. 30; the water contained a very small amount of nitric acid, amounting in the mean to barely 1·0 of nitrogen per million. The water from Plot 6, manured in the spring with 200 lbs. of ammonium-salts per acre, contained at the same time 1·9 of nitrogen per million. The waters from Plots 12, 13, and 7, receiving 400 lbs. of ammonium-salts, contained respectively 2·3, 2·4, and 4·1 of nitrogen per million.

With the evidence already before us, it scarcely admits of doubt that nitrates must have practically disappeared from the upper layers of the soil of the unmanured plots during the preceding summer; also from the soil of Plot 6; and probably, though less certainly, from Plots 13 and 7. The small amounts of nitrate appearing in the drainage-waters from these plots on Aug. 30, are therefore in all probability due to nitrification recommencing in the soils as they became saturated by the heavy rains of August. Nor is the fact that the waters from Plots 6, 12, 13, and 7, contain more nitrate than those of the unmanured plots, conclusive evidence that there was a residue of nitrate present through the summer in these cases; for wherever nitrogenous manure is applied, and larger crops are annually produced, there the soil is richer in nitrogenous organic matter (the residues of previous crops), and in consequence yields a larger quantity of nitric acid when nitrification sets in. That the nitrates in the waters of the plots already named were not derived from the washing out of a residue of nitrates, but from fresh nitrification, is further shown by the fact that the proportion of nitric acid rapidly increases with each running of the drains, till a maximum is reached on Oct. 23.

When we turn to the drainage of Plot 10, which had received 400 lbs. of ammonium-salts, like Plots 7, 11, 12, 13, 14, 15, and 18, but without any of the ash-constituents required for the crop, a very different state of things is manifest. Here the crop has been unable to assimilate all the nitrates at its disposal, and a considerable residue has remained in the soil throughout the summer. The first drainage-water from this plot is thus rich in nitrates, containing 20·3 of nitrogen per million, and the proportion is found to have decreased instead of increased by October 23.

The soils of Plot 9—on which nitrate of sodium, half with and half without ash-constituents, is applied; Plot 8—where as much as 600 lbs. of ammonium-salts with ash-constituents are applied; and, to a less extent, Plot 11—wnere potash is omitted in the manure—are in a condition more or less similar to Plot 10. In all these cases there is a considerable residue of nitrate remaining unassimilated by the crop, which appears in the drainage-water on the first running of the drains.

We now turn to the determinations of nitric acid in the soils of the various plots in Broadbalk Field. We must, however, at starting beg the reader to remember the considerable difficulty of the task we have attempted. The mean composition of the soil of a plot 352 yards long has to be calculated from samples taken from six holes equally distributed in its length; that the mixture prepared from such samples should sometimes fail to represent accurately the average composition of the soil is surely to be expected. In two instances in Broadbalk Field, and one in Hoos Field, the surface soil from individual holes has contained so high a proportion of nitric acid and chlorine, as to lead to the supposition that the sample had been taken from a spot contaminated by the droppings of horses when ploughing; or where possibly a bag of manure had been set down and emptied during sowing. In these cases the results given have been obtained from a mixture of five holes, or, in the case of Hoos Field, of three holes only. There is also always some difficulty in preserving a large number of soil-samples, in this case 160, entirely free from accidental contamination before they are put into bottles; and in one instance, that of the third depth of the unmanured Plot 16, it has been necessary to exclude the results of the analysis from the table, the nitric acid found being far larger than seemed possibly consistent with the truth. A small amount of error will, indeed, distinctly affect the result; the addition of one grain of nitric nitrogen to 1144 lbs. of soil would, in fact, make a difference of 1 lb. per acre in the quantity calculated for a depth of 27 inches. It is clear, therefore, that it will be unsafe to found conclusions on small differences between different plots; we must rather aim to seize the main features of the results.

In calculating the results of the analyses into pounds per acre, it has been assumed that the weight of soil per acre in the first 9 inches is 2,552,203 lbs.; in the second 9 inches, 2,706,573 lbs.; and in the third 9 inches, 2,750,601 lbs., these weights being the mean of all the samples taken on the present occasion, excluding only the surface soil of Plot 2. The analysis of this soil (receiving farmyard-manure) is reckoned on 2,456,509 lbs., the weight calculated from its own samples.

It is of interest to note, that even among the artificially manured plots there is an obvious tendency to give lower weights of surface soil the heavier the crops, that is, the greater the root development, and the amount of crop-residue. Hence the calculation of the analyses relating to the soils of such plots on the rather higher average weights, will so far give results somewhat in excess; whilst those relating to the poorer plots will be proportionally low.

In Table VI. will be found the quantities of nitrogen as nitric acid existing in the first, second, and third 9 inches of soil in the various plots of Broadbalk Field, when sampled on October 10–18, 1881. In the same Table are given the estimated quantities of nitrogen as nitrates removed from each plot in the drainage-water after the first starting of the drain-pipes on August 30. The estimates are calculated from the composition

TABLE VI.—NITROGEN as NITRIC ACID in the SOIL and SUBSOIL, and in the DRAINAGE-WATER of various PLOTS in BROADBALK WHEAT-FIELD, in lbs. per ACRE.

PLOT.	In the Soil when Sampled October 10–18, 1881.						Estimated as removed in Drainage, August 30—January 31.			Estimated in Soil if no Drainage before Sampling.
	First Nine Inches.	Second Nine Inches.	Third Nine Inches.	Total Twenty-seven Inches.	Excess over:— Plots 3 & 4	Excess over:— Plot 5A.	Before Soil Sampling.	After Soil Sampling.	Total	
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
2	30·0	15·4	6·8	52·2	35·8	27·9	..	..	..	..
3	9·7	5·3	2·8	17·8	..	− 6·5	1·3	10·3	11·6	17·7
4	9·2	4·0	1·8	15·0	..	− 9·3				
5 A	12·6	7·1	4·6	24·3	7·9	..	1·3	11·9	13·2	25·6
6 A	16·5	7·5	4·7	28·7	12·3	4·4	1·5	16·0	17·5	30·2
7 A	22·8	11·3	5·7	39·8	23·4	15·5	[3·5]	20·6	24·1	43·3
8 A	21·1	13·9	7·8	42·8	26·4	18·5	?	30·1	..	..
9 A	19·7	10·0	8·2	37·9	21·5	13·6	?	25·2	..	..
9 B	16·3	20·1	17·7	54·1	37·7	29·8				
10 A	14·2	11·9	7·3	33·4	17·0	9·1	7·0	24·1	31·1	37·9
10 B	13·4	9·0	5·9	28·3	11·9	4·0				
11 A	17·9	9·3	3·6	30·8	14·4	6·5	4·7	22·8	27·5	35·5
12 A	15·3	10·3	4·4	30·0	13·6	5·7	2·7	18·1	20·8	32·7
13 A	13·1	8·9	2·6	24·6	8·2	0·3	2·7	16·7	19·4	27·3
14 A	16·1	8·7	3·6	28·4	12·0	4·1	?	17·1	..	..
15 A	13·4	10·7	4·1	28·2	11·8	3·9	..	..	..	..
16 A	10·6	5·0	[2·3]	17·9	1·5	− 6·4	1·7	8·7	10·4	19·6
17 A*	10·3	7·5	3·4	21·2	4·8	− 3·1	2·6	10·3	12·9	23·8
18 A*	11·4	8·4	5·2	25·0	8·6	0·7	?	13·2	..	..
19	14·1	13·0	7·1	34·2	17·8	9·9	..	..	..	..

* The manures on Plots 17 and 18 alternate. This year Plot 17 had received only Mixed Mineral Manure, and Plot 18, 400 lbs. of Ammonium-salts.

of the water issuing from the drain-pipes (Table V.), the quantity of the drainage being assumed as equal to that shown by the 60-inch soil drain-gauge. The amount removed in drainage *before* the samples of soil were taken is given separately in Table VI.; and in the right-hand column this amount is added to that found in the soil, thus showing, as far as in our power, the amount of nitrogen as nitric acid which would have been present in the soil if no drainage had occurred. In the case of several of the plots no drainage before soil-sampling is recorded, the pipes, in fact, did not run. In all these cases loss of nitrates by drainage and diffusion doubtless took place, though we have no means of estimating the quantity actually passing below the first 27 inches of soil. Evidence that the amount passing into the subsoil by drainage and diffusion may in some cases considerably exceed that estimated from the composition of the pipe-drainage, is afforded by results obtained relating to the amount of the chlorides present in the soil.

As a very considerable amount of drainage took place in Broadbalk Field after the samples of soil were taken, it is obviously of interest to compare the results of the analyses of the soils with those of the subsequent drainage-waters. If the drainage-waters fairly represent the condition of the first 27 inches of soil on the different plots, the quantities of nitrate found in the waters should show a similar relation between themselves, as exists between the nitrates found in the soils of the corresponding plots. This comparison of the results of the soil-analysis with the composition of the subsequent drainage from the same plot, indeed brings to view some facts which would otherwise escape attention.

Turning now to the details of the soil-analyses, we observe, first, that the nitrates are most abundant in the first 9 inches of depth; the mean proportion at the three depths (excluding Plot 9B) is, in fact, as 100, 59, and 31. The nitrates have, in fact, mainly been produced near the surface, in most cases quite recently, and are now gradually passing downwards. The case is quite different, however, on Plot 9B, where more nitrate of sodium has been applied than the crop could make use of; here the nitrates are present in largest quantity in the second and third depths, and a part has probably passed to a still lower level. A large portion of this nitrate has existed in the soil ever since the application of the manure in March, and has since then, and especially since the removal of the crop, been moving slowly downwards by diffusion and drainage. From a similar cause, the quantity of nitrate in the lowest depth of Plots 8A, 9A, and 10A is also above the average.

Passing next to the quantity of nitrate found in the various plots, we observe that the unmanured soils of Plots 3, 4, and 16A, yield the lowest amounts, namely 17·8 lbs., 15·0 lbs., and 17·9 lbs. of nitrogen as nitrates per acre. Plot 5A, continuously manured with ash-constituents, yields 24·3 lbs.; this amount, however, bears a higher relation to that contained in the subsequent drainage than is shown by the adjoining Plots 3, 4, 6A, and 7A. Plot 17A, also receiving ash-constituents alone during the year in question, yields 21·2 lbs. per acre. Of the effect of the various ash-constituents in promoting nitrification in the soil, or on the migration of soluble matters, we have at present no certain information.

When we turn to Plots 6A, 7A, and 8A, receiving respectively 200 lbs., 400 lbs., and 600 lbs. of ammonium-salts, with all the necessary ash-constituents, we find 28·7 lbs., 39·8 lbs., and 42·8 lbs. of nitrogen as nitrates per acre, the quantities increasing with each addition to the manure. The quantity of nitrate in the soil of Plot 8A bears a low relation to that found in Plots 6A and 7A. In the case of Plot 8A we are unable to form an estimate of the quantity of nitrate lost by drainage before the sampling of the soil, as the drain-pipe did not run till afterwards; the quantity lost by drainage and diffusion may well, however, have been greater than on Plot 7. The nitrate in the soil of Plot 8A is also very low in relation to that found in the subsequent drainage from the plot. If the proportion between the nitrate in the soil and that removed in the subsequent drainage were the same as on Plots 6A, 7A, and 9AB, the soil of Plot 8A would contain about 56 lbs. of nitrogen as nitrates. It seems possible that in this case an unusually large amount of nitrogen may have nitrified on the plot after the samples of soil were taken; nitrates might thus appear in the drainage which did not exist in the soil at the date of sampling.

In the soil of Plot 9A, where nitrate of sodium equivalent to 400 lbs. of ammonium-salts is applied with ash-constituents, the nitrogen as nitric acid is 37·9 lbs., a quantity quite similar to that found in Plot 7A, receiving the corresponding amount of ammonium-salts, and the same ash-constituents. On Plot 9B, where the same quantity of nitrate of sodium is applied, but without ash-constituents, the nitrogen existing as nitrates rises to 54·1 lbs., a large residue of nitrate unused by the crop clearly remaining in the first 27 inches of soil.

On Plots 10A and 10B, receiving 400 lbs. of ammonium-salts, without ash-constituents, there is deficient produce, and there will be a proportionally large amount of nitrate annually derived from the manure unused by the crop. The quantities found in the soil to the depth of 27 inches are nevertheless not relatively large—namely 33·4 lbs. and 28·3 lbs. of nitrogen as nitrates. The smaller amount is found in the soil of Plot 10B, where, owing to a residue of long previously applied ash-constituents, the crop is always rather better, and would therefore leave rather more crop-residue. In these facts there would seem to be evidence that the whole of the soil-nitrates found was not due to crop-residue, but partly to manure-residue also. That the amount remaining within the range of the soil-sampling was not larger on either plot, is consistent with the fact that there is a greater loss by drainage from these than from any of the other plots receiving the same amount of ammonium-salts, as shown by the estimates for two years, as given in our former Report, and by the composition of the drainage previous to the soil-sampling, as given in Table VI. of the present Report; and it is to be supposed that more has also passed below the drain-pipes, and the range of the soil-samples.

Plots 11, 12, 13, 14, and 7, all receive 400 lbs. of ammonium-salts, and all the same amount of superphosphate, with the addition of sodium-salt to Plot 12, potassium-salt to Plot 13, magnesium-salt to Plot 14, and sodium- potassium- and magnesium-salt to Plot 7. Thus the conditions of the several plots as to soluble matters within the soil are very different. On Plot 11, with superphosphate, there is more produce than on Plot 10 without it, and therefore more crop-residue; but still there will be an excess of nitrates directly derived from the ammonium-salts, compared with the amount on either Plots 12, 13, 14, or 7, where there is considerably more growth. The quantity of nitrogen as nitrate found in the soil to the depth of 27 inches is, however, only 30·8 lbs., or about the same amount as on Plots 10, 12, and 14. But both the previous and the recent records show a greater loss in the collected drainage of Plot 11 than of the other plots of the series under consideration, and there will doubtless be on the average more loss below the level of the drains, and of the range of the soil-sampling. Plots 7 and 13, both receiving potash, yield the heaviest crops of the series. If therefore the nitrates found to the depth of 27 inches depended wholly upon the amount of crop-residue, we should expect to find the largest amount in the soil of both these plots. The fact is, however, that the smallest amount within this series (24·6 lbs.) is found in the soil of Plot 13, with potassium, but without sodium- and magnesium-salts, and the largest amount (39·8 lbs.) in that of Plot 7, with sodium and magnesium, as well as potassium-salt applied. Even assuming there may be some error in the actual figures (and by comparison it would be judged that those for Plot 13 may be too low), the direction of the difference is in accordance with the estimates of average loss by pipe-drainage, Plot 13 showing more loss than Plot 7; whilst on the other hand, with the much higher amount of nitrates found in the soil of Plot 7 at the time of sampling, its immediately succeeding drainage is stronger. The conclusion is, that there is upon the whole a greater tendency to passage downwards by drainage, and less to retention within the first 27 inches of soil on Plot 13 than on Plot 7. Whether this be due to more free movement downwards, with the different conditions within the soil dependent on the different supply of saline matters, we have not the means of deciding. Plot 7 should, it is true, have a somewhat greater accumulation of crop-residue, and should therefore yield rather more nitrates from that source. But only a small proportion of the excess of nitrogen as nitrates, which the figures as they stand show in the soil of Plot 7 to the depth of 27 inches, could be so accounted for. It is very probable, indeed, that a portion of the excess of nitrates found in the soil of Plot 7 is due to less free passage downwards, from whatever cause.

In addition to the various conditions above alluded to affecting the amount of nitrates produced, and their tendency to remain at higher, or to pass to lower levels in the soil, the very different condition as to moisture of the different plots after harvest must not be overlooked. Thus, it is estimated that more water, equal in amount to some inches of rain, has been evaporated from the soils yielding the heavier than from those yielding the lighter crops. This implies, of course, that much less subsequent rain will be required to bring the soil to an equal degree of saturation, and so far as it is dependent on this, to cause an equal passage downwards, in the case of soils giving the poorer than of those giving the heavier crops. Then there is also the possibility of a different mechanical condition of the soils of different plots.

On Plot 19, manured during the three preceding seasons with rape-cake only, we find 34·2 lbs. of nitrogen as nitrates, a quantity considerably larger than that contained in the adjoining plots manured with ammonium-salts. As the rape-cake only slowly decomposes in the soil, a part of the nitrates found will in this case be due to the nitrification of a residue of the manure. A still more striking example of the production of nitrates from organic manures is afforded by Plot 2, which receives annually fourteen tons of farmyard-manure: here the quantity of nitrate in the soil amounts to 52·4 lbs. of nitrogen per acre, exceeding, in fact, every plot excepting that manured with an excess of nitrate of sodium.

The origin of the very considerable quantities of nitrates found in the soils of Broadbalk Field will require but little explanation after what has been already stated. The nitrates found in these soils in October have been produced by the nitrification of the original nitrogenous humic matters of the soil; or from the decay of crop-residues (roots, leaves, and stubble); or from the nitrification of organic nitrogenous manures, as rape-cake or farmyard-manure; or, possibly from the oxidation of residues of ammoniacal manure not previously nitrified; or they consist in part of residues of nitrates which have remained in the soil through the summer. Of the quantity of nitrates produced solely from the oxidation of nitrogenous humic matters, including crop-residue, we have examples in the case of Plots 3 & 4, 16A, 5A, 17A, and probably of several others. Whether any of the nitrate on such plots as 7A and 9A, was due to a residue of nitrate left unused by the crop, must remain doubtful, but the amount of such residues can hardly be very large. Plot 9B affords a capital example of a large residue of nitrate left unappropriated by the crop. In Plots 2 and 19 we have examples of the influence of farmyard-manure and rape-cake in increasing the amount of nitrates produced in the soil. The amount of nitrification observed was probably in all cases considerably above the average, being largely due to the early saturation of the soil by the heavy rains of August.

As the nitrogenous organic matter in the soil was clearly the principal source of the nitric acid it contained, and as this nitrogenous organic matter is largely derived from the residues of previous vegetation, it will be of interest to compare the amount of nitric acid found in certain typical plots with the amount of nitrogen found by analysis in the first 9 inches of soil, and with the average amount of produce which the soil of each plot has yielded. This comparison will be found in Table VII. The nitrogen contained in the surface soil of each plot was ascertained from the analysis of the same samples in which nitric acid was determined. The produce includes corn and straw. The nitrogen as nitric acid is that present in 27 inches from the surface.

TABLE VII.—NITROGEN AS NITRATES IN BROADBALK SOIL, October 1881, for 1000 of SOIL NITROGEN, and of AVERAGE PRODUCE.

PLOT.	MANURING.	Nitrogen as Nitrates in Soil.		
		For 1000 of Soil Nitrogen.	For 1000 Average Produce.	
			Average 30 Years 1852–81.	Average 2 Years 1880–1.
3&4	Unmanured..	6·7	7·6	8·6
6 A	200 lbs. Ammonium-salts, Mineral Manure	10·2	7·3	7·3
7 A	400 lbs. " " " " ..	12·9	7·0	7·8
8 A	600 lbs. " " " " ..	13·3	6·3	6·7
9 A	550 lbs. Nitrate of Sodium, Mineral Manure	12·4	5·5	6·1
9 B	550 lbs. Nitrate of Sodium	19·9	12·6	20·4
2	14 tons Farmyard Manure	11·4	9·4	10·1

In the above Table we really compare the quantity of nitric acid produced during two months in the field (plus residues of nitrates in certain cases), with the total nitrogen contained in the surface soil, and with the amount of previous produce on the same plot. The figures would be more exact if we knew in every case the quantity of nitric acid lost by drainage before the samples of soil were taken for analysis, as this quantity of nitric acid has clearly to be credited to the soil or manure of the plots in question. We are, however, only able to make this correction in the case of three of the plots mentioned in the Table. It will be more convenient, therefore, to confine ourselves to the figures deduced from the actual determinations of nitric acid in the soils.*

On the permanently unmanured Plots 3 & 4, 1000 of total soil nitrogen has yielded 6·7 of nitric nitrogen; and on the unmanured Plot 16A it has yielded 6·6. On the very moderately manured Plot 6A, yielding nearly twice the produce of the unmanured land, the product in the same time has been 10·2 of nitric nitrogen per 1000 of soil nitrogen. This increased capacity for producing nitrates is shown by every plot in the field yielding an increase of produce, the lowest proportions being 8·1 per 1000 in the case of Plot 13A, and 7·6 per 1000 in the case of Plot 17A. Plot 5A, manured with ash-constituents alone, shows 9·7 per 1000; the amount of nitric acid found in this soil, judged by the evidence of the drainage-water, seems to be rather high. We have, further, an indication that with a rise in productiveness over that shown by Plot 6A we have a further rise in the facility with which soil nitrogen is oxidised; the product of 1000 of soil nitrogen on Plots 2, 7A, and 9A being 11·4, 12·9, and 12·4. The high figure shown by Plot 8A, and the still higher figure shown by 9B, are of course due to a larger residue of nitrates in the soil.

The fact indicated by the above calculations is one of great practical importance. Soil contains nitrogenous matters which nitrify with different degrees of facility. The bulk of the nitrogenous matter of soil is only capable of very slow oxidation, but a smaller proportion is far more readily converted into nitric acid. In thoroughly exhausted land the easily nitrifiable matter has to a large extent disappeared; in soil in good agricultural condition it is being continually renewed by fresh crop-residues, or by the application of organic manures. This easily nitrifiable matter constitutes a chief part of the floating capital of the soil, on which its immediate productiveness depends. The larger quantity of more inert nitrogenous matter constitutes the sunk capital which only very slowly becomes available.

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* In the case of Plots 3&4, 6A, and 7A, the corrected proportion of total soil nitrogen to nitric nitrogen will be 1000 to 7·3, 10·7 and 14·0; and the corrected proportion of produce (average of 30 years) to nitric nitrogen, 1000 to 8·1, 7·6 and 7·5.

The facts shown by the other columns of Table VII. are nearly related to those just mentioned. When we see that the average of 30 years' produce of corn and straw on the unmanured plots stands to the amount of nitrogen oxidised in this soil to nitric acid as 1000 : 7·6; that on Plot 6A, with nearly double the produce, it stands as 1000 : 7·3; and on Plot 7A, with more than two and a half times the produce, as 1000 : 7·0, it is surely evident that the capacity for producing nitrates rises side by side with the increase of crop; that, in fact, the crop-residue annually left in the soil constitutes in most cases the chief material out of which nitrates are produced.* Recent crop-residues are not, however, in any case the sole source of soil nitrates; if this were so, it is clear that the figures given in the Table would be in all cases identical, while in fact the proportion of nitric acid produced per 1000 of crop decreases somewhat with each additional increment of crop. This is, however, what must naturally be expected. The nitric acid which is produced is derived partly from the old nitrogenous capital of the soil, and partly from comparatively recent crop-residues; in the case of the unmanured plots the influence of the old nitrogenous capital of the soil is shown to the largest extent, while on the plots of heaviest produce (9A and 8A) it has least influence on the result. On Plots 2 and 9B we need hardly remark that the manure furnishes a considerable source of nitrate over and above the crop-residue.

Before leaving the results furnished by Broadbalk Field, we must look for a moment at the general relation of the nitrate contained in the subsequent drainage to that shown by analysis as existing in the soil. Taking an average of all the plots in which the composition of the subsequent drainage admits of estimation, we find that for 100 lbs. of nitrate existing in the soil in October, 60·2 lbs. have been removed in the course of 3½ months' drainage (8·2 inches), or have passed below the level of the drain-pipes. The amounts of nitrates passing into the subsoil will really be in excess of these estimates, but they are the only figures at command.

We may now pass to the determinations of nitric acid made in the soil of various plots in the Experimental Barley-field.

The manuring of the plots with which we are at present concerned, and their average produce during 30 years, 1852–81, have been already given in Table I. (p. 335). The crop of 1881 was cut on August 5 and 8, and carried on August 18. The land was then scarified, and afterwards ploughed in the beginning

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* The vegetable matter resulting from dead weeds will participate with the residue of the crop in affording material for nitrification; this residue of weeds must always be included in the idea of crop-residue.

of October. Towards the end of February 1882 the land was harrowed and rolled. The samples of soil were taken between February 24 and March 7. The quantity of nitrogen as nitric acid found in the soils and subsoils of the various plots will be found in Table VIII.

TABLE VIII.—NITROGEN as NITRATES in the SOIL and SUBSOIL of various Plots in HOOS BARLEY FIELD, March 1882.

PLOT.	MANURING.	Nitrogen as Nitrates in lbs. per acre.			
		First Nine Inches.	Second Nine Inches.	Third Nine Inches.	Total Twenty-seven Inches.
		lbs.	lbs.	lbs.	lbs.
1 O.	Unmanured	5·9	4·7	5·1	15·7
2 O.	Superphosphate	6·4	5·7	6·3	18·4
3 O.	Sulphates of Alkalies	6·1	5·7	6·5	18·3
4 O.	Mixed Mineral Manure	7·5	9·7	[6·3]	23·5
	Mean of Series	6·5	6·5	6·1	19·0
1 A.	200 lbs. Ammonium-salts	6·1	8·3	7·0	21·4
2 A.	Ditto, with Superphosphate	7·4	11·5	8·2	27·1
3 A.	Ditto, with Sulphates of Alkalies	7·5	6·2	5·6	19·3
4 A.	Ditto, with mixed Min. Manure	8·1	5·8	8·9	22·8
	Mean of Series	7·3	8·0	7·4	22·7
1 AA.	275 lbs. Nitrate of Sodium	9·7	6·8	9·0	25·5
2 AA.	Ditto, with Superphosphate	7·8	10·4	8·3	26·5
3 AA.	Ditto, with Sulphates of Alkalies	7·8	6·2	8·1	22·1
4 AA.	Ditto, with mixed Min. Manure	9·4	5·7	6·2	21·3
	Mean of Series	8·7	7·3	7·9	23·9
1 C.	1000 lbs. Rape Cake	10·6	13·7	7·9	32·2
2 C.	Ditto, with Superphosphate	7·5	13·1	7 8	28·4
3 C.	Ditto, with Sulphates of Alkalies	10·6	11·2	9·5	31·3
4 C.	Ditto, with mixed Min. Manure	8·2	11·5	8·7	28·4
	Mean of Series	9·2	12·4	8·5	30·1
7^1	Unmanured, 1872–81 (Farmyard-manure, 1852–71)	14·8	11·8	10·9	37·5
7^2	14 tons Farmyard-manure	18·6	14·6	10·9	44·1

The experimental difficulties referred to in the case of Broadbalk Field have proved equally great in the investigation now before us; we must be content, therefore, to seize the general features of the results, without expecting perfect accuracy in every detail. The result of the analysis of the third depth of Plot 4O (Table VIII.) has been rejected as plainly excessive, and the figure found for Plot 2O substituted.

In calculating the results of the analyses into pounds per acre, the weight of fine soil in the first 9 inches of the plots of the O A, and AA series, has been taken as 2,527,879 lbs., this being the mean weight actually found in the O, A, AA, and AAS series. The first 9 inches of soil of the plots of the C series (rape-cake) have been taken as 2,361,461 lbs., the mean weight in this series. For the first 9 inches of Plots 7^1 and 7^2 (receiving farmyard-manure) their own weights have been taken. In the case of all the subsoils, 2,593,853 lbs. have been taken as the weight of fine soil in the second depth, and 2,661,134 lbs. as the weight in the third depth, these being the mean weights of all the series above mentioned.

In considering the results of the analysis of the soils in Hoos Field, we must bear in mind the time of year at which the samples were taken. We have not to do, as in Broadbalk, chiefly with a recent production of nitrates, formed in the soil at the end of summer and early autumn, but with the nitrates left in the soil after the washing of the autumn and winter rains. The total amount of drainage passing through the 60 inch drain-gauge during the seven months from August to February was, in fact, 12·5 inches. Of the quantity of nitrates which has passed into the subsoil by drainage during this period, we get some idea from the results already given relating to Broadbalk Field (Tables V. and VI.). It naturally results from the washing out to which the soils have been subjected, that the nitrates are found more evenly distributed than was the case in the Broadbalk samples. In Broadbalk Field, omitting Plot 9B, the nitrates were distributed throughout the first, second, and third 9 inches of soil in the proportion of 100, 59, and 31. In Hoos Field the nitrates are distributed through the same three depths in the proportion of 100, 102, and 88.

There are only four plots in Hoos Field (Plots 1O, 4O, 4A, and 7^2) where the manuring has been identical with plots in Broadbalk (Plots 3 & 4, 5A, 6A, 2); in each of these cases the nitrates found in Hoos Field are distinctly below those found in Broadbalk; a result partly due to the washing of the Hoos soils by the autumn and winter rains, but also partly to the smaller residue left in the soil by a barley-crop.

The four plots in the O series, which have received no nitrogenous manure for 30 years, give a mean of 19·0 lbs. of nitrogen as nitrates in 27 inches of soil. The entirely unmanured plot gives 15·7 lbs.

The four plots in the A series, receiving respectively the same ash-constituents as the four in the O series, but with 200 lbs. of ammonium-salts in addition, give a mean of 22·7 lbs. of nitrogen as nitrates in 27 inches.

The four plots in the AA series, also receiving the same ash-constituents as above, but with 275 lbs. of nitrate of sodium, give a mean of 23·9 lbs. of nitrogen as nitrates in 27 inches.

The four plots in the C series, with the same ash-constituents, and 1000 lbs. of rape-cake, give a mean of 30·1 lbs. of nitrogen as nitric acid to the same depth.

There can be no question that the nitrates found in the soils of the O series have been produced by the oxidation of the nitrogenous organic matter of the soil. In the A and AA series there can be little doubt that a large portion of the nitrates has a similar origin; Plots 1 and 3 in these series are the only ones in which it seems probable that any residue of nitrates derived from the manure can have remained in the soil through the summer. In the plots of the C series, on the other hand, a part of the nitric acid is apparently due to the rape-cake applied as manure, which only slowly decomposes in the soil. The plots which have received rape-cake for 30 years show, in fact, a higher average amount of total nitrogen in the soil than any other plots in the field, with the exception of those receiving farmyard-manure. The considerable amount of nitric acid in the plot manured with rape-cake in Broadbalk Field has been already noticed.

There is thus, notwithstanding the comparatively washed-out condition of the plots when sampled after the autumn and winter rains, still a sufficiently marked difference between the mean amount of nitrates found in the soils of the different series, to be traceable to their different conditions of manuring, and the varying amounts of crop and crop-residue. From the same cause the differences among the plots within each series are also small; but there are indications that these too are dependent on the varying conditions of manuring and growth. In series O, A, and AA, the plots 2 and 4 receiving superphosphate, which yield the largest crop and crop-residue, are those which generally contain the largest quantity of nitric acid. With more growth there would also be more evaporation; the soils after harvest would therefore be drier, in some cases considerably so, and hence it would require so much more subsequent rain to cause the same amount of passage of nitrates downwards, and the nitrates would accordingly remain in a greater proportion within the range of the soil-sampling.

Among the plots of the C (Rape-cake) series a contrary result is observed. Plots 1 and 3, with somewhat less growth, nevertheless show rather more nitrates than Plots 2 and 4; which would seem to be due to a greater residue of manure in the former plot.

The plots receiving farmyard-manure give the largest amounts of nitrates. On Plot 7², where 14 tons of farmyard-manure have been applied annually for 30 years, the nitrogen in the form of nitric acid amounts to 44·1 lbs. per acre to the depth of 27 inches. Of great interest, too, is the result presented by Plot 7¹. Here 14 tons of farmyard-manure were applied for 20 years, but the land during the next 10 years was unmanured, and continually cropped with barley. The effect of the previous manuring is still abundantly shown in the barley-crop (see Table I.), and the land is found to contain 37·5 lbs. of nitrogen as nitrates, a quantity larger than on any other plot, excepting that still receiving an annual dressing of farmyard-manure.

The relation between the quantity of nitrogen as nitrates found in 27 inches of the barley soils, and the total quantity of nitrogen present in the surface-soils of the same plots, is shown in Table IX. The relation of the nitrates to the average total produce of the land is also shown.

TABLE IX.—NITROGEN AS NITRATES IN HOOS FIELD SOILS, March 1882, for 1000 of SOIL NITROGEN, and of AVERAGE PRODUCE.

PLOTS.	MANURING.	Nitrogen as Nitrates in Soil.		
		For 1000 of Soil Nitrogen.	For 1000 Average Produce.	
			Average Fourteen Years 1868–81.	Average Two Years 1880–1.
1 O	Unmanured	6·7	9·4	8·4
1–4 A	Ammonium-salts, with and without Minerals	8·8	5·5	5·1
1–4 AA	Nitrate of Sodium „ „ „	8·7	5·3	4·9
1–4 C	Rape Cake „ „ „	10·0	6·2	5·5
7²	Farmyard-manure	9·9	7·2	6·7

The comparison between the quantity of total nitrogen in the surface-soil, and the quantity of nitrates existing in the land, is not so striking as in the case of the wheat-field, partly because in the present case the nitrates were to a considerable extent removed by drainage before the samples of soil were taken. The results, however, are in the same direction as before. Any increase in the produce of the land is attended with an increase in the amount of nitrates produced within the soil, due therefore to an increased amount of crop-residue. Where rape-cake or farmyard-manure is applied there is not only a nitrifiable crop-residue left in the land, but also a residue of nitrogenous organic matter from the manure, which still further adds to the quantity of nitrate produced.

The relation between the previous amount of crop and the quantity of nitrate in the soil is far less marked than in the wheat-field. This is partly owing to the comparatively washed-out condition of the barley land, but mainly to the much smaller residue left in the soil by barley than by wheat. In the wheat-field the percentage of nitrogen and carbon in the soil of each plot is plainly related to the quantity of crop annually produced. In the barley-field considerable variations in crop are attended with only small alterations in the quantity of nitrogen and carbon in the soil. The recent crop-residues being smaller in the barley-field, a larger proportion of the nitrate is due to the old nitrogenous capital of the soil, or in some cases to residues of manure. The connection between the amount of crop and the production of nitrates is best seen when reference is confined to the last two crops of the field. The relation between the results of different plots is similar to that shown in the wheat-field. (Table VII.)

3. *Nitrates in Land growing Leguminous Crops.*

Several determinations have been made of the quantity of nitrates existing in soils which have grown leguminous crops; to these we must now call attention.

In Table III. will be found determinations of nitrates in two soils in Agdell Field which had grown beans. On the fully manured rotation the bean-crop yielded $26\frac{5}{8}$ bushels of corn; the total crop contained about 66 lbs. of nitrogen. The soil gave in the first 18 inches 20·5 lbs. of nitrogen as nitrates; the other half of the land, which was in bare fallow, yielding at the same time 48·8 lbs. On the rotation manured with superphosphate only, the produce was $7\frac{3}{4}$ bushels of corn, and the total crop contained about 26 lbs. of nitrogen. The soil yielded 10·6 lbs. of nitrogen as nitrates in 18 inches, the corresponding bare fallow containing 36·3 lbs. The bean-crops were cut on Aug. 24, the soils were sampled on Sept. 24–25, 1878. A part of the nitrates found in these soils would probably be produced in the month of August, when the rainfall was very excessive (nearly 5 inches), or in September.

In Table III. will also be found a determination of nitrates in the same field after a crop of clover in 1882. The clover was grown on part of the fully-manured rotation plot. The crop, in two cuttings, yielded $83\frac{2}{3}$ cwts. of hay, estimated to contain nearly 200 lbs. of nitrogen. The clover land, and the corresponding bare fallow, were sampled on September 8, before the clover land had been ploughed. The clover land contained in 27 inches 19·6 lbs. of nitrogen as nitrates, while in the soil of the corresponding bare fallow 59·9 lbs. were found.

It is clear that in each of these comparative determinations between beans and fallow, or clover and fallow, we must not assume that the crop had at command the whole quantity of nitrates found in the fallow soil, as the production of nitrates in it would be considerably favoured by the summer tillage, a condition which was, of course, wanting in the case of the cropped land. Though, however, we may not credit the crop with having assimilated the whole difference observed between the nitrates of the cropped and uncropped land, there can be no doubt that in every case a considerable quantity of nitrate has been taken up from the first 27 inches of soil, the depth to which the sampling was confined. Considerable additional quantities of nitrate would probably be obtained from the lower depths of the subsoil, especially in the case of the clover crop.

In Table IV. determinations of nitrates are given in two plots in Hoos Field, which had frequently grown leguminous crops, and which now failed to grow red clover. One plot had just grown a small crop of white clover, amounting to 24 cwts. of hay per acre; the other had just produced an enormous crop of Bokhara clover, yielding in one cutting 125½ cwts. of hay per acre, and containing about 144 lbs. of nitrogen. The samples of soils were taken on July 26–31, 1882, immediately after the removal of the crops; the sampling was carried to the depth of 54 inches. The whole amount of nitrogen as nitric acid found in this depth was 26·3 lbs. per acre in the case of the short-rooted white clover, and 8·5 lbs. per acre in the case of the deep-rooted Bokhara clover. In the first 27 inches of depth, the white-clover soil contained 13·5 lbs., and the Bokhara-clover soil only 5 lbs. In the second 27 inches, the white-clover soil contained 12·8 lbs., or nearly as much as the first, and the Bokhara-clover soil only 3·5 lbs. It is obvious that the Bokhara clover had withdrawn nitrates to the full depth examined, and it had doubtless done so to a lower depth still. We have here again evidence that a leguminous crop, and especially one having a wide distribution of roots, assimilates the nitrates of the soil; and in the case of such a plant as the Bokhara clover, a great depth of the subsoil is clearly brought under contribution.

We have one experiment yet to mention. It is well known that a clover lay is a good preparation for wheat; this is doubtless chiefly due to the gradual nitrification of the nitrogenous residue left behind by the clover. An illustration of the different condition of land in March after a wheat and after a clover crop, will be found in Table III. (Nos. 11, 12); the comparison is, however, not perfect, as the clover land had been ploughed the preceding October, while the wheat-stubble was untouched. The clover land yielded 38·9 lbs. of nitrogen as nitrates in the first 27 inches, and the wheat land only 14·5 lbs.

The evidence relating to the amount of nitrates in the different soils seems to point to the conclusion that, in the case of cereal crops, the nitrates of the soil are a sufficient source of the nitrogen of the crops. Can the same be said with regard to beans or clover? That these crops do assimilate nitrates in considerable quantity is sufficiently established. A good crop of red clover may, however, in land in favourable condition, but without the direct application of manure, yield from seed sown in the spring of the previous year, hay containing 200 lbs. of nitrogen per acre, and also leave much nitrogenous crop-residue in the surface-soil. Again, the Bokhara clover, grown in Hoos Field, in a soil on which red clover had frequently failed, yielded, during five successive years, 1878–82, without any application of nitrogenous manure, an average of about 93 lbs. of nitrogen per acre per annum. These quantities much exceed the amounts which, according to our present knowledge, can be furnished by nitrates in the soil. Our information as to the amount of nitrates available in the lower layers of the subsoil is, however, as yet very limited. On this point it may be stated that determinations made in samples collected this year (1883) to the depth of 108 inches in the white-clover soil, have shown more than 50 lbs. of nitrogen as nitrates per acre below 45 inches of depth. On the other hand, adjoining land in fallow, which had been alternately wheat and fallow without manure for about 30 years, showed less than 20 lbs. in the corresponding layers. The question obviously arises whether leguminous crops do not find in the soil suited to their growth some other source of nitrogen than nitrates. The very large amount of nitrogen taken up by these crops would, on this supposition, be due to their possession of a power of utilising nitrogen existing in the soil in a condition of combination, as well as of distribution, not available to cereal crops.

We have now completed our account of the quantity of nitrates found at various depths, and at various seasons, in cropped land subjected to a great variety of manuring. Before concluding, we must say a few words as to the bearing of some of these results upon the important questions raised in the last section of the previous Report on Rain and Drainage.

An attempt was there made to correlate the amount of nitrogen applied in the manure, recovered in the crop, and passing away as nitrates in the drainage-water, in the case of many of the experimental plots in Broadbalk Wheat-field. The calculations showed that wherever a large quantity of ammonium-salt was applied, a considerable part of the nitrogen of the manure was unaccounted for in the crop, and in the drainage from the plot, and the amount unaccounted for was the larger in proportion to the quantity of ammonium-salt applied. A similar calculation made regarding the chlorine supplied by the manure showed that it also was only partially accounted for in crop and drainage. It was assumed that the composition of the pipe-drainage did not afford full information as to the amount of nitric acid and chlorine that was passing downwards, and that if this amount were fully known, the unaccounted-for loss of nitrogen and chlorine would, more or less, entirely disappear. Some of the new results described in the preceding pages support the explanation thus offered. Where large amounts of nitrates are present in a soil, the composition of the pipe-drainage doubtless fails to represent the whole amount of nitrate which passes downwards into the subsoil.

The evidence is by no means so clear as to what proportion of a dressing of nitrate of sodium or ammonium-salts remains in the soil unused by the crop. The nitrates found in the soil after harvest are, in fact, largely due to the nitrification of nitrogenous organic matter in the soil, and it is impossible to discriminate between the nitrate so produced, and that remaining in the soil as a residue of manure.

Much has been said in these pages of the passage of nitrates into the subsoil; and in wet seasons, such as we have lately suffered, the quantity of nitrates passing downwards from arable soils in good agricultural condition must generally have been very large. Indeed, it would appear that under certain circumstances the quantity of nitrates in the subsoil may considerably exceed the quantity near the surface. As, however, our examination of soils has in most cases been confined to the depth of 27 inches, we have as yet very imperfect information as to the quantity of nitrates which may exist in the lower layers of the subsoil under varying conditions of cropping, manuring, and season. The agricultural importance of these subsoil-nitrates is also at present not clearly determined. Are we to regard the nitrates in the lower layers of the subsoil as preserved intact, subject only to further removal by drainage, as available for the nourishment of deeply-rooted crops, and capable of being brought again near the surface when the evaporation of water becomes considerable during the growth of a vigorous crop in summer-time? Or are the nitrates passing below a certain level liable to be destroyed by chemical reduction, of which action some examples were given in the previous Report? It may well be, that in subsoils of different character, and in different conditions of saturation with water, one or other of these results may occur, but the information at present at command on the subject is very limited. A further examination of the composition of subsoils at low depths is now in progress at Rothamsted.

SUMMARY OF RESULTS.

1. The soils of the three drain-gauges, 20, 40, and 60 inches deep, which have now remained without manure and without crop for thirteen years, have, during the last six years, yielded nitric acid in the drainage-water, equal to an average of 40·2 lbs. of nitrogen per acre per annum. The production of nitrates is greatest during summer. The minimum amount in the drainage-water occurs in spring; the maximum in July, or in the first month afterwards in which considerable drainage occurs.

2. In three soils at Rothamsted, in fair agricultural condition, cultivated as bare fallow since the harvest of the previous year, 56·5, 58·8, and 59·9 lbs. of nitrogen as nitric acid per acre were found in September or October, to the depth of 27 inches. If the summer has been dry, the nitrates are near the surface; after much rain they are at a lower level. If the amount of nitrates which it is estimated have passed by drainage below 27 inches during the season of fallow (15 months) is taken into account, the total production of nitrates corresponds to about 80 lbs. of nitrogen per acre. When the soil is in a poor agricultural condition, the production of nitrates during fallow is much less.

3. In exhausted land, but left uncropped four years (Geescroft Field), only very small quantities of nitrates were found in the subsoil to a depth of 6 feet. The subsoil was, however, saturated with water, and it seems possible that a portion of the nitrates had been destroyed by chemical reduction.

4. The results relating to land growing cereal crops, receiving no excess of nitrogenous manure, show that only very small quantities of nitrates will remain in the uper layers of the soil through the summer, the crop having assimilated the nitrates formerly present. If rain follow after harvest, and especially if the land be ploughed, a considerable formation of nitrates will occur. Nitrates will continue present throughout the winter, notwithstanding loss by drainage, slow production being always in progress. In late spring or early summer, the nitrates will again disappear if the land is once more under crop.

5. The soils of the various plots in Broadbalk Wheat-field were sampled in October 1881 to the depth of 27 inches. There had been much rain after harvest, and the conditions were very favourable to nitrification. The nitrates were chiefly near the surface, the distribution in the three depths, each of 9 inches, being on an average as 100, 59, and 31.

6. The unmanured plots contained 15·0–17·9 lbs. of nitrogen as nitric acid per acre to the depth of 27 inches. Plots manured with ash-constituents alone, 21·2–24·3 lbs. Plots receiving 400 lbs. of ammonium-salts, or 550 lbs. of nitrate of sodium per acre, with ash-constituents, 24·6–39·8 lbs. With the same nitrogenous manuring, without ash-constituents, 28·3–54·1 lbs. With 1700 lbs. of rape-cake as manure, 34·2 lbs. With 14 tons of farmyard-manure, 52·2 lbs. The rape-cake and farmyard-manure were applied the preceding autumn; the ammonium-salts and nitrate of sodium in March.

7. On plots receiving no nitrogenous manure, or not excessive quantities of ammonium-salts or nitrate of sodium, the nitrates found were doubtless due to the nitrification of nitrogenous matters in the soil, consisting partly of the original stock of humic matter of the soil, but mainly of more recent crop and weed-residues. The quantity of nitrate found, generally bore a distinct relation to the quantity of the preceding crops. Where an excess of nitrate of sodium had been applied (Plot 9B), a considerable residue of unused nitrate was found in the subsoil. Where rape-cake or farmyard-manure had beeen applied, the nitrates present were partly derived from the nitrification of residues of these manures.

8. Comparing the quantity of total nitrogen in the first 9 inches of the Broadbalk Wheat-field soils with the quantity of nitric acid found to the depth of 27 inches, it appears that the nitrogen of permanently unmanured land nitrifies with more difficulty than the nitrogen of land that has yielded large crops, or has received rape-cake or farmyard-manure. The old nitrogenous capital of the soil is thus more slowly oxidised and converted into plant-food than the more recent residues of crops or of organic manure.

9. In the soils of Hoos Barley-field, sampled in March 1882 to the depth of 27 inches, the nitrates had been distributed by the autumn and winter rains; they occurred in the first, second, and third 9 inches in the average proportion of 100, 102, and 88.

10. The unmanured plot contained 15·7 lbs. of nitrogen as nitrate per acre. The plots receiving ash-constituents alone, a mean of 20·1 lbs. The plots receiving 200 lbs. ammonium-salts, or 275 lbs. nitrate of sodium per acre, with or without ash-

constituents, a mean of 23·3 lbs. Plots receiving 1000 lbs. of rape-cake, with or without ash-constituents, a mean of 30·1 lbs. The plot receiving 14 tons farmyard-manure, 44·1 lbs. The residues of the rape-cake and of the farmyard-manure added considerably to the quantity of nitrate produced. The influence of crop-residues in increasing the production of nitrate is not so marked as in the wheat-field, barley leaving a smaller residue in the soil than wheat.

11. A comparison of the quantity of nitrate found in soils cropped with beans or clover, with that found in corresponding land in bare fallow, showed that nitrates are assimilated by leguminous crops. A similar result appeared when the comparison was made between a vigorous deeply-rooted leguminous plant (Bokhara clover) and a delicate short-rooted one (white clover), the former taking more nitrate from the subsoil than the latter.

12. The quantity of nitrogen in luxuriant leguminous crops appears too great to be accounted for by the quantities of nitric acid at present recognised in soils. We have however as yet very limited information as to the quantity of nitric acid in the lower layers of the subsoil. The question remains whether leguminous crops have the power of utilising nitrogen existing in the soil in a condition of combination (as well as of distribution), not available to cereal crops?

13. The results relating to the soils in the Broadbalk Wheat-field, together with those relating to the pipe-drainage-waters, confirm the conclusion put forward in the former Report—that the estimates of loss by drainage founded on the amount of water passing through the 60-inch soil drain-gauge, and on the composition of the pipe-drainage in the wheat-field, are too low; it appearing that considerably more nitrates pass into the subsoil than such a calculation shows.

14. It is a question whether, under some circumstances, and especially if the subsoil is saturated with water, nitrates which have passed into the lower layers of the subsoil are not there destroyed by reduction; or whether, and to what extent, the nitrates which are not reduced, or not finally lost by drainage, return upwards in dry weather, or are available to plants of deep-rooting habit and vigorous growth.

XVII.—*The Progress of Fruit Farming.* By CHARLES WHITEHEAD, F.L.S., F.G.S., of Barming House, Maidstone.

THE increase of the acreage of fruit-land in England, according to the Agricultural Returns, was 26,696 acres between the years 1872 and 1882. It will be seen by an analysis of these Returns that an increase has taken place in twenty-four counties, and a decrease in the remaining counties. The most important additions to the acreage have been made in five of these counties, which have been distinguished for several centuries as fruit-growing counties, viz.—Gloucester, Hereford, Kent, Somerset, and Worcester, in the following order:

NAMES OF COUNTY.	Increase of Acreage from 1872 to 1882.
	Acres.
Hereford	5944
Kent	5362
Somerset	4324
Worcester	4290
Gloucester	3251

In Devonshire, which has long been celebrated for its fruit-production,* the increase only amounted to 358 acres in the same period, owing probably to the fact that the many late wet seasons have been especially injurious to the apple-crop in this county. No important additions have been made to the fruit-acreage in any other county which would tend to show that the occupiers of land were seriously thinking of adopting fruit-culture as a possible means of improving their position. This is somewhat remarkable, and is additional evidence of the fact that English farmers are slow to embark upon what they term "new-fangled" schemes. It is not by any means because the soil and climate of other counties are unsuitable for fruit-growing that fruit-cultivation has not been adopted, for almost all sorts of fruits are successfully grown in the gardens in all but the most northern districts; and in all but these there are parts, and large parts, of all the counties of England where the most useful fruits might be successfully grown. But it is difficult to induce farmers to make experiments of this kind, even though experts may tell them that all the conditions essential to ensure success are present; and they shake their heads dubiously when they are reminded that the kinds of fruit suitable for market

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* Records show that apples were cultivated in Devonshire in 1520.

purposes are produced abundantly in their own kitchen-gardens close to their houses, and that it would pay to cultivate them upon an extended scale. Besides the prejudice against new undertakings, farmers proper, in many cases, object to become fruit-growers, as many object to become vegetable-growers, because it is not their legitimate business, which is, they say, to produce corn and meat, milk, butter, cheese, and wool, as their forefathers did. Many have not the capital to spare for planting fruit-trees, whose return is somewhat slow. Here and there a landowner has done this, notably Lord Sudeley, in Gloucestershire, to whose enterprise detailed references will be made; but a grand opportunity has not been generally taken advantage of in this country. In the meantime, the foreign cultivators have been equal to the occasion, and have extended the acreage of fruit-land enormously, and are sending quantities of fruit into the English markets, increasing year by year. A calculation has been made as to the time for which the food production of this country would keep its mighty population from starvation if its ports were closed to the importation of all foreign supplies. A few weeks alone, it is said, would reduce the English to the famished condition of a besieged army. How long, it may be asked, would the 187,553 acres of fruit-land in Great Britain supply its inhabitants with fruit, and the various confections and compositions made from fruit? They would be utterly insufficient; as even now, with the very extensive consignments from various lands, fruit is sometimes so dear as to be beyond the reach of all but the rich. Taking into consideration the extraordinary increase in the demand for fruit for eating in its raw state, for cooking, for the making of jam, and for other purposes, during the last twenty-five years, and more particularly during the last ten years, the addition to the acreage of fruit-land in England of 26,696 acres since the year 1872, is ridiculously small. It is generally acknowledged that fruit, vegetables, and milk, are becoming year by year more essential elements of the diet of all classes of the community. The temperance movement also has already increased the demand for these articles of diet, and will increase it considerably more, especially as regards fruit; for persons who indulge in alcoholic stimulants rarely take fruit or jam, or conserves made of fruit. An important proportion of the increased fruit consumption is due to the demand for jam for home and foreign consumption. Jam is becoming a common article of food throughout the country. As our dairies cannot furnish butter for those who are unable to give from 1*s.* 5*d.* to 1*s.* 8*d.* per lb. for this luxury, they use jam for themselves and their children. This can now be bought in most village grocers' shops at from 7*d.* to 9*d.* per lb., owing mainly to the energy of French, Belgian, Dutch, German, and American fruit-growers. Jam-factories are being established in various parts of this country, and new processes have been introduced to help and improve the manufacture of jams and preserves of all kinds. There is yet a vast difference in jam. The real jam is made of good freshly picked fruits, which are not mashed up into a mess, but are preserved whole, so that specific fruits may be identified. Beach's jam is of this character, and is acquiring a deserved reputation. It is made of fresh fruit grown in England, and is not boiled down, but steamed. Glucose is avoided, and nothing but the finest sugar is used, and no adulteration is practised, as the fruits remain whole and perfectly distinguishable. But there are jam-makers and jam-makers. There are jam-makers and smashers, although the latter title is repudiated as a calumny upon the trade. The former make it as careful housekeepers make it; the latter mix up fruit of all kinds and qualities into a heterogeneous compound. The first of these take sound, fresh, whole fruit. The others boil down over-ripe and under-ripe fruits of all sorts, particularly apples of low quality, sometimes mixed with marrows and other vegetables when fruit is scarce; and thus with a few seeds and essences make any jam to order. For jam-making, fruit of all qualities and description is cleared off in a wonderfully rapid manner. When there is a short crop, the demand for jams and preserves sends up the prices of fruit to a figure far beyond the reach of ordinary consumers, as in the last season, for example, when damsons and plums were making 4*d.* per lb. wholesale, and black currants from 4½*d.* to 5*d.* per lb. In full fruit seasons, jam-makers buy up fruit, and, having reduced it to pulp, put it into large jars or vessels of various kinds, without sugar. If the air is carefully excluded, this pulp will keep for some time, until a scarcity of fruit happens again. It is, in fact, the adoption of the principle of ensilage to fruit. This is adopted in other countries. Large quantities of apricot pulp are sent from France at an average price of about 5*d.* per lb. A few fruit-growers in England have tried this practice in abundant seasons, and have been enabled to keep their fruit until it was wanted. Some jam-makers take the pulp from the fruit-growers. Others pulp the fruit themselves, and it is satisfactory to find that in many large centres of production jam-factories have been established to which the producers can send both fruit and pulp. In not a few districts, where jam-factories do not exist, it is becoming the custom to sell fruit by contract in large quantities to agents, or to principals, of jam-factories, and to fruit-dealers. Another good feature in the fruit-trade is that growers are getting more into the habit of sending their fruit direct to the retail shops in London and in other large towns; and of supplying co-operative stores, either by contract or by agreement, to take current market prices, thus, as in the former case, saving the expense of the middleman. It is also the practice of some growers to consign their choicest dessert-fruit, carefully and tastefully packed, to retailers in large cities. It is most desirable, in the interests of consumers and producers, that this system should be largely extended. Not a few gentlemen also, having greenhouses and hothouses, and a staff of gardeners, like to turn an honest penny, and combine the useful with the beautiful, and send the choicest fruits and flowers to some of the chief London shops.

Notwithstanding the importation of fruit from divers parts of the world, the prices, taking the average of seasons, are very high, and the prices of fine fruit for dessert purposes place it beyond the means of all but those who have plenty of money. It may seem strange that fruit should be so dear as it was in 1882, for example, when it is seen that the amount of raw fruit sent into this country during this year was 4,045,691 bushels, of the value of 1,718,909*l.*, independently of the large quantities of fruit in the form of pulp, or dried by the sun or by artificial processes. The annexed return will show the amount of raw fruit sent into England in 1871 and in 1882 respectively, and the various countries from which it was sent:—

NAME OF COUNTRY.	1871.		1882.	
	Number of Bushels.	Value.	Number of Bushels.	Value.
		£		£
Germany	69,519	22,104	515,604	151,096
Holland	160,392	59,542	444,886	182,876
Belgium	276,286	95,822	593,158	669,164
France	354,606	214,542	524,683	335,543
Portugal, Azores, and Madeira	73,979	57,081	133,124	81,245
Spain and Canary Islands	59,712	48,795	462,082	277,757
United States	56,441	40,604	1,065,076	387,190
British North America	55,150	37,004	222,128	90,077
British West India Islands	10,063	10,750	20,168	15,810
Other Countries	12,520	9,863	14,197	7,581
Channel Islands	..	..	50,584	20,574
Total	1,128,568	596,107	4,055,691	1,718,907

When it is remembered that the population of Great Britain was over thirty-two millions at the recent Census, the amount of the importation of raw fruit appears comparatively of small importance. It is estimated that the annual average amount of fruit produced in this country is not more than 9,000,000 bushels. But not nearly all this is available for actual consumption as food, as the apples and pears grown for cider and perry must be deducted, and these form a considerable portion of the whole—a third at the least—seeing that in the cider-making counties *par excellence*, viz. Devon, Hereford, Somerset, and Worcester, there are 95,521 acres of fruit-land out of the total number of 187,553 acres of fruit-land in the United Kingdom. There are no statistics showing what proportion of this fruit-land, or orchard-land, as it is for the most part, produces cider and perry-fruit, though no doubt it forms a large part of its yield. In Gloucester, again, cider is extensively made. A little is made in seasons of heavy crops in Kent, but it is not of first-rate quality, and the quantity made is becoming smaller year by year. In Dorset, Monmouth, Salop, and Wilts, the fruit-land consists mainly of apple-orchards planted with trees of second-rate kinds of fruit, the greater part of which is made into cider for the farm hands.

With regard to the importation of foreign fruit, much of this arrives in the English market before the home-grown fruit is ripe, therefore it does not come directly into competition with it—at least in the case of most of the "soft" fruits, as currants, gooseberries, and strawberries. It is different, however, with apples, of which large quantities are sent from Canada and the United States, and reduce the value of English apples considerably in some seasons. Greengages and plums are occasionally sent from Belgium, Holland, and France in such quantities as to materially affect the prices, especially of second-rate samples. The finest foreign plums come from mid-central France before English plums are ripe. Those that come into competition with English plums are of a common description produced in Belgium, Holland, and Normandy, but they tend to depreciate values in the same way as a supply of sprats makes herrings cheap. Large quantities of indifferent plums, known as "Swetchens," are brought from Holland, by water, from Amsterdam and Rotterdam, at excessively low rates. These are sold at St. Katharine's Wharf direct from the steam-boats, and are used principally for jam and cooking purposes, making from 1¼*d.* to 1½*d.* per lb. Greengages of poor quality are also sent from Holland, making from 1¾*d.* to 2*d.* per lb. A few are taken for eating, though the great bulk of this fruit finds its way into the jam-factories. Cherries arrive first from Algiers and Spain, long before English cherries are ripe. These are rather colourless and flavourless, and of a common character. When these are over, very much better cherries arrive from Avignon and other parts of southern and mid-central France, and are succeeded by ordinary growths from Angers and Normandy, which are brought to London at something under half a farthing per lb. for carriage; while for cherries sent to London from Sittingbourne, in East Kent, and Maidstone, in Mid-Kent, about 40 miles, the charge for railway carriage amounts to close upon a farthing per lb. Black currants and red currants come from France, Holland, and Belgium only a very short time before these fruits are ripe in England; they are much inferior in quality to the English, as are the gooseberries which are imported in considerable quantities from France. It is evident from the appearance of these fruits sent from foreign countries that the soil and climate are not nearly so well adapted for their production as those of this country, and that home-growers need not fear that they will be beaten, as far as quality is concerned, in respect of them, or, indeed, of any of the soft fruits. In the matter of pears, however, the case is different. French pear-growers undoubtedly produce better fruit than any others. The pears that are grown in the districts round Nantes and Angers, and in parts of mid-central France, are finely shaped, of taking appearance, and excellent flavour. Pears begin to arrive from France about three weeks before English pears are ripe, and the supply frequently lasts until the ensuing spring.

Producers of pears in France are most careful and diligent in their cultivation, and in the selection of the best sorts, and those to follow in a regular order of ripening, and they do not crowd them into the market directly they are picked, as is too much the fashion with the home pear-growers. Pears are grown in France in many fashions,—upon standards, bushes, pyramids; upon cordons, lateral, oblique, and diagonal; *en gobelet*, *en vase*, *en touffes*, and in other ways. The pruning is attended to with great pains and skill by the small proprietors who are the chief producers of fruit in France, among whom "exists a wide-spread intelligence, and a keen sense of what is profitable and useful for the land cultivated by them as a garden of necessity."*

The greater part of the fruit that is exported from France is collected by agents or dealers, who attend certain markets, depôts, or centres to which the fruit is brought by the growers, and sort it, and classify it, and carefully pack it for the English markets. Sometimes railway arches are used for receiving and packing the fruit. Much judgment and skill are employed in sorting and packing, so that buyers in London have great confidence in the consignees. Certain trade-marks become known and inquired for day after day, and fruit is frequently sold without being seen, the buyers being quite satisfied with the

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* 'Report on Fruit Culture on the Continent, 1868.' By the Rev. T. Collings Brehaut.

note of advice. It has become so general to consign fruit to England, that it is stated that frequently the markets in French towns are badly supplied. A friend who has lived in France for many years says that the increase in the production of fruit during the last twenty years is astonishing; yet to obtain his supplies he was compelled to send into the fruit market before 5 o'clock A.M., or the fruit would have been all sold and cleared off for consignment to England. A French writer, skilled in horticulture and agriculture, remarks that the cultivation of fruit in France has greatly increased, but that the demand has by no means been satisfied. He estimates that more than twenty-three millions of pounds of fresh fruit are annually consumed in Paris alone in various forms; although the Parisians are by no means a fruit-eating people. He counsels the French cultivators to plant fruit-trees, and in answer to the question which is frequently asked, "If all the world plant fruit-trees, what is to become of the fruit?—it will fetch a poor price:" he replies: "This is a gross error; the more the production increases the greater will be the consumption. We produce ten times more fruit than we did forty years ago, and has the price decreased in any degree?" Then he goes on to advise the cultivators not to centre their efforts upon producing wheat and oats upon land that will grow fruit. "What," he asks, "will corn pay him?" He answers, "Nothing. The cultivator is a manufacturer (*fabricant*), and it is his duty to abandon a certain production that does not pay for another that will pay." * This advice has been taken, as any one can clearly see by the increase in the importation of fruit from France in the last few years. It is cited here, as it is peculiarly applicable to English farmers, upon many of whose farms fruit that would pay might be cultivated in the place of corn that does not pay. Let America grow the wheat as long as she will, while English farmers endeavour to turn their land to better account. We have allowed foreign fruit-cultivators to steal a march upon us. Though the importations of fresh fruit have been quadrupled since 1871, the increase in the acreage of English fruit-land during this period is equal only to about 16 per cent. Foreign producers discovered, some years back, that there is a practically unlimited market for fruits. Their fruits have improved in appearance and quality in the past ten years, though, with the exception of apples and pears, they are not equal to the fruit grown in England, whose soil and climate are suitable for the production of fine-flavoured and good-sized fruits.

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* 'Arbres Fruitiers. Culture et Taille rationelles et économiques.' Par V. Lebœuf.

It must be asked, seeing that the British cultivator has these advantages, whether he lacks energy and the spirit of enterprise, or capital? Or is it owing to the nature of the English land laws that he does not adapt his modes and systems to meet altered and altering circumstances, like the Continental and the American farmers? Not only are the French, the Belgians, and the Germans, increasing the area of fruit-land, and improving their methods of cultivation, but the Americans are also planting fruit, and are adopting, with characteristic zeal, new and improved systems of packing and preserving it. In the Report of the American Commissioner of Agriculture for 1878, it is stated that there were more than two millions of acres under cultivation as apple-orchards, and that in twenty years the value of the products had increased from 1,320,000*l.* to over 10,000,000*l.* "The abundance of the fruit-crop," the Commissioner writes, "is one of the most gratifying results of the progress of agriculture in this country. The demand for fruit in the markets at home and abroad has been equal to and is increasing with the supply. The prices have been generally remunerative both to the grower and the dealer, and yet low enough to be within the reach of all. The daily use of fruit as food by our people is greatly to be desired." * Besides apples and many other small fruits, the peach-crop of the United States is estimated at the annual value of 11,500,000*l.*; so that it is not surprising that there is occasionally a superabundance of fruit, especially of peaches and apples, upon which pigs are fed. This waste has been in a great degree obviated by the ingenuity of the Americans in preserving the fruits and drying them. At Baltimore particularly, as well as in other cities which are centres for the accumulation of fruit, large establishments have been built and furnished with the most improved machinery and appliances for the rapid drying and evaporation of the watery parts of fruits. By an ingenious process the water is slowly separated from the solid parts, which at the same time undergo a chemical change, the acid and the starch being converted into grape-sugar. The Commissioner of Agriculture in the Report alluded to says of this: "The proof of the pudding is in the eating, and it is said that an apple-pie made from fruit evaporated by these processes cannot be distinguished from one made from fresh fruit, and yet only one-half of the quantity of sugar is required to sweeten it; and the same fact is true in regard to tomatoes, and all fruits and vegetables." †

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* 'Annual Report of the United States Commissioner of Agriculture, 1878.'
† Op. cit., p. 385.

Iron stoves, and machines constructed on the principles described above, for drying fruit, but portable and costing only about 15*l.*, are used in many districts in the country far from towns. These will, it is said, thoroughly and perfectly dry as much fruit as a family can peel and slice in a day. All kinds of salads and delicate vegetables—such as onions, peas, asparagus, celery, Lima beans—are preserved by these new processes fresh and "dehydrated," like the fruits of all seasons of the year, for all the markets of the world, returning, when placed in water, at any time when desired for use, to their original fulness, colour, flavour, and other properties. "In short," to use the words of the Commissioner of Agriculture, "the trade in 'dehydrated' and preserved vegetables and fruits of all kinds has assumed enormous proportions, giving employment to thousands of persons, realising valuable profits, and supplying business through every artery of trade."

Not only this, but the trade in fresh vegetables and fruits has been lately increased in an astonishing degree by the adoption of refrigerators on the railway-cars and steam-boats, by which these products are conveyed to all parts of the United States, as well as to foreign countries.

Much fruit is produced in Canada. The acreage of fruit-land has been extended largely in the last fifteen years, and the greatest interest is taken by the Government and by the farmers themselves in the promotion of this industry. The main part of the fruit-land is in Ontario, or Western Canada, in which it is said that any fruits can be grown that are produced in the temperate zone. There is a large Fruit-growers' Association in Ontario devoted to the improvement of the cultivation, packing, and preserving of fruits. In 1880 a Commission was appointed by the Lieutenant-Governor to inquire into the progress of agriculture, and in the Report of the Commissioners most valuable information as to fruit is contained, which is not only most useful and deeply interesting to Canadian cultivation, but also to all other fruit-producers. Very fine apples are grown in Ontario, better it is alleged by the Canadians than those that are grown in the United States. It is said that when Canadian apples are good the Americans buy them, and brand them "American," and when they have indifferent samples of their own growth, they brand these "Canadians." Canadian apples have undoubtedly a great reputation in the English markets. A large fruit-grower in Ontario, in his evidence before the Commission, says: "There is nothing to prevent our apples from competing successfully with the English apples in England, if they are properly sent. We have beaten them in their own market with the Ribston Pippin. It sells in England at 3*l.* per barrel."* Another apple, called the "Swayzie Pomme Grise;" grown chiefly in the Niagara district, has made the highest price obtained for Canadian apples in England, as much as 5*l.* per barrel having been made in Covent Garden Market.† This apple, of fine aromatic flavour, was probably introduced into Canada, where it has been long known, from France. André Leroy mentions it as a dessert-apple of the highest quality in his 'Dictionnaire de Pomologie,' and Dr. Hogg says that it is a first-rate apple, and Forsyth believes that the trees were brought from Canada into this country. Not only do the Canadians exercise the greatest skill in the cultivation of apples, but they understand the art of storing them. The most approved plan, according to the evidence given to the Commissioners, is to place them in cellars well drained and ventilated, in which the temperature is maintained at from 32 to 35 degrees.

In a lecture upon fruit-growing in Massachusetts, by Mr. Slade, he said that "one of the least expensive, most efficient and commodious fruit cellars that I ever examined, comprised a portion of a barn cellar. It was under a hay-barn a hundred feet in length, with the walls and floor cemented. There were double doors at the entrance, and the two windows, north and south, were protected by shutters. I was in this cellar early in the spring, and found the temperature at 38°, while outside it was 63°. The bins were filled with apples, and although they exposed to view 125 surface yards, I failed to find a single specimen showing any signs of decay. To manage a fruit cellar successfully requires skill, judgment, and a constant supervision. The light should be admitted sparingly, the air kept pure, and the temperature low and uniform." Mr. Brown, of Lunenberg, remarked, in the discussion upon this lecture, that he had not yet succeeded in keeping apples in large quantities all the year round, but that he could keep them up to June or July.‡

The apples are put upon wooden shelves in some cases, though many prefer to pack them in the barrels as they are picked, and to store them in these until they are wanted. Re-packing for market is well done. Choice dessert-apples are wrapped singly in coloured tissue-paper, and the bottoms, sides, and tops of the barrels are also lined with tissue-paper. Apples of ordinary quality are packed in buckwheat chaff, and care is taken to take out the culls and any fruit that is unsound or specky. The following description of the selection and packing

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* 'Report of the Ontario Agricultural Commission of 1880.'

† A barrel contains 3 bushels.

‡ 'Report of the Secretary of the Massachusetts Board of Agriculture for 1881

of this fruit will, it is thought, give many valuable hints to English growers:—"If apples are to be packed in the orchard," says one of the witnesses before the Ontario Commission, "a tent should be put up to shade the fruit from the sun, with a table under it; nail strips of wood round it, to keep the fruit from rolling off. Cover it with woollen cloth, so that the pickers may empty their baskets without injuring the fruit; let the packers select the fruit, rejecting every apple that is under size, spotted, or wormy, or deformed in any way. Don't be tempted to put medium and large-sized apples in the same barrel. Pick the apples carefully, lay them down, don't throw them the whole length of the arm into the basket so that they will rattle against each other, empty them gently upon the table for selection."* The reason why Canadian and American apples make such high rates is, that they, as a rule, come to market in admirable order and in regular succession, and they frequently arrive when the supply of English apples is exhausted. It is a very weak point in the English system that the fruit-growers, and especially the large fruit-growers, do not pay sufficient attention to the storing, packing, and selecting fruit for market. Indeed, many of the large growers do not store it at all, their great object being to get rid of it as quickly as possible. This entails an enormous waste in the case of apples and pears, because they are bought by persons, in most instances, who have neither capital nor any means of storing. The apples are roughly handled by the labourers while full of juice, and while their skins are tender; no pains are taken in sorting. They are roughly packed and banged about, while yet unripe, in frequently shunted luggage trains, so that they positively are unfit for keeping, and therefore they must be sold for speedy consumption, or for jam-making. Thus much fine dessert-fruit is sacrificed. It is absurd to say that English fruit will not keep as well as that of America and Canada if it is properly treated. It is equally absurd to say that England cannot produce as good apples as these countries, and that their fruit is deliberately preferred. English fruit-growers should not fold their hands and allow Transatlantic energy and perseverance to take quiet possession of the trade. A few changes only are necessary. Certain improvements in the system should be made, to effect which we might well take a leaf out of the book of our American cousins. These remarks apply not only to apples, but also to soft fruits. If it is desired to retain the present market for these, and to extend their production, as it might be extended far beyond its present

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* 'Report of the Ontario Agricultural Commission of 1880,' p. 54.

limits, something like the American plan must be adopted, either of having central preserving factories for canning, drying, and preserving the fruit in various ways, and for boiling down pulp without sugar, and keeping it until there is a demand, and for making jam; or that the growers themselves should have these appliances, or combine to establish them in convenient centres. England has a vast advantage over other countries in the preserving of fruit with sugar, and in the manufacture of jam — that is, fruit boiled down or steamed down with sugar—on account of the cheapness of sugar, caused by the action of free trade. In the United States the price of sugar is from 6*d.* to 8*d.* per lb. In France the price ranges from 5*d.* to 6*d.* per lb., and in Germany, Holland, and Belgium, it is relatively dear. Partially preserved fruits come from all these countries. They are not preserved in sugar, but are merely dried by the sun or by artificial processes. It is necessary to apply sugar to the great bulk of the preserved fruit that is sent from America, before it is cooked or eaten. English growers have also this advantage over foreign growers, in being able to send their fruit comparatively fresh to the jam-manufacturers. It is most essential to the production of really good jam that the fruit should be in a good state, not sweated, nor bruised in long transits. English fruit, fresh, whole, and ripe, is therefore vastly preferred by the makers of the best jams to Continental fruit which has been heated, and has lost all its freshness before it reaches the coppers; and it is believed that jams, warranted to be made from English fruit in the heart of fruit-producing districts, would be taken by the public in preference to all others. Considering these advantages, the manufacture of jam could be largely extended in this country if fruit-growers would produce plenty of fruit, and join together to put up suitable buildings for converting it into pulp or jam. Lord Sudeley, who has lately planted fruit-trees most extensively upon his estate in Gloucestershire, has, with much foresight, turned some farm-buildings into a convenient place for manufacturing jam and preserving fruits upon a large scale, or for pulping them, or for packing them in a fresh state for market, so long as the market prices are profitable. Now if it pay, as it assuredly will pay, to have a jam and pulp factory upon 500 acres of fruit-land upon Lord Sudeley's estate, it would certainly be more profitable and advantageous to all concerned to establish factories upon a larger scale in neighbourhoods where there are thousands of acres of fruit-land, as, for example, in or near Maidstone, and in or near Sittingbourne, and in or near Farningham, the respective centres of the fruit-growing industries of Mid, East, and West Kent. Attempts were made to start a jam-making company in Maidstone last year; but it failed, as the fruit-growers and landowners did not evince the slightest interest in the undertaking. In Lord Sudeley's case, a barn and other buildings have been turned into a factory at a comparatively small cost. This has been let to Mr. Beach, the well-known manufacturer of pure jam, for ten years, who has arranged to take all the fruit grown on 500 acres at fixed rates, and will either steam it down, or pulp it, or sell it fresh, as he may deem expedient. This factory is now in working order, and was inaugurated this summer by a capital crop of strawberries, estimated at 10 tons. About 100 tons of fruit will be grown on the estate this year, which is a capital quantity, considering that no fruit-trees were planted until the autumn of 1880. The expense of the carriage of fruit in this case is saved, also the commission of salesmen, which are most important items in seasons of large crops, and, when fruit is cheap, amount to from $\frac{1}{4}d.$ to $\frac{1}{2}d.$ per lb., and even more where the market is distant. In these jam-factories, other modes of preserving fruit might be adopted besides that of making jam, such as that of bleaching and drying apples, which holds in the United States and Canada. "A fruit-drying establishment," says a witness before the Ontario Commissioners, "has been recently started in St. Catherines, with a capacity to dry 150 bushels of apples a day. The apparatus used consists of an upright frame or box built over a furnace, and on each side there is a belting like a straw carrier. As the fruit rises on the slabs, it is subjected to the hot air of the furnace. The temperature required is from 160° to 170°. The fruit comes out all dried, and is packed in 50lb. boxes.*

Without any doubt the insufficient means for the distribution of fruit tend to lower prices, and to prevent a more general increase of the acreage of fruit-land. Gluts occur from time to time in some of the large fruit markets, entailing considerable losses upon producers. This is not by any means an indication that there is too much fruit-land in the country, but that the system of selling it is wrong. As it has been pointed out in a former article in this 'Journal,' † it may happen that at Covent Garden fruit may be dirt-cheap, while at St. John's Wood the usual high figures are ruling. This is the direct result of the fashion of consigning fruits of all kinds as fast as they ripen to a few central markets; a most extravagant fashion, and advantageous neither to the producers nor to the consumers. It is believed that the fruit-trade is conducted upon as unsound principle as the fish-trade, whose rottenness has been recently

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* 'Report of the Ontario Agricultural Commission, 1880.'

† "Fruit Growing in Kent." By Charles Whitehead, vol. xiii. 2nd Series, R.A.S.E. Journal.

exposed. The difference between the prices paid to the producers and those paid by the consumer is unreasonably great. A direct supply to the consumers or to retail shops is urgently wanted. This would not be difficult with respect to the finer fruits and hard fruits. It is now done to some extent in Kent, and to a considerable extent in Worcestershire. Many of the fruit-growers in the famous Evesham district advertise their fine plums in the 'Times' and other papers. It is very frequently a great boon to numbers of housekeepers to know where to get good fruit both for eating and preserving, and especially when it is offered at a fair price. Some of the Co-operative Supply Associations afford admirable media for the distribution of fruit, and contract with the growers to furnish them with fruits in due season. The Parcels Post offers admirable advantages for the distribution of fruits, and will enable those who prefer their fruit fresh to have it direct from the growers day by day.* Contracts for this purpose will be made with growers; and while the charges of commission agents and of retailers will be avoided, the fruit will arrive comparatively fresh, not having been exposed in markets and shops, and not having been picked over by various hands more or less dirty. Convenient packages, either baskets or boxes, for juicy fruits and for harder kinds will be necessary. These will probably soon be forthcoming, and it is fully expected that a very large trade will be carried on, if the growers promptly seize the opportunity.

In the case of apples and pears it is most imperatively necessary that the growers should change their practice, and store the best eating and cooking apples as the Americans and the Canadians store them, and supply the markets as they ripen. If they wish to compete successfully with foreign producers, this must be done. Inferior apples, which are not wanted for cider, or for which there is no demand for mixing up with other fruits for jam, should be dried after the American plan, either in thin slices called "chips," or "sliced fruit," or as "cored quarters," or "uncored quarters." In the counties where cider and perry are made, apples and pears of all kinds can be utilised when there is a glut in the market; though this has not happened for some years. The demand for well-made cider and perry has perhaps decreased locally in a degree, owing to the labourers being better able to afford to buy beer, and the preference for it among them; but the general demand has increased at least 50 per cent. Considerable quantities are sent

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* The low rates now charged by the Railway Companies for small parcels, by reason of the competition of the Post Office, will also much expedite the distribution of fruit.

to Ireland to be distilled into whiskey. "Champagne cider," a sparkling well-made cider of wine-like quality and appearance, is largely and profitably manufactured in parts of Devonshire, and meets with a ready sale. Much improvement is required in the making of cider, even in the reputed cider districts, and in turning it to the best account. A good deal of cider is made in America; and vinegar, which is said to be scarcely inferior to the best white-wine vinegar, is extensively produced from it in America and Canada. A better kind of cider is also made in New Jersey, and is sent to New York to be turned into champagne. The area of land in England which yields fruit fitted for making really good cider is limited, being confined to certain strong loamy and loamy clay soils of the Old Red Sandstone formation, in parts of Devonshire, Herefordshire, Worcestershire, and Somersetshire. Cider is made in other counties, as Dorsetshire, Gloucestershire, Hampshire, Kent, and Shropshire; but it is of indifferent quality, and the amount made is gradually decreasing, as beer is preferred. It is quite a mistake to suppose that good cider can be made in any district where apples grow plentifully, and that the same kinds of fruit will make equally good cider wherever they can be grown. The Foxwhelp, Skyrmes' Kernel, Cockagee, Styre, Redstreak, Thousand Pound, Duffling, and other apples famous in Herefordshire and Somersetshire for their cider-making qualities, would not make much better cider in Kent or Dorsetshire than the ordinary native sorts. Nor is it the fault of the manufacture that the Dorsetshire, Hampshire, and Kentish cider is comparatively thin and tart. It is because the soil is not suitable for the production of fine cider-fruit. As the finest Golding hops can only be produced upon certain soils confined to few districts, so apples and pears suitable for the finest cider and perry can only be grown in peculiar places. In these the growers have practically a monopoly, and might, it is believed, make more of this than they do at present, and improve the product by adopting better processes of manufacture. Good bottled-cider is dearer than the finest bottled-beer and stout. Perry is still dearer, and sometimes it is impossible to get it good. In Devonshire the proportion of cider-fruit to dessert-fruit is about 90 per cent. Competent authorities state that the cultivation of the Devonshire orchards remains just as it was a century ago. The trees are so close together that the grass under them is almost worthless, and they are in far too many cases unpruned, moss-covered and decaying. Some growers have recently planted or filled up orchards with new sorts of sour apples, which, blossoming late, are more likely to escape the May frosts. They are probably also induced to do this in consequence of the demand for common apples for jam and preserve-making, and the saving of trouble and risk which cider-making entails, as the fruit is sold by the ton on the trees to the agents of the jam-makers. New sweet sorts, of a late habit, have also been planted for cider, to avoid the action of spring frosts. In Somersetshire there have been rather more movement in the introduction of new sorts, and considerable additions to the acreage, in which the trees have been judiciously selected, more carefully planted, and not put so closely together.

In Worcestershire fruit-bushes have been extensively planted, either alone, or with plums, damsons, and apples over them. Plum and damson-trees have been preferred generally to apples, as coming to bear more quickly. The sorts chiefly planted are the Pershore, Egg, Victoria, Early Prolific, with gooseberries and black currants under them. The extension of the fruit acreage has been larger in Herefordshire in the last ten years than in any other county, and mainly consists of grass-land planted with apple and pear-trees of approved sorts for cider-making and dessert purposes. Heading old trees has been carried out here and there, and grafting with new quick-bearing kinds. One enterprising landowner planted several acres with Lord Suffield apple-trees, an early cooking apple, much grown in Kent, and considered as good as the Keswick Codlin by many persons; but finding they did not do so well as he wished, he headed them and grafted them with the Ecklinville Seedling, a cooking apple of vigorous growth and a free bearer, whose fruit ripens by the end of August, at a time when there is no foreign competition. These trees, grafted in 1881 with grafts not so thick as a pencil, have fruit upon all of them this season. This apple is not yet generally known; when it is, it will without doubt be largely planted.* There are in this county, and in the western part of Worcestershire, many orchards in a wretched condition, just as in Devonshire and Somersetshire, with closely interlaced trees spoiling the grass beneath and bearing fruit only in their upper branches. It is not satisfactory to note that so much of the finest fruit-land in the kingdom, situated in these cider-making counties, is in a sadly neglected state, and not producing a tithe of what it should and would if it were properly cared for.† However, there are signs that this

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* Another fine apple of brilliant colour, and a good bearer,—the Worcester Pearmain—is being largely grown in many fruit-growing districts. This apple is ripe in September. The trees are hardy and good bearers, and do well as bushes.

† In a much-quoted article in 'Macmillan's Magazine' for August, 1879, this passage occurs. "Is it not piteous to see in some of our counties the large old trees, picturesque certainly at all times, and gloriously beautiful when laden with their blossom, dying away for want of proper manuring and pruning, and producing in the best season only small and inferior fruit?"

is being altered. A few landowners and tenants are setting an example which, it is hoped, may be generally followed. Here and there, also, fruit-bushes have been planted, chiefly gooseberries and black currants, which thrive remarkably well in the better soils of this county. The recent plantations of fruit in Gloucester principally consist of plum and damson-trees, with black currants and gooseberry-bushes planted under them. In Kent, also, plum and damson-trees of the Crittenden sort have been extensively planted with gooseberry and red-currant-bushes upon the lighter soils, and black-currant-bushes upon those more heavy and clayey. A good deal of land has been planted with black currants in the Weald of Kent. Cherry orchards have been extended in East Kent, and apple-trees have been put in in various parts of the county. The cultivation of raspberries has largely increased, especially in the Sevenoaks and Farningham district, and in that near London, where strawberries are also abundantly grown. Near Southampton large additions have been made to the strawberry plantations, and the cultivation of this fruit is increasing in Cheshire, Cornwall, and Scotland, and in other districts remote from towns. The facilities of railway transport render it possible to supply customers at long distances with fresh fruit packed in boxes containing punnets. In a most interesting and instructive work recently published in America, entitled 'Truck Farming at the South,'* it is stated that in Norfolk, Virginia, the largest strawberry farm in the world is located, one cultivator having 250 acres planted with this fruit. Shipments are made to New York and other Northern towns, and high prices are made, as the fruit comes early.

A favourite way of planting fruit on the heavier Kentish soils is to put apple and damson-trees alternately with hops, the trees being 18 feet apart in the rows, and the rows 24 feet apart. After fourteen or fifteen years the hops are grubbed, and the land is laid down to permanent pasture. This is a good method on land where hops will not do well for more than for fifteen to twenty years, as in parts of the Weald of Kent, Herefordshire, Sussex, and Worcestershire. In some cases bush trees, or dwarf trees of apples, pears, plums, damson, and cherries have been planted, and the practice is gradually extending. It is being adopted by fruit-growers near London, and generally in gardens where vegetables are grown, and to some extent by fruit-farmers. These, as well as pyramids, take up but little space, come into bearing directly, and grow fine fruit. As a

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* 'Truck Farming at the South. A Guide to the raising of Vegetables for Northern Markets.' By Dr. Oemler. New York, 1883.

description of these trees and of their advantages was given in a late number of this 'Journal,'[*] it will not be necessary to allude to them further here.

Seeing that planting land with fruit-trees improves its value in an important degree, and for a long period, it is strange that landowners have not largely embraced so good an opportunity of increasing the value of their estates. It is exceptional to find any one who has done this upon a large scale. Lord Sudeley, to whom reference has previously been made, is the only landowner who has taken up the question in a thorough and business-like manner. He has already planted 500 acres, and is intending to plant 200 acres more at once. The land is a fairly free-working, moderately good soil on the Lias formation. It was deeply steam-ploughed and well manured, and standard trees of apples, pears, cherries, plums, and damsons were put in 16 feet apart: 3000 apple-trees were planted of the best sorts, including Lord Suffield, Keswick Codlin, Grenadier, Cox's Orange Pippin, Cellini, Warner's King: 812 pear-trees have already been put in—Beurré de Capiaumont, Easter Beurré, Louise Bonne, Jargonelle, Beurré d'Amanlis, Doyenné d' Eté, and other choice varieties. There are 32,000 plum-trees of 44 different kinds, such as Diamond, Pond's Seedling, Early Orleans, Greengage, Victoria, Autumn Compôte. Of damson-trees, there are 9000, nearly half of which are the sort known as Crittenden's, so largely grown in Kent, and the remainder are the Shropshire Prune, Cheshire, Common Prune, and Black. Only 522 cherry-trees have been hitherto put in, as Lord Sudeley is not quite certain as to whether they will flourish at Toddington. These are of the best kinds, such as the late and early Bigarreau, Black Heart, Kentish, and Flemish, and at present are looking very well. Gooseberry or currant-bushes, and strawberry-plants, are set between the standards, and in some cases raspberry-canes are put between the gooseberry and currant-bushes. There are over 50 acres of black currants, raspberries, and strawberries, by themselves, without standards. There are 100 acres of strawberry-plants in all, and 60 acres of raspberry-canes. Some of the apple-trees are pyramids, which do very well. Lord Sudeley has not yet planted bush-trees in any large quantity, but he intends to plant 80 acres of plums in this way, by which the expenses of staking are avoided, and injury from wind, and these trees come into bearing more quickly than standards. The strawberries are the kinds known as the Stirling Castle and the American Scarlet, brought from Isleworth, where they

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[*] 'Hints on Vegetable and Fruit Culture." By Charles Whitehead. Vol. xviii. 2nd Series.

are highly esteemed for preserving. Gooseberry-bushes number 130,000, and consist of no less than 45 varieties. Those, however, which have been planted for the main crop are the Warrington, Lancashire Lad, Lancashire Prize, Crown Bob, and Whitesmith. No less than 228,000 black-currant-bushes have been put in of the leading kinds, such as Lee's Prolific, Baldwin's Black, Black Naples, and Prince of Wales. Black currants appear to thrive well in the soil and climate of Toddington, and bid fair to be fertile sources of profit, for no fruit is in greater demand, or gives a better return, when the bushes are planted on suitable land and properly managed. The raspberries are chiefly Carter's Falstaff; and the red currants the Raby Castle and Scotch Red. Those who know anything about fruit-growing will say that nothing could be more judicious than the selection of the sorts of the various fruits; and those who have seen the manner in which the plantation has been formed, the cultivation, the Jam Factory—which has been described above, making the grower independent of markets—and the general arrangements, hold that nothing could have been better conceived and carried out. It is unique. There is nothing like it in this country in point of extent and order. There may possibly be larger fruit farms in America, but none like it, as it were, in a ring fence, and with such a varied assortment of fruits. Belts of poplars, Scotch firs, and other quick-growing trees have been placed round the plantation to shelter it from the prevailing winds. Beds of osiers have been formed on the banks of the little stream Isbourne, which have taken so well that all the baskets required for the fruit are now made on the estate. Ten acres more are to be planted at once with osiers. A nursery for raising trees and bushes has been formed in a convenient and well-sheltered spot, where standards, pyramids, bush-trees of all sorts and sizes are seen, well-grown, well-trained, and worked upon the most approved stocks, as well as all descriptions of fruit-bushes. This is most economical in the first cost of the trees, and prevents possible loss and disappointment through getting trees that are not true to name, or that have been badly worked and trained, and starved on poor land, or land exhausted by continuous cropping. It is a great mistake to think that it is better to have young fruit-trees and bushes from poor soils. Like all young things under the sun, they require generous nurture, or they become stunted and prone to canker and premature decay. The owner of this plantation got his fruit-trees from the very best sources and paid full prices, and is rewarded by having a perfectly vigorous and healthy lot of trees and bushes; so much so, that at this time, among the 40,000 plum and damson-trees, there are not five in a thousand that have gone wrong. The selection of fruit-trees is a most important factor in the success of fruit-plantations. Many who have been inspired with the laudable intention of planting fruit have been estopped with grief, because they had not courage enough in the first place to give high prices for the best sorts of trees, strong and healthy; nor in the second place to carry out the planting thoroughly well. To succeed in this, as in most other agricultural ventures, not a little capital and no end of judgment are essential. It makes one gnash the teeth to note the manner in which some set about fruit-growing, who buy whatever trees come to their hands most easily, and above all, most cheaply, and stick them in a pasture, putting a few thorns round them to keep animals off. Probably no stakes are provided, and on passing by two years after, it is found that the trees are barked and bitten, that they are twisted and bent in every way, and the would-be fruit-grower declares in disgust that he has had enough of this game. Or another sets the trees on arable land in pretty much the same fashion, and goes on ploughing and harrowing and sowing almost as if they were not there, and wonders that they have become in two years or so, cankered, distorted, stunted objects. A third plants standards on ordinary arable land, and puts bush-fruits beneath them as thickly as he can, and crops the interstices with mangolds, potatoes, cabbages, until the trees bear, without manure, or without extra manure, wholly ignoring the fact that the fruit-trees require every atom of fertility that the soil and the heavens above can supply. Naturally the results of these experiments prevent the extension of fruit-growing in the neighbouring districts. On the other hand, the Toddington plantation is a standing example of success, and should serve to encourage waverers and those disheartened.

It will be gathered from the foregoing pages that rather more attention is now being paid in this country to fruit-growing, and that some progress has been made during the past few years both as regards planting fresh land and, in a degree also, the improvement of existing orchards and fruit-plantations. That this recent increase in the plantations is utterly inadequate and insufficient goes without saying; while the amount of improvement to the existing orchard and fruit-plantations must appear ridiculously small to those who know the state in which thousands of acres are still allowed to remain with the trees unpruned, covered with moss and lichens, and the ground unmanured. It is high time that this state of things were changed, and that fruit-growing were seriously adopted by British agriculturists.

XVIII.—*On River Conservancy, and the Cause and Prevention of Floods.* By W. H. Wheeler, Mem. Inst. C.E., Boston, Lincolnshire.

The frequent floods of the last few years have called prominent attention to the conservancy of the rivers of this country. There is scarcely a river valley in England which has not suffered, and that is not subject to inundations. The consequence of any prolonged downfall of rain is the submergence of hundreds of square miles of the richest land in this country, and the number and frequency of these floods prove them to be an evil which demands a remedy. Those whose occupations have caused them to travel throughout the length and breadth of England must frequently have observed, when passing through the river valleys and low-lying districts, the whole country, as far as the eye could see, resembling an inland sea,—the hedges often entirely submerged, houses and farm-buildings standing like islands in the midst of the watery plain; all communication by road stopped, and the trains frequently with difficulty continuing their way through water reaching nearly up to the carriage floors. The ordinary sluggish current of the river has become a rapid stream, bearing on its surface cocks of hay or sheaves of corn, and occasionally the bodies of dead animals, which had been swept away before they could be rescued from the fields. This picture is not an isolated one, but such occurrences have been frequent and widespread.

The damage has in many cases been most disastrous, not only from the immediate loss of crops, but from the injury done to the land by soddening it and rendering it difficult to work in the winter season, and thus disturbing the ordinary course of cropping; also by washing out the manure and destroying the condition of the land. In summer the grass-land is rendered useless by the deposit of earthy matter left on the herbage, and the poached condition of the land makes it unfit for the stock; even in winter, when floods, if not of too long continuance, may do good to grass-land, in some cases, by their long duration, and in others by the deposit of ferruginous and siliceous matter contained in suspension, they have been most detrimental to the pastures. By frequent and long continuous flooding, the quality of the pasture becomes deteriorated, the fine grasses dying off, and being succeeded by coarse and non-nutritious herbage.

These losses cannot be regarded as affecting only the persons more immediately concerned, but become a matter of national concern, and tell seriously on the food-producing resources of the country and the national wealth.

To give any estimate of the actual loss incurred would be impossible, but an idea of its magnitude may be gathered from examples where the amount has been to some extent ascertained. Mr. Brundell, in his evidence before the Committee of the House of Lords, stated that the estimated damage of a flood which occurred in Yorkshire, in July 1872, to one district situated on the River Don, amounted to 70,000*l.*; and that, in other districts on the same river, it could not be put at less than hundreds of thousands of pounds. Mr. Tarbotton stated that, by the flood in the Trent, which occurred in July 1875, thousands of acres of crops were destroyed, a large number of cattle endangered, and immense damage done by the houses and factories of the lower part of Nottingham being flooded. The damage was so great that he found it impossible to place a money value on it. These floods on the Trent are frequent, and the towns of Leicester and Burton-on-Trent are also subject to inundations from the same river. Isolated attempts at self-protection in these places has only rendered the flooding at other points worse. In the basin of the Aire and Calder, by a flood in October 1866, the whole river-valley was inundated, several people and cattle were drowned, crops were destroyed, and some portions of the towns of Leeds, Wakefield, Huddersfield, Barnsley, and Dewsbury flooded to a depth of from six to eight feet, the estimated damage amounting to nearly a million of money.

In the West of England the floods in Somersetshire on the Parrott are notorious. On the Wye and the Lug, in Herefordshire, Mr. Lloyd stated to the Committee that the roads were sometimes blocked up by the water for nine weeks together: that for miles the basin of the valley is nothing but a sea of water, the area of land thus affected not being less than 8000 acres. In July 1875, a summer flood washed all the hay-crops away from the meadows lying along the river, besides other various damage.

In the East of England, along the four rivers emptying into the Wash, the flooding is frequent and constant. A short continuance of rain places the whole valley of the Ouse from Bedford to Earith under water, the floods rising above the top of the hedges, and stopping all communication by road. In the Nene the same flooding occurs from Northampton to Peterborough. On the Welland scarcely a season passes without most disastrous inundations. In 1880, no less than four floods occurred, namely, in July, September, and October. The whole of the hay-crops were floated away from the meadows along the river; several villages were flooded, the water rising in the streets to a depth of from three to four feet, and inundating the houses; the traffic on the main line of the Great Northern Railway was stopped, and the lower part of the town of Stamford flooded several feet deep. The flood in September was nearly as disastrous, the sheaves of corn floating about in the fields, and the stackyards being flooded sufficiently deep to seriously injure the ricks. In October the river was again unable to contend with the water poured into it; thousands of acres were flooded, the water standing up to the bands of the sheaves. It was impossible to harvest the corn, which was left to rot in the fields; and even after the flood subsided, the lands were so saturated that they could not be ploughed for the autumn wheat-sowing. On the Witham, in the same year, a very large area of land was covered with water at harvest time; river banks were broken, part of the city of Lincoln inundated, and the works of some of the large agricultural implement works brought to a standstill. On the same river, in 1877, many thousands of acres were submerged, crops destroyed, tenants ruined, and a loss incurred estimated at 100,000*l.* Hundreds of houses in Lincoln were then submerged, and the comfort and health of the inhabitants were sacrificed.

Similar instances in other parts of the country could be multiplied to an extent which would render the account appalling; sufficient have, however, been given to afford some general idea of the enormous loss to the country which is continually occurring from the want of a proper system of management and control over the rivers.

These floods are not mere passing evils due to abnormal causes, but are constantly recurring, and are succeeded by droughts, when the want of water is almost as greatly felt as its excess. Owing to their magnitude, and the causes from which they arise, these floods cannot be grappled with by private enterprise, and can only be adequately dealt with by some comprehensive Imperial enactment. If it had been practicable to regulate the rivers and prevent flooding, by any combination of the landowners whose estates have suffered, there is no doubt this would have been done long ago. The extensive works that have been carried out for the reclamation of waste lands, and more especially in the drainage of the Great Level of the Fens, where upwards of two millions of money have already been expended in embanking, straightening, and deepening the rivers, and controlling the discharge of the water, show what can be accomplished when the circumstances will allow of improvements being effected. It is neither money nor energy that is required, but a strong enactment fixing the liability of maintenance on a representative governing body, laying down certain fixed principles as to taxation, and giving the conservators power of dealing with rights and privileges which have been allowed to spring up to the public disadvantage.

The enormous cost of obtaining Acts of Parliament for the improvement of only portions of a river stand forth as a bar to improvement, except in the most extreme cases. These costs must in the preliminary stage be guaranteed by the landowners, in case of failure to obtain an Act giving the necessary power of taxation, a risk not lightly to be incurred, considering the immense number of interests on every river, and the spirit of opposition on the part of any body of Commissioners when there is the chance of privileges being interfered with.

It has been stated that the contests over the jurisdiction of the lower section of one of the second-class rivers on which improvements have recently been carried out have cost 100,000*l.* during the last fifty years; and that the cost of obtaining Parliamentary powers for the improvement of the outfall of another river draining a large section of the Midland district has amounted to 150,000*l.* during a like period. On the Don it cost 7000*l.* to obtain an Act to improve only twelve miles of the river, 3000*l.* being spent by the opposition, or about one-third of the total cost of the works. An unopposed Act costs nearly 1000*l.*, and the smallest opposition, if carried on only in one House, trebles or quadruples this amount.

It frequently happens that the different sections of a river are under separate jurisdictions; perhaps with intervening sections with no jurisdiction. Some portions may have been canalised, others subject to the rights of millers. The channel may belong to one set of commissioners, the banks to a different set, or even divided in short lengths, with a liability to maintain and repair devolving on the riparian proprietors, and measured by yards. Take, for example, the river Aire:—from Skipton to Keighley, the Aire-dale Drainage Commissioners control the channel, then follows an intervening space with no control beyond that of the individual wills of the riparian proprietors through whose land the river passes; from Leeds a Navigation Company has possession, and from the end of their jurisdiction to the outfall into the Ouse there is again no controlling power. The consequence is that the improvements made and maintained in the upper portion, and the requirements of the navigation of the middle portion, subject the intervening country to constant floods. On the Nene, over a distance of thirty miles from Peterborough to the sea, there are at the present time no less than fourteen different bodies having control over either the banks or the channels. On the river Witham, between Grantham and the sea, there are seventeen sets of trustees or commissioners who claim jurisdiction over some part of the stream, and exclusive of the commissioners having control over the interior drainage areas. Mr. Tarbotton, in his evidence before the Committee of the House of Lords, drew attention very forcibly to this difficulty of dealing with rivers under present circumstances, and stated that, although the Corporation of Nottingham had spent a considerable amount of money in improving their section of the Trent, the town was still liable to floods, from the condition of the river outside their boundaries. The same is the case at Leicester with the Soar.

Here is an evil of a very grave character that demands a remedy.

There is not wanting a precedent for the action now required to be taken up by the Legislature. The highways of the country were at one time in a most wretched condition. There was, as in the case of rivers, the liability *ratione tenuræ* of adjoining proprietors to maintain roads running past their property, and of parishes to have certain statute duty done, and of proprietary roads, similar to canals, but there was no generally organised and compulsory system of maintenance. As the population increased, a better and more extended system of locomotion became necessary, and the wretched condition of the highways could no longer be tolerated. Attempts were first made to provide a remedy by statute duty, and direct lines of communication were opened out by the enterprise of private individuals combined together in the form of trusts. In the reign of William the Fourth this anomalous condition of affairs was at last remedied. A general highway Act was passed, previous statutes were amended, and the law relating to highways placed on a satisfactory basis. The responsibility of their maintenance was clearly defined, and a remedy in case of default provided; the money required for the purpose of repairs was raised by a regular system of taxation, spread over all lands and buildings whether directly benefited or not.

As the roads are the great highways for traffic and locomotion, so are rivers the great highways for passing the rainfall from the land on which it falls to its ultimate destination, the sea; and, as no land is exempt from rainfall, it is contended that there can be no injustice in making all pay its fair share towards maintaining the channels in efficient condition.

With increase of population the circumstances of the country have altered, and greater efficiency is demanded in the management of every branch of social economy, involving the imposition of burdens which in a more tolerant age were not required. The organization of a system of rural police, greater attention to the preservation of health, and the compulsory education of the rising population, have added new duties and fresh taxation on the country. Higher cultivation of the land demands more protection from floods and droughts, and the cost of providing more efficient waterways has become a necessity.

Although rivers may at times occasion disastrous havoc, yet on the whole they are productive of universal benefit. In a variety of ways they promote every interest of civilized life, but especially that of agriculture; they provide a constant supply of one of the first necessaries of existence, both of animal and plant life; a cheap means of moving heavy produce; an economical power for working mills and other machinery; and they yield in the fish which inhabits them a wholesome and useful supply of food.

CAUSE OF FLOODS.

In dealing with the question of improved river conservancy, it is necessary to consider whether floods are more frequent and more serious in their character than they used to be, or whether those of the last few years are due to an excessive fall of rain, which, being abnormal in character, is only temporary, and therefore does not demand any permanent remedy. Although there was some slight division of opinion on the part of the witnesses who appeared before the Committee of the House of Lords on River Conservancy as to the cause of floods, the testimony was unanimous that they were both more frequent and more disastrous in their character than formerly; and that although in some cases the floods did not last so long, yet the water rose to a much greater height during the time they lasted than was formerly the case. There is also to be taken into consideration the fact, that owing to the much higher system of cultivation which is now pursued, land is much more seriously damaged than it would have been under other circumstances; and as the loss is so much heavier, the greater is the necessity for improved drainage and the prevention of floods. A higher system of cultivation also demands that all stiff lands shall be thoroughly drained with tiles. This means that the ditches and smaller arterial drains shall be kept well scoured out, so that the tiles may have a free discharge; the brooks and larger arterial drains must be improved and kept in order, so that the water from the ditches may have free escape; and thus it happens that over the whole cultivated portion of a watershed, the great object is to void the excess of rainfall as rapidly as possible, and prevent its standing in hollow places or choking the pores of the earth. The consequence is that the rivers receive a much larger quantity of water in a less space of time than that for which they were originally adapted; and being unable to hold the water sent to them within their banks, it overflows the lower lands. This effect is enhanced by the improvements which are made by riparian proprietors to protect their land from flooding, by embanking, diminishing the flood-area in their own locality, and driving the water on to the low lands of their neighbours. Again, the increase of population and the demand for land have caused the reclamation of large tracts which were once commons and peat mosses. These were formerly in an undrained state with many low parts; and while dry in summer, became, after heavy rain, reservoirs to hold the rainfall and regulate the supply to the rivers. The stubbing of woodlands has had the same effect, as the soil in which trees grow absorbs and retains an immense amount of water.

The question whether tile-drainage has added to the increase of floods, is one that has caused a division of opinion; it being maintained by some that, by drying the land, it makes it more porous and absorbent, and, like a dry sponge, ready to receive and hold the rain. If, however, under-drainage does not void the water off the land more quickly, of what use is it? Taking two arable fields situated side by side, one drained by tiles and the other undrained, except by top grips,—in a wet season, from the former, after a heavy rain the water will, in a very short time, begin to run out of the pipes into the ditches in a continuous stream; whereas, from the undrained land, no visible discharge will take place. On the former land, work could be resumed in a very short time; whereas, on the latter, if clay, it would be several days before the land would be workable, and only when by the evaporation caused by the sun and wind, or by slow and imperceptible percolation into the subsoil, the water due to the rain had passed away. The argument that pipe-drained and steam-cultivated land, by being rendered more porous, and consequently more absorbent, is calculated to hold more water, is good so far as it relates to the result in dry weather. However, floods do not generally occur under these circumstances, but only after a continuance of rain, when absorbent lands have become saturated and the natural level of the water in the ground has been raised to the level of the under-drains; after this has taken place the whole of the surplus rainfall must be discharged more rapidly, from the facilities afforded by a perfect system of drainage. On land undrained, and with the subsoil not broken up by cultivation, the rain lodges on the surface and in the furrows, and slowly finds its way by percolation through the pores of the earth to ditches choked with weeds, and so arrives at the river by degrees long after the water from the drained land has passed away. In an undrained field the water may be seen standing on the surface and in the furrows and hollow places for weeks; whereas, in an adjoining field, properly drained and cultivated, not a drop of water will be seen, the whole of it having been passed away through the pipes.

The rainfall being thus discharged more rapidly into the rivers, the question requires consideration as to whether the rivers are in a better or worse condition to receive it than formerly. To this there can be only one answer—that in the majority of cases they are worse. The mere fact of the floods bringing down the bulk of the rain-water rapidly, and leaving little to maintain a steady and continuous stream during the rest of the year, is detrimental to the condition of the channel. The growth of weeds is encouraged; and the absence of a sufficiently strong current allows of the deposit of alluvial matters washed into the stream, which would otherwise be carried away to the estuary.

The condition of the River Ouse, the receptacle for the drainage-water from 700,000 acres of land, may be quoted as an illustration of our rivers generally, it being described by Mr. Coote as gradually growing up without any effort to check the evil, or any authority with power to do so. The navigation has been nearly destroyed by the railways, and the owners of water-mills do what is right in their own eyes, restrained only by the common-law rights of their neighbours above and below. To which may be added from the Report of Mr. Abernethey on this river, "the obstructions to the free passage of the water arising from want of attention to the conservation of the river-channel increase year by year, and also as a consequence the area of low lands liable to inundation; and, unless this evil be vigorously dealt with, the river channel will be gradually filled up by silt and weeds, and the whole valley of the Ouse subject to the passage of flood-water without control." A further illustration may be taken from another correspondent of the 'Times,' who, writing on the same subject, says, "the condition of some of the smaller rivers is deplorable. Their channels are generally an alternation of weed-choked swamps, and nearly impassable rapids, with here and there a rare oasis of deep steady stream, the consequence of the needs of some mill-owner."

Abandoned navigation works have also added to the unsatisfactory condition of river channels. Previous to the introduction of railways, the system of conveyance of goods by water had been very greatly developed, and wherever the natural capabilities of a river were such that they could be adapted for this purpose, the stream had been canalised, and locks and weirs constructed for holding the water; but the greater facilities afforded by railways have almost entirely diverted the traffic. The proprietors of these navigations have suffered seriously by the loss of the dues; and although unable to fulfil the duties belonging to a proper maintenance of the streams, they still cling to the remnant of traffic left, and would offer great obstruction to any scheme of improvement which did not offer to reimburse them for their lost rights. So long as these navigations were maintained in order, the shoals dredged out, the weeds cut or kept down by the traffic of the boats, and the staunches and weirs kept in good order and properly attended to, the rivers were in a fair condition to discharge the flood-waters; but since the navigation has ceased, there are no funds to maintain the works in an efficient condition, or to alter and improve the weirs so as to adapt them to modern requirements of drainage. In some cases the canals have been entirely abandoned by their original owners, the Acts of Parliament obtained for this purpose making no provision for restoring the rivers to their original condition. Thus, on the Ivel, a tributary of the Ouse, the navigation Trust created in the reign of George II. was abolished in 1876; the works have been all abandoned, the locks and weirs allowed to go to ruin, the channel has diminished one-half in width and one-half in depth, and the bottom is gradually being raised to the level of the land. A miller, to protect his supply of water, has placed a solid dam across the stream, and nobody has now sufficient power over the river to prevent him. In like manner the Lark, another canalised river, is said to be almost entirely silted up since the navigation ceased.

Another cause of floods is undoubtedly to be traced to the condition of bridges. In many cases these are utterly inadequate to take the water in times of flood, and form a permanent block to its flow. Even where the arches are of sufficient capacity, they have often been allowed to become blocked up, and otherwise unsuited for the free flow of the water. As a rule, the duty of maintaining bridges over public streams devolves on the county; but this duty only relates to maintaining the roadway, and not the waterway, and there is nobody whose duty it is to compel the removal of obstructions, or to undertake to raise the funds and carry out improvements necessary to render many of the older bridges adapted to the altered condition of the streams and rivers.

PRESENT CONDITION OF LEGISLATION.

The ownership in the bed and banks of a non-tidal stream of water is in the proprietors of the adjacent lands up to the middle of the stream, but neither proprietor can use the stream so as to interfere with the natural flow of the water to the injury of the other riparian proprietors above or below. He is entitled to the use of the water as a natural incident to the right of the soil itself, as he is to all other advantages belonging to the land of which he is the owner; and he has the right to have it come to him in its natural state in flow, quantity, and quality, and to pass from him without obstruction. He may use the water for turning mills, or other similar purposes, and may divert it over his own estate, or for purposes of irrigation, providing he again returns it to the stream with no other diminution than that due to the evaporation and absorption attendant on irrigation; but he has no right to interrupt the regular flow of the stream, if he thereby interferes with the lawful use of the water by other proprietors, and inflicts upon them a sensible injury. Thus, a riparian proprietor would not be entitled himself to establish, or permit others to establish, water-works for the supply of a town, and by so doing divert permanently a portion of the stream from its natural course, to the damage of other riparian proprietors. On the other hand, he is bound to submit to receive all water that comes to him in a natural way, even although it may flood his land. Unless the flow of the stream is increased or diverted by some unauthorised act, he has no remedy, but must submit to what is the result of natural causes; but a riparian proprietor will be liable to his neighbours for damage if he diverts or interferes with the stream, or brings upon his land water which does not naturally belong to the stream, and thereby causes damage. And if, without wilfulness or negligence, he uses the stream in the ordinary way, though mischief thereby ensue to his neighbours, he will not be liable. Thus where a stream becomes by natural causes choked with weeds or deposit, and in consequence overflows adjacent lands, there is no common-law remedy to compensate the owner who may be damaged. A riparian proprietor also has the right to protect his lands from floods by embankments, provided such works do no injury to other lands; but he is not entitled to construct works, the direct effect of which would be to divert the scour of the water from his own banks, and throw it on that of his neighbour.

In tidal rivers the ownership of the bed of the stream, so far as it is covered by a medium high tide, is in the Crown, under the management of the Board of Trade, except where special grants have been made to Lords of the Manor, adjoining proprietors, or bodies of conservators appointed by Act of Parliament. The Crown is also, by virtue of the office of Lord High Admiral, entrusted with the Conservancy of all navigable rivers, and has power to prevent wilful obstructions, but there is no duty on the Crown by common law to cleanse or keep free from silt or deposit the bed of a navigable stream. Neither is there any liability at common law on the owners of a bed of a navigable river, or in a body of proprietors when the same is vested in them for the purposes of navigation only, to keep the channel clear of natural obstructions, or to remove weeds, although floods may be caused thereby.

In fact there appears at the present time to be no authority or person on whom devolves the duty of maintaining the rivers of this country in efficient condition, except where some portion of the channel has by the enterprise of the landowners in its neighbourhood been vested in Commissioners created by special Act of Parliament, or where the rivers have in certain districts been placed under a Commission issued by the Crown under a statute passed in the reign of Henry VIII.*

Even where legislation has been effected, it only applies to a section of the river where some body of proprietors, more enterprising than their neighbours, have obtained special Acts, enabling them to carry out works creating separate rights and interests which become the cause of great complications, and stand in the way of any future general scheme of improvement. Thus it occurs that on some rivers the banks are vested in one set of trustees, and the channel in another, and even the rights over the channel are divided between navigation and drainage trusts. The number of these private Acts now in force amounts to between 2000 and 3000.

With regard to the banks of the river, it occurs in some cases that the maintenance of these devolves on the riparian proprietors, *ratione tenuræ*, and they are divided in short sections, each proprietor being responsible for his own length. The difficulty of getting a number of persons to carry out works simultaneously, or to deal rapidly and effectually with a bank that is liable to be broken in a flood, is obvious, and to this cause may be traced many serious disasters which have occurred.

The earliest attempt at legislation with regard to the rivers and watercourses of this country was in the reign of Henry VIII., when, in consequence of the frequent representations to the Crown of the condition of certain low fen lands on the east and south coasts,—from the breaking of the protecting banks, and choking up of the drains and watercourses by means of which a great deal of this land had been rendered uninhabitable,—a statute was enacted, under which power was permanently given

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* The author is indebted for the principal part of the information here given to 'The Law of Waters,' by Coulsan, published in 1880.

for the issue of Commissions of Sewers. This statute was amended in the reign of William IV., but the principle of its original constitution remained unaltered. The purpose for which the Courts of Sewers were created was the preservation of marsh and low lands, and the maintenance of the sea-banks, and other defences, and the removal of impediments and obstructions made in the streams or sewers by the erection of mills, mill-dams, weirs, gates, &c. They were to have survey over "all walls, fences, ditches, banks, gutters, gates, sewers, callies, ponds, bridges, rivers, streams, watercourses, &c."

Romney Marsh, a tract of low land in the county of Kent, seems to have been the first to have benefited by this Act; and the rules there adopted for the guidance of the court formed the precedent for subsequent courts; and it is to places of this description, and the Fens and marsh lands on the East Coast, that the action of these Commissions is confined. They have no general control or jurisdiction over the watercourses of the country. They exist principally for the maintenance of existing works, but have power to construct new works, when necessary, for the more effectually defending and securing any lands within their jurisdiction against the interruption or overflowing of the sea, or for draining and carrying off the superfluous water; but such new works cannot be made without the consent of the owners or occupiers respectively of three-fourths of the lands lying within the district proposed to be charged with the cost. The court has power to raise money for the maintenance of existing, or for the construction of new, works, by an acreage tax on lands lying within the level. Under the Land Drainage Act, 1861, Commissioners of Sewers may be issued for districts where they have not formerly existed, under the authority of a provisional order issued by the Inclosure Commissioners and confirmed by Parliament; but the machinery for obtaining such an order is too complicated, and the power given too limited, to be applicable to any extensive area or to effective drainage by means of arterial streams.

The next legislative attempt to deal with drainage was an Act passed in the present reign (10 & 11 Vict. cap. 38); but this only related to the drainage of estates, and gave proprietors power, under certain conditions, to improve the outfalls of their drainage by opening out or improving the watercourses passing through lands lying below them; or, by summary proceedings before two justices, procuring the clearing or scouring out of the channel of any stream where the proprietor has failed or declined to do so.

In 1861 a most valuable and important Act was passed

(25 & 26 Vict. cap. 33), the object of which was to facilitate the formation of drainage Trusts, without the great expense attending a special Act of Parliament. This Act gives all the powers and facilities necessary for dealing with the main drainage of land, and the improvement of the smaller class of rivers, brooks, and streams ; and it is a matter of surprise that it has not been more generally taken advantage of.

If the several watersheds of the tributary rivers were formed into districts under the powers of this Act, and a general body of Commissioners were formed by representatives from these smaller districts for the management of the whole main river, with power to levy contributions for general improvements and maintenance, the rivers of the country could, without any complicated system of representation, be placed in a thoroughly safe condition. This principle has long been carried out in the drainage of the Fens, the evil there, however, being that the system is only applied to a section of the river instead of the whole. To take an example: the Fen Acts relating to the River Witham extend over a length of about thirty miles between the towns of Lincoln and Boston. The fen land between these points is divided into six districts, each having its own Commission for the management of the interior drainage works, the number of members being regulated by the number of parishes in each district, each parish selecting one representative. These Commissioners elect from amongst themselves members to represent them at the Board of General Commissioners, which consists of thirty-three members, thirty-one being furnished by the districts, and the remainder by the towns of Lincoln and Boston. The General Commission has the control of the River Witham and its banks, and certain main drains in the district, and power to levy taxes for the works necessary to maintain them in efficient condition. This organization has, during a long series of years, proved itself thoroughly efficient, as far as it goes.

Subsequent Acts (27 & 28 Vict. cap. 14, and 40 & 41 Vict. cap. 31) have been passed with reference to the improvement of drainage, but these Acts only deal with the drainage of land and the improvement of estates, by the construction of reservoirs and works necessary for the water-supply of the landowner's own estates or the adjacent villages. The Rivers Pollution Act, passed in 1876, prescribed penalties for putting solid matter into any public stream so as to interfere with its free flow, and for polluting it by the discharge of sewage, or of the refuse water from mines.

Full particulars of these several Acts, and the method of obtaining provisional orders under the Land Drainage Act of

1861, were given in the article by me on "Arterial Drainage and Storage of Water," in Part I. of the 14th volume of the 'Journal,' and it is therefore needless to refer to them in greater detail here. It is sufficient to say that these Acts give all the facilities that are required for obtaining the necessary powers for dealing with the tributary streams, watercourses, and drains; but they now require to be supplemented by a General Act, constituting Boards for dealing with the main rivers into which these tributaries discharge.

In 1877, owing to the constantly increasing complaints as to the damage caused by flooding, a Committee of the House of Lords was appointed, at the instance of the Duke of Richmond, "to inquire into the operation of existing statutes in regard to the formation of and proceedings by Commissioners of Sewers and Conservancy, Drainage and River Navigation Boards; to consider by what means such bodies may be more conveniently and inexpensively constituted, their procedure improved, and their powers enlarged so as to provide more efficiently for storage of water; the prevention of floods, and the discharge of other functions appertaining to such boards."

A large body of evidence was taken, and the Committee reported: That floods have been more frequent and of longer duration in recent times than formerly: That, amongst the causes assigned for this, prominence was given by the witnesses to the adoption of the system of subsoil-drainage: That, if the channels and outfalls of rivers be properly cared for, water flowing into these rivers may reasonably be expected to be discharged in sufficient time to prevent serious damage to agricultural lands by floods: That floods of moderate duration are not always prejudicial, but that injurious consequences arise when the water is suffered to stagnate upon the soil: That with regard to the Acts now in force relating to the appointment of commissioners and the Land Drainage Act, 1861, although large powers of executing works and rating have been conferred upon the persons charged with the execution of these general Acts, their duties have only been indicated in a vague and general manner; and that certain powers are wanting which are essential for the maintenance of an adequate system of drainage; and further, that the constitution of these authorities is not compulsory, and that there is an absence of responsibility which may be held to account in a great measure for the present neglected state of the rivers. The Committee further arrived at the conclusion that rivers differ so widely in their characteristics that it is impracticable to prescribe any general scheme of conservancy which would be applicable to all rivers without exception, and that the particular measures which should be adopted for keeping the main channel in a satisfactory condition must be left to be determined by a consideration of the circumstances of each separate case; that they concurred with the almost universal opinion of the witnesses, that in order to secure uniformity and completeness of action in dealing with each river, each catchment area should be placed under a single body of conservators, who should be responsible for maintaining the river from its source to its outfall in an efficient state. That with regard to tributary streams these might be entrusted to district committees acting under the general direction of the conservators. The Committee further recommended that action for the formation of Conservancy Boards should emanate from the landowners, and that the scheme for each district should be settled after local inquiry by a Government Inspector. That great caution should be exercised in dealing with prescriptive rights of mill-owners and others, in respect to dams and weirs, as the evidence pointed to the conclusion that weirs and dams, when properly constructed, are not necessarily prejudicial. That with regard to the principle of assessment for laying the rates, they were of opinion that the principle adopted under the statute of Henry VIII., of taxing in proportion to the benefit conferred in each particular case by the works of conservancy, appeared to work unfairly and to be incapable of general application; and that of taxing equally all riparian lands, included within a certain level, seemed likewise open to objection; and therefore they had come to the conclusion that the rates should be distributed over the whole area of a water-shed, the lands and houses below the flood-level being rated at a higher amount than those above, and other graduations and exceptions made to meet particular cases. That the basis of taxation should be the rateable value, and that towns and houses should contribute to the rates; and that they saw no injustice in rating uplands to the maintenance of a channel to which they contribute their quota of water.

Several attempts have since been made by the Government and also by private members to pass an Act of Parliament founded on these recommendations; but the pressure of other business has hitherto prevented any measure being carried. None of the Bills which have been brought forward have contained measures for placing the rivers of the country on as satisfactory a footing as the highways, or making Conservancy a compulsory measure; but they have left the initiation of proceedings to the voluntary action of the landowners in the district draining by each river.

The main features of the Bills promoted by the Government, and amended in conformity with the expression of opinion of the Committee to which the one brought in 1881 was referred, may be generally summarised by stating :—That their purpose was the conservancy of rivers and the protection of lands from floods. The Act might be set in motion as regards any particular river on the application of not less than twenty owners and occupiers of land in the river basin, amounting in rateable value to 2000*l.*, or by any Sanitary or Conservancy Authority. On receipt of such an application, the Local Government Board would send an Inspector to the district to hold a public inquiry, and to report as to the limit of the district, and the expediency of its division into lowlands, midlands and uplands ; as to the proportions to be paid by each ; as to whether any lands should be exempt wholly or partially from taxation, from having already executed works. The Local Government Board then would issue a provisional order defining the limit of the district, the constitution of the Conservancy Board, which was fairly to represent the taxpayers, and, if necessary, for dividing the river basin into districts. This order subsequently would be confirmed in the usual way. Land subject to ordinary floods and damage therefrom would be regarded as "lowlands ;" lands occasionally subject to floods, or to the destruction by floods of the outfalls of their drains, as "midlands," and the remainder of the district as "uplands." The rate on uplands would be limited to one-tenth of the rate in the pound paid by the highest rated districts. The Conservancy Board, when formed, would have power to do all works and acts necessary and incidental to the proper maintenance of the river, and to compensate persons injured by the works. The money required would be raised by a precept on the overseers of the poor, and the rate would be payable by the owner of the lands rated. Provision would be made for the repeal of local navigation or other Acts, and for repealing or modifying existing Commissions of Sewers, Drainage and Conservancy Trusts. Special provisions would also be made with regard to the Fenlands on the east side of England.

Hitherto there has been no special department of the Government which has had more immediately under its care the rivers and streams of this country, but the carrying out of the laws enacted under such Acts as are in existence is divided amongst the Board of Trade, which has the care of navigable streams ; the Inclosure Commissioners, who have the management of proceedings under the Land Drainage Acts ; and the Local Government Board, of the River Pollution Act. This latter department is to be entrusted with the carrying out of the Conservancy Act, should one ever be passed, but it will then have only a divided jurisdiction with the Board of Trade and the Inclosure Commissioners.

In Holland, France, and Italy, distinct departments are formed, having control over the Hydraulic Works of these countries. In Holland the Acts of the department are principally directed to the maintenance of the banks and drains to which the country owes its safety. In Italy the principal object is irrigation, by means of which the land in places has been raised immensely in value. In France this subject has, from the earliest times, received attention; and the principle of the Roman law is there adopted: that the ownership of all rivers, together with their beds and shores, was vested in the people. No one can hinder the navigation of a river, or alter its course, or raise obstacles to its flow, or commit any act that may prejudice the rights of others. Acting on this principle in 1789, all concessions which had been granted by the landowners in virtue of their supposed feudal rights of erecting mills, fishery weirs, and other obstructions, were annihilated; and all prescriptive rights as regards rivers of France were for ever abolished. All rivers, both navigable or otherwise, and all streams possessing a character of general utility were declared to be the property of the nation. The owner of an estate traversed by a running stream is allowed to make use of the water of such stream for the purpose of irrigation, but he may not divert it altogether, and is bound to return the water, after he has used it, into the old channel at the point where his property ends.

While thus the general law of France as regards rivers and watercourses is in a more favourable condition for their conservancy than that of England, and whilst the Government offers the assistance gratuitously of an able staff of engineers, and of a department specially formed for the purpose, yet, owing to the want of practical energy in the country, the voice of lamentation is constantly heard complaining of inundations which spread disaster and devastation of a more ruinous character even than those in this country. No sufficient efforts are made to husband this surplus of water by the formation of reservoirs, or other means of storing the water, for the irrigation of the arid districts during the scorching heats of the dry season.*

The difficulty of legislating on this subject in this country arises not only from the necessity of dealing with, and compensating, existing interests and prescriptive rights which have gradually sprung up; but also of providing the means for carrying out the necessary works of improvement, and remedy-

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* A general description of the rivers of France and the laws relating thereto will be found in an article in the 'Journal' of the Society, by Mr. F. R. de la Trehonnais, for 1862, entitled "The Water Economy of France in its relation to Agriculture," from which the information here given has been obtained.

ing the neglect of past ages, and adapting the rivers to modern requirements. On the one hand it is contended that as the rivers are the natural outlets for the surplus rainfall which falls on every acre of land, all lands should pay in proportion to their rateable value. It may be true that moorland or pastures in a high district require no drainage, and would be equally serviceable whether rivers existed or not; but against this it is urged that, as this land sends its water on to the lower plains, it ought to bear its share of maintaining the water-courses in the same way that it contributes towards highways, towards the maintenance of the poor, of education, &c., none of which are requisite for land which has no houses on it, and the only road required is one sufficient to drive the mountain sheep over occasionally. Exemption is further pleaded for the high lands on the ground that, being situated far away from flooded districts, the rainfall escapes from them, and under no circumstances can they be flooded; that they have an ancient and prescriptive right to the rivers; and that, if the lands at the lower end are inundated occasionally, they are only in the condition in which nature made them, these low lands being the sinkholes to receive the water poured from the adjacent high land; and that, if for the individual profit of the owners they have been embanked and cultivated, it has been done at their own risk, and they must now take the consequence. Therefore, to put these high lands under taxation, for the improvement from which they will not benefit, would be an arbitrary and unjust interference with private rights. To this it is replied; that it is the action of the owners of the high lands that has brought about the necessity for further legislation and consequent taxation. By improved drainage the rainfall is voided more quickly, and poured more rapidly into the lower reaches, and where these have been improved, the works were designed for a natural escape of the rainfall; and that it is only due to the more rapid discharge, owing to improvements carried out on the high lands to meet the requirements of the modern system of agriculture, that they have now become inefficient; while it is not asked that the high lands should pay for works which are solely for the improvements of these low lands, yet they should bear their fair share of maintaining the water-way in a condition to carry off the rainfall poured into it. That the great improvements which have in most cases been carried out by river authorities at the outfalls may fairly be set against any prescriptive right of drainage by the owners of high lands. That if these high lands are far above and away from the portion of the river where floods occur, it may fairly be answered that an outfall for the rainfall is an absolute necessity; that without an outfall, their works of under-drainage and improvement would be rendered abortive; that whether the water from their drains soaks into the ground or passes away along the ditches and watercourses, its ultimate destination is the river, the great highway for the water; the further, therefore, the lands are removed from the outfall, the greater the length their rainfall will have to travel over, and the greater their mileage rate. The further land is removed from the outfall the more river it requires. A field lying near the sea may get rid of its rainfall by a passage through a water-way to be measured by chains, whereas another plot of land near the source only returns its rainfall to the sea after a passage of many miles. Acre for acre the rainfall may be the same, and an acre at the source of a river may discharge the same quantity as a corresponding area at the outfall, yet the duty required for the removal of the former is so much greater as its distance is from the point of discharge.

The proprietors of the lower lands, who have in many cases, at great cost to themselves, improved the outfalls of their rivers, and so facilitated the discharge from lands lying above them, further contend that it would be unfair, in assessing the rates to pay for improving a portion of the river lying above that on which their works are situate, not to give any credit for the amount already expended, which otherwise would have required to be done.

To meet these various demands, the Bills brought in by the Government divide the watershed into high lands, medium lands, and flood lands. The former being taxed only to one-tenth the amount of the latter, and the proportion of taxation of the two latter to be determined by the Government Department entrusted with the carrying out of the Act, after local inquiry by their Inspector sent down to settle the details for each river.

WORKS FOR THE IMPROVEMENT OF RIVERS.

While it is impossible to lay down any general scheme for the improvement of all rivers alike, there are certain general principles that should always be kept in view.

These may be stated as follows:—

That the improvement of a river should be progressive from its outfall to its source.

That it should be of sufficient capacity to carry off the rainfall of the district without flooding the lands through which it passes.

That the flow of the upland water should be equalised as much as possible throughout the year.

In the lower or tidal portion ample capacity, combined with efficient scour, should be given, and every facility afforded for the free flow of the tidal water, and the low-water level of the sea brought as far up the river as practicable. By this means a large reservoir is secured for the reception of the downfall-water in times of floods, which then fills the place which, under ordinary circumstances, is occupied by the salt water carried up and down by the tides.

A river should not only be of sufficient capacity from its outfall to its source to carry off the rainfall of the district without flooding the lands through which it passes, but the water-level should be kept sufficiently low to allow of the thorough drainage of all lands within the basin. Exceptions to this rule may be made in the case of areas lying at so low a level, that the cost of adapting the outfall to their efficient drainage would involve works of such magnitude, that it would be more economical to remove the water off them by steam-power. There are also occasional floods which occur only at such long intervals, and are then of such short duration, that in such cases it may be found desirable to run the risk of flooding rather than incur an enormous expense in protecting the land. Again, there is along the valleys of all rivers a great deal of low-lying land that, as pasture or meadow, is not damaged, but rather benefited by occasional flooding in winter; where the owners have converted such areas into arable land, they can only ask to be protected from summer floods, and cannot expect the rest of the level to be taxed to prevent flooding in winter, which is injurious owing to their own mistaken action.

The space occupied by the water in a river due to the normal flow is so small as compared to the flood area, that if the channel be adapted for the latter, it would be so large as to be unable to maintain itself in efficient condition, owing to the growth of weeds and the accumulation of deposit from the want of scour, and there would also be the waste of a very large area of land. To meet this difficulty, the channel of a river flowing through a cultivated river-valley should therefore be divided into two sections; the lower one being adapted to carry the normal flow, with side slopes as steep as the nature of the soil through which it passes will permit; the upper, or flood section, having the sides laid at a slope sufficiently flat to allow grass to grow, and of the grazing of sheep and cattle, the flood-banks being set back sufficiently far to allow room for the greatest floods likely to occur. Bridges and other openings must, of course, be adapted to the flood discharge. By these means, the ordinary flow of the water being retained in as small a compass as possible, a deep stream would be maintained, the weeds would be less likely to grow or shoals to accumulate, and provision would be secured for flood-water without loss of productive land.

Great stress was laid by some of the witnesses who gave evidence before the Committee of the House of Lords on River Conservancy as to the advantage of embanking to prevent floods, as against deepening the channel; but it is submitted that the two works should go on together. By dredging out and deepening the channel, the level of the water is kept lower, and there is less risk consequently of flooding from a breach of banks, while at the same time material is provided for the formation of the protecting banks.

With the view of equalising the flow of the upland water as much as practicable throughout the year, it is desirable that, while provision is made for getting rid of the rainfall as rapidly as possible in times of flood, the regulation of the water-supply should be aimed at, rather than the mere voidance of the water. If all the water due to the winter rainfall is discharged at once, the lands drained would probably suffer far more loss from droughts in summer than ever the floods would have occasioned.

Water is required not only for the growth of vegetation, but for drinking and other purposes, and may be made valuable as a mechanical aid in carrying on the work of the farm. Water is obtained for drinking principally from wells and springs, which are fed from supplies stored up in the pores of the material composing the crust of the earth and in the cavities of rocks, and a certain proportion of the rainfall must be allowed to soak into the ground during wet weather to feed them, and to maintain a constant stream of water down the rivers and their tributaries during the dry season. In chalk districts and where the rocks are porous and absorbent, the greater portion of the rainfall is taken up in this way, and the absence of streams in a chalk district is thus accounted for. In lime and sandstone districts this condition of the substrata might be taken advantage of much more largely than it is, by carrying shafts through the upper impervious strata to the lower porous rock, and thus causing these to act to a certain extent as flood regulators, and providing more abundant and constant supplies to the springs. There are also many valleys where, at small expense, embankments could be thrown up and reservoirs formed, which could be made available for the water supply of villages and farmsteads, and at the same time frequently could be made ornamental adjuncts to parks and pleasure-grounds. The embankments for such reservoirs need not necessarily be of great height, but, where a valley is long and continuous, could be made in steps, and they need not necessarily be perfectly watertight, the object being to equalise the downward flow of the stream as well as storage. Such reservoirs scattered over the tributaries of a river would, while affording a supply of water, tend to equalise the downward flow in heavy rains, and check to a certain extent the liability of the main streams to floods.

To prevent flooding entirely by means of reservoirs is utterly impracticable. The enormous area required to hold the flow of even a small river would involve a waste of land that would be utterly out of proportion to the damage done by flooding, or to other means that might be adopted for securing the same end. In the original design for the drainage of the Fens large tracts of land were left at the lower parts of the rivers, and running parallel with them, the flood banks being set a considerable distance back from the channel,—these "Wash-lands" being intended as receptacles of the water in times of flood. Now, owing to obstructions which have been made at their lower ends, these form large reservoirs, which are filled when the main channel is insufficient to carry off the downfall water. The washes on the Nene and Welland cover an area of 5000 and 3000 acres respectively; and although these rivers drain only a small tract of comparatively flat country, yet when these washes are covered four feet deep, they only make provision for a fall of a little over one-third of an inch of rain. This fact should be sufficient to show that it is out of the question to depend on reservoirs alone as flood-regulators, as has so frequently been advocated.

If, in the anxiety to provide a remedy for floods, the river channels are so deepened and improved that the water-level of the soil is lowered without adequate provision for holding it up in summer, the consequences may be found to be very serious. The soil will then become so drained, that the moisture will sink so far below the roots of the plants that capillary action will fail to bring it to them. A great deal of undeserved blame has been thrown upon millers for holding up the water in the rivers for working their mills; but there can be no question that the value of the meadows found frequently by the side of such streams is due entirely to the moisture obtained from the water thus held up. There are many light soils, notably the black peat lands and the lands in Holland, which are only rendered fit for cultivation by means of the water which is held up in the drains which intersect the district. This keeps the understratum of the soil sufficiently moist in hot weather to feed the growing plants. For purposes of irrigation, also, water requires to be maintained at a uniform level in the river channels. The value of water for this purpose is hardly sufficiently recognized in this country; but the high rents which the water meadows command in Devonshire, the value of irrigated lands in Italy, Spain, and even in Norway, and the rich meadows which are periodically covered with water from the overflowing of some rivers, clearly prove that water has a fertilizing power independent of climate, and beyond that of the moisture supplied to the growing vegetation.

As a source of power, water is most valuable, and might be used far more extensively than it is as an aid to the working of farms. Threshing, grinding, chaff-cutting, &c., could as well be done by a water-wheel or a turbine as by a steam-engine, and at far less cost; but to make the rivers available for this purpose, it is necessary to hold the water up for the purpose of obtaining the required head and supply.

For all these reasons great caution requires to be exercised before the weirs and other works of abandoned navigations are removed, or the rights of millers purchased with a view to improving the rivers. Attention should be more directed to obtaining a complete control over these weirs, and having them placed in the hands of the body responsible for the proper conservancy of the river, so as to regulate their discharge, not with the view of any private interest, but for the good of the whole watershed. It is an error to suppose that weirs are necessarily detrimental to the discharge of a river in flood time. Weirs, if properly constructed, and of sufficient capacity, are aids rather than hindrances to the free flow of the water. The still pond of water which they hold up converts the action of the downward current into something of the nature of a wave, and saves the friction caused by the water having to overcome the obstacles in the bed of a stream, at one time dry and at another time a torrent, washing the stones and soil on its bed into alternate shoals and deep cavities, and destroying its character as an efficient water-carrier. The water coming into a river having a weir, at the first of a flood, instead of entering a channel almost dry and rushing along it in a raging torrent, encounters instead a quiet pool of water, gently raises its level, and passes on in a steady gradually deepening stream, mounting over the crest of the weir, if it be a fixed one, or otherwise passing freely through its openings.

Where water is thus permanently held up, the drainage of the adjacent country can be provided for by carrying the water, either by side cuts running parallel with the main stream or other arterial drains, to a point below the pond, and thus obviating any objection that could be urged against this system on the score of drainage.

In all works for the improvement of rivers, water should be regarded as a most useful servant, but one that requires to be kept well under control; and the remedy required for dealing with the present disastrous condition of our rivers, by which so much flooding and loss are occasioned, is that these should be placed under a proper system of management, with a representative body responsible for their care and maintenance in efficient order; and that, while the tributary streams may be left to be dealt with under the machinery provided by the existing law, legislation is required for the main streams, which must be dealt with from their source to their outfall by one uniform and adequate system.

XIX.—*Recent British Weather.* By G. J. Symons, F.R.S.

Just as in the million-peopled capital of the British Empire one never sees two faces precisely alike, though all are composed of the same features, so no two seasons are alike, though the same general characteristics are to be found in all.

Hence arises the extreme difficulty of rigorously accurate comparison between different seasons, when based only upon the averages of observations during long or short periods. And yet these are the best guide, for mere general impressions are useless, except in years of altogether exceptional weather such as 1860, or the autumn of 1852. Records of weather made without reference to instruments, depend partly on the physical and social status of the man who makes them. A man in the prime of life, in vigorous health, and with a comfortable balance at his banker's, will give a very different report upon a season to that which would be given by perhaps his nearest neighbour, who might be weighed down by age, sickness, or poverty. Nor can reliance be placed upon recollections of bygone seasons, except (as before observed) in very marked cases. Certain facts as to the extraordinary lateness of the harvest in one year, or the wonderful yield of another, remain firmly impressed upon the memory: but less marked seasons succeed one another so rapidly, that their features are soon blurred and forgotten.

I therefore propose in this article to base my remarks almost entirely upon actual instrumental records, although, as I have already pointed out, the general result of a season is based upon so many separate conditions that it is impossible to individualize them. It may be well to give a specimen of the sort of difficulty to which I refer. There may be two Augusts, with practically identical mean temperature and total rainfall; one may be a month of equable temperature, and constant drizzle, the other cold and wet at first, then dry and brilliantly hot: the results produced would not only be widely different, but they would also be different according to the characters of the months which had preceded them.

Fortunately there is a tendency in climate to take up, and hold for a considerable time, types of weather. Cold and wet generally go together in summer, while warmth and wet go together in winter, and there are several similar connections which might be mentioned—and hence we shall find that, in spite of all drawbacks, actual numerical data will agree with popular impressions as regards marked seasons, and hence may be trusted as correcting doubtful opinions respecting ordinary ones.

In the present notice it will tend to simplify matters if I separate the consideration of the two principal factors of climate, heat and rainfall.

TEMPERATURE.

Thanks, chiefly to Mr. Buchan, but also to the observers who furnished the data, we possess now a very fairly approximate knowledge of the average temperature of each month, and of the year, over the whole of the British Islands. Extreme accuracy in the present paper is not needed, but rather a broad general view of the facts, and this may be given very briefly. The mean annual temperature of Penzance may be taken as 52°, and 1° may be deducted for each hundred miles further north—*e.g.*, York is about 260 miles north of Penzance, and Edinburgh about 410. Therefore

Penzance	52°·0	Penzance	52°·0
Correction for 260 miles =	− 2·6	Correction for 410 miles	− 4·1
Mean temp. of York	49·4	Mean temp. of Edinburgh	47·9
Mr. Buchan's Map gives	49·0	Mr. Buchan's Map gives	47·7

Agreements quite near enough for ordinary purposes.

There is another circumstance which affects temperature quite as much as latitude, and it is the altitude of the locality above the sea-level. Everybody has a vague idea that high localities are cold; but everybody does not know the precise amount of cooling due to any given altitude—it may be taken as 1° for each 300 feet.

Hence follows the rough general rule that every 300 feet of elevation is equivalent to going 100 miles further north; and thus we see one reason why the high lands (1000 to 2000 or more feet) of Yorkshire and Derbyshire cannot bring to perfection crops and fruits which flourish on the low lands of the north of Scotland.

Tables of temperature relating to Camden Square, in the north of London, and to Greenwich, lend themselves more readily to my present object than any others; but as it may be alleged that observations from the outskirts of a great city are scarcely suitable for agricultural purposes, I will begin by a brief comparison of some of the principal facts relating to 1882 at the two metropolitan and at two widely-distant country stations—both nearly in the same latitude.

TABLE I.—TEMPERATURES in 1882.

STATIONS.	Absolute.		Average.		Mean.
	Max.	Min.	Max.	Min.	
Strathfield Turgiss, Hants ..	83°·7	18°·0	57°·9	41°·3	49°·6
Ross, Hereford	84·1	19·6	57·1	42·3	49·7
Greenwich Royal Observatory	81·0	22·2	57·8	42·6	49·7
London, Camden Square	80·8	24·5	58·2	43·1	50·3

This indicates that the metropolitan stations are on the average a few tenths warmer than other places in the same latitude, but that for all practical purposes the town and country stations agree. Curiously enough, in 1882, the maximum temperatures at the metropolitan stations are below those at the country ones; this is unusual, for the records from Greenwich have often exceeded those at any other station in the country.

Having now got the coast cleared from preliminary difficulties, I may begin to attack the question of whether recent years show exceptional departures from the average of long series of previous years.

In the first place, I have compiled from various publications by Mr. J. Glaisher, F.R.S., the following table of the mean temperature of each of the last 112 years, as *observed* at Greenwich since 1841, and as *computed* for previous years from observations made in the Metropolis. (Table II., p. 414.)

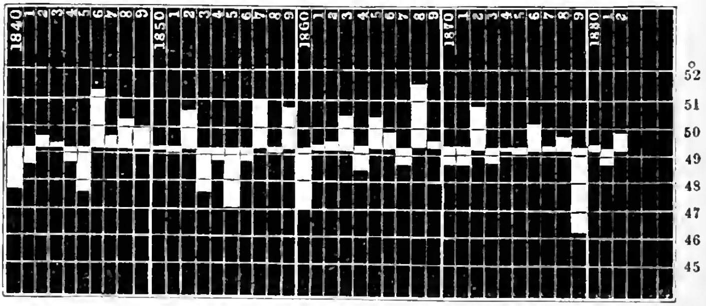
The first feature which that table renders evident is the considerable difference between the average of the first 50 years (47°·9) and the last 50 years (49°·3), a rise of very nearly 1½ degrees. Mr. Glaisher believes that this is a real rise. As, however, the fact has been doubted, and the whole question of secular change of temperature is now being investigated, and as we are concerned rather with the temperatures of the last quarter of a century than with that of remote periods, we may confine our attention to the 43 years from 1840 onwards. The average of this period is about 49°·3, and an examination of Table II. will

TABLE II.—MEAN TEMPERATURE of each YEAR at GREENWICH, from 1771 t
1882, both inclusive.

	1770.	1780	1790.	1800.	1810.	1820.	1830.	1840.	1850.	1860.	1870.	1880
0	° ..	48°·8	48°·1	48°·3	48°·7	47°·4	47°·8	47°·8	49°·3	47°·0	48°·7	49°
1	45·4	49·8	48·1	49·0	49·6	49·3	50·4	48·7	49·2	49·4	48·7	48·
2	47·1	45·5	48·0	48·0	46·5	51·0	49·1	49·6	50·6	49·5	50·7	49·
3	46·6	48·0	47·9	48·2	47·2	47·3	49·0	49·4	47·7	50·3	48·9	..
4	47·7	45·1	48·9	49·5	45·8	48·3	51·0	48·7	48·9	48·5	49·3	..
5	50·0	46·5	47·2	47·7	49·0	49·6	49·2	47·6	47·1	50·3	49·2	..
6	48·3	45·8	47·8	50·5	46·4	49·9	48·1	51·3	49·0	49·8	50·1	..
7	48·2	48·1	47·2	48·3	47·7	48·5	47·3	49·6	51·0	48·6	49·4	..
8	49·2	47·9	48·6	48·1	50·8	50·1	46·4	50·2	49·2	51·5	49·6	..
9	51·2	46·7	45·7	48·0	49·3	46·6	47·7	49·9	50·7	49·5	46·2	..
Average	48·2	47·2	47·8	48·5	48·1	48·8	48·6	49·3	49·3	49·4	49·1	..

(NOTE.—It will be observed that in order to ensure compactness in the table, the year have to be read off by the top and side figures—*e.g.*, the first entry 45°·4 is for 1771, th next 47°·1 for 1772, and so on, the values for each decade being arranged in one column and the average for the ten years given at the bottom.)

show, that with the exception of the one cold year, 1879, and one hot one, 1868, the temperatures of the past twenty years have been singularly near the average. This is clearly indicated by the following diagram, in which the values in Table II. for 1840 and for each subsequent year are laid off, upwards in years of which the temperature was above the average, downwards in years in which it was below it. I may mention that 1868 was the hottest year of the whole 112, and 1879 the coldest since 1814.



It appears legitimate to conclude that the records of mean temperature show no recent variation which can be regarded as important.

It is therefore necessary to turn to more detailed records.

I will first take the mean temperatures of recent summer months. The mean temperature of the air at 9 A.M. daily is very nearly the same as the mean of the extremes, or as the mean of any number of equidistant observations. The following are the values for Camden Square:—

Months.		June.	July.	August.	Summer.
Average 1859–78		61°·7	64°·9	63°·4	63°·3
Maximum	Degree ..	66·0	70·4	67·4	67·4
	Year	1868	1868	1871	1868
Minimum	Degree ..	57·1	59·2	59·4	58·8
	Year	1860	1879	1860	1860

A little additional evidence is afforded by these figures, but the following table puts the matter much more strongly.

TABLE III.—DIFFERENCE of MEAN TEMPERATURE at 9 A.M. in each of the SUMMER MONTHS of the last TEN YEARS from the AVERAGE of the TWENTY YEARS 1859–78.

Year.	June.	July.	August.	Summer.
1873	− °·3	+ °·3	+ °·3	+ °·1
1874	− 1·1	+ 1·8	− 1·1	− ·1
1875	+ ·3	− 3·6	+ 1·0	− ·8
1876	− ·6	+ 2·5	+ 1·4	+ 1·1
1877	+ 2·8	− 1·5	+ 1·4	+ ·9
1878	+ 1·1	+ ·6	+ ·7	+ ·8
1879	− 3·0	− 5·7	− 1·7	− 3·5
1880	− 2·8	− 2·2	0·0	− 1·7
1881	− ·1	+ 1·6	− 3·2	− ·6
1882	− 2·6	− 3·3	− 2·3	− 2·7
Mean	− ·6	− 1·0	− ·3	− ·6

This shows that while the decrease of the mean temperature of the *year* during the last decade (as shown by Table II.) was merely about 0°·2, or practically *nil*, the falling off in June was more than half a degree, and in July amounted to 1°·0, which, as already remarked, is equivalent to moving the country 100 miles further north, or raising it 300 feet.

It may, moreover, be mentioned that out of the 24 Junes, 1859–82, there were 10 below 61°·2, and of these 5 occurred in the last 10 years.

Of the corresponding 24 Julys, 10 were below 63°·5, and of these 5 occurred in the last 10 years.

Of the corresponding 24 Augusts, 10 were below 63°·0, of these 4 occurred in the last 10 years.

Therefore, whichever way these figures are considered, the same general feature becomes evident, viz., lower summer temperature than usual.

If we turn to tables of extremes, we learn a somewhat similar lesson. On the average of the 20 years, 1859–78, the temperature on some one day during each year reached 88°·4.

TABLE IV.—HIGHEST TEMPERATURE in SHADE in each of the last TEN YEARS, and NUMBER of DAYS on which it exceeded 80°.

Year.	Date.	Absolute Maximum Temperature.	Days above 80°.
1873	July 22nd	90°·1	10
1874	July 20th	90·8	16
1875	August 16th	86·1	8
1876	July 15th	92·6	25
1877	July 31st	87·1	16
1878	June 26th	86·5	12
1879	July 30th	80·2	1
1880	September 4th ..	88·3	5
1881	July 15th	94·6	19
1882	August 6th	80·8	2
1883*	June 29th	85·6*	4*

* Up to July 26th.

Out of the 24 years there have been 12 in which the extreme temperature did not reach the average, and of these 6 have been in the above 10 years, being of course more than there should have been, but only one more. The extremely low maxima in 1879 and 1882 are without precedent, except in the sunless summer of 1860, when the absolute maximum was 76°·1 in May.

A very good notion of the warmth of a summer is afforded by the number of days on which the temperature exceeds 80°; the 20 years average is 17, it will be seen above that the average has been reached only twice during the last 10 years, and the average is 11 instead of 17.

RAINFALL.

As already pointed out in an earlier part of this article, it is not so much the total quantity of rain which falls, as its distribution, which is of vital moment to agriculture. The total fall has, however, during the last few years been so excessive, that I feel bound to treat the subject rather fully. At the same time, as it is impossible to give here all the steps which have been necessary preliminaries to the calculations and conclusions which I intend to give, I am obliged to insert merely a *précis* of the preliminary stages, and to refer those interested, to the annual volume in which they are fully described.*

Fairly trustworthy records of rainfall have been kept at two or more stations in every year from 1726 onwards. In the Report of the British Association for the Advancement of Science for 1866, I gave a series of calculations whereby I had ascertained the relative rainfall of every year from 1726 to 1865. In the above-mentioned work this calculation is extended to 1882, and a diagram is given illustrating the relative wetness of each of the 157 years. This diagram, which is chiefly applicable to central England, shows a group of 4 consecutive wet years, 1734–7; of 4 very wet years, 1773–6; of 5 slightly wet years, 1827–31, and of the unprecedented number of 8 consecutive wet years, 1875–82. As it shows that on the average the excess has been rather more than 14 per cent. per annum, it follows that in the last 8 years there has fallen rather more than the average fall of 9 years.

This excess has been greater in some parts of the country than in others, and although the determination of the areas over which it has prevailed with various degrees of intensity is rather laborious, it seems likely to be of primary importance to the agricultural interest, as it is quite possible that these areas may be found to have features of resemblance to those where sheep-rot and other causes of agricultural depression have been most prevalent.

It is a fortunate fact that the rainfall during the ten years, 1860–9, was very nearly the same as the average of a long period of years. It was perhaps one or two per cent. in excess; but it may for all practical purposes be regarded as very near the truth. In Table V. (pp. 419–421) only those stations are quoted at which the rainfall was regularly recorded during the ten years, 1860–9, and also during the years 1875–82. As, for the present purpose, I wish to show primarily the areas over which the excess has been most severe, the table does not give actual rainfall, but percentage of excess. For instance, at the first station the mean ratio of rainfall for 1875–82 is given as 115; that is to say, the fall during those eight years has been 15 per cent. above the average, and therefore (8 × 15 = 120) in those eight years there has been a total excess of 120 per cent. Or, to put it in its simplest form, during the last eight years there has fallen one and one-fifth more than the average; we have, therefore, had the average rainfall of 9 years and 2 months deposited in 8 years. It will be noticed that there are in the

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* 'British Rainfall,' 1882. London: Stanford.

table several stations where the ratios are much higher, four exceeding 130, and at these stations the last eight years have had the average rainfall of nearly 10½ years. No wonder that there have been Bills brought before Parliament for the regulation of floods.

As regards the localities which have suffered most, it will be found, by plotting these values on a map, that they are generally higher in the Midland and Western Counties of England than anywhere else. In Cheshire there has scarcely been any excess, and in the North of Lancashire, in Cumberland, and in Westmoreland there has been a marked deficiency. This deficiency also prevailed, but only slightly, along the West of Scotland; but I should be extremely glad of additional records from that district. In the East of Scotland and in Ireland there has been a slight excess.

Perhaps there are few localities whence stronger evidence of the wetness of recent years could be produced than from the station at Saul Lodge on the Gloucestershire shore of the Severn. Mr. Clegram, C.E., thus epitomizes some of the facts.

"The total rainfall of 1882, 40·40 in., is the greatest for 25 years, exceeding even 1872 by 1·44 in.

"There is no record of any approach to so continuous a wet period as the last six months of 1882, when 25·27 in. fell, which is 0·85 in. more than the average *yearly* fall of the 13 years, 1858–70.

"The rainfall has been recorded here for 25 years, the average of the whole period is 28·03 in.; the first 13 years were 3·61 in. below, and the last 12 years 3·92 in. above that average, giving a difference of 7·53 in. between the two periods."

In corroboration of the above, the figures from Clifton may be quoted.

"The total rainfall of 1882, 48·28 in., is the greatest for 30 years.

"The rainfall has been recorded here for 30 years, the average of the whole period is 34·32 in.; the average of the last 11 years has been 4·85 in. in excess."

Hence we arrive at two broad results:—

I. That recent years have been characterised by low summer temperatures.

II. That, concurrently with the above, the rainfall has been greatly in excess, especially in the Central and Western Counties of England.

TABLE V.—RELATION of RAINFALL during the EIGHT YEARS 1875–82, to the AVERAGE of the TEN YEARS 1860–9.

COUNTY.	STATION.	OBSERVER.	Mean Ratio of Rainfall, 1875–82.
			per cent.
Middlesex	London, Camden Square	G. J. Symons, Esq., F.R.S.	115
Surrey	Weybridge Heath (Bartropps)	Mrs. Harrison	111
,,	Wimbledon	T. Devas, Esq.	116
,,	Kew Observatory	The Kew Committee	119
Kent	Maidstone (Hunton Court)	Mr. P. Goddard	105
,,	Greenwich (Royal Observatory)	The Astronomer Royal	108
Sussex, West	Chichester (Chilgrove)	J. W. Woods, Esq.	110
,, ,,	Arundel (Dale Park)	Mr. E. Sandford	109
,, East	Maresfield (Forest Lodge)	Capt. W. Noble	110
Berks	Reading (Englefield)	R. Benyon, Esq.	135
,,	Long Wittenham	Rev. J. C. Clutterbuck	117
Herts	Bayfordbury	W. C. Baker, Esq.	117
,,	St. Albans (Gorhambury)	Mr. J. Thompson	118
,,	Hemel Hempstead (Nash Mills)	Messrs. J. Dickinson and Co.	123
,,	Tring (Cowroast)	H. Thomas, Esq., C.E.	122
,,	Hitchin	W. Lucas, Esq.	120
,,	Royston	H. Wortham, Esq.	112
Bucks	High Wycombe	H. S. Wheeler, Esq.	112
Oxford	Banbury (High Street)	T. Beesley	124
Northampton	Northampton (Althorp House)	C. S. Groom, Esq.	129
,,	Wellingborough	E. Sharman, Esq.	128
Bedford	Cardington	Mr. J. McLaren	127
Cambridge	Ely (Stretham)	Mr. H. Walters	125
,,	Wisbech (Bank House)	A. Peckover, Esq.	121
Essex	Braintree (Bocking)	S. Tabor, Esq.	119
Suffolk	Bury St. Edmunds (Westley)	R. Burrell, Esq.	119
,,	,, ,, (Barton Hall)	Mr. W. Allan	120
,,	,, ,, (Culford)	Mr. J. Smith	115
Norfolk	Norwich (Cossey)	H. Culley, Esq.	123
,,	,, (Honingham Hall)	Lady Bayning	126
,,	Holkham	J. Davidson, Esq.	119
,,	Hunstanton Hall	Mr. Nisbet	134
Wilts	Salisbury Plain (Chitterne Ho.)	R. Hayward, Esq.	112
,,	Swindon (Pen Hill)	H. Arkell, Esq.	115
Devon	Tavistock Library	Mr. R. Westington	122
,,	Bovey Tracey	J. Divett, Esq.	114
,,	Exeter (Devon and Exeter Inst.)	Mr. E. Parfitt	112
,,	Barnstaple	Mr. E. Knill	111
Cornwall	Penzance (South Parade)	W. H. Richards, Esq.	117
,,	Bodmin (Castle Street)	Capt. Liddell, R N.	111
Somerset	E. Harptree (Sherborne Res.)	Bristol Water Works	112
Gloucester	Clifton (South Parade)	Dr. G. F. Burder	118
Hereford	Ross (The Graig)	H. Southall, Esq.	122
Shropshire	Shrewsbury	Messrs. Marshall and Co.	134
,,	Oswestry (Hengoed)	Rev. A. R. Lloyd	114
Worcester	Northwick Park	Rt. Hon. Lord Northwick	126
,,	Tenbury (Orleton)	T. H. Davis, Esq.	115
Leicester	Thornton Reservoir	F. Griffith, Esq., C.E.	120
,,	Belvoir Castle	W. Ingram, Esq.	123
Lincoln	Spalding (Pode Hole)	Mr. A. Harrison	114
,,	Boston	W. H. Wheeler, Esq., C.E.	126

TABLE V.—RELATION of RAINFALL during the EIGHT YEARS 1875–82, to the AVERAGE of the TEN YEARS 1860–9—*continued.*

COUNTY.	STATION.	OBSERVER.	Mean Ratio of Rainfall, 1875–82.
			per cent.
Lincoln	Lincoln	M. S. and L. R. Co.	133
,,	Gainsborough	,, ,,	110
,,	Grimsby	,, ,,	121
,,	Appleby	Rev. J. E. Cross	121
,,	New Holland	M. S. and L. R. Co.	120
Notts	Worksop	,, ,,	129
,,	Retford	,, ,,	115
Derby	Chesterfield	,, ,,	121
,,	Kilnarsh (Norwood)	,, ,,	127
,,	Chapel-en-le-frith	,, ,,	100
,,	Woodhead Station	,, ,,	104
Cheshire	Bosley Minns	,, ,,	113
,,	,, Reservoir	,, ,,	115
,,	Macclesfield (Park Green)	Mr. J. Dale	107
,,	Bollington (Sponds Hill)	M. S. and L. R. Co.	100
,,	Whaley	,, ,,	103
,,	Marple Aqueduct	,, ,,	105
,,	,, Top Lock	,, ,,	107
,,	Godley Reservoir	J. F. Bateman, Esq., F.R.S.	108
,,	Mottram (Matley's Field)	M. S. and L. R. Co.	107
,,	Arnfield Reservoir	J. F. Bateman, Esq., F.R.S.	120
,,	Rhodes Wood Reservoir	,, ,,	103
,,	Woodhead Reservoir	,, ,,	102
Lancashire	Denton Reservoir	,, ,,	110
,,	Gorton	,, ,,	107
,,	Manchester (Ardwick)	J. Casartelli, Esq.	117
,,	,, (Piccadilly)	M. S. and L. R. Co.	104
,,	,, (Fairfield)	,, ,,	93
,,	Bolton-le-Moors (The Folds)	H. H. Watson, Esq.	99
,,	,, ,, (Belmont)	R. H. Swindlehurst, Esq.	114
,,	,, ,, (Heaton)	,, ,,	102
,,	Rochdale (Nayden Dane)	J. Diggle, Esq., C.E.	104
,,	Ormskirk (Rufford)	J. Porter, Esq.	107
,,	Blackpool (South Shore)	G. Sharples, Esq.	113
,,	Clitheroe (Downham Hall)	R. Assheton, Esq.	103
,,	Cartmel (Holker)	Mr. W. Fox	99
,,	Monk Coniston Park	V. Marshall, Esq.	86
York, W. R.	Sheffield (Broomhall Park)	D. Doncaster, Jun., Esq.	116
,,	,, (Redmires)	J. Gunson, Esq.	120
,,	Tickhill	G. G. Phillips, Esq.	125
,,	Rastrick	A. Clay, Esq.	110
,,	Halifax (Warley Moor)	J. A. Paskin, Esq., C.E.	111
,,	,, (Midgley Moor)	,, ,,	106
,,	Leeds (Leventhorpe Hall)	J. T. Leather, Esq., C.E.	112
,,	,, (Holbeck)	Messrs. Marshall and Co.	123
,,	Arncliffe	Ven. Archdeacon Boyd	109
York, E. R.	Hull (Beverley Road)	H. Smith, Esq.	118
York, N. R.	Malton	H. Hurtley, Esq.	109
Northumberland	Allenheads	Mr. J. Charlton	95
,,	Bywell	Mr. W. J. Tono	114

TABLE V.—RELATION of RAINFALL during the EIGHT YEARS 1875–82, to the AVERAGE of the TEN YEARS 1860–9—*continued.*

COUNTY.	STATION.	OBSERVER.	Mean Ratio of Rainfall, 1875–82. per cent.
Northumberland	North Shields (Rosella Place)	R. Spence, Esq.	113
,,	Stamfordham	Rev. J. F. Bigge	116
,,	Ilderton (Lilburn Tower)	E. J. Collingwood, Esq.	121
Cumberland	Borrowdale (Seathwaite)	Mr. Dixon	84
,,	Keswick	J. F. Crosthwaite, Esq.	94
,,	Bassenthwaite (Mirehouse)	H. A. Spedding, Esq.	90
,,	Cockermouth (Whinfell Hall)	W. Robinson, Esq.	88
Westmoreland	Kendal (Kent Terrace)	R. J. Nelson, Esq.	97
Glamorgan	Cardiff (Ely)	J. A. B. Williams, Esq., C.E.	116
Carnarvon	Llandudno (Warwick House)	Dr. Nicol	110
Kirkcudbright	Cargen [Dumfries]	P. Dudgeon, Esq.	97
Roxburgh	Kelso (Springwood Park)	Mr. P. Reid	118
Selkirk	Selkirk (Bowhill)	Mr. J. Mathison	108
Peebles	N. Esk Reservoir [Penicuick]	Mr. J. Garnock	109
Edinburgh	Inveresk	Mr. McAuslane	108
Lanark	Hamilton (Bothwell Castle)	Mr. A. Turnbull	103
,,	Airdrie (Hillend Reservoir)	Mr. W. Ritchie	116
Renfrew	Ryat Lynn	J. M. Gale, Esq., C.E.	103
,,	Waulk Glen	,, ,,	92
,,	Middleton	,, ,,	97
Stirling	Falkirk (Kerse)	A. Brown, Esq.	98
Argyll	Lochgilphead (Poltalloch)	Mr. J. Russell	98
,,	Appin (Aird's)	R. Macfie, Esq.	88
Kinross	Loch Leven Sluice	Mr. W. Clark	112
Perth	Aberfoyle	J. M. Gale, Esq., C.E.	92
,,	Dunblane (Kippenross)	P. Stirling, Esq.	98
,,	Lanrick Castle	Mr. J. Begg	95
,,	Bridge of Turk	J. M. Gale, Esq., C.E.	116
Forfar	Craigton	J. Watson, Esq., C.E.	124
,,	Hill Head	,, ,,	124
,,	Arbroath	A. Brown, Esq., LL.D.	108
Kincardine	The Burn [Brechin]	Col. McInroy	111
Aberdeen	Braemar	J. Aitken, Esq.	108
,,	Aberdeen (Rose Street)	A. Cruickshank, Esq.	111
Elgin	Gordon Castle	Mr. Webster	110
Inverness	Inverness (Culloden House)	D. Forbes, Esq.	96
Sutherland	Golspie (Dunrobin Castle)	Mr. D. Melville	120
Orkney	Shapinsay (Balfour Castle)	Col. Balfour	94
,,	Pomona (Sandwick)	Rev. C. Clouston, LL.D	95
Cork	Cork (Royal Institution)	Dr. Caulfield	113
King's County	Tullamore	H. J. B. Kane, Esq., C.E.	115
Wicklow	Bray (Fassaroe)	R. M. Barrington, Esq.	104
Armagh	Armagh Observatory	Rev. Dr. Robinson, F.R.S.	104
Antrim	Belfast (Queen's College)	Mr. W. Taylor	103

XX.—*Report of Feeding Experiments on Sheep, conducted at Crawley-Mill Farm, Woburn, with Linseed-cake and Barley-meal, Linseed-cake and Malt, Linseed-cake and Pea-meal.* By Dr. AUGUSTUS VOELCKER, F.R.S., Consulting Chemist to the Royal Agricultural Society.

WITH the approval of the Chemical Committee, a few feeding experiments on sheep were made by me last winter and spring at Crawley-Mill Farm, Woburn. They had for their object to test practically the comparative feeding and fattening value of barley and malt as an additional food to roots, chaff, and a moderate daily allowance of linseed-cake.

In connection with the feeding experiments with barley and malt, another lot of sheep were fed upon roots, hay- and straw-chaff, and a moderate allowance of linseed-cake and pea-meal.

Thirty young growing strong sheep-tegs, about 10 months old, were weighed and then arranged into three lots. Each pen of ten sheep weighed very closely the same, as will be seen by the following figures:—

TABLE I.—WEIGHT OF EACH LOT OF SHEEP at the COMMENCEMENT of the EXPERIMENT.

PEN I.			PEN II.			PEN III.		
cwts.	qrs.	lbs.	cwts.	qrs.	lbs.	cwts.	qrs.	lbs.
0	3	18	0	3	22	0	3	9½
1	0	8¾	0	3	18¼	0	3	18
0	3	26	1	0	19¾	0	3	23
0	3	15	1	0	0	1	0	14
1	0	6¾	0	3	27½	1	0	8¾
0	3	18¾	0	3	18¼	0	3	18
0	3	17½	0	3	23¾	1	0	7¾
1	0	26½	0	3	25½	0	3	23¾
0	3	12	0	3	24¾	0	3	18¼
0	3	18	0	3	15¾	0	3	25½
9	2	27¾	9	2	27½	9	2	26½

As the sheep were young, it was considered undesirable to force them on too rapidly, but to feed them steadily. For this reason they were supplied, for the first eight weeks, with only a small quantity of cake and corn, in addition to swedes and hay- and straw-chaff.

The feeding experiments were carried out in the open, on a light sandy field called Hill Field, at Crawley Farm, in which a healthy and well-matured crop of Swedish turnips had been grown in 1882.

All the sheep were allowed to help themselves *ad libitum* with swedes, cut into slices, and hay- and straw-chaff. The hay- and straw-chaff were mixed in equal proportions, and weighed quantities of the mixed chaff were placed before the sheep, and periodically a heap of roots was weighed out, from which the sheep were supplied and allowed to eat as much as they liked. As regards roots, hay- and straw-chaff, all the sheep were treated alike.

As concentrated additional food, all the sheep were supplied during the first eight weeks with ¼ lb. of good linseed-cake per head per day. In addition to the cake, the sheep in Pen I. had ¼ lb. of barley-meal per head per day; those in Pen II. the malt and malt-dust produced from ¼ lb. of the same kind of barley as that upon which the sheep in Pen I. were fed; and in Pen III. the sheep had ¼ lb. of pea-meal (from old peas) per head per day.

It is impossible to malt properly a small quantity of barley. A maltster in the neighbourhood of Woburn for this reason was requested, before putting the usual quantity of 15 quarters of barley on the malt-floor, to reserve a sufficient quantity of the barley to furnish a full store for the requirements of the whole experimental period.

The malt and malt-dust produced from 15 quarters of barley were weighed, and from this weight the quantity corresponding to the amount of barley consumed in the course of the experiments was readily calculated.

Both the barley and the malt and malt-dust were ground into meal, and in this state given to the sheep. Eight cwts. of barley-meal, it was ascertained, produced 6 cwts. 2 qrs. and 20 lbs. of ground malt and malt-dust, in the condition in which the latter was consumed by the sheep, which shows in round numbers a loss in weight of 16½ per cent., which the barley sustained in the process of malting. Or, in other words, 140 lbs. of barley-meal corresponded with 117 lbs. of malt and malt-dust, in the condition in which both were given to the sheep.

The barley-meal had the following composition:—

Moisture	18·10
Oil	1·67
*Albuminous compounds (flesh-forming matters) ..	9·56
Starch, sugar, and digestible fibre	63·39
Woody fibre (cellulose)	4·73
†Mineral matters	2·55
	100·00
* Containing nitrogen	1·55
† Including sand and silica	·55

The malt produced from this barley, fresh taken from the kiln, contained only 4½ per cent. of moisture; but after it was ground into meal, and had been exposed to the air for some days, it was found to have absorbed about 5 per cent. more moisture, and then had the following composition :—

Composition of Malt.

Moisture	9·35
Oil	1·97
*Albuminous compounds (flesh-forming matters)	11·37
Sugar	13·85
Dextrine, starch, and digestible fibre	54·42
Woody fibre (cellulose)	5·53
†Mineral matters (ash)	3·51
	100·00
* Containing nitrogen	1·82
† Including sand and silica	1·45

The malt, it will be seen, contained a considerable proportion of sugar and a little more nitrogen than the barley from which it was made.

An average sample of malt-dust (malt coombs) had the following composition :—

Moisture	10·51
Oil	·77
*Albuminous compounds (flesh-forming matters)	24·41
Dextrine, sugar, starch, and digestible fibre	47·19
Woody fibre (cellulose)	10·28
Mineral matters (ash)	6·84
	100·00
* Containing nitrogen	3·88

It will be seen that malt-dust was very rich in nitrogenous organic matters, and also much richer in mineral matters than either malt or barley. The ash of malt-dust, moreover, contains a good deal of phosphoric acid, for in the 6·84 per cent. of the ash which the malt-dust furnished, on analysis I found 1·74 per cent. of phosphoric acid. For these reasons the malt-dust was given together with the malt in the feeding experiments on sheep with malt and barley.

With regard to the loss which barley sustains in the process of malting, I would observe that the loss is chiefly due to the expulsion of moisture in kiln-drying the malt.

Barley on an average contains from 16 to 18 per cent. of moisture, and malt taken fresh from the kiln only about 4½ per cent. Roughly speaking, 100 lbs. of barley, containing 18 per cent. of moisture, may be assumed to make from 75–77½ lbs. of malt, containing 4½ per cent. of moisture and about 3½ lbs. of kiln-dust, or the loss in weight on an average amounts to about 20 per cent. Of this loss in weight, I find, however, only

5 per cent. consists of dry and mainly carbonaceous matter, which is dissipated in the form of carbonic acid in the process of germination on the malt-floor.

In considering the comparative merits of barley and malt for feeding purposes, it should be borne in mind that, in the process of malting, barley loses about 5 per cent. of dry feeding substance, and that the cost of malting probably will not be less than 2*s.* 6*d.* per quarter of barley.

It is scarcely necessary to direct attention to the fallacies included in the results of feeding experiments in which equal quantities, by weight, of barley and malt were given to sheep or oxen, or in which a different kind of barley, probably an inferior feeding barley, has been given to one set of animals; and malt, produced from first-class barley, to another lot.

In all comparative feeding experiments with malt and barley the same kind of barley ought to be employed, and the malt and malt-dust be given together in proportion to the weight of the barley from which they had been produced.

The linseed-cake used in the sheep-feeding experiments had the following composition:—

Moisture	11·05
Oil	12·03
*Albuminous compounds (flesh-forming matters) ..	35·12
Mucilage, sugar, and digestible fibre	22·86
Woody fibre (cellulose)	10·73
Mineral matter (ash)	8·21
	100·00
* Containing nitrogen	5·62

This cake, it will be seen, was both rich in oil and albuminous compounds, and decidedly a linseed-cake of superior quality.

The pea-meal was made from old peas, and had the following composition:—

Moisture	13·70
Oil	1·43
*Albuminous compounds (flesh-forming matters) ..	22·69
Mucilage, sugar, and digestible fibre	52·96
Woody fibre (cellulose)	5·57
Mineral matter (ash)	3·65
	100·00
* Containing nitrogen	3·63

The feeding experiments were begun on the 23rd of December, 1882, and continued until the 17th of February, or for a period of eight weeks, after which the sheep were weighed, and the following results obtained:—

Table II.—Weights of the Three Lots of Sheep after Eight Weeks Feeding.

Additional Food in	Pen I. Linseed-cake and Barley.			Pen II. Linseed-cake and Malt.			Pen III. Linseed-cake and Peas.		
	cwts.	qrs.	lbs.	cwts.	qrs.	lbs.	cwts.	qrs.	lbs.
Weight of Sheep	1	0	14½	1	0	17¼	1	0	23½
	1	0	7½	1	1	0	1	0	8¼
	1	1	2½	1	0	4½	1	0	8
	1	1	3¼	1	1	1	1	0	26
	1	0	25	1	0	14¼	1	0	18¾
	1	1	0½	1	0	2¾	1	1	18½
	1	0	7½	1	0	10½	1	0	4¼
	1	0	21	1	0	22½	1	0	11½
	1	0	5½	1	0	13	1	1	19
	1	0	1	1	2	1½	1	0	5½
Total weight of 10 sheep on the 17th of February, 1883	11	2	4¼	11	3	3¼	11	3	3¼
Weight of the sheep on the 23rd of December, 1882	9	2	27¾	9	2	27½	9	2	26½
	cwts.	qrs.	lbs.	cwts.	qrs.	lbs.	cwts.	qrs.	lbs.
Increase in Live-weight of 10 sheep in 8 weeks	1	3	4½	2	0	3¾	2	0	4¾
Or in lbs.	200½ lbs.			227¾ lbs.			228¾ lbs.		
Accordingly, the average increase of each sheep per week was	2 lbs. 8 ozs.			2 lbs. 13½ ozs.			2 lbs. 13¾ ozs.		
And the daily average increase per sheep was	5·73 ozs.			6·5 ozs.			6·53 ozs.		

It thus appears that the sheep in Pen I. fed upon linseed-cake and barley as additional food, increased less in weight than those in Pen II., which had been given the same amount of linseed-cake, and malt and malt-dust, corresponding to the barley-meal consumed by the sheep in Pen I. It will further be noticed that the sheep in Pen III., fed upon the same quality of linseed-cake as the others, and pea-meal equal in weight to the quantity of barley-meal consumed by the sheep in Pen I., did fully as well as those in Pen II. During the period of eight weeks the ten sheep in each of the three pens consumed the following quantities of food:

Pen I.—78 cwts. of sliced swedes, 1 cwt. hay-chaff, 1 cwt. of wheat-straw-chaff as bulky food, and 140 lbs. of linseed-cake and 140 lbs. of barley-meal. Each sheep in Pen I. accordingly consumed per day 15·6 lbs. of swedes, 3·2 oz. of hay-chaff, 3·2 oz. of straw-chaff, and ¼ lb. of linseed-cake, and ¼ lb. of barley-meal.

Pen II.—78 cwts. of swedes, 1 cwt. of hay-chaff, 1 cwt. of wheat-straw-chaff, and 140 lbs. of linseed-cake, and the malt and malt-dust from 140 lbs. of barley. Each sheep on an average had a daily allowance of 15·6 lbs. of swedes, 3·2 oz. of hay-chaff, and 3·2 oz. of wheat-straw-chaff, ¼ lb. of linseed-cake, and the malt and malt-dust from ¼ lb. of barley.

TABLE III.—STATEMENT of QUANTITIES of FOOD consumed by each PEN of SHEEP.

	Food Consumed by Ten Sheep in each Pen.		
	2nd Period (2 Weeks), February 17 to March 3, 1882.	3rd Period (2 Weeks), March 3 to March 17, 1883.	4th Period (2 Weeks), March 17 to March 31, 1883.
PEN I.			
Linseed-cake	70 lbs.	105 lbs.	140 lbs.
Barley-meal	70 lbs.	105 lbs.	140 lbs.
Swedes	12 cwts. 1 qr.	13 cwts. 2 qrs.	12 cwts. 2 qrs. 4 lbs.
Hay-chaff	35 lbs.	33 lbs.	35 lbs.
Wheat-straw-chaff	35 lbs.	33 lbs.	35 lbs.
The Average Daily Allowance per Sheep was:			
Linseed-cake	½ lb.	¾ lb.	1 lb.
Barley-meal	½ lb.	¾ lb.	1 lb.
Swedes	9·7 lbs.	10·8 lbs.	10 lbs.
Hay-chaff	4 oz.	3·77 oz.	4 oz.
Wheat-straw-chaff	4 oz.	3·77 oz.	4 oz.
PEN II.			
Linseed-cake	70 lbs.	105 lbs.	140 lbs.
Malt and Malt-dust	58½ lbs.	87¾ lbs.	117 lbs.
Swedes	12 cwts. 1 qr.	13 cwts. 2 qrs.	12 cwts. 2 qrs. 4 lbs.
Hay-chaff..	35 lbs.	33 lbs.	35 lbs.
Wheat-straw-chaff	35 lbs.	33 lbs.	35 lbs.
Average Daily Consumption per Sheep:			
Linseed-cake	½ lb.	¾ lb.	1 lb.
Malt and Malt-dust	6·68 oz.	10·02 oz.	13·36 oz.
Swedes	9·7 lbs.	10·8 lbs.	10 lbs.
Hay-chaff	4 oz.	3·77 oz.	4 oz.
Straw-chaff	4 oz.	3·77 oz.	4 oz.
PEN III.			
Linseed-cake	70 lbs.	105 lbs.	140 lbs.
Pea-meal	70 lbs.	105 lbs.	140 lbs.
Swedes	12 cwts. 1 qr.	13 cwts. 2 qrs.	12 cwts. 2 qrs. 4 lbs.
Hay-chaff	35 lbs.	33 lbs.	35 lbs.
Wheat-straw-chaff	35 lbs.	33 lbs.	35 lbs.
Average Daily Food per Sheep:			
Linseed-cake	½ lb.	¾ lb.	1 lb.
Pea-meal	½ lb.	¾ lb.	1 lb.
Swedes	9·7 lbs.	10·8 lbs.	10 lbs.
Hay-chaff	4 oz.	3·77 oz.	4 oz.
Straw-chaff	4 oz.	3·77 oz.	4 oz.

PEN III.—78 cwts. of swedes, 1 cwt. of hay-chaff, 1 cwt. of wheat-straw-chaff, and 140 lbs. of linseed-cake, and 140 lbs. of pea-meal (old peas); or each sheep on an average had a daily allowance of 15·6 lbs. of swedes, 3·2 oz. of hay-chaff, 3·2 oz. of wheat-straw-chaff and ¼ lb. of linseed-cake, and ¼lb. of pea-meal.

After the first period of eight weeks, the daily allowance of linseed-cake of ¼ lb. was increased to ½ lb. per sheep, and that of barley- and pea-meal was also increased from ¼ lb. to ½ lb. per head per day; and the sheep in Pen II. received ½ lb. linseed-cake and the malt and malt-dust from ½ lb. of barley. Upon this allowance of concentrated food they were kept for the next two weeks. In the following fortnight the additional food was further increased to ¾ lb. of cake and ¾ lb. of corn per head per day, and in the succeeding two weeks, or the fourth experimental period, 1 lb. of cake and 1 lb. of barley-meal per sheep per day were supplied as concentrated food to Pen I.; 1 lb. of linseed-cake and malt and malt-dust, produced from 1 lb. of barley, was given to the sheep in Pen II., and those in Pen III. received during the same period 1 lb. of linseed-cake, and 1 lb. of pea-meal.

In the course of the second, third, and fourth periods, each continuing for two weeks, each pen of ten sheep consumed the quantities of food shown in Table III. (p. 427).

On the 31st of March, 1883, after having been under experiment for 14 weeks, the sheep were again weighed, with the following results:—

TABLE IV.—WEIGHT of SHEEP in each PEN on MARCH 31st.

Additional food in	PEN I. Linseed-cake and Barley.			PEN II. Linseed-cake and Malt.			PEN III. Linseed-cake and Pea-meal.		
	cwts.	qrs.	lbs.	cwts.	qrs.	lbs.	cwts.	qrs.	lbs.
Weight of Sheep	1	0	13¼	1	0	24	1	0	12½
	0	3	24	1	1	11½	1	0	13½
	1	1	13¼	1	1	8	1	0	13¼
	1	1	2	1	0	16¾	1	1	5¾
	1	1	8¼	1	0	2	1	1	8
	1	1	24¾	1	2	1½	1	0	21½
	1	0	16¾	1	0	14¾	1	2	8
	1	0	24	1	0	25	1	1	12
	1	1	0	1	1	2	1	1	14¼
	1	0	26¾	1	1	0	1	1	7½
Total weight of 10 sheep on the 31st March, 1883	12	1	13	12	1	21½	12	3	4¼
On the 17th of February, after the 1st experimental period of 8 weeks, the sheep weighed	11	2	4	11	3	3¾	11	3	3¼
	cwts.	qrs.	lbs.	cwts.	qrs.	lbs.	cwts.	qrs.	lbs.
They consequently gained in the succeeding 6 weeks	0	3	9	0	2	17¾	1	0	1
Or in lbs.	93 lbs.			73¾ lbs.			113 lbs.		
And each sheep on an average gained in weight per week	1 lb. 8·8 oz.			1 lb. 3·48 oz.			1 lb. 14·13 oz.		

It thus appears that, although in the first experimental period of eight weeks the sheep fed upon linseed-cake and barley-meal did not increase as much in live-weight as those fed upon the same quantity of linseed-cake and malt and malt-dust corresponding to the barley consumed by the sheep in Pen I., the difference in the weight of the sheep in Pens I. and II. was nearly effaced by the greater weight of the sheep in Pen I. in the following six weeks. It further appears that the sheep in Pen III., fed upon linseed-cake and pea-meal as additional concentrated food during the last six weeks, increased more in weight than either the sheep in Pen I. or in Pen II.

On looking at the table of results showing the increase in live-weight of each of the three lots of sheep, it will be seen that in the first eight weeks, when the sheep consumed more swedes per week than in the following six weeks, and with an allowance of only ¼ lb. of cake and ¼ lb. of barley or pea-meal, or malt and malt-dust from ¼ lb. of barley, the increase in the weight of the sheep, amounting in the case of Pen I. (linseed-cake and barley) to 2½ lbs., in Pen. II. (linseed-cake and malt) to 2 lbs. 13½ ozs., in Pen III. (linseed-cake and pea-meal) to 2 lbs. 13¾ ozs. per week, was considerably higher than in the following six weeks, when the daily allowance of cake and corn was doubled in the first fortnight, then tripled in the next two weeks, and in the last two weeks quadrupled.

Thus the weekly increase in the weight of each sheep in the second period of six weeks amounted on an average per sheep in Pen I. to 1 lb. 8·8 oz., Pen II. to 1 lb. 3·48 oz., and in Pen III. to 1 lb. 14·13 oz.

In these experiments a fair and moderate allowance of linseed-cake and meal, and swedes supplied *ad libitum*, together with some hay- and straw-chaff, certainly gave a better result, at less cost, than a more liberal or excessive allowance of such concentrated foods. I may add that the sheep were regularly supplied with fresh water, and would remind the reader that the sheep were tegs, only about ten months old.

Comparing the weight of each lot of sheep when they were put up on the 23rd of December, 1882, with the weights on the 31st of March, 1883, or after 14 weeks, it will be seen that the total increase in the live-weight in the 14 weeks was as follows:—

	lbs.
10 Sheep in Pen I. gained in 14 weeks	293¼
„ Pen II. „ „	301½
„ Pen III. „ „	341¾

Or, in round numbers, the 10 sheep in Pen I. (linseed-cake and barley) gained per week 20 lbs. 15 oz., or nearly 21 lbs.

In Pen II. (linseed-cake and malt) 10 sheep gained in weight 21½ lbs. per week.

In Pen III. (linseed-cake and pea-meal) the 10 sheep increased 24½ lbs. in live-weight per week.

The differences in the increase of the weight of the sheep in Pens I. and II. indeed are so small, that they may be regarded as due to purely accidental circumstances over which the experimenter has no control. The only legitimate conclusions that can be drawn from the preceding experiments are: 1st, that barley-meal and linseed-cake given to young growing sheep in moderate proportions, together with roots and some hay- and straw-chaff, is as good a food as the same feeding-mixture in which the same amount of barley is used in a malted state; 2ndly, that linseed-cake and pea-meal, in equal proportions, and used at the rate of ¼ lb. each per head per day, in conjunction with some hay- and straw-chaff and swedes, given *ad libitum*, is a better food for young sheep than either a mixture of linseed-cake and barley-meal, or linseed-cake and malt.

Before disposing of the sheep, it appeared to me interesting to ascertain how the three pens of sheep would get on if they were kept for another fortnight on the maximum allowance of cake and corn upon which they were fed during the last fortnight of the experimental period of 14 weeks.

The sheep in Pen I., however, did not eat all the barley-meal, and also left some of the hay- and straw-chaff which was given them, and what they left over was weighed back from time to time.

The sheep in the two remaining pens consumed all the concentrated food with which they were supplied. The following quantities of food were consumed in the fortnight between the 31st of March and the 14th of April by each pen of 10 sheep:—

TABLE V.

	PEN I.	PEN II.	PEN III.
Linseed-cake	140 lbs.	140 lbs.	140 lbs.
Barley-meal	115 lbs.	..	..
Malt and Malt-dust	..	117 lbs.	..
Pea-meal	..	..	140 lbs.
Swedes	15 cwts. 3 qrs.	15 cwts. 3 qrs.	15 cwts. 3 qrs.
Hay-chaff	34 lbs.	37 lbs.	37 lbs.
Wheat-straw-chaff	34 lbs.	37 lbs.	37 lbs.
On an average each Sheep consumed per day :			
Linseed	1 lb.	1 lb.	1 lb.
Barley-meal	13·1 oz.	..	..
Malt and Malt-dust (from 140 lbs. barley)	..	13·36 oz.	..
Pea-meal	..	..	1 lb.
Swedes	12 lbs. 14·1 oz.	12 lbs. 14·1 oz.	12 lb. 14·1 oz.
Hay-chaff	3·8 oz.	4·2 oz.	4·2 oz.
Wheat-straw-chaff	3·8 oz.	4·2 oz.	4·2 oz.

The sheep did remarkably well during the last two weeks of the sixteen weeks during which they were under experiment, as will be seen by the following weighings, which were made at the conclusion of the experiments on the 14th of April:—

TABLE VI.—WEIGHT of the SHEEP on the conclusion of the EXPERIMENTS, on the 14th of APRIL, 1883, after a period of SIXTEEN WEEKS.

Additional Food in	PEN I. Linseed-cake and Barley.			PEN II. Linseed-cake and Malt.			PEN III. Linseed-cake and Peas.		
	cwts.	qrs.	lbs.	cwts.	qrs.	lbs.	cwts.	qrs.	lbs.
Weight of Sheep	1	1	13¾	1	0	20½	1	1	1½
	1	1	24½	1	1	0	1	1	23¼
	1	0	8¾	1	1	7¾	1	1	7
	1	1	6½	1	1	20¾	1	1	2½
	1	0	20¼	1	1	3	1	1	25½
	1	1	4¼	1	2	11¾	1	1	1
	1	1	25½	1	1	14	1	2	16
	1	1	16½	1	1	19	1	1	21
	1	1	9	1	1	21½	1	1	21½
	1	1	4	1	1	7	1	2	5
Total weight of 10 sheep on the 14th of April, 1883	13	0	21	13	2	13¼	14	0	12¼
The weight of the 10 sheep in each pen on the 31st of March was ..	12	1	13	12	1	21½	12	3	4¼
	cwts.	qrs.	lbs.	cwts.	qrs.	lbs.	cwts.	qrs.	lbs.
The 10 sheep in each pen consequently increased in weight during the 5th period of the experiments, extending over 2 weeks	0	3	8	1	0	19¾	1	1	8
Or in lbs.	92 lbs.			131¾ lbs.			148 lbs.		
10 sheep gained per week	46 lbs.			65·875 lbs.			74 lbs.		
Or each sheep increased per week ..	4·6 lbs.			6·58 lbs.			7·4 lbs.		
Or per day	·657 lbs.			·94 lbs.			1·06 lb.		

In the fifth period the sheep in Pen II. (malt and linseed-cake) made nearly 1 lb. of live-weight per day, and did much better than those fed upon linseed-cake and barley-meal as additional concentrated food. Linseed-cake and pea-meal given during the last fortnight at the rate of 1 lb. each per day, produced a daily increase of fully 1 lb. per sheep.

The increase in the weight of the sheep, in comparison with their weight a fortnight ago, was so considerable, that in order to check the correctness of the weighings, all the sheep were weighed a second time two hours after the first weighings were made, and results were obtained which differed but little from those of the first weighings.

At the conclusion of these feeding experiments, extending over sixteen weeks, the weight of each pen of 10 sheep, as just stated, was—

TABLE VII.

	PEN I. Linseed-cake and Barley.	PEN II. Linseed-cake and Malt.	PEN III. Linseed-cake and Peas.
Weight on April 14th	cwts. qrs. lbs. 13 0 21	cwts. qrs. lbs. 13 2 13¼	cwts. qrs. lbs. 14 0 12¼
When the 10 sheep were put up for experiments on the 23rd of Dec., 1883, they weighed..	9 2 27¾	9 2 27½	9 2 26½
The sheep consequently increased in weight in 16 weeks	cwts. qrs. lbs. 3 1 21¼	cwts. qrs. lbs. 3 3 13¾	cwts. qrs. lbs. 4 1 13¾
Or in lbs.	385¼ lbs.	433¾ lbs.	489¾ lbs.

It will be seen that the 10 sheep in the second pen, fed upon linseed-cake, malt, and malt-dust, made 48½ lbs. more live-weight in sixteen weeks than the 10 sheep in Pen I., which received linseed-cake and barley in the place of malt. The sheep in Pen III., which received per head per day 1 lb. of linseed-cake and 1 lb. of pea-meal in the course of the last four weeks of the experiments, in sixteen weeks produced 56 lbs. more live-weight than the sheep in Pen II., and 104½ lbs. more than the 10 sheep in Pen I.

According to these data, each sheep, on an average, increased in weight:—

	Per Week. lbs.		Per Day. oz.
Pen I.	2· 4	....	5½
Pen II.	2·71	....	6·19
Pen III.	3·06	....	7 (6·9964)·

It is strange that the sheep in Pen I. picked up the whole of the daily allowance of 1 lb. of linseed-cake, but refused to eat along with it the whole daily allowance of 1 lb. of barley-meal, whilst those in Pen II. ate up all the cake (1 lb. per head per day) and all the malt and malt-dust from 1 lb. of barley.

On the whole, taking into consideration that, for some reason or other, the sheep did not eat all the barley-meal with which they were supplied in the course of the last fortnight of the experiments, the differences in the feeding properties of barley, and of the malt and malt-dust produced from the same quantity of barley, in these experiments were but trifling. A better additional food to swedes and chaff than either linseed-cake and barley, or linseed-cake and malt, for young fattening sheep appears to be a mixture of linseed-cake and pea-meal.

12, HANOVER SQUARE,
August 1883.

XXI.—*The late Lord Vernon.* By W. Wells, Holmewood, Peterborough, Ex-President of the Society.

Sufficient time has perhaps now elapsed since the sudden and lamented death of Lord Vernon, to ensure that an attempt to give some short record of his life and estimate of his character, even by one who had with him a warm and unbroken friendship of many years, shall at least be calm and impartial.

The unexpected death of men of greater eminence in the State has often occurred without so wide and general a feeling of a public loss being evinced as when, on the morning of the 2nd of May, it was publicly announced that Lord Vernon had died the previous evening. His life, especially in his later years, though one of unceasing activity, and of earnest determination to do his best in whatever work he was engaged in, was yet so little obtrusive, so free from any desire on his part to attract popularity, that this wide-spread manifestation of grief was a remarkable evidence of the general appreciation of his singularly sterling character.

Augustus Henry, sixth Baron Vernon, was born on the 1st of February, 1829. For a short time only he served in the Navy; and between his leaving that branch of the Service and his joining the Scotch Fusilier Guards, he was at Magdalen College, Cambridge, though not long enough to take his degree. He remained in the Guards until 1851, in which year he married the third daughter of the first Earl of Lichfield. He succeeded his father in 1866.

In 1859 he contested the Division of South Derbyshire in the Liberal interest, losing the seat by one vote, that vote, in point of fact, being his own, which he omitted, or declined to record for himself. Although the incidents of an election held so long ago can have but little interest now, yet a hustings answer given at the time by Lord Vernon, seems so characteristic of his own life as to be worth recording. Being asked what he would give as an equivalent for the ballot, his reply was, "Honesty and straightforwardness;" and then he added: "If it should please you to send me to Parliament as your representative, I will act the part of a free and independent member, not following this or that minister because he is a minister, but voting in favour of measures rather than men. I pledge myself to do my duty, honestly, diligently, and assiduously, studying to promote to the utmost of my ability not only the local interests of this county, but the common good of our common country."

Though by no means a strong politician, Lord Vernon gave his support generally to the Liberals, with whom his sympathies undoubtedly were, and with whom he always wished to act. But his loyalty to them in recent years was put to many a severe strain, so severe indeed that, on several important occasions, he found himself unable to support the measures of the present Government.

For some years before his father's death, the entire management of the Widdrington property, near Morpeth—since sold—had been placed in his hands; and probably he then acquired that liking for agriculture and country affairs, which led him subsequently to devote to them so much of his time and energies.

THE LATE LORD VERNON.

It was in 1859 that Lord Vernon was elected on the Council of the Royal Agricultural Society, and from that time forward his interest in the Society and work for it were unremitting. He acted as Steward of Implements at Canterbury in 1860, at Leeds in 1861—where the senior Steward especially called attention to how much the Society was indebted to the exertions of the Hon. A. Vernon in superintending the trials of Steam-ploughs—and again at Battersea in 1862. He was elected President of the Society in 1871. His devotion to his three years' duties as Steward of Implements had given him a taste for agricultural machinery, and a considerable insight into their merits and defects, while his management of the Widdrington estate had included the introduction of the use of the steam-plough; so that on his accession to the Presidency of the Society, he offered at the Show at Wolverhampton a Prize of 100*l.* "for the best combination of machinery for the Cultivation of the Soil by Steam-power, the cost of which shall not exceed 700*l.*" Those who were in office with him, will well remember his unflagging watchfulness over the very important trials of implements that were conducted in that year, which embraced Traction-Engines, besides Steam-cultivating Machinery—the former quite a new feature in connection with the Society's Shows.

One result of Lord Vernon's Presidency was the conviction he at that time arrived at—a conviction in which he was supported by the opinion of others in the Council—that the whole question of the receipts and expenditure of the Society should be considered, with a view of securing, if possible, "equal results at less cost." To this end a Special Committee, known by the name of Lord Vernon's Committee, was appointed in November 1871, which, receiving suggestions from the representatives of the several departments of the Society, was enabled to present a report that laid the foundation for many changes, combining efficiency and economy in the working of the Society.

In the Chemical Department, from the first, Lord Vernon took an active interest. Placed on the Chemical Committee the year after he joined the Council, he brought to it a certain amount of useful knowledge, having learned under Professor W. Allen Miller, of King's College, the rudiments of Analytical Chemistry.

Those were the days when probably the consciences of the vendors of artificial manures and feeding-stuffs were at their lowest level, and when it seemed to several members of the Council that the good old rule of *caveat emptor* was hardly a sufficient protection to many members of the Society. No one was more impressed with the magnitude of the evil, and with a desire to find a remedy, than Lord Vernon; and, with others specially interested in the work of the Chemical Department, he warmly supported the resolution, proposed by Lord Lichfield in 1879, for the publication, in the Society's 'Journal' and in the agricultural newspapers, of reports of sales of inferior or adulterated manures or feeding-stuffs, which were brought under the notice of the Consulting Chemist by members of the Society.

It was not long before the Society was called upon to defend the publication of what they considered such a case. The action was tried at Leeds in 1872, before Mr. Justice Blackburn, and although it was decided in favour of the Plaintiffs, the Society never regretted the course they had adopted. Their conduct was warmly approved by the members of the Society; and from that time forward it was recognised that the Council had entered upon a course of unflinching antagonism to those dealers who acted against the spirit of the resolution just stated. Caution, however, in dealing with such cases is very requisite, and the responsibility—after what had occurred at Leeds—of involving the Society on inadequate grounds in heavy expenses, became no trifling one. But, trifling or not, Lord Vernon was always ready to bear his own, and more than his own, share of it. His indignation was with difficulty restrained as the report of some flagrant cases were read out, and he was apt to be almost impatient if, as he was ready to think them, too timid counsels sometimes prevailed.

As might have been expected from his activity when acting as Steward of Implements, his interest in the Implement Committee was unceasing. One of the results of "Lord Vernon's" Committee was a remodelling of the scheme for implement trials, so that only those implements of the most recent invention, and the manufacture of which seemed the most backward, were retained on the official list for trials in rotation.

The present position, of being almost embarrassed by the perfection to which agricultural implements have arrived, and of the necessity for an occasional pause in their trials, in order, as it were, to give time for the ingenuity of the makers to bring out something with a substantial claim to novelty, is very different from the state of things some thirty or even twenty years ago, when threshing-machines, reapers, mowers, drills, and other implements, were only in the first stage of their invention, and were brought before the public with all their juvenile imperfections.

It was under such circumstances that Lord Vernon's ever-wakeful sense of justice led him, while giving every credit to the few large firms for the ingenuity they showed, and the heavy expenses they incurred in producing these implements, to fear lest any such system of trials as then existed, should unintentionally give an undue advantage to the larger manufacturers, and cast the efforts of smaller men into the shade.

His proposals, as already indicated, resulted in a considerable reduction of the list of standard implements put down for trial in rotation, coupled with an enlarged power to the Stewards to select for trial, in either the current or any future year, such new implements as might seem to them and the Judges at any Country Meeting, to promise well for the benefit of the English farmer. Without attempting to give a complete statement of the operations of this plan, it may be useful to recall the attention of the members of the Society to the fact that self-binding reapers have since been tried twice, and hay-drying machines once; although under the old system of a fixed rotation, neither of these novel inventions could have been subjected to such exhaustive trials as have been given them recently.

At the Society's International Exhibition at Kilburn, in 1879, Lord Vernon accepted the position of Chairman of the Committee appointed to receive and entertain foreigners of distinction, or those having special recommendations to the good offices of the Society. Under his guidance visits were paid on three days respectively to the Royal Farms at Windsor, to Woburn Abbey, and to Rothamsted, of the pleasure of which all who were present spoke most warmly, attributing much of the success to the kindness and good management of Lord Vernon, who cemented some old, and established several new, friendships among the foreign guests who followed him.

It was in this year also that, after an interval of seventeen years, he was asked to undertake a second time the office of Steward of Implements. He had considerable hesitation in accepting the post; and, coming as it did at the moment when he was fully occupied with the work of the Royal Commission, to which he had been appointed in August, there can be no doubt it was a severe tax upon his strength. During the Reading Show, for instance, he was frequently at work at five in the morning on his Royal Commission task, in order that he might have the day clear before him for his steward's work—unusually heavy that year, owing to the protracted trials of Hay- and Corn-Drying Apparatus.

Coming from, and living in a dairy county like Derbyshire, Lord Vernon was sure to take a great interest in all that pertained to that branch of agriculture; and long before the recent depression had turned the attention of farmers in general, and arable farmers in particular, to the production of more butter and cheese, and less corn, he had been busying himself in giving a helping hand to the introduction of cheese factories into his county.

In 1868 he moved the 'Journal' Committee of the Royal Agricultural Society to make inquiries into the working of these factories in America; and in 1870 we find him subscribing to the starting of one in Derby, about the same time as the Hon. E. Coke set up his at Longford in the same county.

In December of the same year, the chair was taken by Lord Vernon at the Society of Arts, when Mr. Jenkins delivered a lecture on Cheese Factories. The success which has attended these undertakings is well known; and to Lord Vernon, as one of the first pioneers of the movement, no inconsiderable share of the credit is due.

Only two years ago Lord Vernon established at Sudbury a butter-factory—one of the first of the kind in England. Owing to the novelty of the undertaking, many difficulties had to be encountered; and it required all his patient perseverance and close personal attention to bring it into working order.

It has been greatly appreciated by his tenants and neighbours, to whom a ready and steady sale for their milk is invaluable; and, with some new machinery and improvements suggested and introduced by the present Lord Vernon, and under the management of his brother, the Hon. W. Vernon, it is rapidly becoming an important concern.

His tenants at once showed their complete confidence in their landlord's judgment, and, at the risk of offending their former customers in the trade, without hesitation agreed to supply the milk at market price. They have never since regretted their decision, and they now obtain a regular and steady sale, with a certainty of payment.

During the year of his presidency of the Society, in 1871, some of the hardest work that ever fell to his lot was performed by Lord Vernon in connection with the fund raised to supply to the French peasants the seed which the ravages of the German war had, over large districts, deprived them of. Lord Vernon consented to preside at a preliminary public meeting, and to act as Chairman of the Fund afterwards.

In such work as this, all his sympathy and energy were sure to be fully engaged; and during the greatest part of the year his labour was incessant in the cause. Ably supported by his indefatigable lieutenant, Mr. Jenkins, and his co-Secretaries (Sir Brandreth Gibbs and Mr. W. H. Delano), who were foremost in giving shape to the suggestions originally brought forward by Mr. Howard, and loyally helped by his colleagues on the Committee, Lord Vernon toiled on day after day, often from morning to evening, writing, organizing, and meeting the ever-new difficulties which the nature of the undertaking presented.

An article by Mr. Jenkins in vol. viii. of the 'Journal,' gives full details of all that was done; and it is only necessary to say here, that for the succour thus promptly and liberally afforded, the French nation showed themselves to be adequately grateful.

It is interesting at this moment to give the following extract from a letter to Mr. C. Randell from the Comte de Paris, dated only in September, in which, referring to a subscription he sends for the Vernon Memorial, he says:—

> "I avail myself of this opportunity to pay a tribute to the memory of one who has shown his active sympathy towards my country in the days of our disaster, and whose intelligent and practical charity has made his name popular in many French villages.

The two following letters express the feelings of the French Government of the day, and of M. Thiers, then President of the French Republic:—

Mon cher Lord Vernon,— Londres, 26 avril.

Vous savez combien le Gouvernement français est désireux de perpétuer le souvenir des services que la Société des Secours en Semences a rendus aux Agriculteurs français dans ces deux dernières années. Dans cette pensée, M. le Ministre de l'Agriculture et du Commerce a fait frapper une médaille en or qu'il me prie de vous transmettre. Il m'est agréable d'être encore, dans cette circonstance, l'organ de la reconnaissance de mon gouvernement, et de pouvoir y joindre le témoignage de mes sentiments personnels de haute estime pour le Président et les membres du Comité des Secours aux Agriculteurs français.

Veuillez, mon cher Lord,
Me croire votre tout dévoué,
Ch. Gavard.

Je joins la médaille à cette lettre.

My Lord, Versailles, le 30 novembre 1871.

L'œuvre du Comité qui s'est chargé, sous votre direction, de venir aux secours des agriculteurs français victimes de la guerre en leur faisant distribuer des semences, a rendu à la France de trop grands services, pour que le Président de la République ne fût pas désireux de vous donner un témoignage de sa gratitude. Le Président m'a chargé de vous offrir une porcelaine de Sèvres. Je m'empresse de vous transmettre ce souvenir et je me félicite d'être, en cette circonstance, l'interprète du Chef de l'Etat, et d'avoir cette occasion de vous exprimer, my Lord, mes sentiments personnels de haute considération.

Le Ministre des Affaires Étrangères,
Remusat.

A Lord Vernon, Président du Comité pour la
distribution de Semences aux Agriculteurs français.

To the latter of these letters the record of a curious agricultural circumstance may be added. The "porcelaine de Sèvres" consisted of a beautiful series of seven pieces illustrating a wild-boar hunt, and they arrived in due course at Dover, most carefully packed in hay. There the Veterinary Inspector of the Privy Council impounded them, for fear of introducing cattle-plague into England, as the fatal rinderpest was then raging in

France, having been carried there by the German armies. It would require many pages to describe the efforts made, and the precautions taken, by all parties concerned to liberate this handsome gift from the clutches of the Veterinary Inspector, whose devotion to his duty was of course commended by none more than by Lord Vernon himself.

A striking illustration of how much his own individual work was recognised and appreciated by those for whom it was undertaken, is given in the following extract from a letter:—"When we were at Tours, an old French peasant and his wife drove in from the country to thank him in person. Their story was a touching one. They had been very well off till the time of the war, when they paid a heavy sum to buy their only child off from serving in the army. A second conscription obliged him to go, and he was killed. They meantime had had their crops ruined, and but for the help of the seed-fund would have failed altogether." The same letter mentions there having been much disappointment at Tours because Lord Vernon was too unwell at the time to accept an invitation to a public dinner which they were very anxious to give in his honour.

When in 1875 a fund was raised by the Lord Mayor for the relief of the sufferers by the disastrous inundations in the valley of the Garonne, Lord Vernon joined the committee, and gave much valuable assistance and advice, especially insisting that all English subscriptions should be distributed by English agents.

As a fitting sequel to the thought and labour he had bestowed for so many years on agricultural and other cognate subjects, he was appointed a member of the Royal Commission on Agriculture in August 1879. To accept any appointment meant with Lord Vernon that he would give his whole care and attention to it; and it may be well imagined how soon he became absorbed in the work of the Commission.

Lasting, as it did, for nearly three years, it is not too much to say that it seemed hardly ever out of his thoughts. Besides the scrupulous pains which, as mentioned by the Duke of Richmond (p.442), he took at the sittings of the Commission in framing his questions—frequently written out beforehand—so as to extract the truth from whatever source it could be arrived at, his correspondence and interviews with tenant-farmers, land-agents, and others, were incessant; and that his views were well thought out and independent is best shown by his having, while agreeing with the rest of the Report of the Commission, produced a Supplementary Memorandum on the vexed question of unexhausted improvements. It was on the basis of this memorandum that he framed his Bill for the Amendment of the

Law relating to Agricultural Holdings. Upon the drawing-up of this measure he had spared neither time nor thought, and it was to have been brought forward by him at the afternoon sitting of the House of Lords on the 1st of May, only an hour or two after the sudden and fatal attack occurred.

It has been noticed, in general terms, how wide-spread and deep the expressions of grief were when his untimely death became known; and although it would be out of place to refer in much detail to the many written tributes to his memory of a public nature, and still more so to those from private and intimate sources; yet, as evidence of the singular esteem and affection in which he was held by all with whom he was brought into contact, a few extracts from some of the many letters of sympathy which were written at the time of his death may be permitted.

From France the Marquis de Dampierre writes on the part of the "Société des Agriculteurs de France:"—"J'ai cédé au premier élan de mon cœur en exprimant notre douleur de la perte de l'homme éminent qui avait su, en France comme en Angleterre, s'attirer le respect et l'affection de tous. . . .

"Le prochain numéro du Bulletin de la Société des Agriculteurs de France contiendra une courte notice sur Lord Vernon, et donnera l'extrait d'une lettre, à mon adresse, qui correspond bien aux sentiments de ce noble cœur."

The extract from the 'Journal de l'Agriculture de France' of May 10, 1883, is as follows:—

"Nous avons été douleureusement émus en apprenant la mort de Lord Vernon, arrivée subitement à Londres ce 1^er^ mai courant. Son nom était doublement sympathique à la France; d'abord, à raison des services qu'il a rendus à l'agriculture en général; ensuite et surtout, à cause des secours qu'il a donnés à nos campagnes lors des désastres de l'invasion. . . . Dans la séance de la Société Royale du 2^d^ mai, le Président, M. le Duc de Richmond, a rappelé les grandes qualités de l'esprit et de cœur, que possédait le défunt. Sa mort prématurée, a-t-il dit, est une perte nationale. La France, pouvons-nous ajouter, partagera le deuil de l'Angleterre, car elle perd en Lord Vernon, un ami et un bienfaiteur."

The press in his own and neighbouring counties lament his loss in a warm and generous manner. The editor of one paper, writing privately, says—"I feel I may be permitted to express, however inadequately, the deep personal esteem and respect with which I regarded him. . . . The loss is such that it affects society at large; and, indeed, my experience does not extend to another case in which the public feeling has been more heartfelt and deep."

On behalf of the Derbyshire Agricultural Society the chairman writes—"During the 18 years Lord Vernon had been a member of this Society his energies were ever directed to its advancement, and his great practical knowledge, coupled with his clearness of judgment enabled him thoroughly to appreciate the wants and necessities of the farmers. . . . In all questions arising between landlord and tenant his manner was always so courteous, and his judgment so dispassionate, that his decision was accepted not only without a murmur, but with gratitude."

A well-known Queen's Counsel writes to a legal friend of the family—"His loss will be greatly and widely felt, and in the Midland counties no one can well fill the vacancy his untimely death will cause."

"What I look back to with most pleasure is the evenness of his disposition and the patience and fairness of his judgment." This paragraph from the letter of a well-known statesman gives a singularly true description of his well-balanced and conscientious mind, and of the feelings of confidence and affection that any intercourse with him produced—feelings which are well illustrated in two letters of sympathy, written, the one on behalf of his old tenantry in Northumberland, the other by one of his fellow-workers on the Seed Fund. The first says—"Rest assured that the love and respect we all cherished for Lord Vernon and the family will never be effaced, and though connections which once existed are now severed, yet the recollection of his Lordship's ever kindly interest in us, and anxiety for our welfare, are too vivid to be easily erased from our memory." The second says—"Having been associated with him in the distribution of the French Peasant Farmers' Seed Fund in 1871, and of the Inundation Fund in 1875, I have never worked with or under any man who more thoroughly won and preserved the sympathy and affection of his subordinates."

At a meeting of the Council of the Royal Agricultural Society on May 2nd, the Duke of Richmond, as President, on taking the chair said: "Before proceeding to the ordinary business of the Council, I must call your attention for a moment to one of the saddest calamities that it has been my misfortune to hear of; that is, the very sudden death of our dear lamented friend, Lord Vernon. I am sure that all of us who have worked with him on this Council appreciated his great virtue, his good habits of business, and his courtesy of demeanour on all occasions; and I can assure you that I feel his loss more acutely, perhaps, than many others, because for three years I sat with him in constant consultation on the Royal Agricultural Commission, and upon all occasions on that Commission I had the greatest possible assistance from him, the most loyal consideration for everything which I suggested or put forward; and though we did not always agree upon everything, as was to be expected in such a large inquiry, I always found in him the most fervent, honest, straightforward friend that anybody could wish to have. Active as he has always been upon this Council, energetic as he has been on all occasions regarding everything connected with the welfare of this Society, and agriculture generally, I consider it to be a national loss that he has been so early cut off in what I must say was a very useful career; and I cannot but think that his energy in the subject which he had recently taken up has been the cause of his sudden decease. I believe that the Bill which he had drawn up, and which only yesterday he was to have brought before the House of Lords, was too great a strain upon his brain, for up till two o'clock yesterday he was apparently in good health, and at eight o'clock he was no more. I did not think it would be right or proper that we should meet to do the ordinary business of the Council without expressing our sincere and earnest regret at so great a calamity."

It would be a mistake to think that what related to agriculture directly or indirectly engrossed Lord Vernon's attention to the exclusion of other subjects. Even without referring to the management of his own collieries, to which he gave the most minute and watchful attention, he found time to take a prominent part in county affairs of whatever kind. He was a Governor of the important Repton School, had been Chairman of the School Board for some years, and this is how he is spoken of by one of his fellow-workers there: "Lord Vernon's death is a national loss, but it touches us here very nearly; no one can in any sense replace him."

An Oxford friend, a man of high standing in the University, in alluding to his loss, adds that it had been his intention to have proposed his name on the first opportunity for the distinction of an hon. degree; and this perhaps is a fitting place to mention that, with the assistance of Sir James La Caita, he completed the elaborate and expensive edition of Dante which had been begun by his father. Only a few copies of this very fine work were printed and sent to certain public and to a few private libraries.

If, as all that has been said abundantly shows, there was in Lord Vernon's character something which made even those who had with him mere business transactions, feel at once drawn towards him, and prompt to claim him as a friend, it can be well imagined how warm were the more intimate relations of his life, among his immediate neighbours, his tenants, and his employés.

Those who had the privilege of seeing him in his home must often have been struck, for instance, by the bond of friendship which existed between the Hall and the village. The two seemed rather to be one large family, with him at its head—all having common interests, common joys, and common sorrows. And as at Sudbury, where everything tending to the comfort as well as the moral well-being of his tenants and poorer neighbours, including the excellent school, was sedulously promoted; so also at Poynton, in Cheshire, where his collieries were situated, the like vigilant care in the same direction was exercised.

Among the colliers at Poynton he was very popular, and an interesting account is given in a Stockport paper of a threatened strike being avoided by his personal influence. "He met," the account says, "a deputation of the men, listened patiently to all the arguments that could be adduced on behalf of the miners, pointed out the mistakes they had made, and the result was a reconciliation, the full import of which can scarcely be appreciated by those unacquainted with the consequences of a workman's strike." And it may well be added here, that perhaps one of the most touching letters of condolence received by the family on Lord Vernon's death was from a working miner at Poynton.

Such, then, is a very brief outline of the life and character of one whose earnestness in the discharge of his duties, and of his self-imposed tasks, to the utmost of his abilities, was very remarkable; and if occasionally a disposition arose to look upon his anxiety as extreme, and his conscientiousness as excessive, it was quickly lost in admiration of the noble spirit and generous motives which produced in him those feelings of perhaps over-sensitiveness.

But the quality and value of a man's career must be judged mainly by the effect it leaves on the minds of his fellow-men; and Lord Vernon had this seal set on his—that in his death he was as much and as widely regretted as in his life he had been honoured and beloved.

XXII.—*Report on the Exhibition of Live-Stock at York.* By S. P. Foster, of Killhow, Carlisle, Senior Steward.

The Meeting of the Royal Agricultural Society held on the Knavesmire at York, and so looked forward to with feelings of mingled hope and doubt, will long be remembered; for was it not one of the greatest exhibitions of live-stock ever held, whether we consider quantity or quality?

The Show, as usual, opened on the Saturday (14th of July), but on that day the Implement Yard was the only part to which the public could gain admittance.

On Sunday the excellent institution of holding Divine Service in the Yard was again adhered to, when the large marquee was crowded with an attentive congregation, composed of a few members of the Local Committee and their friends, a few Members of Council, and some hundreds of grooms, herdsmen, and shepherds; in fact, I think that every tongue, whether from south or north, east or west, in Great Britain, with additions from the Emerald Isle, had one if not more representatives, a result which proves the popularity of this appropriate service! His Grace the Archbishop of York preached, and gave much good advice to all, his sermon being listened to by the congregation with marked attention.

On Monday began the real work of the week, *i.e.* the judging of horses, cattle, sheep, and pigs; but it is not my duty to write a long and full account of the live-stock, and I think it is fortunate for the readers of the 'Journal' that a description, by a more practised hand, will be given of the greatest and most successful collection of stock for exhibition got together for many years.

The Prince of Wales, who was the guest of Sir G. Wombwell, again did all that was possible to make the Show a success, and right royally was he received by the good people both of county and city, nothwithstanding that his arrival took place at the time of a perfect downpour. This year his Royal Highness paid a longer visit to the Show than of late he has been able to do, so at his command the cattle were first brought before him as at an ordinary parade, and not the prize animals alone shown to him, which was the case at Derby and Reading. After the parade of cattle, an adjournment was made for luncheon; but his Royal Highness was soon again in the Grand Stand, from whence he reviewed the whole of the horses, between five and six hundred passing before him in one continual stream. The Prince having expressed a desire to see all he possibly could, that master of detail, Mr. Jacob Wilson, arranged that the sheep should be in position on either side of the principal avenue as his Royal Highness drove down; these instructions, as is well known, were carried out by Mr. Gorringe, one of my many able colleagues, the result being that a parade of sheep before the Prince was successfully inaugurated. After the cattle parade, and before luncheon, his Royal Highness attended the General Meeting of Members of the Society, and in a telling speech, amidst the greatest applause, gave our noble President a title, acknowledged by his Grace to be the proudest title he could bear, namely, that of the "farmer's friend." I think I hear many say, "the truest and most appropriate title."

It was next proposed that Sir Brandreth Gibbs should be President for the ensuing year, and the reception of that gentleman proved that there were not two opinions as to the selection by the Council of their President-elect being endorsed by the Members of the Society.

I am glad to be able to record that a hearty vote of thanks was passed to the Railway Companies; and I believe I cannot be contradicted when I say that never did the Railway Companies do their work in a better style; and well was the vote of thanks deserved, that was so ably acknowledged by Mr. Dent, the Chairman of the North-Eastern Railway, who himself last year at Reading occupied the position of President of the Society.

On the evening of Wednesday the 18th, the Lord Mayor and Corporation of York held out the right hand of hospitality and "good fellowship" towards the Society, by entertaining at a banquet at the Mansion House the noble President and the Council.

Perhaps the greatest feature of this Show, as compared with the previous one held at Reading, was that this can indeed be called a great "horse show;" and I think the owners of all stock will admit that the cart horses alone were a grand sight, and that Class 1, the Shire Horse Class, stands in its right place at a Royal Show as the greatest of English cart breeds. At the same time, Thoroughbred Stallions for getting Hunters were a great improvement on the previous year; while Hunters, I heard a well-known Judge remark, kept on getting better and better, as class followed class.

It will be remembered by all who stood round the large horse ring on the Monday, that the first prize for thoroughbred horses for getting hunters was awarded to Messrs. Dodgson and Thompson for "Mulatto;" and many will regret that the Stewards were compelled, on a protest being lodged against him, to give the coveted red card to Lord Scarborough for "Discord," a useful horse, but without the substance and power of "Mulatto."

Now let me give a few words about the cattle. Shorthorns, Herefords, and Polls (Angus) were well represented, as also Devons and the Channel Islands breeds.

Shorthorns, as is generally the case, were by far the most numerous, and certainly there were some animals of great excellence; but I think that, if we take the numbers shown in the Hereford Classes and compare them with the numbers shown in the Shorthorn Classes, the Herefords had the pull; this is probably to be accounted for by many breeders of Shorthorns preferring to keep their animals in breeding condition at home, rather than run the risks of long journeys, bad weather, and disease, while the owners of the white faces may not be desirous of hiding their "light under a bushel." It may not be out of place to mention that during the last few years, in which I have been a Steward of the Society, I have often heard the remark, that better prizes are offered for Shorthorns than for other breeds; but if we look at the numbers entered, it will at once be seen that the boot is on the other leg, for the Shorthorns entered at York were 129, while of Herefords, Devons, and Polled Angus, altogether, we only had 112 entries. Again, last year, in the West of England, there were 127 Shorthorns entered, as against 116 Herefords and Devons! There was not a class for Polled Angus at Reading.

It will not be forgotten that last year many said, "how the Sussex Cattle have improved of late years!" I think this remark might have been endorsed at York.

Sheep were again a good show, but the premiums, both for quality and quantity, again, I understand, must be given to the Shropshires,—the Southdowns, however, running them very close.

In point of numbers, the pigs were above the average: taking them according to the Catalogue, the Large Whites did not muster as strong as might have been expected, considering that the Show was held in their own country! There were, however, fine specimens, and great praise is due to the breeders for the improvement in quality and fineness of bone especially apparent in some of the sows.

The competition amongst the younger pigs of this breed was considerably reduced by dentition disqualifications.

In the Middle Whites there were a number of most useful pigs. This breed appears to be growing in favour, as the "happy medium" between Small and Large Whites, and are now quite establishing for themselves a distinctive type. The Small Whites, though fairly strong, were not a large gathering; one well-known yard being unrepresented, owing to the difficulty of transit occasioned by "the foot-and-mouth regulations."

The Blacks were a full entry, and some good pigs were shown.

The Berkshires were by far the strongest part of the Pig Classes; in point of numbers they almost doubled any other breed, and came from all parts of the country. As was to be expected in so large an entry, great variations were found in point of merit; at the same time, with a few exceptions, they all showed the firm flesh for which this breed is so noted, and were also true to types and markings. Under the head of Other Breeds there was nothing worthy of note except some curious specimens of the "old Tamworth breed," one young pig certainly showing great size for his age! The new system of having separate Judges for White and Black Pigs is decidedly a step in the right direction, but I would suggest three Judges in each division, not three and two. I am greatly indebted to the pen of Mr. Ashworth for the account I have given of the pigs, and I hoped to have added a few lines by Mr. Gorringe about the sheep, a subject with which he is so well acquainted, but unfortunately the printer cannot wait. I have no doubt, however, that these classes, and for the matter of that all others, will be thoroughly described by the official reporter a few pages further on.

The weather was, taking one day with another, good and bad together, favourable; but on the Tuesday, just as the Prince came, and the last hour that the Show was open on Friday, visitors learnt that it can rain at York as easily as at Kilburn or Carlisle. It was certainly very fortunate that the tremendous wet of the dying hours of the Show, and of the two following days, did not come sooner, for I am told that the "Knavesmire" gave indications on the morning of the 21st as to the state it could have got into had it been compelled to appear during the Show week with its "great-coat" worn out! The Local Committee deserve more than a few words of thanks, for doubtless they had many ups and downs to contend against, that we know not of.

Before I send off these few lines to Hanover Square, may I ask our noble President to allow me to thank him for his great kindness to me during the time I have had the honour to work under him as Steward of the Royal Agricultural Society, and also to thank my companions in Stewardship for all their aid, including with them our good friends the Assistant Stewards? It is not for me to speak of the work done by our indefatigable Secretary, either as regards the Stock Yard, or in superintending the rearing of his favourite child, "the Dairy," but I should like to thank him and the whole of his staff for their uniform courtesy to me during my term of office.

I must not forget to mention that the building of the stables, &c., again showed the skill of Mr. Bennison's hands.

My work is now done; but I must ask that all my shortcomings may be excused, and especially so poor a Report, it being but the effort of a "three-year-old," pushed, perforce, by the exigencies of the Society, to early maturity, instead of the work of a well-developed Steward of four years' standing.

XXIII.—*Report of the Live-Stock exhibited at the Society's Meeting,* 1883. By WILLIAM MACDONALD, Editor of the 'North British Agriculturist,' Edinburgh.

DESPITE the deterring effects of restrictions on the movements of stock, arising from the existence of a considerable amount of foot-and-mouth disease in various parts of the kingdom, the York Show, held on the 16th, 17th, 18th, 19th, and 20th of July, will take its place among the most successful the Society has had. This is saying a great deal, when it is remembered that heavy showers characterised the weather of the second day, and a deluge of rain that of the closing day; that no little dread of disease naturally existed among pedigree stock-owners, and that agriculturists have passed through a long period of great depression. Of the agricultural disasters of recent years, it is true, there was little or no trace in the Showyard. If one were to judge by what he saw at York, it might be assumed that the worst was past, and that that worst had not, after all, been so bad. Well, it should not be too much to expect that the worst is over; but, as to the magnitude of the depression, it would be misleading to estimate that by what turns up at a national Show.

Be that as it may, it is so far comforting to find so much vitality and confidence still in agricultural quarters as was manifested at the York Meeting. The live-stock showed no falling off, neither did the attendance of visitors. Both in respect of the character of the bestial collection and of the patronage of the public, the York Meeting is likely to be pointed to with a considerable degree of satisfaction for years to come. The magnificence of the site on Knavesmire, the railway and other accommodation, and the admirable manner in which the Yard was laid out, as well as the precision with which the arrangements were carried into effect by the officials, are matters on which all concerned can reflect with pride and pleasure. The authorities of the ancient city of York rose to the occasion, and gave the foremost Agricultural Society a welcome worthy of the town and of the Exhibition.

Any report of the Show would be incomplete without reference to the success of the precautions taken by the Council of the Society to prevent the spread of disease. Early in the summer the Council were confronted by the facts that foot-and-mouth disease had a considerable hold of the country, was prevalent in some parts of the county in which the Show was to take place, and had occasioned restrictions on the movement of stock which, if not partially relaxed, would have proved almost fatal to the Exhibition. Those best able to form an accurate opinion on the subject, however, were satisfied that, with due care, there was no occasion to postpone the Show. The Council took that view, in the belief that the precautions they were about to adopt would prevent the occurrence of the Show from augmenting the amount of foot-and-mouth disease. The Council, as the result of much consideration and forethought on the part of the Society's responsible officials, and at much expense, succeeded in (1) purchasing the grazing rights of the 300 acres called Knavesmire (on which the Show took place), with the view of keeping it clear of cattle, sheep, or pigs from the 4th of June till after the Show; (2) closing the Railway siding at which the stock were to be received and despatched for a similar period; and (3) closing the York Cattle Market from the 21st of June till after the Exhibition. No cattle, sheep, or pigs were to be admitted from an infected area. The Council submitted these arrangements to exhibitors, to the Privy Council, and to local authorities throughout the kingdom, and were able to assure all, that there had for a long time been no disease within the jurisdiction of the City of York, nor very near the town. The result of the labours of the Council and the Secretary in this matter was that exhibitors came forward with a considerable degree of confidence; that local authorities agreed to allow stock to return to their respective homes from the Show, on the receipt of a certificate from the Secretary, countersigned by one of the Society's Veterinary Inspectors, to the effect that there was no disease in the Yard, and that the particular animals were healthy. With these precautions rigidly carried out, it is gratifying to the Society, and satisfactory to all concerned, that no outbreak of disease has been traced to the movements of stock involved by the Show.

The collection of the British breeds of stock was better than might have been expected. Saving alone Kilburn, it may be doubted if ever the Society had a Show that embraced such a good representation of so many different varieties of horses, cattle, sheep, and pigs. In no section of the Show was there so much improvement as in that of horses. The Society popularised the classification of the heavier breeds, and increased the prize-money somewhat, while, thanks to the liberality of the Local Committee and of the Yorkshire Agricultural Society, greater inducements than usual were offered, and not in vain. Seldom, if ever, has the Society had such a splendid show of horses, both heavy and light-legged. The Cattle sections were more remarkable for generally well-sustained merit than for the super-excellence of any one variety. Sheep, more particularly of the Down order, were fully up to the average; and pigs, as was looked for in York, were creditably represented.

A careful perusal of the Catalogue and a glance at the following detailed Report will convey some instructive and gratifying facts. In the first place, a very large proportion of the animals exhibited were bred by the exhibitors. This was so as regards cattle, while very few of the sheep and pigs have ever changed hands, and many of the horses were bred and reared by their present owners. In the next place, an astonishingly large number of the prize-winners in the younger classes are the produce of males and females still in Showyard trim, and adorned by prize-tickets at this very Meeting. This favours the belief that high feeding is not so detrimental, in skilful hands, to successful breeding as is generally supposed. Preparation for modern Showyards is a severe ordeal, and only good-constitutioned animals can endure it. It leads to many breeding mishaps and failures; but when one finds the sires and dams of so many of the prize-winners themselves in the prize-list as was the case at York, one is forced to the conclusion that successful showing and breeding go hand in hand to a considerable extent, and to a larger degree than is commonly imagined.

Overfeeding has been disappearing somewhat in recent years. There is still too much of it, though rather less at York than usual. The Society is to be congratulated on its choice of Judges. In many of the classes the task of a Judge was an arduous one. The awards on the whole, however, were judiciously made. Turning to my descriptive notes of the different breeds, I begin, as the Catalogue does, with

HORSES.

As before stated, the exhibition of horses was one of the best yet witnessed in England. The great size and early development of the Shire and Agricultural colts and fillies were fitting subjects of remark. The clean hardy bones, free pasterns, and fine action of the Clydesdales had to be pitted against the greater weight and earlier maturity of the corresponding breeds across the Border. The good-wearing legs and portly bodies of the Suffolk, and the great activity of many of the hunting horses and hacks, riveted attention, no less than did the symmetry and quality of several of the ponies.

Shire Horses.

The Aged Stallion Class was small, but very good. Lord Ellesmere's first horse was "Exchange" (2421), bred by Mr. Stanley, and very heavy for a five-year-old. He has more feather than the rest, and is powerfully coupled, but bad in action. By many, Mr. Shaw's second horse, "Cromwell" (2415), from Lancashire, would have been preferred. He was first at Reading, has good clean bone, strong build, splendid neck, and moves better than the first. Mr. Pole-Gell's third is a neat, if not very heavy, four-year-old chestnut, bred by Mr. Kent, Lincolnshire. He stands well on nice legs, and appears to advantage in motion.

Three-year-olds were stronger in numbers, and quality was not deficient. The Hon. Mr. Coke's chestnut "Certainty," bred by Mr. Tinsley, Lincolnshire, is an animal among a thousand. He shows muscle and general development, that are not often visible in older animals. He was first at Reading, and has gained in all a dozen first prizes. Well-sustained as merit was in the class, he was abreast of the others, and moved so well that he very properly got the cup as the best entire horse of the breed. "Esquire," of Lord Ellesmere's, bred by Mr. Blunt, placed second, has immense forearm and bone, with more feather than is common among Shires, while his buttock is grand, and character good. His head may be rather heavy for some tastes, but he is an animal of great substance. To him fell first honours at London in the spring. Mr. Forshaw's third, bred in Lincolnshire, is compact in build, with better bone than some of the others, and easy action. He stood first among all ages at Doncaster, beating Lord Ellesmere's first aged horse. Lord Egerton's Reserve colt, bred by Messrs. Waring, Lancashire, is a tidy bay, son of the celebrated prize-horse "What's Wanted."

Still larger were numbers, and correspondingly greater was size, in the Two-year-old Colt Class. The Judges, as they say themselves, had no sinecure here. A satisfactory first was found, however, in Mr. Elsey's handsome bay colt, bred by Mr. King, Lincolnshire, and sired, like Mr. Coke's champion colt, by "Lincolnshire Tom" (1367). This colt is wonderfully ripe, strong in bone, good in feet and feather, and in general features not unlike a Clydesdale, but bigger and better matured than animals of the Scotch breed usually are at the age. The biggest colt in the class, if not in the Show, for a two-year-old, was Mr. Welcher's second, of Mr. Betts's breeding, and also sired by "Lincolnshire Tom." He has monster legs, measuring below the knee 12½ inches. His thighs and forearm are very strong, but his hocks are too fleshy. He has gained eight first prizes, and is an extraordinary colt for size and substance. Mr. Bacon's third, an active well-put-together colt, of his own breeding, is the best "stepper" of the three, and has good pasterns and feet. The Hon. Mr. Coke's Reserve black colt, bred by the exhibitor, has excellent feet and pretty good form.

Lord Ellesmere furnished a capital leader in a well-filled class of Shire Mares, with foal at foot, in the shape of a seven-year-old brown "Darling," bred by Mr. Kelsall, and sired by "England's Glory." She is a really good all-round mare, heavy in body, with legs to harmonise, good feather, and excellent feet. She would pass in appearance for a Clydesdale, and has an exceptionally promising foal at foot. The second mare, owned by Mr. Gilbey, is a nine-year-old black, of Mr. Stokes's breeding. She is a thick, well-put-together mare, of a fine, old, very durable stamp. Of her foal by the second-prize horse "Cromwell," great things are naturally expected. A granddaughter of "England's Glory" is Mr. Miller's third twelve-year-old bay mare "Trimmer," from Singleton Park, and bred by Mr. Richardson, Cambridgeshire. She is strong on the back, and good in the legs. Her tail, however, is too small for such buttocks. Lord Ellesmere's Reserve mare is fifteen years old, and moves well, though now looking a little the worse for wear. Her breeder was Mr. Martin, Wainfleet. If she had not had good pasterns, she would not have worn so well.

One of the gems of the Meeting was the Hon. Mr. Coke's first three-year-old black filly, bred by Mr. Lawrence, Lancashire, and sired by "Lincoln" (1350). The symmetry of her body was as noticeable as her size, sound feet, and good legs. She moves nicely, and repeated her Derby, Reading, and London firsts easily, making her sixteenth victory. Lord Ellesmere's second has a frame and features not unlike the biggest and best-bodied Clydesdales. Mr. G. Taylor's third, or Reserve filly is not so heavy as the others, but she is evidently made of good useful material. The Two-year-old Filly Class was both large and remarkably good. Mr. Shaw's first, "Sunflower," bred by Mr. Fisher, Lancashire, is a beauty, and her symmetry and quality have not been procured at the expense of size. She has grown so well, that in dimensions she would not be a poor apology for a fully-developed mare. In bone, feather, and feet, she approaches the Clydesdale features, with more muscle and flesh than they generally display at the age. Mr. Coke's second is a granddaughter of "England's Glory," and is wonderfully up on all her points for a two-year-old. Bred by Mr. Blackley, Northamptonshire, she had not much to spare with Lord Ellesmere's massive third chestnut of Mr. Brown's breeding, or with Mr. Gilbey's black fourth, admirably coupled, and descended from Mr. Blundell's stud. The whole class was deservedly commended.

The Judges' Report of Shires will be found after my notes on the Agricultural Classes, which were judged by the same bench.

AGRICULTURAL HORSES.

These newly opened classes, confined to animals not eligible as Shires, Clydesdales, or Suffolks, were not very well filled. Mr. Riddell's first aged horse is a five-year-old bay of Mr. Drew's breeding, sired by "Prince of Wales," and out of the English-bred mare "Sheba," which got the cup as best cart-mare or gelding at the Liverpool Royal in 1877. This is a well-proportioned horse, not unlike his sire, with splendid legs and feet, and was beautifully brought out, as Mr. Riddell can so well do. Sir Robert Loyd Lindsay's second is a six-year-old ponderous chestnut, bred by exhibitor, but not so blooming as Mr. Riddell's horse. The Messrs. Stanford's pair of three-year-olds had the class to themselves, and are of hardy-looking type. Mr. Cheer's first two-year-old black, of Mr. Cogswell's breeding, is a well-furnished, substantial, free-moving son of the prize-horse "British Wonder" (278). About the other four in the class there was nothing remarkably fine.

Nor was competition keen in the Mare and Foal Class. Mr. Lowe's first, bred by the exhibitor, is a six-year-old roan-coloured shapely mare, likely to breed good cart-horses. Mr. Charlton's second is a compact brown, which has won prizes in the north of England. Fillies were better represented, Mr. P. Blundell's leading three-year-old, bred by Mr. Chapman, is an up-standing bay of firm build and good action, with feet and legs calculated to wear. Mr. D. Riddell's second, bred by Mr. McTier, Dumfriesshire, is a brown with strong back, good head, and a deal of Clydesdale character. The Messrs. Stanford's third, bred by themselves, is half-sister to the first three-year-old colt. Mr. Machin's first two-year-old filly, bred by the exhibitor, is a fairly good daughter of "Honest Tom" (1105); but there was not great merit in the class.

Three-year-old Agricultural Geldings, for which prizes were offered by the Local Committee, were very good, at least as far as the prize-tickets went.

Judges' Report on Shire and Agricultural Horses.

CLASS 1. *Shire Stallion foaled in* 1876, 1877, 1878, or 1879.—There were only three entries in this class, and this is not surprising, when it is considered that few Stallions, which have had a successful season, are fit to show in the middle of July. All of them came into the ring, and we awarded first prize to No. 1; second to No. 3; and reserve number to No. 2.

CLASS 2. *Shire Stallion foaled in* 1880.—This class contained nine entries. All of them were shown, and as each one possessed qualities of a high order we had some trouble, after awarding the first prize, in making our selections for the second and third. The first prize fell to No. 12, to which horse we also awarded the Champion prize; second prize to No. 7; third prize to No. 10; highly commended and reserve number to No. 5.

Class 3. *Shire Stallion foaled in* 1881.—This was a very large and good class. Out of the twenty-four entries seventeen were shown, and nearly all of these were very fine animals. Our duties, therefore, were necessarily heavy. We at the finish selected No. 30 for first prize; the second prize fell to No. 22; third prize to No. 23; highly commended and reserve number to No. 27; and No. 36 highly commended.

Class 10. *Agricultural Stallion, not qualified to compete in any of the preceding classes, foaled in* 1876, 1877, 1878, *or* 1879.—There were only three entered and shown in this class, and we awarded first prize to No. 78; second prize to No. 76.

Class 11. *Agricultural Stallion foaled in* 1880.—This class contained three entries, two of which were shown. The first prize fell to No. 79, and the second to No. 80.

Class 12. *Agricultural Stallion foaled in* 1881.—Only five out of the ten entries were shown, and we selected No. 84 for first prize, No. 82 for second prize, and No. 89 for third prize.

Class 17. *Shire Mare and Foal.*—This was a good class in point of numbers, and also in quality as far as regards the mares. It generally happens that good mares have only ordinary foals, and there was no exception to this rule amongst those shown. There were ten entries and nine exhibits. The first prize went to No. 156; second prize to No. 150; third prize to No. 147; highly commended and reserve number to No. 155; and No. 148 commended.

Class 20. *Agricultural Mare and Foal.*—This class had four entries, and three exhibits. The three shown were extraordinarily fine animals. No. 178 took first prize; No. 177 second prize; No. 179 highly commended and reserve number.

Class 26. *Shire Filly foaled in* 1880.—In this class there were five entries, all of which were shown. A greater number might reasonably have been expected, but the quality of the animals exhibited in some measure compensated for the lack of entries. Each one did credit to the judgment of the exhibitor. The first prize fell to No. 213; second prize to No. 211; highly commended and reserve number to No. 214.

Class 27. *Shire Filly foaled in* 1881.—There were sixteen entries, and fourteen exhibits in this class. These were probably the best lot of animals of the breed ever exhibited in any Showyard, and we had considerable trouble in making our selection. After awarding the three prizes, we felt compelled to recommend a fourth, and we also commended the whole class as an extraordinarily fine lot of animals. No. 219 took first prize; No. 228 second prize; No. 235 third prize; No. 229 highly commended and reserve number; and Nos. 223 and 226 highly commended.

Class 31. *Agricultural Filly foaled in* 1880, *not qualified to compete in the preceding Classes.*—In this class there were six entries and five exhibits. Those shown were very good representative animals, and the three selected well deserved prizes. No. 257 took first prize; No. 260 second prize; No. 259 highly commended and reserve number.

Class 32. *Agricultural Filly foaled in* 1881.—Only three out of the seven entered came into the ring. We awarded first prize to No. 265, and second prize to No. 266. No. 263 was disqualified by the veterinary surgeon, leaving two very moderate animals to take the prizes.

Class 31. *Agricultural Gelding of any breed foaled in* 1880.—This was a very good class, and we had considerable trouble in making our selection. There were nineteen entries, and all came into the ring. First prize fell to No. 297; second prize to No. 299; highly commended and reserve number to No. 300; and No. 304 was commended.

The Champion Prize for Shire Stallions fell to No. 12, the chestnut horse which took first prize in Class 2.

In concluding this Report we would observe that the competitions in the foregoing classes must always form an important feature in the Annual Show, and the Society is to be congratulated on having this year secured such a large number of entries. The number which actually came before us in the ring was ninety-seven, and it is perhaps not too much to say that a finer lot of animals was never before exhibited at any similar meeting.

We must also be allowed to add that the arrangements made for our convenience and assistance were admirably carried out; and it was due to this alone that we were able to finish our labours in one long day instead of being engaged two days, as was anticipated from the large number of entries.

William Littley.
James Martin.
Alexander Turnbull.

CLYDESDALES.

This breed has probably never mustered better, and rarely so well, on English soil. They were beaten in size, substance, and early development by the English breeds. The Scotchmen, however, consoled themselves with the cleaner legs, superior pasterns and feet, together with the better action which the Clydesdales exhibited. Mr. Riddell's first aged stallion had no difficulty in his class. He is no other than "St. Lawrence," the Glasgow prize-horse of the last two years, bred by Mr. Drew, and sired by "Prince of Wales." Considering that he was not quite through with a hard season's work, he was shown in good bloom. He has great muscle, firmly-knit frame, and good quality, with fair size, plenty of feather, and splendid feet. He was "going" a little wide behind, which Clydesdale judges seem to dislike more than Englishmen do. The second horse was Mr. Montgomery's "Manfred" (758), of Sir M. Shaw Stewart's breeding, which was second three-year-old at the Glasgow Highland Show last year. "Manfred" is out of a "Prince of Wales" mare, and is rather high on the leg, but his pasterns and action are excellent. Mr. Moffat's third is a well-furnished seven-year-old bay of good feather and muscle, bred in Campbeltown, and second winner at the Carlisle Royal Show in 1880. Mr. Collings' Reserve black horse, of his own breeding, had for sire and dam Royal winners, the former having been Mr. Richard Tweedie's "Tam o' Shanter" (851), that has left a large number of fine stock in the Darlington district.

Three-year-olds were a small but select Class. Mr. Montgomery's first, of Mr. Rennie's breeding, is not heavy below the knee. He is not big anywhere, but he is very nice, and was shown in the pink of condition. His owner knows his business too well to go far from home with a doubtful card. All that style, smartness, good carriage, fine-set hocks, long pasterns, and hair of the right sort, could accomplish was available.

These good qualities, however, were all required to atone sufficiently for the lack of size, to win the cup given by the Clydesdale Horse Society, for the best stallion or colt, over such a thick substantial specimen of a cart-horse as "St. Lawrence." The Marquis of Londonderry's second colt is a heavier bay than the first, was bred by the exhibitor after the well-bred sire "What Care I," and out of a Lochfergus champion mare. Mr. Moffat's third bay is of a good old Galloway type, bred by the Duke of Buccleuch, and very compactly put together. The Aldborough commended colt is a neat even brown, bred in Perthshire. Mr. McCowan's victorious colt in a good class of two-year-olds was bred by Mr. Houston, sired by the famous prize-horse, "The Macgregor," and comes beautifully down to the ground. His pasterns, hocks, and feet apparently belong to an animal that is calculated to improve with age. The Hon. Mr. Waldegrave Leslie's second colt, of Urie breeding, was the second yearling at Glasgow last year, has good legs if not very strong bone. His body is well grown, and the feather and feet helped him in the contest. Mr. Rodger's third colt, of his own breeding, is above the average size, and carries his legs well under him. The commended pair from Aldborough are fair, the better of the two having been bred in Forfarshire, and the other by the exhibitor, after "Tam o' Shanter."

Mares and Foals engaged the attention of the Judges for a considerable time. The first one, from Newton Airds, Dumfries, was bred at Keir, and is of the "Lochfergus Champion" strain. She has hard, flat, clean bone, fair build, and moves satisfactorily. Her good parts were visible to the skilled eye, but her position would have been rendered more distinct if she had been rather better brought out. Mr. Charlton's second mare, a six-year-old bay of Mr. Jobling's breeding, is a deep-bodied, short-legged, active-looking sort. She had more bloom than the first, and had a very fine foal at foot; but the first had the best of it in pasterns, on which Scotch judges lay so much stress. Mr. Rodger's third is a four-year-old shapely brown, of his own breeding, displaying good legs, with, however, toes slightly pointed out, which breeders do not like. Her promising foal is sired by "The Macgregor," and her dam, shown unsuccessfully at York, was first Highland Society's mare at Kelso in 1880. The Marquis of Londonderry's fourth is a strong handsome three-year-old daughter of Mr. Drew's "Prince of Wales," and bred at Merryton. Among those "left out in the cold" was the Messrs. Stanford's "Lady Strathmore," a five-year-old bay, bred by Col. Williamson, of Lawers, and a noted prize-winner in the South of England.

The Three-year-Old Filly Class, as the Judges observe, was the best of the breed. Three of the best of the age in Scotland headed the class. Mr. Martin's first and third fillies are a magnificent pair. They have been in the leading three throughout the season, and have changed places several times. They have been sold at 800 guineas for exportation to Australia. General regret was expressed at the loss of such animals to this country. The first one is the lighter of the two, but she is the sweeter, and moves to perfection. When in action her fine pasterns come into play beautifully; and it is a treat to see her trot. Bred by Mr. Milroy, Gladenoch, she is sired by the distinguished horse "Lord Lyon," and has won many a prize. The third filly was bred by the exhibitor after the noted "Crown Prince," and out of a "Tintock" mare. She has more substance, heavier muscle, and better feather than the first, but does not move so gracefully. Mr. Lucas's second filly is not so large in size as the other two, but she is quality all over, was bred by the Earl of Strathmore, and sired by "Lord Lyon." The Orchardmains fourth filly, bred by the noble exhibitors, has good feet and form, and was sired by "Farmer" (288). Mr. Loder's commended filly is a daughter of Mr. Riddell's "Darnley," out of a prize-winning mare. Mr. Martin's "Lord Lyon" filly got easily the 25*l.* Champion Prize offered by the Clydesdale Horse Society for the best mare or filly.

Two or three of the best five Two-year-Old Fillies of the season came before the Judges. Mr. McCowan's first, bred by Mr. Ure, Wheatlands, sired by the Dunmore "Prince Charlie," has great thighs and pasterns, good hocks and graceful action. She has carried everything before her this year, but got beaten at the Highland Show the following week, rather unexpectedly, by Mr. Riddell's "Queen," only third at York. The latter is fully as fat as the other, and, being a daughter of "Darnley," she is handsome in body, but has not such good feet as the winner. Mr. Matthews's second is a stylish bay daughter of "Lord Lyon." Mr. Loder's Reserve filly, of his own breeding, is a daughter of "Druid," the Champion Clydesdale at Kilburn. "Druid" and "Darnley" sired the commended fillies.

Report of the Judges of Clydesdales.

Class 4. The Judges have to report regarding Class 4, *Aged Stallions*, that the quality of the exhibits was on the whole fair, the first-prize horse being an animal exhibiting several of the best points of the breed, although lacking in one or two important features. The other prize-winners were fair representatives of the breed.

Class 5. The animals exhibited in this class were generally of superior quality; the first-prize animal being an extra good representative of the Clydesdale breed. In style and quality and gay carriage he was not excelled by any other animal in the Yard, and was consequently, without hesitation, awarded the Champion prize, as the best male Clydesdale exhibited. The second-prize animal in this class is a good promising horse; while the third shows strength and quality.

CLASS 6. *Two-Year-old Clydesdale Stallions.*—The first- and second-prize animals in this class were excellent colts: the others were only an average lot.

CLASS 18. This was a large class and fairly representative of the breed. With the exception of one or two animals, the whole class was of excellent merit, and we consider them valuable brood mares.

CLASS 28. This class was *par excellence* the class in the Showyard. The three first animals are perhaps as good as anything of the Clydesdale breed seen in any Showyard for many years. The Judges placed five animals in this class, and without exception all the five were good, and even superior mares. The Judges awarded the Champion prize for the best female Clydesdale in the Yard to No. 237, and think her perhaps the best Clydesdale mare exhibited this season.

CLASS 29. This class of *Two-Year-old Fillies* was of good quality. The first-, second-, and third-prize animals were of great merit, and the reserve number filly was also a useful mare, of good size, and looked like improving.

PETER ANDERSON.
DAVID BUCHANAN.

SUFFOLK.

This useful Eastern breed compensated in quality for some shortcomings in numbers. The Judges' Report is so minute and exhaustive, that space would only be wasted by any remarks of mine. It may be stated, however, that the Suffolk foals were bigger than many of those of other breeds. The attention of the reader is invited to the excellent Report of the Judges, appended.

Report of Judges of Suffolk Horses.

We report a good exhibition of animals of the true characteristic of the breed, considering the distance of the Showyard from the Eastern Counties and the curtailing of the number and amount of the prizes offered. The number of animals exhibited will compare favourably with the entries of other breeds of horses. The very wholesome rule of some local societies in refusing to give prizes to any but animals free from hereditary unsoundness is bearing useful results, as we can report that, excepting in one class, we did not require the services of the veterinary surgeon; and perhaps the unsoundness there may be attributed to the desire of the owners of the animals to show them in such high condition. We regret that no prize was offered for Gast Mares, as these, not being pulled down with foals upon them, generally present the best specimens of any breed, and are mostly animals in the prime and full bloom of life.

CLASS 7. *Aged Stallions.*—There were three before us. To No. 61, the Duke of Hamilton's "Eastern Emperor," we awarded the first prize—a very grand horse, but wanting in quality for a Suffolk; to No. 62, Mr. Wolton's "Chieftain," we gave the second prize—a horse of immense size, but full of good quality and Suffolk character; had his hind-quarters been equal to his fore-end, he would have been a very hard horse to beat in a Showyard. No. 60 appeared so out of sorts, and had so many suspicious-looking scars on him, that we declined giving him the reserve number, notwithstanding that offhand his form was quite equal to that of the prize horses.

CLASS 8. *Stallions, Three Years old.*—No. 66, Mr. Wolton's "Big Ben," claimed the first prize. We saw no particular merit in him, but as Nos. 64 and 65 were decidedly lame, and as the veterinary surgeon declined to pronounce them sound, we felt bound to disqualify them, and so No. 66 came in for an easy win.

CLASS 9. *Stallions, Two Years old.*—The first prize went to No. 69, Sir R. Wallace's "Banner Bearer," a colt with plenty of bone and heavy quarters, but hardly so good on his back; the second prize to No. 75, Mr. Toller's "Verger," a very large heavy colt, but rather weak on his ankles—quite an old-fashioned sort; No. 74, Mr. Wolton's "Gambler," the reserve and highly-commended, is a very good-looking colt; Nos. 67 and 70 were given highly-commended cards—all the others were most deservedly commended. All the animals present in this class we considered very good, and, excepting No. 72, of perfect Suffolk character.

CLASS 19. *Mares and Foals.*—We had no doubt in awarding to No. 171, Mr. H. Wolton's "Queen of Newbourne," the first prize, regarding her as a very superior mare of full size and superb quality; to No. 172, Sir R. Wallace's "Jessie," we gave the second prize—she is a four-year-old mare with a foal upon her; and, holding her own against full-aged mares, shows her of good merit. She is a little weak on her fore-legs, but being a young growing mare may perhaps improve there. No. 173, the reserve and highly-commended, is a very pretty showing small mare, having true Suffolk character; No. 174 was a small mare, and not being in show condition, she did not look to advantage with those that were; No. 175, a strong useful mare, but not having smartness or quality enough, will never please Suffolk horse-fanciers.

CLASS 30. *Fillies, Two Years old.*—No. 253, the Duke of Hamilton's "Gaudy Poll," had no difficulty in claiming the first prize, although she is a little calf-kneed; No. 255, the second-prize filly, owned by Mr. Byford, is a good strong animal, and looks more like doing hard work than being in a Show-yard—with her white legs she will never be quite a favourite with Suffolk men—(this was the only animal in the Suffolk classes in the Show so marked); No. 251, the reserve; Nos. 254 and 252 call for no remarks.

MANFRED BIDDELL.
WM. THOMPSON.

HUNTERS.

In the midst of a great hunting and horse-breeding country, a very large and superior exhibition of Thoroughbreds and Hunters was expected, and anticipations must have been realised. It is somewhat strange that the first ticket, carrying with it a premium of 100*l.*, should have fallen, in a good class of thoroughbred stallions, to an animal bred in Aberdeen. This horse, owned by Messrs. Dodgson and Thompson, Lancashire, is very strong on the back, well-turned over the buttock, well up in the withers, and a good mover. For some irregularity in the pedigree he was afterwards disqualified, and the second horse of Lord Scarborough's promoted. The latter is a seven-year-old bay upstanding horse, bred by Mr. Thomas Brown, Newmarket, and very stylish. He has great muscle and splendid action. Colonel Barlow's third is very big to be only four years old, and was bred by the Duke of Westminster. He is full of spirit, fine in the bone, and grand in muscle. A durable, handsome horse is Mr. Carr's fourteen-year-old chestnut "Rattle," bred by Sir Tatton Sykes, and well known in the Showyard. Several of the unsuccessful horses would not have disgraced first tickets. The Hunter Mare and Foal Class was not particularly good. Mr. Dixon's veteran twenty-one years old chestnut, of his own breeding, has kept together admirably, and has credit in getting second at such an age. Her foal at foot by "Mapleton" shows that her breeding properties have been as well preserved as her good looks. Mr. Wright's first, bred by Mr. Spencer, is a twelve-year-old chestnut, of rare action and strong body. The third mare, owned by Mr. Nalton, and bred by Mr. Duffitt, is also a chestnut, well up in years. All the winners, curiously enough, were of one colour, and advanced in age.

Handsome premiums offered by the Local Committee drew out large entries in nine classes of Hunters, from heavy-weight matured hunters down to yearlings. The Judges had very hard work, especially in the four-year-olds, which were an extraordinary class. In the heavy weights, five years old and over, Mr. Andrew Brown won with "Waterford," a brown powerfully-built five-year-old, of the Marquis of Waterford's breeding. The quality and sprightliness of this horse were as noticeable as his bone, breeding, and strength of body. Of the same age, colour, and ownership, was the second, also a gelding of fine quality, and bred in Ireland by Dr. Nickle, Meath. Mr. Brown exhibited five beautiful hunters, which made a marked impression on the critical onlookers. Mr. John Robinson's "Elegant," a powerful chestnut gelding, also five-year-old, made a close third. It too was bred in Ireland by Mr. Trew, Kildare. In such a good class it is a great honour to the Emerald Isle to have bred the best three—all very pretty, and admirably adapted for crossing country. Mr. Bayly's fourth is a straight, dashing, seven-year-old black gelding, whose breeder is unknown. Many good animals were beyond the reach of the tickets.

The Light-weight Hunters were numerous, and included several very clever specimens. A seven-year-old chestnut gelding of Major Thwaites was popularly first, being a great beauty, and very stylish in action. Mr. Letts's second is a six-year-old bay mare, with light flinty bone, and much spirit. It was bred in the county of York. Mr. Jacob Smith's third is a six-year-old brown mare, which, like Mr. Robinson's five-year old commended gelding, is distinguished in the Catalogue by the "breeder unknown." Of the thirty-three four-year-old geldings entered, no fewer than fourteen were absent. The nineteen that paraded before the Judges contained an amount of high merit not often attained. All the more honour, then, is it to Mr. John B. Booth to carry the chief prize with a bay of great proportions and much quality. His breeder seems to be unknown, but he is far from disgraced. Mr. T. H. Hutchinson's second is a stylish, admirably-equipped chestnut, bred by Mr. Fisher, Blackpool, and sired by that grand old getter "Laughing Stock." Mr. Brown's third is a smartly got-up grey, bred by Mr. Little, Lincolnshire, and sired by "Snowstorm." Four-year-old mares were not so good. Mr. Garbutt's first carries its head nicely, and has a strong loin, with active hardy-looking limbs. It was, like Mr. Curry's second, bred in Yorkshire, and is all that could be wished in quality. Mr. Wood's third is a clean-limbed sprightly bay, bred by the exhibitor; while Mr. Stephenson's fourth displays high breeding, and was bred by the late Lord Lamerton, sired by "Paragon."

A pair of handsome Irish-bred three-year-old geldings of Mr. Andrew Brown's failed to get further than Reserve in their class, which was a very good one, and was topped by a beautiful brown of Mr. Nicholson's, bred by Mr. Gromet, Cumberland, and well grown for its age. It has the makings of a first-class hunter, having bone and body to harmonise. Mr. Peacock's second, bred by Mr. Milner, is very promising, and was sired by "Haphazard." Mr. Darrell's third was bred by the exhibitor, and may be further heard of. Three-year-old fillies were not strikingly fine. Mr. Whitchead's first—a smart neat chestnut of his own breeding—is a daughter of "Highthorne," and was one of the nicest youngsters in the Show. The second is also a stylish chestnut, owned by Mr. Mitchelson, and bred in Yorkshire, sired by "Conductor." The Two-year-old Gelding Class was stronger. Mr. John B. Booth bred the chestnut son of "Castlereagh," with whom he deservedly won first honours. This gelding has great promise, and in such good hands may be favourably heard of again. Mr. Wright's second, also bred by the present owner, is a worthy son of "Silvester." Mr. Goodeson's first filly, bred by the exhibitor, is a well-balanced active youngster. Mr. John T. Robinson's second is a tidy daughter of "Bondsman," and was bred by the exhibitor. Mr. Carr's leading yearling, of his own rearing, was sired by "Gladstone," and stands well up for its age. Lord Middleton's second, bred by his Lordship, walks out hopefully.

Judges' Report on Hunters.

We consider the Show of Hunting Horses generally very good, especially the young classes—far superior to the average of Royal Shows.

Class 13. *Thorough-bred Stallions.*—This was a large class, and of fair average merit.

Class 21. *Mare and Foal.*—With the exception of those placed, there was nothing much worthy of notice.

Class 40. *Mare or Gelding up to* 15 *stone.*—Although a large class, the animals exhibited didn't run back as well as might have been expected. Nos. 329, 332, 314, 316, were horses of considerable quality and merit.

Class 41. *Hunters up to* 12 *stone.*—Well filled, amongst which were some useful horses, especially Nos. 359 and 340.

Class 42. *Gelding foaled in* 1879.—A very good class, and quite ahead of any of the former classes. No. 367 was a wonderfully nice blood-like hunter, and does great credit to the land of his birth and the judgment of his present owner. No. 393, a county-bred horse, followed close on his heels; No. 401, backward in condition, with time must come out a valuable animal.

Class 43. *Mare foaled in* 1879.—A very fair class, but nothing like up to the form of the colts.

Class 44. *Gelding foaled in* 1880.—Another very good class, well filled, and full of promising colts; those placed being of a very high standard.

Class 45. *Fillies foaled in* 1880.—Though not so well represented, this class included Nos. 456 and 453, both extremely good fillies, the winner very much out of the common, being one of the best animals brought before us.

Class 46. *Gelding foaled in* 1881.—Again, quite up to the mark; the three animals placed would do credit to any ring.

Class 47. *Filly foaled in* 1881.—Not so well filled as the last, but quite up to the standard of the colts, the winner being a rare long and low sort.

Class 48. *Gelding or Filly foaled in* 1882.—Short in numbers, but on the whole a good average class.

The Judges beg to remark that they could hardly account for the falling-off in the number of entries in the two younger classes. It almost appeared as if breeding hunters is not now so popular amongst the Yorkshire farmers as formerly.

H. A. F. Luttrell.
H. Reginald Corbet.
J. Wm. Hope.

Coaching and Cleveland.

Here, again, the liberality of the Local Committee had its deserved effect. The Coaching Stallion Class was not very good, yet Mr. Kirby's "Nobleman," a fast-looking bay of Mr. Appleyard's breeding, was a nice specimen. Mr. Reader's second is also young, and was bred by the exhibitor from a mare that has gained many prizes. Mares and foals were good, though few. Mr. Kelsey's first is a six-year-old bay, bred by the exhibitor, and likely to breed valuable harness-horses, coming as she does from one of the best studs of the kind in Yorkshire. Mr. Kirby's second is bearing up well for a twelve-year-old. Mr. Pelch's Cleveland mare would have stood closer competition, being strong and handsome.

The three classes of Coaching Fillies were not numerously filled, the average in the class being about four. The prize-winners were of fair merit. Those in the two-year-old and yearling classes were bred by the exhibitors, but the three-year-olds were not. Mr. Kirby's first three-year-old coaching gelding is a handsome good-moving horse. The others in the Gelding Classes were of about average merit. Mr. Fisher's first brown mare in harness was good, but those beside her only middling. The winners in the Harness Class under 14·2 hands were active and useful specimens.

Judges' Report of Coaching and Cleveland Horses.

Our Report of Coaching and Cleveland Bays is thus:—

CLASS 14. *Coaching Stallions.*—A bad class.
CLASS 22. *Coaching Mare and Foal.*—Good class.
CLASS 23. *Cleveland Bays.*—Only one entry; very good.
CLASS 33. *Coaching Filly.*—Good class.
CLASS 34. *Coaching Filly.*—A bad class.
CLASS 35. *Coaching Gelding or Filly.*—Good class.
CLASS 36. *Coaching Gelding.*—Good class.
CLASS 37. *Coaching Gelding.*—Good class.
CLASS 58. *Harness Mare or Gelding.*—A bad class.
CLASS 59. *Harness Mare or Gelding.*—Very good class.

JOHN S. STOWELL.
W. ROBINSON.

HACKNEYS AND PONIES.

Many very serviceable and very fast animals appeared in these classes. Mr. Grout's five-year-old brown stallion "Fashion," of Mr. Wortley's breeding, and a grand mover, of admirable build, easily added another to his list of first honours, including the first prize at Reading. Mr. Martin's second is a firmly-built clever four-year-old, of his own breeding, and has won seventeen prizes. Mr. Anderson's fine pony-stallion, of Mr. Cowton's breeding, is very neat and compact, full of action and character. Mr. John M. Martin's second is the plump, handsome brown of his own breeding, sired by "Derby," which was first at Glasgow. Mr. Robert Martin's first hackney mare, with foal at foot, is a thirteen-year-old brown of his own breeding, and of a good old type—able to carry a heavy weight, and pass the milestones quickly. Mr. Hammond's second is a sweet little grey of rare action, and six years old. Mr. Moore's third is only four years old, and was bred by the exhibitor. Mr. Glossop's first pony-mare is an eight-year-old brown, bred by the late Mr. Winter, and, though very neat and active, was never shown before. She has worked hard the last five years in single and double harness, and looks nothing the worse. Mr. Gledhill's second is a lively little thirteen-year-old, the winner of many prizes. These two were decidedly ahead of the others. The prize-winners in the Heavy-weight Hackney Class were strong, well-furnished, swift animals, offering one another keen competition. Mr. Robinson's winner was bred by Mr. Crow, Lincoln. In a good Class of Light-weight Hackneys Mr. Bentley had an obvious first in the form of a six-year-old bay gelding, of great activity and quality. The second, though bigger, has not the quality of the first. Three-year-old geldings and fillies mustered very well. The geldings of this age formed the best of the Hackney Classes. Mr. Verity's first is an exceedingly clever handsome animal, bred by Mr. Robinson, Sledmere, and much admired. Mr. Fewson's first filly is sweet and promising. She is sired by the same horse, "Lord Derby," as was Mr. Dunn's second gelding. In the younger Hackney Classes, as also in the two Classes of Ponies, there was, as will be observed by the Judges' Report appended, a great deal of merit.

Judges' Report of Hackneys and Ponies.

CLASS 15. *Hackney Stallions, above* 14 *hands* 2 *inches, and not exceeding* 15 *hands* 2 *inches.*—We had no hesitation in awarding the first prize to No. 138, "Fashion," a dark brown with grand action, and altogether a very superior animal. No. 139 is a nice horse, and we considered him well worthy of the second prize. No. 132 was disqualified for lameness, and we therefore awarded the third prize to No. 133, as being the next best in the class.

CLASS 16. *Pony Stallions, above* 13 *hands* 2 *inches, and not exceeding* 14 *hands* 2 *inches.*—This was a good class. No. 142, to which we gave the first prize, is a nice upstanding animal, with good and true action. The next in order of merit we placed Nos. 145 and 144, and highly commended No. 140.

CLASS 24. *Hackney* (*Mare and Foal*), *above* 14 *hands* 2 *inches, and not exceeding* 15 *hands* 2 *inches.*—This too was a very good class, and included some good mares and foals.

CLASS 25. *Pony* (*Mare and Foal*), *above* 13 *hands* 2 *inches, and not exceeding* 14 *hands* 2 *inches.*—Nos. 204 and 205 were both good exhibits, and by far the best in their class.

CLASS 49. *Hackney* (*Mare or Gelding*) *up to* 15 *stone.*—To Mr. Robinson's black gelding, No. 498, we awarded the first prize, and the second and third to Nos. 502 and 501, which were not much inferior in merit.

CLASS 50. *Hackney* (*Mare or Gelding*) *up to* 12 *stone.*—The bay gelding, No. 508, is an exceptionally good one, and a nice mover. No. 515, to which we awarded the second prize, is a grand goer, but lacks quality. No. 514 is a handy little mare, and a good third.

CLASS 51. *Hackney* (*Gelding*) *foaled in* 1880.—This on the whole was the best class we had before us, and well deserving of a third prize. No. 519 is a good horse, but out of his class.

CLASS 52. *Hackney* (*Filly*) *foaled in* 1880.—This was a fairly good class, but rather mixed.

CLASS 53. *Hackney* (*Gelding*) *foaled in* 1881.—This was also a good class, but needs no special comment.

CLASS 54. *Hackney* (*Filly*) *foaled in* 1881.—This lot was good throughout.

CLASS 55. *Hackney* (*Gelding or Filly*) *foaled in* 1882.—There were only three exhibits in this class, and we awarded the first prize to No. 556, a well-shaped chestnut gelding; and the second to No. 558.

CLASS 56. *Pony* (*Mare or Gelding*), *above* 13 *hands and not exceeding* 14 *hands* 2 *inches.*—No. 561, "Lady Silver," is a nice mare with good action, and some quality about her, but a bit fretsome. No. 560 moved better than most of the others, and, like No. 561, shows more quality. No. 567 (reserve) is of a heavier stamp, but a nice goer.

CLASS 57. *Pony* (*Mare or Gelding*), *not exceeding* 13 *hands.*—No. 578 is a capital pony, but not so high in his action as No. 575, to which we gave the second prize.

We may remark that the entries in the various classes (except No. 55) were well filled, and in most of them the exhibits were especially good.

William B. Turner.
George Higgins.
Wm. Flanders.

CATTLE.

Shorthorns.

The display of this premier breed of cattle did not on the judging-day strike the casual visitor as remarkably fine. It improved, however, on acquaintance; and as the contents of the long rows of shedding were carefully inspected, the opinion became general that the collection of the favourite "red, white, and roan" was fully up to the average of recent years. The appearance of the Shorthorns daily in the parade-ring tended to confirm the belief that the York muster would bear comparison, especially in the younger female classes, with the Shorthorn entry any year since Kilburn, if not before.

The Class of Bulls over four and under seven years old was not large. The entry numbered eleven, but three were absent. The best-bred animals in the class, as far as straight breeding is concerned, were not the best-looking. They were Sigismund Cathcart de Trafford's four-year-old, white, "Wild Prince," of Lord Lathom's breeding, of the "Wild Eyes" tribe crossed by Oxford bulls; and Mr. William Handley's six-year-old, roan, "Hesperus" (39,994), of Mr. William Aylmer's breeding. The former is a big, lengthy bull, with a deal of gaiety, but he is rather heavy in bone, not very strong in the back, nor very neat at the tail. Accordingly he was passed over by the Judges. "Hesperus," of Mr. Aylmer's "Maid" family, crossed with good Booth bulls, was more fortunate, but had to be content with a Reserve. He was bare in hair and not in high condition, but his masculine head, good crest, fine forearm, and fair character, justified his selection for fourth place.

The first bull, Mr. Outhwaite's "Lord Zetland," at once asserted his position. Bred by the Earl of Zetland, this massive, grandly haired, four-year-old roan, had for his sire the celebrated prize bull "Royal Windsor" (29,890), of Carperby breeding, and the sire of a great many national prize-takers. The son has more substance and better-packed hind-quarters than ever the father possessed, but the latter was sweeter about the head, and altogether rather more of what is termed "the gentleman." "Lord Zetland's" dam's sire was "George Peabody" (28,710), a Sittyton "Butterfly" bull, of great scale, which won several prizes when in the possession of Sir William Forbes, Bart. The pedigree is of a somewhat mixed nature, with a leaning to Booth. The horn of "Lord Zetland" is not nice, the neck is rather short, and the bone is big; but his loin, rib, hind-quarters, flank, and thighs, are almost perfection. He easily repeated his Derby and Reading firsts, and, notwithstanding his rough head, some good judges would have given him a little more at York than he received. The second bull also leans to the Booth side. He is "Hovingham," a ponderous white, bred by the exhibitor, Sir W. C. Worsley, Bart., is nearly four years old, and was sired by Mr. Linton's well-known prize-bull, "Sir Arthur Ingram" (32,490), while the dam's sire was no other than the noted prize-winner "Lord Irwin" (29,123), also of Mr. Linton's breeding. "Hovingham" handles pleasantly, has a good outline, and great scale, though he is not so well made up as the "Bainesse" bull, very properly placed before him. The white is, in at least one respect, a remarkable animal. It is freely said, and often I fear with truth, that prize-animals do not reproduce themselves satisfactorily: "Hovingham" is an exception in that he is the son and grandson of two first-prize Royal bulls, and is the sire of Mr. Rowley's champion bull at the York Show, to be described presently. Mr. Robert Thompson's "Beau Benedict" (42,769), from Inglewood, Penrith, and bred by Mr. Linton, of Sheriff Hutton, is a four-year-old lengthy roan, which was Reserve at Reading and second at Derby, sired by the Killerby "Hecuba" bull, "Paul Potter" (38,854). Mr. Thompson's bull has a deep chest, good forearm, and "nice-touching" flesh. His flank might be fuller, however, and his rump less inclined to be gaudy. It is worthy of record that the three money-prizes were awarded to animals bred in Yorkshire, of good old material, topped by bulls more or less directly of Booth descent. A considerable quantity of "Oxford" blood is in the veins of a heavy, well-grown, four-year-old roan of Mr. Swann's, from Bedlington, Northumberland, and bred by Sir W. C. Trevelyan, Bart., but he lacked the finish and quality of several of the winners.

The leader in the Three-year-old Bull Class was not so easily selected as in the senior Class. Mr. Foljambe's white "Bright Helm," from Asberton Hall, bred there, which was so much admired at the top of his class at Reading, has not gone on quite so well as could have been desired, and Mr. Wakefield's "Baron Sedgewick" (44,373) accordingly proved a more dangerous opponent than he has yet done to the white. The white is of the "Aylesby Bright" tribe, with, however, a "Grand Duke" cross on, as the sire of his dam. The sire of the bull was

Mr. J. B. Booth's "Titan" (35,085). "Bright Helm" has beautiful quality of flesh, very attractive head and neck, with charming bone, and much gaiety. He falls off a little behind the "hooks" or "huggings," and might be better covered over the chine. His quality and splendid character eventually availed him once more, and he got to the front. "Baron Sedgewick," bred by the spirited owner of Sedgewick Hall, after a Holker-bred Barrington bull, is a roan of great substance. With a masculine head he combines wealth of flesh, thickness over the crops, width of rib, and massiveness of thighs, which arrest attention. The forearm is strong and neatly fitted in—symptoms of good constitution. On the hind-quarters he is not so square or "pointy" as he should be, but he has few faults, and made a very creditable second. His pedigree is not a very valuable one, as fashion goes, but, as is often said in Aberdeenshire, he carries "a good pedigree on his back." Mr. William Forster's third bull, from Bull's Hill, Northumberland, bred by Mr. Bell, The Nook, Cumberland, is heavy for age, deep in carcass, long in frame, and carries a thick coating of flesh under somewhat hard hair. His sire was the "Lady Bates" bull, "Baron Turncroft Bates 3rd" (39,443), of the Rev. P. Graham's breeding; and the dam traces back through some "Butterfly" blood to the fine old Southwick herd. The Reserve ticket was awarded to Mr. C. W. Brierley's "Rosedale Oxford," a long-quartered red-and-white, bred by the exhibitor after "Oxford Duke 10th" (38,830), and mostly of "Bates" blood. He was first in the Aged Class at this year's Bath and West of England show, and has a magnificent front, with strong hind-quarters. His neck-vein is splendid, and under-line inviting, but his loin is not strong enough for such ends. The Prince of Wales' Kingscote Honey light-roan bull, "Harry Hotspur" (44,922), from Sandringham, placed third last year, had gaiety and straightness to keep his position, but he has not widened in frame, and, despite good quality, he only got commended. This distinction was bestowed on a long-quartered and by no means over-fed red-and-white Aylesby "Waterloo" bull, of Mr. J. C. Toppin's, bred by Mr. Meade Waldo. Three of the twelve entered were absent, including the Duke of Northumberland's roan, "Shylock" (45,585), which could not be sent on account of disease restrictions.

Of the dozen entered in the Two-year-old Class, ten put in an appearance, and formed one of the best classes in the Show. The first was not difficult to pick out. Mr. Rowley's tidy roan of Sir W. C. Worsley's breeding, already referred to as the son of the second-prize aged bull, "Hovingham," has thriven beyond recognition since he was purchased from the breeder last autumn at 40 guineas. First in his class he clearly was. His head is proportionate and well set on; legs beautifully in below him; thighs full; loin, rib, and rump fascinating; while his gait is stylish and quality exceedingly good. On the top of the shoulders he is a little low, but he has few if any decided faults. The Judges gave this youngster the cup as best male Shorthorn. At first many looking on thought the "Bainesse" old bull should have had the trophy, but a closer inspection on subsequent days convinced several that the Judges could not be said to have erred. On the dam's side this beautifully brought-out bull traces back to the late Mr. S. Wiley's grand old blood. In hair, quality, and compactness he resembles the "Earl of Derby" bulls of the deceased veteran breeder. The Duke of Portland's second, of Mr. J. R. Singleton's breeding, is "Grand Ruth" (46,459), a large-sized shapely white, well clad with good-handling flesh, and gay in the ring. The hind-quarters, however, are plainer than the winner's. The third one, from East Hill Mills, Northumberland, owned and bred by Mr. Langhorn, was not popularly placed. Probably some of his critics, however, did not observe that he was only twenty months old, or fully six months younger than most of the others. Yet it was not so much his lack of size that was complained of as his bareness of flesh along the back, and somewhat ungainly horn. His flank, under-line, and thighs are excellent, and he has masculine character; still he was not a favourite with many for third honours. The sire of his dam was "Prince Regent" (29,676), whose stock, it may be remembered, carried so many prizes at the Carlisle Royal in 1880.

The York Show was distinguished by the presence of more of the aristocrats in the Shorthorn arena than has been the case for several years. A "Duke" bull from Wetherby, bred by and the property of Colonel Gunter, adorned the Two-year-old Class, and a good "Duke" he is. The produce of a "Duchess" cow and of a "Wild Eyes" bull, preceded by two "Oxford" crosses on the male side, "Duke of Tregunter 9th" (46,272)—such is his name—is a lengthy, square-quartered, deep-chested, red and white, with a head and neck indicative of his high breeding. His flanks are well filled, thighs full, skin pleasant to touch, and masculine character good. Over the back and ribs he was not so uniformly coated as several of his opponents, and the Judges, having had no "respect of person," so to speak, relegated the "Duke" to fourth or Reserve. The public would not have frowned though this animal had been at least one step higher. A "Lady Worcester" red-roan upstanding bull from Hindlip, shown and bred by Sir Henry Allsopp, Bart., and tracing back to that marvellously fine cow, old "Clear Star," followed the "Duke" in the prize-list. The last four crosses in this bull's pedigree are "Dukes," so that the animal partakes largely of the "Duke" character. He has a good head, fine crest, straight lines, and excellent skin. Mr. Willis's commended roan from Carperby, bred there, is of his famous prize-winning and stock-getting "Windsors." Of quality this youngster is not deficient, but he lacks wealth of flesh and width of frame, though he is true on the side-view. Still, he is not quite up to the average Carperby showyard bull standard. Mr. Ackers's red and white "Trojan," which led at Reading, moved badly, and showed unevenness of flesh, which induced the Judges to give him no ticket.

The Yearling Bull Class was the largest, if not quite the best, of the males. Twenty-four were entered, and all were shown except three. The Judges had hard work in this class. Many of the critics looking on thought that the tussle for first ticket should have been between Mr. Stratton's roan—that eventually did win—and Mr. D. Pugh's light roan, that got only third. When in motion the last-named was rather the favourite, as he has a broad deep frame, well covered with flesh, a beautiful head and neck, and much gaiety. A close examination, however, such as the Judges had, revealed a little weakness on the back when the animal stands. Whether that was sufficient, considering the many grand features of the bull, to justify the selection of two before him, is pretty much a matter of opinion. Though he had been either first or second, there could not have been much occasion for grumbling. He was bred by Mr. Pugh, after the West Dereham Abbey bull, "Sir Charles," of Mr. Aylmer's "Lady" family, and second yearling at the Carlisle Royal. The dam was Reserve heifer at Kilburn, and was sired by the "Aylesby Flower" bull "Falmouth" (38,268), which cost 280 guineas as a youngster at the memorable Aylesby sale in 1875. "Sir Charles" cost 200 guineas, and the two bulls, though now well up in years, are still doing good service in the carefully-managed and valuable herd of Mr. Pugh. Mr. Richard Stratton's first bull has all the compactness of build, symmetry, and quality, which characterise the Stratton cattle, with more size and masculine character of head than they often display when so young. Sired by the prize-bull "Rover" (43,924), this yearling was bred by the exhibitor; he has a beautifully set-on shapely head, well-fleshed back, nicely laid-in shoulders, straight legs, and deep thighs, with, however, a tendency to get proud at the tail-head. Between the roans came a heavy if somewhat oxy-looking red of Mrs. Atkinson's from Sedgewick. This bull is very big for age, and carries a great deal of natural flesh under a skin a trifle too thick. His contour is pleasing, and his head sweet-looking, if not so masculine as it should be. This fault, however, may mend with age. He was bred by Mr. Drewry, at Holker, out of a "Wild Rose" cow, which was bought at a sale near Preston. His sire was an "Oxford" bull, his grandsire and great-grandsire "Duke" bulls, used in the Duke of Devonshire's magnificent herd. Mr. John Foster's Reserve bull is a finely-topped red and white, bred by the exhibitor, not very high in condition, but straight in top and under-lines, and sired by the prize-bull "Kalamazoo" (40,093). The others in the class included three promising youngsters — a "Gazelle," a "Cold Cream," and a "Prunette" — from Sandringham, a "Lady Bates" from Low Hill, &c.

Cows and heifers were relatively better represented than bulls. The Cow Class occupied the attention of the Judges for fully an hour. Often when so much time is taken the awards are not very satisfactory. It was so on the 16th of July. From the beginning of the Show till the end the favourite cow among the experienced onlookers was Mr. T. H. Hutchinson's beautiful four-year-old "Gratia," of his own breeding, after the Killerby bull "Pluto" (35,050), out of a cow by the Killerby bull "M. C." (31,898). The other sires constituting the last four were no other than the Warlaby "Knight of the Shire" and "Vain Hope" (23,102). She is thus well-bred, and is quite as good-looking as she is fashionably descended. She was the first two-year-old heifer and Champion female at Derby, and third cow at Reading—one from the same herd, "Gainful," having been first on the latter occasion. The great length of her frame, and grandeur of her shoulders, bosom, and brisket, with the massiveness and depth of her hind-quarters, make her appear a little slack on the loins. She is not, however, far gone there, and then what a noble bearing she has! What fine bone, wealth of flesh, and feminine character she displays! In her appearance there was, perhaps, more of "the lady" visible than in that of any other cow or heifer of the breed. Yet she only got Reserve, or fourth, which was generally regarded as a mistake.

The three cows placed before her are good, thick, round-ribbed, substantial animals, partaking largely of what is recognised in England as "the Scotch type." It would ill become me to leave readers to infer that the cows are any the worse for that resemblance. They may be all the better, but they are not square enough in the quarter, nor sufficiently developed on the more inviting points of a Shorthorn, to have, in the opinion of many people, beaten "Gratia." Mr. C. W. Brierley's tidy white "Snowflake," rising five years old, and bred by the exhibitor, which made a good fight at Reading for only "reserve," was in better luck at York. She is sweet in front, and has an admirably sprung rib, with great wealth of flesh over the crops, but defective hind-quarters and legs. Still, she is a thick, deep, well-furnished cow, descended from some fine old Angus or Tyneside blood, and the best of the three prize-winners. Mr. D. A. Green's second cow is not yet four years old, and for her age she is well grown. Bred by the exhibitor, she is largely of "Bates" blood, has the best rib, perhaps, in the class, a magnificent loin, and good neck-vein. Mr. Sharp's third cow is a sweet-looking four-year-old, bred by the exhibitor from his "May Duchess" family, crossed with "Duke" and "Oxford" bulls. She handled well, has fine hair, charming under-line, and much quality. She was third in the Heifer-in-Milk Class at Reading, and looks as if higher honours were in store. Highly commended tickets were deservedly given to Mr. Pugh's four-year-old roan, first at Reading, of his own breeding, got by the "Flower" bull "Falmouth," and Mr. Harris's "Ringlet 7th," of "Peepy" descent. Mr. Pugh's cow has great width in front, and handles well, with immense thickness behind the shoulder; but she is deficient on the rump or hind-quarters. Mr. Harris's was bred by Mr. T. H. Miller, Singleton, and is a good specimen of his well-known prize-family, whose name the cow bears. She is good on the loin and rib, but rather low in front. Five of the fourteen entered in the Cow Class were absent.

Cows or Heifers, in milk, calved in 1880, formed a small Class, but at least two of the animals were very good. Mr. Ackers's "Lady Carew 9th," of his own breeding, sired by the Christon bull "Lord Prinknash 2nd" (38,653), and belonging to a well-known prize-family, confirmed her premier place of 1882. In front of the "hooks" she is covered admirably with the very finest of flesh, and the nice soft hair enhances the charm with which one handles her. A good feminine head and neck are backed by slanting shoulders, on which flesh was better taken on than is the case with probably any other Shorthorn in the Yard. Behind the shoulder she is developed to perfection. On the rump, however, she is bumpy, and she does not walk so easily as could be wished. Withal she is a wonderfully good animal, a little more like what one expects to find in Smithfield, perhaps, than Mr. T. H. Hutchinson's second, "Good Tidings," of his own breeding, and out of the same cow as "Gratia." The Catterick heifer has undeniable Booth—I may almost say Warlaby—character, and, not being very forward in condition, fascinated the breeder's eye, especially walking. Standing wide in the chest, she has a splendid head, attractive colour, and is grandly furnished without being in any way overdone. Mr. Gibson's highly commended heifer is a heavy red, of the late Mr. John Lynn's breeding, rather bumpy at the tail. She is chiefly of Bates blood, and so is Mr. Brierley's commended, "Miss Doncaster." After the first two there was nothing superfine in the Class of five from an entry of seven.

Two-year-old heifers furnished perhaps the best Class of the breed, and it embraced the Champion female Shorthorn. Nineteen were catalogued, but only twelve came before the Judges, who had no difficulty in assigning the first ticket to Mr. Hutchinson's "Lady Pamela," of his own breeding, and partaking rather less of Warlaby blood and type than some of the Catterick exhibits. She was the best yearling at Reading, and has given a good account of the year. Her head might be carried better, but there is no gainsaying her grandeur over the chine, great breadth of middle, and substance generally. She got the Cup as best Shorthorn female—an honour which would have been in my opinion as fittingly "Gratia's." The Duke of Portland's second heifer, bred by his Grace, leans Bates-ways, is very large in size and heavy in flesh, with, however, a rather thick skin. Her length, wealth, and good under-line, seemingly carried her into a better position than her "touch" warranted. There is more of the female in the pretty pair of roans belonging to and bred by Sir Frederick Smyth, Bart., which came third and fifth. The third, a handsome "Winsome," sired by the "Oxford" bull "Wild Oxonian" (40,927), was second at Reading; she has a charming countenance, and a deep covering of flesh over the foreribs and chine. The fifth, a massive roan, of the "Lady Ashton" family, is rather big in the bone, but well fleshed, and, like her companion, nicely brought out. The grandsire of the latter was the 4500-guinea bull, "Duke of Connaught" (33,604). Sir Hussey Vivian's roan, "Maid of Glamorgan," bred by the exhibitor, of mixed blood, as distinguished from line-breeding, repeated her Reserve position of 1882, and is likely to make a good cow, being already well gone in calf. Among the unsuccessful were a "Lally" from Low Hill and a "Kirklevington" from Wetherby. The latter is of a good type, but, not being in high condition, she was hard on the back.

Nearly as great merit was illustrated in the Yearling Heifer Class, where from an entry of twenty-five there were eight absentees. A few were of only moderate quality, but the majority were of exceptional merit. Mr. Wakefield's "Gusta 4th," a red and white of his own breeding, after a Holker bull, was a distinct first. Of fair size, she is as plump and ripe to all appearance as a Devon, and retained a beautiful coat of hair. Mr. Pugh's second, roan, covers a great deal of ground for her age. She had for sire the West Dereham Abbey bull "Sir Charles," already referred to, and for dam a cow of the "Cazarina" family.

The yearling is heavy in carcass and full of good Booth character, though already a trifle patchy at the tail. Of less scale but more beauty is Mr. Ackers's "Western Georgie" that stood third. Long level quarters, fine bone, rare quality, and sweetness, would justify any owner in expecting more than third for such a little beauty. In the company in which she appeared at York, however, it was difficult to make further way for her. Her dam was "Vain Countess," by the Warlaby "Knight of St. Patrick" (38,520), which was bought at the Lethenty sale, and is of the Killerby "Georgie" tribe. The Reserve roan, from Inglewood Bank, bred by Mr. Thompson, is a symmetrical promising daughter of the third-prize aged bull, "Beau Benedict." Mr. Earle's fifth is long, but somewhat plain-looking. The Havering Park and Brandsby commended heifers inherit a good deal of Bates blood through the sires. A Siddington from Low Hill did not escape notice.

For the family prizes there was better competition than is generally the case. The Sandringham first family were irresistible, consisting of "Diadem," a red and white eleven-year-old cow and her four daughters, three of which are already cows, and all good-looking. The matron was bred by Mr. Fisher, Pitlochry, and was bought at his remarkable sale in 1874 for the late Rev. Mr. Micklethwait, Norfolk, at a high price. She is of the Windsor Cold Creams—Knightley's topped with Booth,—and retains much of the fine milking properties imparted to the tribe by the impressive bull "Earl of Dublin." The old cow wears well and milks deeply. She and her daughter, "Diadem 3rd," were purchased at Mr. Micklethwait's sale some years ago by Mr. Beck for the Prince of Wales, and the purchase has proved a lucky one. The daughters, sired by good Booth bulls, are big handsome animals—generally improvements on the dam. Mr. Scoby's second family was "Duchess of Yetholm," a twelve-year-old red and white cow, of Sir W. C. Trevelyan's breeding, and her four daughters, also good animals, but not so uniform in character and quality as the first family. Mr. Foljambe's third family is "Cressida 4th," a massive eight-year-old of the Rev. T. Staniforth's breeding, and her three daughters, all bred by the exhibitor. The animals in the Family Class were in a refreshingly moderate state of feeding.

Judges' Report of Shorthorns.

The Judges of Shorthorns, in presenting their Report, have to state that the Show as a whole may be considered an average one, though, with two or three exceptions, there was nothing shown of very extraordinary merit. Amongst the old bulls were several well-known prize-winners.

Class 62 was the best *Bull* Class, and included some young bulls of considerable promise, especially No. 620, whose excellent symmetry and fine quality, combined with great evenness of flesh, left little to be desired. No. 627 was also a very good young bull. No. 623, the youngest bull in his class, giving some of his opponents ten months, had excellent hair and quality of flesh, good hind-quarters, but was light in his crop, with a plain head. The reserved number (No. 625) was the oldest bull in the class; he had great growth and general development, but was rather high in the legs, hair a little harsh, and flesh inclined to patchiness along the back.

The old *Cows* were a difficult class to judge; none of them being first-class animals, and by no means coming up to the standard of excellence expected at a Royal Agricultural Society's Show. No. 664 had a very bad rump and coarse hind-legs; but having capital flesh, well defined fore-quarters, with a robust constitution, she was considered entitled to the first prize in her class.

Class 65 was fairly good, though the drooping hind-quarters of the first-prize *Heifer* took much from her otherwise great merit.

Class 66 was excellent, and in No. 690, the winner of the first prize, contained the best *Shorthorn* in the yard; the winners of the second and third prizes, together with the reserved number and highly-commended heifers, were all animals of great promise.

Class 67 was good in point of numbers, and also contained some very nice young *Heifers*, especially the first-prize animal, No. 707.

The show of *Families* was very interesting, and in the first-prize lot demonstrated how the original can be improved by judicious crossing. There was also another pleasing feature in this class, viz. all were shown in fair breeding condition, and apparently without forcing of any sort.

H. W. Beauford.
E. W. Meade-Waldo.
W. Parker.

Herefords.

Merit was more remarkable in the section devoted to the white-faces than numbers were. This celebrated grazing breed has in recent years grown rapidly in popularity for American ranching purposes. Prices have risen almost in keeping with the demand, and are now high. Nevertheless the shipments to America annually reach several hundred head. Just after the York Show, 200 Herefords were despatched to Mr. Burleugh, in the United States. The Earl of Coventry's five-year-old, "Fisherman," of Mr. T. Rogers's breeding, which was second at Reading, was alone in the Aged Bull Class. He has grown in his fifth year, has a deep chest with colossal proportions, and fine character. To all appearance he was the heaviest beast in the yard. Only three two-year-olds were entered. Mr. Arkwright's first bull, bred by the exhibitor, is out of "Rosebud," a cow that when ten years old cost 150 guineas at the sale of the breeder, Mr. Tudge. "Rosebud" was a Royal winner, and produced this bull when she was fourteen years old. He is long in the quarters, with nicely laid-in shoulders and a very attractive outline. A little more width might improve him, but he is smart and stylish, with unmistakable evidence of high breeding. Mr. Taylor's second bull from Showle Court, of Mr. Carwardine's breeding, has plenty of substance but less quality than the first. The second, however, was good enough to justify the special recommendation of the judges for a money prize to him. In a good class of yearling bulls there was striking evidence of the early maturing properties of the Hereford. Mr. Carwardine's first youngster, of his own breeding, is by the same sire, "Lord Wilton" (4740), as the second two-year-old, while both were out of half-sisters. The yearling's loin development and evenness of flesh were remarkable for the age. He was only third at Hereford shortly before, where Mr. A. E. Hughes's "Washington," now second, was also then second. The first at Hereford was not at York. The second bull, bred at Wintercott, handles nicely for a Hereford, and carries much good flesh. He is higher at the tail than the first, and was considered fairly beaten. Mr. Turner's third, from The Leen, bred by the exhibitor, is a son of the prize cow "Helena," and is particularly good over the crops and full in the neck vein. Mr. Hall's Reserve yearling is a promising son of "Lord Wilton," already alluded to; while Lord Coventry's commended bull is a lively-looking son of the first aged sire.

One of the most impressive sights in the great Yard presented itself in the Hereford Cow Class. Three cows of the calibre of Mr. H. W. Taylor's "Modesty," "Adelaide," and "Rosamond," which made a sweep of the money prizes in the order named, are very rarely seen in one man's possession. They were all bred, too, in the far-famed Showle Court herd. The first led this year as last, obviously. She is an eight-year-old of immense scale, and laden with flesh of the richest nature, evenly taken on. In high condition as she is, she breeds regularly, having had a very pretty heifer calf six weeks old at foot. Her sire, as well as the sire of the second cow, was the famous prize bull "Trevelyan" (5077). "Adelaide" is six years old, and is full sister to "Modesty." The second is not so well covered over the shoulder as the first, but she is very massive and feminine-looking. "Rosamond" is also six years old, and though proud on the rumps, she is good forward. Mr. Tudge's Reserve cow "Mermaid," six years old, and bred by Mr. Robinson, was second last year, and has great size but less quality than the winners. Only three heifers in-milk entered the ring, but they were all good. Mr. Hughes's first, of Mrs. Sarah Edwards's breeding, was second last year. She has grown in wealth since, and displays marvellous thickness of flesh over the ribs and crops, with a stylish head. Fat as she is, she has begun breeding, and has an astonishing show of milk. Her hind-quarters droop rather much, even for a Hereford, but she is grand forward. Mr. Tudge's second has a shapely frame laden with flesh and fat. Bred by the exhibitor, she is already in full milk. Mr. Hall's first two-year-old heifer, bred by the exhibitor, was one of the plums of the breed. Rarely is a Hereford seen with so much sweetness and quality. To both ends she falls off a little, but her middle is one of the finest imaginable. Of "Lord Wilton's" good-getting properties she affords additional proof. Mr. Platt's "Prettymaid 4th," bred by the exhibitor, placed second, is bigger than the first, but not so nice. She is very strong over the loin and back. The other two ticketed were of full average merit, and were bred by the exhibitors. Mr. Platt's winning yearling, bred in the herd, is half-sister to the second two-year-old, but is more symmetrical. With size and substance she combines squareness of quarter and development of points that at once arrest the eye. The second, from The Leen, is truly marked, and is good under the hand. Mr. Fenn's third and fourth, bred by himself, are sired by "Downton Boy" (5877). Mr. Carwardine's fifth was sired by "Lord Wilton." Several good heifers were commended. The family groups, for the prizes offered by the Hereford Herd-book Society, made an imposing array. The Earl of Coventry's first family was headed by that grand old cow, "Giantess," now in her twelfth year, bred by Mr. Tudge, Adforton, still fresh and level, and very big. Her following consisted of a four-year-old cow and a handsome twenty-months-old bull, both bred to Lord Coventry. Mr. Hall's second family were younger and the same in number, all bred by the exhibitor. Mr. Wm. Tudge's third were of his own breeding, and Mr. Platt's group was led by a fine cow, hailing from Showle Court.

Judges' Report on the Herefords.

Considering the distance from the home of the *Herefords*, together with the prevalence of foot-and-mouth disease, and the great drain there has been on them for exportation, there was a very fair muster of the red with white faces.

Although the *Old Bull* Class failed to bring out more than one animal, that one was a good representative of the breed, and would have taken a very good bull to have beaten him.

Only two *Young Bulls* came out in Class 70, but those were both well worthy of first and second prizes in a good class. "Rose Cross" is probably one of the best young sires we have left in England, and "Franklin" has been hard at work, which pays the owner much better than excessive feeding and no stock.

The *Yearling* Class generally brings out a few "stars." Mr. Carwardine's "Monarch" is a diamond of the first water, and "Washington," from the Wintercott herd, is a no mean rival; "Hogarth," a son of "The Grove 3rd," is third on the list, and is very neat and compact, although not quite big enough for his age, and there are some other good specimens.

It is seldom that four better *Cows* appear before the Judges than the three from Showle Court and Mr. Tudge's "Mermaid;" the latter, although a very massive grand-looking cow, lacks quality, and had to give way to the three of Mr. Taylor's, each of them worthy of first honours.

Class 73. Three fairly good *Heifers;* the first and second prize animals were each shown with a calf at foot. The only other exhibit was a very level good-fleshed heifer, and will no doubt be heard of at the Christmas Fat Stock Shows.

Mr. Hall's "Dorothea" easily won first prize in the *Yearling Heifer* Class, and might be called one of the "gems of the Showyard;" the second, Mr. Platt's "Prettymaid," and one or two others, were worthy of special mention in this class.

Perhaps there were few better *Heifers* in the Showyard than Mr. Platt's "Primrose 5th," first in Class 75, very level, of good size and quality, and looking likely to develop into a grand heifer. "Portia," daughter of "The Grove 3rd," was second; there were also a pair of Mr. Fenn's, and some others, worthy of mention.

Class 69. One exhibit.—A very good animal.

Class 70. Two exhibits.—Two fair animals, first-prize winner being of good quality.

Class 71. Eleven exhibits.—A good class, including several very promising young *Bulls*, especially the first- and second-prize takers. The third-prize winner is very neat, but rather small for his age.

Class 72. Five exhibits.—A very good class. No. 746, the reserve number, is of great scale, but handled rather coarsely.

Class 73. Three exhibits.—The first- and second-prize animals had good calves by their sides; the reserve number is a grand level *Heifer*, but we considered her more suitable for a Fat Stock Show.

Class 74. Six exhibits.—A fair class. No. 755, which won first prize, is a very superior *Heifer*.

Class 75. Ten exhibits.—A very good class, commended nearly throughout. The first prize is a beautiful *Heifer*, and the second is of grand quality.

Class 76. This *Family* Class brought out four lots, all of great merit. Lord Coventry's exhibit we considered entitled to the first prize, being more in number, besides the general excellence of each animal. Mr. Hall's "Lovely," with yearling heifer and bull calf, was a good second; Mr. Tudge's and Mr. Platt's were both good families.

John H. Yeomans.
Wm. Groves.

Devons.

This charming South of England breed, which is still honoured with the leading place in the Smithfield catalogue, was not so well represented as it is when the Show is nearer the "Devon Country." The bulls were generally bigger than usual, but scarcely so plump and beautiful. Mr. Perry's first aged bull, bred by the exhibitor, is nearly six years old and wears admirably. He handles very firmly, is wide and deep forward, and padded over the loins, crops, and rumps with the richest of meat. He was the sire of the commended three-year-old from the same herd—a good, sappy, useful bull. Viscount Falmouth's second, "Sir Michael," six years old, and bred by the exhibitor, is very near the ground; fine on bone and rich in quality. On the back he shows a tendency to give way since he stood first at Reading. The Reserve bull from the same herd is a compact four-year-old, with splendid loin, bred by the exhibitor, and sired, like the first, by the prize bull "Sirloin" (1443). Sir W. Williams' commended bull is a stylish three-year-old of Mrs. Langdon's breeding. Mr. Perry's first two-year-old was sired by the leading old bull, bred by the exhibitor, uniformly grown and well fleshed, though for some people's taste rather strong in the horn. Mr. Howse's second, of Mr. Coles's breeding, was only twenty-one months old, and for his age is one of the biggest of his breed that has been shown for some years. Mr. Herbert Farthing's first yearling of his own breeding is well up on all his points, and is likely to be heard of again. Mr. Skinner's second is a plump little representative of the celebrated Stowey Court blood. The same exhibitor's first in a small class of cows is a deeply fleshed four-year-old, bred by the exhibitor, and first three-year-old at Reading. She is far above the average size for a Devon, and is by no means devoid of quality or character. Mr. Howse's second cow is a five-year-old, bred by her present owner; she stands high with a good covering over the chine, but has rather bare shoulders.

Sir Wm. Williams had credit in topping probably the best class of the breed in the Show, with a round-ribbed, admirably clad three-year-old heifer of Mrs. Langdon's breeding. She shows quality and maturity all over, and is a worthy member of the well-known prize family of "Temptresses." Mr. Howse's second heifer, of his own breeding, was first at Reading, and is still good, though not so near perfection as the first. Mr. Fryer's highly commended heifer of Lord Portman's breeding was second at Reading. The Reserve was "Sally," a symmetrical heifer of Mr. Skinner's, bred by Mr. Walter Farthing. Her half-sister triumphed in the two-year-old class, and is also owned by Mr. Skinner, whose cattle displayed more Devon character than some of the others. Of the distinguished "Moss Rose" tribe of Stowey Court, the first two-year-old was one of the most symmetrical Devons in the exhibition, and is above average size. Mr. Skinner's first yearling at Reading was unsuccessful. "Mignonette," of Mr. Fryer's breeding, has grown very uniformly, and deserved her second ticket. The third from the same herd is by the same sire, "Viceroy" (1661), and looks like making a good cow. The star in the Yearling Class was the little beauty shown and bred by Sir Wm. Williams, of similar blood to that of the first three-year-old.

The females were not so uniform in size, set of horn, and character, as they generally are.

Judges' Report of Devons.

In the majority of the classes the number of animals exhibited was smaller than on many former occasions, which may perhaps to some degree be accounted for by the distance from the district in which Devon cattle are produced.

In the various Classes of *Bulls*, although there were a few good specimens, we think that on the whole they were not quite up to the standard of former years.

In the *Cow* and *Heifer* Classes the above remarks apply generally, but in Classes 81, 82, and 83 (those of heifers), there were some very meritorious animals.

H. W. Keary.
Richard Hamshar.
John Risdon.

Sussex.

No breed of cattle in the United Kingdom has made such marked improvement, in its Showyard representatives at least, during the last seven or eight years, as this variety. The vast progress has been evidenced both in the Smithfield and the Royal exhibitions. The Sussex Cattle have not only improved in size and shape, but decidedly also in quality, wealth, and levelness of flesh. With something like the scale and outline of the Shorthorn, the Sussex breed approach the Devon in uniformity and quality of flesh. They are, indeed, grand beef-producing cattle, and deserve a wider hold than they yet possess of this meat-raising country. The Messrs. Stanford's "Goldsmith" (391), of Mr. G. Smith's breeding, is a magnificent six-year-old bull, first at Reading, and easily first this year again. With a brisket well down to the ground, the ponderous bull is no more noteworthy in respect of size, width, and length, than for levelness and accumulation of flesh. He is astonishingly coated, and retains his bloom wonderfully. The same exhibitors' successful three-year-old is shapely and well covered on the shoulder. Bred by the exhibitors; he is straight, stylish, and plump as a Devon. Mr. Stewart Hodgson's second bull, bred by the exhibitor, is very large in size for his age, but he does not walk so gracefully as the first. The Messrs. Stanford's first and second bulls, calved in 1881, were both bred by the exhibitors, and headed the Yearling Class at Reading, in different order, however, from that of York. The first one this year is a smart son of the monster old bull above described. Mr. Agate's Reserve bull curiously took the same position last year against the Messrs. Stanford's pair, which are well furnished, good, substantial bulls.

Merit was higher in the female than in the male classes. Mr. Hodgson's successful cow is "Laura 5th" (2412), a four-year-old of his own breeding, and first winner at the recent Bath and West of England Show. She is covered with flesh that in quality would not disgrace a Devon, and in quantity would adorn a Hereford or a Shorthorn. Mr. Green's second is a six-year-old, which was second at Reading, was bred by Mr. Lansdell, and has a beautiful head, though a less evenly fleshed frame than the first. The other cows were fair. The Messrs. Stanford's fine three-year-old heifer is "Dorset 8th," bred by the exhibitors, and very firm under the hand, with a compact body and nice underline. Her sire was the first old bull at Reading. She stood Reserve, and has now changed places with Mr. Agate's "Honesty 6th," of his own breeding. Mr. Hodgson's fine heifer, calved in 1881, bred by the exhibitor, was only twenty months old, but showed remarkable maturity, as well as no little quality and character. The Messrs. Stanford's second was the favourite at Reading. She is still pleasing on the chine and ribs, and claims for her sire the first old bull. The first one has all the gaiety and style of a Shorthorn. Mr. Agate's third is big for her age, and well fleshed, and, like the other winners, bred by the exhibitor. The victorious yearling, owned and bred by Mr. Vickress, riveted attention on account of her great length, squareness of quarter, evenness of flesh, as well as wealth of it. Few animals of any breed of the age would scale with her, and withal she is symmetrical. The second, from the same herd, is somewhat stubby in the head, but well down on the thighs. Mr. Hodgson's third is higher on the leg than those preferred by the Judges. In the classes of this breed, as well as those of Devons and Herefords, there were not many animals unadorned by prize or commended tickets.

Judges' Report on the Sussex.

In the Classes of *Bulls* there was only one animal calling for special notice, and the remainder must be described as considerably below his standard.

The *Females* were on the whole good, and included many animals of great merit, and we express a hope that the breed of these very useful cattle will increase, and that they will continue to make as much improvement in the future as they have made in the past.

H. W. Keary.
Richard Hamshar.
John Risdon.

Norfolk and Suffolk Polled.

This valuable grazing and beef-producing variety deserves greater popularity than it has yet enjoyed. The turn-out at York was calculated to spread the fame of the breed. If the kindly feeding and good flesh-forming properties of the Red Polls were only better known, the demand for them would rapidly increase. Mr. Austin's "Shylock," of the late Mr. Palmer's breeding, rising four years old, was, on account of his superior quality and uniformity, selected for first honours in the Aged Bull Class in preference to Mr. Hammond's five-year-old "Davyson 7th," of his own breeding. The latter was first last year, and is a heavy animal, well descended, but he is not so level and smart-looking as the first. Mr. Taylor's third bull, of his own breeding is only a two-year-old, and was thus somewhat handicapped. On the back he is well covered, but his underline is defective. The other four bulls in the class got commended tickets, a fact which attests the high merit of the class. Yearling bulls were not so good. Mr. Colman's first is a long-sided, big, straight-topped animal, bred by the exhibitor. If this bull fills out properly with age he will be an old bull of great size and substance, with fair quality. The second bull of Mr. Haggard's, bred by Mr. Biddell, is also well grown for his age, but is not so nice as he might be. Mr. Loffts' third, bred by himself, is not quite up to the Troston standard.

Females were better than the males, at least in the younger classes. Mr. Colman's first cow is rising four years old, was bred by the exhibitor, has a strong loin, well padded with beef, square hind-quarters, full brisket, and wealthy bosom. Nor is she devoid of character and quality. The second, from the same herd and by the same sire—"Rufus" (188)—is only two and a half years old, and heavy in calf. She is well coated over with flesh, especially on the shoulder, and pleases the eye, but does not fill the hand quite so well as the first. Mr. Taylor's third, of Mr. Palmer's breeding, is of the "Davy" tribe, and has accumulated a considerable quantity of fine-handling flesh over the chine. With one exception the others in the class were good enough to secure commended tickets. Mr. Hammond was ill to shake off in the Yearling Heifer Class. Two-year-old heifers competed with cows, as did two-year-old bulls with the aged of this breed. It would have been better if two-year-olds and yearlings had been bracketed, if only two classes could be allowed for each sex. Mr. Hammond's first and second yearlings were a well-developed pair, bred by the exhibitor, of the "Davy" family, and sired by the second-prize aged bull, also of that family. The first is as firm under the hand as a Devon, and already carries a great deal of meat on the crops and back. The second is massive, but not sweet. Mr. Taylor's third, of his own breeding, is large in size and level in flesh. Five of the remaining nine were commended.

Judges' Report of Norfolk and Suffolk Polled.

In the Class of *Old Bulls* there were many good animals, and we are sorry that we cannot apply the same remark to the other Class of *Young Bulls.*

The *Female* Classes contained some extremely good *Cows* and *Heifers*, and we are glad to see that this very useful breed of cattle are apparently increasing and improving.

H. W. KEARY.
RICHARD HAMSHAR.
JOHN RISDON.

WELSH.

Very few animals of this old-established and hardy race of stock were entered. Eight appeared in the four classes, and all were ticketed. Lord Harlech and the Earl of Cawdor had the best of them. The former's first bull in the senior class was surprisingly developed for a three-year-old. It was bred by the exhibitor; this bull had as noble a head as might be expected in a West Highlander, while a well-balanced frame was as evenly covered with flesh as a Polled bull's would be. He has won several prizes. Lord Cawdor's second bull, also three years old, is fleshy, but not so strong on the back as the first. Lord Harlech's yearling bull is half-brother to the three-year-old; and though not wide in rib, he is good on the back and fair in the quarter, with a fine glossy skin. Perhaps the prettiest animal of the breed was Lord Cawdor's seven-year-old cow "Leonora," bred by the exhibitor, and full of quality. She looks all over a milker, having a little white at the udder, which in black cattle has long been regarded as evidence of good lacteal qualities. His Lordship's heifer was bred by Mrs. Williams, Carmarthenshire, and has attractive Welsh character.

Judge's Report of Welsh Cattle.

It is much to be regretted that this hardy breed was not more largely represented, but the quality of the few animals shown would go far to account for the high esteem in which "Welsh Blacks" are held by Midland graziers and West-end butchers.

In CLASS 91, for *Bulls Two Years old and upwards*, the first prize went to a three-year-old of great size and merit, with good thick flesh; and a promising *Young Bull, under Twelve Months old*, took the prize in CLASS 92.

Only two *Females* were shown in CLASSES 93 and 94, the *Aged Cow* being a grand specimen.

It is hoped that the newly established Herd-book may be the means of inducing more breeders from the Principality to compete in the showyard.

JOHN WILLIAMS.

POLLED ANGUS OR ABERDEEN.

No breed of cattle has risen so much in value during the last three years as this one. In the rank and file, so to speak, the advance in market value has since 1878 been nearly 100 per cent., while for the very best bred families the rise has been double that amount. The late Mr. M'Combie's achievements at the Paris Exhibition in 1878, securing the principal group prizes open to all comers with his "black skins," gave the breed a great "lift" in distant lands as well as at home. The Americans were captivated by the fine flesh-forming and early-maturing qualities of the breed, as also by the absence of horns. The result has been a large and yearly growing demand for Northern Polls to cross the Atlantic. As much as 500 guineas has been paid for one female for exportation, and about that figure has oftener than once been paid by home breeders.

The display at York would have been much larger and better but for the risks of disease and the uncertainties of the return journey to Scotland. Only two animals came direct from Scotland; but so many Polls have in recent years gone to establish herds in England, that a fair appearance was made. It is doubtful if more than one or two of the Polls at York would have found their way into the prize list at the Inverness Highland Show the following week, and certain it is that none of the English exhibits would have got to the front at the Highland capital. The York entry, however, was not to be despised, especially as over-feeding was almost avoided. Mr. Rouse's first Bull over Two Years old is a six-year-old, bred at Drumin, Banffshire, and descended from the Rothiemay "Georgina" family. He did good service in the herds of Lord Lovat and Mr. Robertson, Aberlour Mains, and has thriven well since he crossed the Border last year. In the flank he is light, but atonement for that is offered in excellence of loin and abundance of flesh on the top. There was not much between the Bradley Hall entry and Mr. Egginton's two-year-old that followed. The latter is the thicker in the middle, and has a good front. He was bred by the late Mr. Walker, Montbletton, and cost 97 guineas last autumn. His sire was the 255-guinea bull "Young Hero," and his dam a member of the "Lady Palmerston" family, that averaged over 200 guineas a head at the Montbletton sale in September last. Mr. Wallis's bull, that ranked third, has more length, and fully as much style as the other, but he is weaker in the middle. He was bred at Ballindalloch, of the prize-winning "Sybil" tribe, and had for sire the National Society's first-prize bull "Justice." Yearlings were numerically stronger. A stiff pull ensued for the first ticket between Mr. Wilken's "Mayflower" bull, of Lord Tweedmouth's breeding, and Mr. Wallis's "Jilt" bull, of his own breeding. The latter, descended from one of the best Ballindalloch, Tillyfour, and Keillor families, is good along the back, fair in his quarters, but roughish in the neck, and finished second best. Mr. Wilken's cost 110 guineas last spring, and had for dam one of the late Mr. M'Combie's famous "Paris" group, while the sire was the son of another of that distinguished lot. This yearling is above the average size, and has no very decided defect, if not much that could be called grand. He was fairly enough first. Mr. Stephenson's third and fourth bulls, bred by himself, were strong and well fleshed—the former being an "Erica" and the latter a "Ruth." The "Erica" one has strong massive quarters, but rather a weak back. The other would be improved by more spring of rib.

There was evidently only one house-fed animal in the Cow Class, and she was considered by the Judges to be too fat. There were fatter animals in the prize list, but not of that breed; and the rest having been moderately fed, her high state of obesity was all the more pronounced, and the Judges set Mr. Wilken's exhibit aside accordingly. Seven of the ten cows entered were paraded. There was nothing like a clear first in the lot. Eventually the Judges settled on a Rothiemay-bred eight-year-old of Mr. Egginton's, with round ribs, level loin, good hind-quarters, and feminine head and ear. Her breeding qualities were certified by the calf at foot, and still more impressively by the excellence of her two-year-old daughter, which topped a good class, and had also a nice calf at foot. Mr. Stephenson's second cow, bred at East Tulloch, Stonehaven, has more substance than the victor, being very thick behind the shoulder, but not so long in the quarter. The third, from Bradley Hall, bred at Rothiemay, is one of the Ballindalloch "Nosegays," and had the best head and neck in the class, with good quarters, but she had not strength enough on the loins to take a higher place. The others in the class were fairly good. The Two-year-old Heifer Class was, like that of cows, perplexing to judge. Considerable allowance must have been made, and not improperly, for Mr. Egginton's first heifer, already alluded to, being under milk. In the circumstances she is of large size, and has good quarters, though a little bareness over the chine. Milking so early would aggravate, if not occasion, the latter. Mr. Wallis's "May Queen," of the Advie "Old Rose" tribe, and a 225-guinea purchase at the Advie sale last autumn, had possibly the best body of any animal of the breed in the Show. Her quarters are shapely and well packed; loin, rib, shoulders, and back are quite in harmony with the proportionate quarters. She is too short of neck, however, for a female, and lost the first ticket on that account. Mr. Stephenson's third is a large-sized daughter of the second prize cow. She is heavier than her opponents, but rather plainer. Mr. Greenfield's fourth heifer was the youngest in the class, and smallest. It was bred by Mr. Hannay, Gavenwood, Banff, of the "Westertown Rose" tribe, and had a beautiful head and neck, with deep massive quarters. Its coat of hair was rather heavy, and an attempt to "curl" had the opposite effect from what the attendant intended.

Through the liberality of the Polled Cattle Society, prizes were offered for yearling heifers, and they formed probably the best class. Mr. Wallis got to the front at last. His first heifer is a thick substantial shapely "Pride," of Mr. Hannay's breeding, and is well set on short legs. She has a splendid head and ear, and, barring a tendency to rise at the tail, would be difficult to beat. Mr. Stephenson's second, of his own breeding, is a daughter of his second-prize cow, by a Ballindalloch "Erica" bull. The cross of the latter has sweetened the produce as compared with the two-year-old heifer. What the yearling may want in size it makes up for almost in symmetry and quality. Major Godman's third heifer is nice along the back, and steps out gaily. Five recently established English herds thus carried all the prizes save one, and a very creditable start they have made.

Judges' Report of Polled Aberdeen and Angus Cattle.

The entries of the Aberdeen and Angus Polled breed numbered 32; of these 22 were forward.

Class 99. *Bull calved in* 1877, 1878, 1879, 1880, *and* 1881.—There was nothing in this class *very superior*, but all the exhibits were good fair specimens of the breed, and well deserved the awards made.

Class 100. *Bull calved in* 1882.—A good fair class all over, but contained no animal of any *very marked* or special merit. The prize-winners were in our opinion worthy of their honours.

Class 101. *Cow or Heifer in-milk or in-calf, calved previously to or in* 1880.—A good average class, but contained no one that could be termed a *really first-class* animal. The Judges had some difficulty in placing the awards made in order, on account of the varied nature of the merits of the greater number of the animals. They thought it their duty to disqualify and set aside No. 900, as *over-fed*, and showing more of a *fat* animal than a breeding one.

Class 102. *Heifer calved in* 1881.—In this class the Judges placed first a heifer in-milk with calf at foot, as, with this disadvantage to her appearance, she was considered to be possessed of most merit. Both the second and third prize heifers were possessed of considerable merit, but were of very different types. The reserve number, 907, had more the characteristics of a *Galloway* than a *Polled Angus and Aberdeen*, and this fact weighed with the Judges in not placing her higher.

Class 103. *Heifer calved in* 1882.—The whole exhibits in this class were good fair animals, and probably the best average in point of merit of all the classes. The first prize animal was a really good heifer, and the Judges considered the whole well worthy of the awards made.

The Judges desire to remark, speaking generally, that the whole of the entries forward of this breed appeared to be very creditable specimens, and all healthy and useful, with the exception in Class 101, already mentioned, and were well worthy of the awards made.

George J. Walker.
Wm. Whyte.

Galloways.

The classes of this old-established Border grazing breed were fairly filled. Merit was not throughout sustained, but several of the best animals of their day were exhibited. On the Galloway herds there have been heavy drafts for exportation in the course of the last two years. The hardiness and heavy coats of hair of these cattle adapt them for the exposure during winter to which American ranche cattle are subjected. They have increased materially in value, and are destined to rise further as their grazing capabilities become wider known on the other side of the Atlantic. The Judges in their official report appended go so fully into the merits of the prize-winners that only very little can be added.

The first aged bull, from Tarbreoch, whence many a fine animal has come, has had a very successful Showyard career, and has proved himself an impressive sire; and he is still as fresh and fit as ever, though six years old. He has gained the highest honours in Scotland, and had no difficulty at York, looking, as he was, as level and wealthy of flesh, and almost as blooming as ever. The breeder is Mr. James Graham, Lynefoot, Carlisle, and the sire was the celebrated getter, "Sim of Whitram" (562). Mr. Villiers's second bull is a four-year-old, bred by Messrs. Shennan, Balig, and was first as a yearling at the Carlisle Royal. He is not so heavy as the first, but he comes well down to the ground, and displays some of the best characteristics of the breed. Mr. McCowan's third is a three-year-old, bred by Mr. James Graham and sired by the first-prize bull. Very massive hind-quarters and well-clad back are his; while the Duke of Buccleuch's fourth of the same age, and bred by the exhibitor, carried a great deal of flesh and hair. The Tarbreoch first yearling, bred by Mr. McTurk, is of good blood, and if not in high condition, has plenty of frame and not a little promise. The Duke of Buccleuch's second, bred by the exhibitor, is out of a "Lady Stanley" cow—a Tarbreoch family at the top of the tree—and after the fourth prize aged bull. In this yearling are illustrated some of the cherished points of the breed. The duke's herd had the credit of producing Mr. McCowan's third bull, a promising stirk. The fourth prize fell to a young breeder—the Rev. John Gillespie, Mouswald, who as Editor of the Galloway Herd Book, and in various other capacities, has latterly done more to popularise his favourite breed than any other man. One of the pair of young bulls which he exhibited got Reserve, which is a fair success, considering the material against which he had to contend.

The Duke of Buccleuch's first cow in a good all-round class is a seven-year-old, thick-quartered, deep-ribbed animal, bred at Culmain, and not unknown to Showyard honours. The third, from the same herd, bred by Mr. Routledge, is a ten-year-old, and wears wonderfully. The Tarbreoch second is a four-year-old, bred at Kirklands, and of moderately good quality. Mr. McCowan's first heifer, bred by Mr. W. Shennan, does not lack the leading features of the race, and may be heard of as a cow. The second, from Tarbreoch, is well bred, and was calved in the herd of the Messrs. Nivison, Lairdlaugh.

Report of the Judges of Galloways.

We found the exhibition of *Galloways* good on the whole, especially considering the distance of the Show from the headquarters of the breed.

The *Aged Bulls* were really good, and we commended the entire class. The first-prize animal, No. 922, is a first-rate specimen of this breed, being excellent in almost every point. The second one, No. 921, shows very good quality, and is specially good in his fore-quarters. The third, No. 919, is a level symmetrical bull all over, and promises to improve with age.

The representation of *Yearling Bulls* was a good one, most of the animals being full of promise. The one placed first, No. 929, was easily a winner. He is a massive good bull, and appeared in excellent bloom. No. 925, to which the second ticket was awarded, shows much symmetry; while the third, No. 926, is good in almost all his points, and seems very promising.

Of the eight *Galloway Cows* submitted to our inspection, half-a-dozen constituted a really good lot. The first-prize cow, No. 931, is a remarkably good one, combining substance and quality in a large degree. The second, No. 936, is a cow of much quality; while the one to which the third ticket was assigned, No. 932, has many excellent points, though her long age of eleven years told against her in the competition.

There were only two *Heifers* brought before us, and they were both good, though different types of animals. The one which we placed first, No. 938, is a heifer of very superior quality, while the second, No. 939, is a strong well-developed animal.

Thos. Gibbons.
M. Clark.
James Hamilton.

AYRSHIRES.

Though this renowned dairy breed was meagrely represented in number, a few of the choicest sorts were forward. The first aged bull, as the Judges remark, is one of the best that has been exhibited for many years, and has never been beaten. With some of the best points of the Ayrshire he unites a degree of size rarely seen. In nobility of gait, or in fact fierceness of countenance, he would not have been a lame apology for a Chillingham wild white bull. Since the York Show, this animal, chiefly owing to his temper, has been sent to the butcher. No animal for some years has made a close second to Mr. Bartlemore's bull, but the Duke of Buccleuch's second at York, bred by the exhibitor, and only three years old, followed creditably, being good on the top and stylish in head and neck. Mr. Bartlemore's first yearling, bred by Mr. Jack and sired by the old bull, is small, but very well bred and a likely winner in the future. The Duke of Buccleuch's first cow is a tidy three-year-old, bred by the Duke; carries a good milk-vessel very gracefully, and has fine bone and quality. The second is a five-year-old, also bred by the Duke, who owns the best herd of the kind in the country. Mr. Wilson's winning heifer is a beauty, and the Duke's second shows high breeding.

Judges' Report of the Ayrshires.

The Ayrshires, though few in numbers, made a creditable appearance.

The first-prize *Aged Bull*, No. 941, is a beast of very exceptional merit, and seldom, if ever, has a better representative of the breed been seen anywhere. The second-prize one, No. 943, though relatively inferior, has good points.

The first-prize *Yearling Bull*, No. 944, though not large, possesses fairly good quality, and is a moderately good animal. No. 945 was placed second.

As a class, the *Cows* were fairly good. We awarded the first ticket to No. 950, a cow which shows all the characteristics of a good Ayrshire. The second, No. 952, possesses great style, and shows superior breeding, while the third, No. 947, though apparently a good cow, appears at a disadvantage from having very recently calved.

The first-prize *Two-Year-old Heifer*, No. 953, is a remarkably good beast, showing very superior quality and great symmetry; while the one placed second, No. 955, is moderately good.

JAMES HAMILTON.
THOS. GIBBONS.
M. CLARK.

JERSEYS.

So far from the headquarters of this valuable dairy breed, the display, though not so good as at Reading, was on the whole satisfactory. The extraordinarily high prices lately paid —into the four figures—for Jerseys in America, freshens the interest in the breed in this country. Accordingly the Jersey stalls were thronged daily. The first-prize aged bull is a three-year-old of Mr. T. W. Walters, from Radford, Dawlish, and bred in the island from which the breed derives its name. He is truly marked, and of superior quality. Mr. Sutton's second, also bred in the island, being a year older, is bigger, and also well-bred. The third, owned by Mr. Firman, and bred at headquarters, has a characteristic head and good skin. Being only three years old he was in bloom. Mr. Arnold's leading yearling, bred in Jersey, has a thorough-bred look and fine quality, with sweet bone. The Wray Park second bull, of Mr. Simpson's own breeding, was in the same position at Bridgwater. He is a grey, of fine quality, and more than average promise. The Duke of Portland's third, bred by his Grace, is a dark brown, with a good skin, and fair size.

Cows mustered very well. Mr. Arkwright had a deserving first in a five-year-old light-coloured cow, bred in Jersey, and of beautiful hue, with marvellous milk-veins, and hard clean-cut features. Mr. Simpson's second is a three-year-old grey, bred at Wray Park, and of exceptional quality, with fine bone and wiry frame. She was first at the Bath and West of England Show, and third at Reading. Mr. Arkwright's third cow is a beautiful four-year-old fawn, bred in Jersey, and possessed of many of the points so much desired in a cow of the sort. No fewer than six of the remaining fifteen were commended, and they merited the distinction. Mr. Corbett's successful three-year-old heifer is a tidy fawn, bred in Jersey, sharp along the top, hard on the rump, sweet in the skin, and well coloured. Mr. Ashcroft's second, of Mr. Simpson's breeding, ran the winner very closely. She is a grand milker, and has already had two calves, being the dam of the first yearling heifer. The commended heifer from Wray Park is of a fine old true-breeding sort, being in direct descent from "Milk Girl," bought for 150 guineas at Mr. Gilbey's sale. "Milk Maid," of the same family, went to America at 165 guineas. Mr. Cornish's third heifer, bred by the exhibitor, is a sweet little thing, evidently milking deeply, and uniformly marked. Mr. Streatfeild's Reserve heifer is bigger than some of the others, and by no means deficient in character.

The Wray Park first two-year-old is a charming grey, bred by Mr. Simpson, and already in-milk. She was second at Reading and first at Bridgwater, and is full of promise, having a skin like a glove, and very well-defined features. The third, from the same renowned herd, is a surprising milker; though only two years old she has produced as much as 14 quarts of milk per day, and is likely to be an acquisition to the herd. Mr. Arkwright's second is a silver-grey, bred by himself, with more substance than most of the others, but, for a Jersey, not quite sharp enough on the chine. Mr. Cornish's Reserve heifer is a smart silver-grey fawn, bred in the island. Mr. Ashcroft's first yearling, referred to above, is a great beauty, likely to rival her dam, the second-prize three-year-old. Yorkshire herds got in at last. Lord Feversham's and Lady Hawkes's second and third yearlings, bred by the exhibitors, promise fairly for the future.

Judges' Report of the Jersey Cattle.

Taken as a whole, there is nothing remarkable to report in reference to the Jerseys exhibited, although it must be noted that some classes were vastly superior to others. Perhaps this may be accounted for by the fact that in the northern district this breed of cattle is not so generally kept as it is in the south. The total entries numbered 72.

In CLASS 112—*for Bulls born from* 1877 *to* 1881 *inclusive*—there were nine animals. No. 957 took the first prize. This bull shows good quality, and has some good symmetrical points, but he lacks fineness to some extent. The second prize is of well-bred appearance. No. 956, the third prize, was shown with too much flesh, which tended rather to spoil than improve his appearance. The reserve number went to No. 963, a useful bull.

CLASS 113. *Bulls calved in* 1882.—This class was represented by ten entries, of which No. 974, a promising young animal, took the first prize; No. 967 the second; and No. 969 the third—this bull, though somewhat deficient in form, is notably rich in quality. The reserve was given to No. 972.

CLASS 114. *Cows in-Milk or in-Calf, born in* 1879, *or before.*—This is the largest class, there being nineteen entries, and among these some good specimens of milking cows. No. 979 took the first prize; No. 977 the second; and No. 981, the third; No. 976 being the reserve. Nos. 978 and 983 were highly commended. All these are excellent animals. Exhibitors should clearly understand that the Jersey is essentially a dairy-cow, and that however well shaped she may appear, if she fails in her milk and butter-producing properties, she must be discarded. It is useless to exhibit large fleshy animals, or yet animals with bad udders; these can never obtain distinction in the prize-ring.

CLASS 115. *Cows or Heifers in-Milk or in-Calf, born in* 1880.—There were only seven entries. The prizes were awarded as follows:—No. 1001, first prize; No. 997, second; and No. 1010, third. The reserve, No. 998. Though a small class it was one of the best.

CLASS 116. *Heifers born in* 1881.—Entries fifteen. The first prize, No. 1002, is a good heifer, and so are Nos. 1005, 1003, 1001, which took second and third prizes, and reserve number respectively.

CLASS 117. *Heifers calved in* 1882.—In this class there were twelve entries, and they were on the whole a decidedly inferior lot. With one exception, the difficulty experienced was in finding animals for the prizes offered. In this class there were heifers exhibited which, through over-feeding, had lost the most important features and essential characteristics of the breed. There was also one which, through having the foundation of a very ill-shaped udder, lost its chance for a prize, but which otherwise might have been considered a good animal, and might have been entitled to the first place in the class.

C. P. LE CORNU.
G. W. BAKER.
C. STEPHENSON.

DAIRY CATTLE.

There was nothing of surpassing merit in these classes. The detailed Report of the Judges is appended.

Report of the Judges of Dairy Cattle.

CLASS 118.—Twelve animals put in an appearance in competition for the handsome prizes offered by the York Local Committee. There was naturally great diversity of breed and character under the open conditions of the competition. We had no difficulty in selecting for the first prize No. 1031, an excellent specimen of a rent-paying cow, combining with perfect milking characteristics a well-developed frame, and every indication of breeding highly profitable grazing stock. The second prize we awarded to a fine old white cow, of true Shorthorn type, and excellent milking qualities. She bears evidence of having been a highly profitable animal, and five years ago she would have been bad to beat. The third prize we awarded to a very useful general-purpose young cow, which, though not then in milk, bore evidence of being good at the pail. For the reserve number we selected a very thin cow, standing over an extraordinary udder.

CLASS 119.—This class greatly disappointed us. We hoped to have seen twenty-five or thirty competitors. Instead of this, only two *Heifers* entered the ring, and neither of them came up to our ideas of a Royal first-prize dairy heifer. We therefore awarded only the second prize to a pretty little Shorthorn, endowed with moderate milking properties.

WILLIAM STRATTON.
THOS. BOWSTEAD.

SHEEP.

Excepting Shropshires, the display of sheep was not quite equal to that of some former years; but on the whole it was a full average, and clipping seemed to have been better accomplished than formerly.

LEICESTERS.

Mr. Hutchinson endeavoured to keep the first place in the Two-shear Ram Class with a symmetrical animal that was the first shearling at the Yorkshire Show last year. A big, wide-ribbed, nice-handling sheep of Mr. George Turner's, bred at Thorplands, was victor. He showed good character and fair quality, and covered more ground than the handsome if rather short Catterick sheep that followed. The latter has a good leg of mutton, fair wool, and turns pretty well. The Messrs. Linton's third or Reserve sheep, of their own breeding, is wealthy both in wool and mutton, and several serviceable stylish sheep were commended. Numbers were greater in the Shearling Class, where Mr. Hutchinson was triumphant with a finely balanced, tastefully shown sheep, sired by the second shearling at the Derby Royal, and third two-shear at Reading. Two from the same flock were commended, and the three displayed symmetry and quality which could not be overlooked by the judges. Mr. Wm. Brown's second is true in form and of good character, with a well-covered top and good wool. Mr. Jordan's third and fourth, bred, like the other winners, by the exhibitor, have splendid wool, nice heads, and good covering below. Their ribs are nicely rounded and their style is inviting. The same exhibitor's first Shearling Ewes were well clad under, wealthy to handle, and lively in head and ear, with excellent skins. The

Messrs. Linton's second were large-framed nicely furnished gimmers; and Mrs. Herrick's commended ones were well brought out.

COTSWOLDS.

So far from the stronghold of this heavy breed, the display was all that could have been expected. Four good tups tried their mettle in the Two-shear Class, all bred and shown by the two exhibitors. Mr. Swanwick had the best of the encounter, as he has often before now had with large, lengthy, long-woolled specimens. His first tup had thickened since the Bridgwater Show at the end of May, where he was only Reserve. Size and quality had both increased in the interval. The Messrs. Gillett's second ram, also full of substance and heavy woolled, was first at Bridgwater. There was not, however, much to choose between the pair. Shearlings offered stiffer competition. There the visitor found eight or nine very fine sheep from the flock of Mr. Thomas Brown, of Marham Hall. They could not all get tickets, but they left very little to their opponents, which is saying a great deal, when it is remembered that the antagonists were Messrs. Swanwick and Gillett. The four leading tickets were secured by Mr. Brown, leaving only a high commendation to Mr. Swanwick. The Marham prize shearlings combined size and wealth of mutton with good contour and true Cotswold character, while the dry climate of the East had favoured the preparation of Mr. Brown's sheep for the exhibition. They were very creditably shown indeed. The Messrs. Gillett's shearling ewes had no opposition, but both pens were so level and so good that the two money prizes were awarded, and opponents would have had hard work to win.

LINCOLNS.

A larger show of these grand wool-growers was expected. Quality, however, left very little to be desired. Mr. Robert Wright and Mr. Henry Smith had a pair each in the Two-shear Tup Class, all bred by the exhibitors and all good. They got slice about of the honours; Mr. Wright leading. The latter's sheep proved admirably under the hand, had splendid wool, and was first at the Lincolnshire Show and at the Yorkshire last year, as well as first at Lincoln this year. Mr. Smith's second sheep has great thickness of mutton on the rib and back, and had not been shown before. Though other competitors appeared in the Shearling Tup Class, the two just named got all the tickets, except one commended. Mr. Smith turned the tables here, getting first with his level, massive, stylish ram, which was first at Lincoln and Doncaster a week or two before. This shearling was a pronounced victor. As at both those Shows, however, Mr. Wright followed with a sheep of great carcass and fine wool. In a select Class of Shearling Ewes, Mr. Wright won with his wealthy handsome gimmers, which topped their class at Peterborough, Doncaster, and Lincoln. Mr. Pears, with his second Lincoln pen, followed the Norton Heath lot at a respectable distance. All the prize sheep—indeed, all the entries, with two exceptions, in the Longwoolled Classes—were bred by the exhibitors.

As Leicesters, Cotswolds, and Lincolns were judged by one trio, the Judges' Report of the three breeds may be given here.

Judges' Report of Leicesters, Cotswolds, and Lincolns.

LEICESTERS.

CLASS 120 was very good, but one or two good sheep in other respects were deficient in wool underneath.

The *Shearling Rams* were well represented.

Shearling Ewes were very good; we commended the whole class.

COTSWOLDS.

CLASS 126. Only three entries, and call for no particular comment.

CLASS 127 was well represented, and contained some very useful sheep.

LINCOLNS.

Some very good sheep, but short in numbers.

SKELTON JEFFERSON.
THOS. PORTER.
CHARLES CLARKE.

BORDER LEICESTERS.

This breed was under the average, alike in numbers and merit. One two-shear ram was entered, but not sent. Half-a-dozen shearlings were not difficult to judge. Mr. Wood's first sheep has a good skin and fair character, but he was not in high condition, fortunately, shall it be said, for the man who uses him this year. Mr. Twentyman's second has a well-covered head and fair coat, but he is not very strong in the neck. Mr. Whyte's commended tups were only moderately good specimens; the first gimmers, however, had good strong coats and fair character.

The other Longwoolled sheep referred to in the subjoined Report were not very noteworthy, excepting a pair of Merino rams bred and owned by the Duke of Manchester, and of Australian extraction.

Judges' Report of Border Leicesters and Longwools.

The *Border Leicesters* were a very poor show, and badly represented, probably owing to the restrictions.

The *Longwool Sheep* were few in number, but of good quality.

George Rea.
William Ford.

Wensleydales.

This valuable crossing breed made a good appearance. The first winners, and even some other lots, were stylish upstanding sheep, with strong coats and moderately fleshed backs. A cross between these tups and half-bred or blackfaced mountain ewes, in the northern counties of England, produces capital lambs. Mr. Lambert's first two-shear ram, bred by Mr. Joseph Row, Carperby, though somewhat hard on the top of the shoulder, was of splendid quality. Mr. Willis's second ram is bigger, but not so sweet. Mr. Lambert's first shearling was perhaps the best specimen of the breed in the Show, being shapely and uniform in coat and covering. He was bred by Mr. Pilkington. Mr. William Raw's second is well-grown, good in wool, and was bred by the exhibitor. The prize gimmers of Mr. Pilkington are big sappy sheep, with open wool and better covered heads than the tups.

Judges' Report of Wensleydale Sheep.

In the *Two-Shear* Class 132, the *Ram* that obtained the first prize we considered of extraordinarily good quality, but somewhat light in bone. The second was big in bone, but not so good either in quality or wool.

In the *Shearling* Class 133, the first prize was awarded to a *Ram* good in every respect. The second prize was a very useful sheep, but somewhat short of quality. The whole class was worthy of notice.

Pen of five Shearling Ewes, Class 134.—The first prize was awarded to five ewes full of bone and size, but somewhat short of quality. The same remark applies to the second prize.

The *Wensleydale Sheep* are a most useful class, and the first prize *Rams* in their different classes are splendid animals to cross with either the half-bred or blackfaced mountain sheep.

John Ingleby.
Robert Hutchinson.

Oxford Downs.

This improved and improving breed, happily, was not so deficient in quality as in numbers. Mr. Brassey's pair of two-shear rams, bred by the exhibitor, are descended from former Royal winners, and have plenty of size, with nice heads and fair coats. The first shearling from the same distinguished flock is a good specimen of early mutton and heavy growth of wool, bred by the exhibitor. Mr. Treadwell's second and third rams are well furnished both with mutton and wool, and stand nicely on their legs. Mr. Brassey's shearling ewes were beautifully brought out. The growth of bone, flesh, and wool was remarkable, while the symmetry and quality attracted the eye of Mr. McLennan, who purchased both pens at high prices for exportation to Buenos Ayres. Mr. Frederick Street's third gimmers have plenty of size, but not the finish of the first and second pens.

Judges' Report on Oxfordshire Downs.

After the prominent position taken by this breed of sheep at the Meeting held at Reading last year, we regret that so few entries came before our notice to-day, but doubtless the long distance from the districts in which they are mostly bred has been the cause of such a small display.

We feel there is nothing of especial merit in the various classes to call for any particular remarks, but undoubtedly the best specimens are amongst the two prize pens of shearling ewes.

A. F. Milton Druce.
W. D. Little.

SHROPSHIRES.

Of this rising and already very popular breed there was a better representation than of any other fleecy variety. The judging of the ninety odd entries of Shearling Rams, for instance, was a severe task; but the gentlemen in office bestowed great care and no little time on their duties. The Two-shear Class was not so large nor so difficult to judge. Here Mr. Thos. J. Mansell brought further honour to the Dudmaston flock. His beautiful and rarely covered little sheep, which was first in a monster Shearling Class at Reading, and whose letting price last season was 165 guineas, came out to try his fortune again, in company with a more lengthy sheep from the same flock, but bred by Mr. C. Wadlow, Bridgnorth. The pair were invincible. Opinions differed, however, as to which should be first. The Judges gave the preference to the greater size and gaiety displayed by the Bridgnorth sheep. His skin was not quite so good as that of the second, and the latter had the better rump and more quality, but the other sheep had the best of it in front. Some tup-breeders who are good judges would prefer to use the second; yet the first is a great gay sheep that cannot be readily set aside. Mrs. Barr's third sheep, bred by the exhibitor, has a covering of head that would please the most fastidious, while his size and character merited his position. Mr. Loder's fourth displays good breeding, and is descended from Mr. Beach's stock.

Ten of the ninety-two pens for Shearling Rams were empty, but there was ample material left to perplex the Judges. The struggle closed, as in the previous class, with a double victory to one exhibitor. It was more remarkable in the one case than the other, however, as the shearlings were much more numerous than the two-shears and more nearly equal in merit. Lord Chesham's pair, bred in the old Latimer flock, accomplished a wonderful performance. The first one was as ripe almost as a pear. On the back he handled charmingly; his rump was neat and well covered; his head attractive, bone fine, and character perfection. Since then he has been purchased by that good all-round judge, Mr. Randell, at 100 guineas. The sire of the first shearling was "Dudmaston," a celebrated sheep of Mr. Mansell's breeding. The second, whose sire was also "Dudmaston," is bigger than the first, but he is not quite so plump and full of quality. Both have good skins. The second may beat up on the first by another year, being a stylish, handsome, outcoming sheep. He has been purchased by Mr. Darling, of Beaudisant, Lichfield, at 100 guineas. The other two of the four sheep from the same flock were commended, and a beautiful quartette they were. The third sheep, from Hattons, bred by Mr. Beach, was not in very high condition, but he is naturally an animal of great substance and true type. He is wide between the ears, long in the quarters, splendid in the neck, though not very well sprung in the rib, while he might stand a little better on his hind-legs. Altogether he is a stylish sheep of grand character. Mr. German's fourth sheep had a truly covered head, and well-fleshed carcass. He was sired by a Dudmaston sheep, and is evidently well bred. The Dudmaston shearlings were not up to the usual standard of excellence. They were rather small, and not so forward in condition as they generally are, but there was no defect in type or character. Mr. Mansell, Jun., got a highly commended ticket for a level, well-brought-out, lengthy sheep; not, however, very strong in the neck, but nicely covered in the head. He was commended for a sweet sheep, carrying good wool and a well-covered head. The Duke of Portland's commended pair look like making good old sheep. The commendations extended over sixteen, and did not even then embrace all the good sheep.

Shearling Ewes, if not so large an entry as Shearling Tups, were nevertheless very fine, and nearly uniform in type and quality. Mrs. Beach's first pen are big sappy gimmers, bred by the exhibitor. They resemble one another almost as closely as five peas would do, and have beautiful heads and striking character and quality. Mrs. Barr's second are almost similar in type, pleasing to the eye, and satisfactory under the hand. The Oaklands third pen exhibited the striking features of that fine old flock. Lord Chesham's Reserve gimmers are very sweet, and ten good pens were commended. More than half the twenty-five pens were therefore ticketed, and deserved the honour. The Shearling Classes of both sexes were exceptionally meritorious.

Judges' Report of Shropshires.

Class 140. *Two-Shear Ram.*—This class was short in number, only seven animals being exhibited. The prize animals fairly represented the breed.

Class 141. *Shearling Ram.*—It gives us great pleasure to bear our testimony to the excellence of this grand class of sheep, represented by eighty-seven entries. They have never previously been more uniform in character. The first- and second-prize animals show beautiful form, and have well-covered frames. The third-prize sheep is possessed of great style, and carries a strong head and neck. We felt it our duty to highly commend and commend no less than sixteen entries.

Class 142. *Pen of Five Shearling Ewes.*—This class contained more than twenty entries, comprising over one hundred animals, and was generally admired. Mr. Beach's first-prize pen were of beautiful style and quality, possessing the chief characteristics of the true Shropshire. The second-prize pen were of uniform character with well-developed frames.

Altogether, we consider the exhibition equal to that of any previous year.

John Coxon.
Thos. Instone.

SOUTHDOWNS.

Among these there was a great deal of nearly equal merit. The similarity of type rendered judging very difficult, and the destination of the tickets somewhat uncertain. The most remarkable event in this section was the comparative failure of Lord Walsingham's sheep in the various classes to get any of the money prizes. Only commended tickets reached his Lordship's animals this year, which is a very unusual circumstance. The first two-shear ram, bred at Sandringham, and exhibited by His Royal Highness the Prince of Wales, is a very handsome ripe animal; he is mutton almost from heels to ears, and was brought out very tastefully. The dam was a prize-winner, and the son was first at Bridgwater, first and champion at the Norfolk County and Winchester Shows, and was successfully used in the flock last season. At Reading last year he was second to a tup of Lord Walsingham's, now passed over. Mr. J. J. Colman's second, bred by the exhibitor, is a compact, richly furnished, deep-carcassed sheep, and a former winner. The Goodwood third ram, bred by the noble Duke, is shapely, and carries his mutton very well. For his weight of bone he displays a considerable quantity of fine handling meat, and very fair wool. Mr. Carew-Gibson had to be content with a highly commended ticket for a substantial two-shear ram. He, however, was more fortunate, because probably more formidable, in the Shearling Class, getting second and third in good company. His second shearling is a lengthy upstanding stylish sheep, with a well-carried head, and fine quality along the back. The third is a smart sheep, and has been, like the other, a winner at some district Shows. Mr. Chapman's first shearling was the winner at Bridgwater, has a splendid rib, shoulder, and chest, and is of superior quality; he is, in short, a beauty, and was not grudged his place. Sir Wm. Throckmorton's second at Bridgwater was unable to get a place; but one from the same flock, not ticketed at the Bath and West of England Show, was commended at York. Mr. Colman's fourth sheep is rather smaller in size than several of the others, but in symmetry and quality he was not wanting. The Duke of Richmond and Gordon's highly commended pair from Goodwood, the place of their birth, show much of the fine old Southdown characteristics. Six very even sheep of Lord Walsingham's were highly commended. Though, comparatively speaking, in the shade for the time, the Merton sheep were greatly admired for their true character and style. The Prince of Wales's highly commended ram is a little beauty. Fourteen in all were commended.

All along the line Lord Walsingham's bad luck seems to have followed him. In a good Class of Shearling Ewes the most that the Merton well-bred pen could get was a highly commended card. His Lordship's gimmers, however, were hardly as well covered as some of the rival pens. Mr. Colman's winners were abreast of the others in respect of quality, wealth of mutton, and lightness of offal. Their uniformity of type, too, enlisted the admiration of visitors. Mr. Chapman's second were well matched, and had been very carefully tended. The third and fourth pens were composed of well-bred and generally well-furnished gimmers.

HAMPSHIRE DOWNS.

The exhibitors of this valuable early maturing sheep were few in number. Mr. Alfred Morrison carried the three leading tickets for Aged Tups, all bred by the exhibitor, and of considerable size and good covering below. The first one has a grand neck, strong rump development, and fair style. First and third for shearlings also awaited Mr. Morrison. The winner has the symmetry and quality of a Shropshire, with greater size. Mr. Barton's second has good wool, and a heavy carcass of fine mutton, with fair character. Mr. Parson's first shearling ewes handled well, are good in the legs, and nice in the head. Mr. Lambert's second lot, bred by the exhibitor, are nicely matched and good in coat.

Report of the Judges of Southdowns and Hampshire Downs.

SOUTHDOWNS.

The classes of *Southdowns* were well filled—all the principal flocks being represented—considering the great distance the Show was held this year from the South Downs.

CLASS 144. *Shearling Rams.*—There was a large show in this class, numbering thirty-four entries. The Judges had very great difficulty in awarding the prizes, there being such uniformity of character in the animals exhibited.

CLASS 143—*Two-Shear Rams*—comprising seventeen entries, which the Judges considered very representative, many of the older flocks being amongst the number.

CLASS 145—*Five Shearling Ewes*—comprising ten entries. This class the Judges commended, considering they were most evenly matched.

HAMPSHIRE DOWNS (badly represented).

CLASS 146. *Two-Shear Rams.*—There were eight entries; only five exhibited. First prize a remarkably good sheep.

CLASS 147. There were eleven entries; only five exhibited.

CLASS 148. Very good; only three entries.

H. HARWOOD.
JOHN G. KING.

CHEVIOTS, BLACKFACES, &C.

The collection of Cheviots was neither large nor very fine. The Messrs. Robson's prize sheep, however—and the two brothers took all the prizes—were of full average merit, including several tups that won last year, and again, since York, at Border Shows. They showed good old Northumberland blood, having nice heads, fair wool, and gaiety.

The Blackfaced Mountain Breed was pretty well represented from the Northumberland and Cumberland hills. Mr. McCracken's first two-shear ram, bred by the exhibitor, is a squarely-made-up, shapely, dark-faced sheep, with well-filled face, flat horns, and good wool. He got the cup at last year's Northumberland Show. Mr. Dodds's second has a good face, horn, and wool. Mr. Armstrong's first shearling is dark in the face, strong in the horn and wool, and well up in the body. Mr. Irving's second and fourth are stronger in coat, and fairly grown. Mr. McCracken's third is thick forward, and hard in the face and legs. Mr. Henderson's second gimmers were stronger than the first, but not so sweet, nor so hard and dark in the face.

Some useful mutton-making sheep appeared among "Other Short-woolled Breeds."

Report of the Judges of Cheviots, &c.

Cheviots were few in number, and nothing among them calling for special remark.

Black-faced Rams of both ages were good, more especially the *Dinmonts*. *Ewes* were superior of their class.

The *Suffolks* were very superior in the Shortwoolled Breed. The Suffolk *Shearling Ewes* were a very nice pen.

ROBERT PATERSON.
JOHN CLAY.

Report of the Inspectors of Shearing.

We have, as your Inspectors of Shearing, carefully looked over and examined the whole of the sheep as placed before us in the Yard, and have to report that we found them as a whole well and fairly shorn. There were a few cases we considered necessary to look over a second time; they were not, however, unfairly shorn to the same extent as in former years, and we were not warranted in recommending disqualification in any case.

The attention of your Inspectors was drawn to the use rather freely of wool shears, for dressing sheep in the Yard, and we venture to recommend that you prohibit their use.

WILLIAM JOBSON.
J. B. WORKMAN.

PIGS.

In this section, which was creditably filled, the vexed question of dentition as an indication of age was raised, though to a much smaller extent than on some former occasions. The Inspectors—Professors Brown, Duguid, and Robertson—reported that two pens of Large White Pigs and three of the Medium White Breed, as well as two lots of young pigs still with their dams—one in each of these breeds—indicated by the state of dentition that the animals were above the age stated in the certificates of entry, and they got no prizes. Many good pigs were unable to find their way into the prize list.

WHITE BREEDS.

In the Aged Boar Class of the large variety, Lord Ellesmere was invincible. His first boar is very thick, of great size and length, but only middling quality. The winner is a two-year-old; the second, also from Worsley, and bred by his Lordship, is a year older and bigger, but not strikingly fine. His Lordship was fairly beaten in the one-year-old class of boars by an evenly grown pig of good quality and great scale, owned and bred by Mr. Duckering. Lord Ellesmere's second is a well-furnished level pig of moderate quality. The Breeding Sows were relatively better than the Boars, and formed a grand class. Lord Ellesmere got first for "Queen," a three-year-old of his own breeding, and a former winner. She is very heavy and full of quality. His Lordship's third sow "Countess," bred by the exhibitor, and also three years old, is evidently a splendid breeder, and lacks neither dimensions nor quality. That Mr. Nuttall's second sow, a two-year-old of his own breeding, was good enough to come in between such a fine pair as Lord Ellesmere's, is convincing testimony of her unquestionably high merits. Five were commended. Pigs of the produce of 1883 were not so good. Yet Lord Ellesmere's prize lots were strong shapely youngsters, that may improve with age.

The entries in the Middle White Classes were fair, and their quality superior. Lord Ellesmere's first aged boar is "Prince," a three-year-old son of "Peter," a capital getter, and grandly furnished. His features at once commanded attention. Mr. Ascroft's second is a well-fleshed pig, but not very close on the winner. The three pigs commended were of full average quality. Lord Ellesmere's first and second one-year-old boars are symmetrical, and carry a great load of meat for the size of their bone. They were bred at Worsley; the second having been sired by the first three-year-old boar just described. The Class of Sows was not large, but very good. Excellent as it was, Lord Ellesmere's three-year-old "Princess," of his own breeding, and sired by "Peter," was a positive winner. She is not quite new to fame, and is of unusual features and quality. She is full sister to the first-prize boar, and is a valuable breeder. Mr. Dixon's second is a three-year-old of great substance, and was bred by Mr. Dickson, Crocky Hill. Lord Ellesmere's prize young pigs, sired by "Peter," would have given a good account of themselves in stiff competition, which, however, they had not to encounter.

The Small White Breed Classes were well filled with plump grand meat-producing pigs. The Judges, however, it will be observed, were of opinion that many of the animals were verging on the Middle Breed. Messrs. Wilson, Crosby and Co.'s first is a beautiful two-year-old, bred by Mr. Sanders Spencer, and full of the best character. Lord Ellesmere's second, of his Lordship's breeding, is a twenty-months-old, of rare symmetry, and great thickness of flesh and fat. His Lordship's first and second one-year-old boars are compact and full-fleshed, with fine bone and great quality. They are full brothers, and are by the same sire as the second boar in the previous class. The third pig, owned by Wilson, Crosby and Co., followed very closely, and was bred by Lord Ellesmere after the same sire as the first and second. The first and second sows, nearly two years old, from Worsley Hall Home Farm, were first-class specimens, having extraordinary quality and great wealth of carcass. The only exhibit in the Young Pig Class was Mr. Nuttall's moderately good lot, to which only second prize was awarded.

Judges' Report of White Breed Pigs.

Class 157. First prize awarded to a good pig, a little coarse in quality; the remainder of the class were moderate.

Class 158. First prize was a good pig all round; remainder were very poor.

Class 159. First and second pigs were very good and full of quality, also the reserve number. This class was very good, deserving a general commendation.

Class 160. A bad class.

Class 161. First prize was full of merit, superior to the remainder, which included useful animals.

Class 162. Prize went to a fair good pig.

Class 163. The prize *Sow* in this class is one of the best animals we saw, and well deserved the premier honour in a small class of good quality.

Class 164. No competition. The only pen exhibited was of good quality, and was awarded first prize.

Class 165. Only three pigs were of the true type of the Small Breed, the remainder of the class approaching the Middle Breed.

Class 166. Same remarks in the preceding class will apply to these.

Class 167. First, second, and reserve number were of extraordinarily great merit. The remainder of the class were good, but we thought they were showing a tendency to the Middle Breed.

Class 168. A poor class, only one pen being present, to which the second prize was given, not having sufficient merit for the first prize.

John Angus.
Peter Eden.
Joseph Smith.

Black Breeds.

The Aged Boar Class of the Small Black Breed was indifferently filled. Mr. Benjafield's first boar, two years old, and bred by the exhibitor, is a firm-fleshed, handsome animal, decidedly ahead of his competitors. The Duke of Hamilton's second is a twenty-one-month-old fairly furnished pig, bred by the exhibitor. His Grace's first one-year-old boar is well set on his legs, broad in the back and full in the hams, with splendid breed characteristics. Major Dod's second is a gay, strong-backed, massive pig, bred by the exhibitor. The others in the class were so good that the Judges bestowed a general commendation upon them. The Breeding Sow Class was of full average merit, though the Judges regretted the absence of litters in so many cases. Mr. Smith's first is "Princess," a two-year-old, well-grown, handsome sow of his own breeding. The Duke of Hamilton's second, also two years old and bred by the exhibitor, is a well-proportioned animal of good character. The Duke's first young pigs are of extraordinary promise, and would have been difficult to beat in any company. The others in the class were fairly good.

Probably the best represented breed was that of Berkshires. Mr. Russell Swanwick's first two-year-old boar, bred by the exhibitor, is a very fine pig, full of the cherished Berkshire features, and splendidly shown. Mr. Humfrey's second is a massive shapely pig, not so nice about the head as the winner. The third and fourth pigs had several very good points, as well as some defects, as will be seen by the Judges' Report. The victor in a large Class of One-year-old Pigs, belonging to the Executors of the late Mr. Stewart, is a very handsome pig, with fine hair and quality. He was fatter than Mr. Tombs's second, which is an animal of rare shape and plenty of character, bred by the exhibitor. Mr. Swanwick's Reserve pig, if not big, is very well bred, and handsome, with about as much gaiety as a pig could have. Of this breed, again, females were superior to males. The Sows were an admirable lot. Mr. King's first, only eighteen months old, was faultless, and had astonishing quality and symmetry, considering that she was heavy with pig. Mr. Tombs's second sow, two years old, and bred by the exhibitor, had less bloom, which was attributed to her having recently nursed a litter of pigs. The commended sows were of good Berkshire character, with plenty of size. Young pigs were exceedingly good, and the whole class was commended. Mr. Willis's first had very little pull of Mr. Swanwick's second. Both lots were first-class, and the Judges hesitated, but eventually gave preference to the greater equality of the first lot. Some good porkers were shown successfully in the "Any Other Breed" classes.

Report of the Judges of Black Breeds of Pigs.

Class 169. With the exception of the first-prize animal, a moderate class.

Class 170. The whole class was highly commended; the first-prize animal was of very good true type, and the second was a well-topped pig.

Class 171. As in previous years, there was an absence of litters, which is to be regretted, as giving less opportunity of judging of the merits of breeding sows.

Class 172. With the exception of the first prize, which was a remarkably good pen, nothing specially to notice.

Class 173. Good class; first prize an extra good pig; second, very heavily fleshed, but with a coarse head; third was somewhat coarse in hair and bone; highly commended had excellent quality, but with drooping quarters and small hams.

Class 174. Very good class, though the first prize was, if anything, fat for work; the second pig was of a thorough good type and in working condition, which is much to be desired; the reserve number, though not large for his age, was very neat and stylish.

Class 175. A grand class. The first prize was perfect in all points, and heavy in-pig; the second was in somewhat rougher condition, due to having recently reared a litter of pigs; third, or reserve, was an excellent model, and well merited a prize, though not as yet having bred. This class especially deserved a third prize.

Class 176. The whole class was highly commended. First and second pens were of nearly equal merit; the former very level, giving them the advantage.

CLASSES 177, 178, 179, call for no special remark.

CLASS 180. First prize the best pen of the age that came under our notice.

RICHARD FOWLER.
JAS. EDWARDS.

Report of the Inspectors of Dentition of Pigs.

Having examined the pigs in Pens 1481, 1482, 1503, 1504, and in 1508, we are of opinion that the state of dentition indicates that the animals are above the age stated in the Certificates of Entry.

We are also of opinion that the young pigs with the breeding sows in Pens 1472 and 1505 are above the age of two months.

WM. ROBERTSON.
WILLIAM DUGUID.
G. T. BROWN.

DAIRY PRODUCE.

BUTTER.

This valuable article of diet was an object of attraction, and as to quality, of great admiration. The Judges very properly gave the display of Butter a high character.

Report of Judges of Butter.

We, the undersigned Judges of the *Butter* and *Cheese* Show, beg to express our great satisfaction with the exhibits of sweet butter, and have to say it has taxed our discrimination severely to determine which was the best, and regret we cannot exercise our powers in further rewarding the numerous competitors and exhibitors.

We also regret having to disqualify No. 15, through having salt mixed in it.

G. W. BURROWS.
JOHN ROBINSON.
ANTHONY GRAHAM.

CHEESE.

July is not the best month of the year for showing cheese; nevertheless, a better display might have been expected. The prize samples were fair for the period of the year, but the section, as a whole, was not very creditably filled.

Report of the Judges of Cheese.

With respect to the exhibits of *Cheese*, we regret to report very small show in that department, and we had to exercise our powers of ingenuity to give any prizes at all. We consider it is a great reflection upon Yorkshire to have made such a small and poor exhibit, especially when we see the great advance made in Scotland and other countries, where the make has considerably improved, and the tendency is still in that direction.

G. W. BURROWS.
JOHN ROBINSON.
ANTHONY GRAHAM.

BEE-KEEPING, &c.

The Apiarian department was thronged with interested visitors throughout the week, and the movements of the "busy bee" were watched very closely.

Report of the Judges of Hives, Honey, and Bee-keeping Appliances.

The exhibition of Bee-Hives and Bee Appliances showed a decided advance upon former years, many of the Hives entered for competition being excellent in construction as well as reasonable in price. Bee-keeping is extending so rapidly in every part of England, and its benefits, not only in increasing the supply of food raised in our own country but also in aiding the fertilization of flowers and fruits, are now so generally recognised, that the winner of a prize at the Royal is certain to sell a large number of hives, and the competition in consequence is very close. The amount of honey exhibited was not so large as it would have been had the Show been held later in the season, and scarcely afforded an index of the large harvest that has been secured this year. The public interest in the various Bee Appliances, Manipulations and Lectures in the Bee Tent was very great. Many persons had travelled long distances to learn all they could about bees, and remained in the Bee Tent almost all the day. Instances are becoming common of tenant farmers who are adopting bee-keeping as a part of their ordinary occupation, particularly if they grow white clover, mustard, or other plants from which the bees obtain honey in any quantity, and some of these are said to secure good profits. The increase in the supply appears to be creating a demand, and as the honey obtained under modern and improved methods is more attractive and more marketable, there is less difficulty in securing a sale at a remunerative price.. The assistance rendered by this Society to the British Bee-keepers' Association enables the latter to bring the benefits of rational and modernised bee-keeping before a class of the community whom otherwise the Association could scarcely reach, and in this way the agricultural interest is directly benefited. The Addresses delivered during the Show at various intervals each day by experienced lecturers, and their practical illustrations of the management of bees, together with their explanations in reply to inquiries, diffuse an amount of information, and moreover create an interest, which justify the hope that before many years bee-keeping in England will not be inferior, either in skill or means, to the art as practised either on the Continent of Europe or in America.

Edward Bartrum, M.A.
William N. Griffin.
John M. Hooker.

XXIV.—*The Yorkshire Farm-Prize Competition*, 1883. By Thomas Bell, of Hedley Hall, Gateshead-on-Tyne.

The area of competition for the liberal prizes jointly offered by the Local Committee and the Royal Agricultural Society of England for the best-managed farms in the district of the York Meeting was confined to the county of York. This, the largest county in England, is by no means a limited area; it is as large as any other two counties in Great Britain; nearly as large as

Wales, more extensive than many German dukedoms, and very nearly as large as modern Belgium. The extent of the whole county is 5979 square miles. The turnpike and highway roads have an aggregate length of nearly 11,000 miles.

Yorkshire does not depend on its extent alone for its greatness. It may fairly be said to be rich in all that makes a county famous. It abounds in historical associations. The ancient Britons had a town at York. For three hundred years York, or Eboracum, was the great Roman city in Britain. The Cæsars, then Emperors of the world, during part of that time held their court at York, which we are told was the scene of imperial marriage festivities as well as royal obsequies. The district suffered greatly for its determined opposition to William the Conqueror. All down through the ages, whenever wars in England are chronicled, we almost invariably read of battlefields in Yorkshire.

Not less interesting is this district to the student of ecclesiastical lore. The special glory of York is its cathedral. Well may the natives be proud of York Minster, it is a structure of almost unrivalled grandeur and dignity. Strangers driving through the county are again and again delighted by dropping down on the ruins of an abbey surrounded, as they generally are, by the richest of green pastures. What visions rise to the eye of the imaginative mind round the remains of those once magnificent piles!

The modern history of the county, though more prosaic than that of the remote past, is not less famous. The arts of war have fortunately given place to those of peace. The manufactures of Yorkshire are now of world-wide importance, and on their prosperity depends very much the welfare of British agriculture. The woollen mills of Leeds, Bradford, Halifax, Wakefield, Huddersfield, &c., have not participated in the general revival of trade throughout the country to the extent that the exigencies of the English flock-masters would seem to demand. We are told that the changes of fashion have created a demand for fine short-wools, such as are grown in the colonies, and that the English long-wool is at present an almost unmarketable commodity. Certain it is, that the present price of wool is a sore subject with many English farmers, more especially those who have old stocks on hand. So long, however, as the mills keep going, the industrial population creates a demand for other products of the farm, which, though it does not compensate the farmer for the fall in the price of wool, maintains that of other agricultural commodities.

The immense coal-fields of the West Riding, said to extend over not less than 600 square miles, have no doubt been the chief factor in developing these industrial enterprises, which have multiplied to an enormous extent the population of many of the hills and valleys of West Yorkshire.

The mineral resources of the county are as varied as they are extensive. The Cleveland hills have been called the "new iron-fields of England." Middlesborough has grown as rapidly as a Western American city, and is now the metropolis of the iron-trade. Lead-mines have been successfully worked in the moorlands and in the dales. Deposits of alum-shale have given rise to manufactures of alum near Whitby, Lofthouse, and Guisborough. In that district we find what is perhaps the most beautiful of all its products, viz. "Whitby jet."

The most popular attraction to those who live outside the county is the enjoyable summer resorts to be found both inland and on the coast. Scarborough is pronounced "the queen of watering places." Nature and art have combined in rendering the surroundings of her coast as charming and enchanting as the most ardent votary could wish. Redcar, Whitby, and Bridlington have a smaller radiance, but have, nevertheless, a fair quota of admirers. Harrogate and Ilkley are famous for their mineral springs, and are not so much dependent on "the season" for their visitors.

Owing to the great extent of the county, it has been divided into three parts; the East, North, and West Ridings, which are really, for many purposes, shires in themselves. The name of one of the varieties of areas with which England is blessed is known in the county as a "wapentake," of which there are twenty-six in the shire. This word is not used further north, nor have I heard of it except in Lincolnshire. It is said to be used in place of "hundred," and is derived from "wœpen," a weapon, and "tæcan," to teach.

Mr. Coleman, in his exhaustive report to Her Majesty's Royal Commission on Agriculture, treats of the county in seven divisions, "according to well-marked surface geological characters," viz.:—No. 1, Holderness; No. 2, The Wolds; No. 3, The Oolite Series; No. 4, Vale of York; No. 5, Magnesian Limestone; No. 6, Coal and Iron-fields; No. 7, Mountain Limestone. In that truly admirable report, the geological formations, physical outlines, and general agricultural features are so well described, that any attempt in that direction in this Report would certainly suffer by comparison.

The varieties of soil, climate, and elevation, have, as a natural consequence, been productive of systems of farming differing from each other as widely as any one system of English farming can differ from another. The large arable farms of the Wolds of the East Riding,—where sheep are looked upon as having "golden feet," and where straw in some cases is a nuisance difficult to be got rid of,—contrast strangely with the grazing farms on the hills and in the dales of the West Riding, where the plough is an obsolete implement, and where cattle are treated to the roughest prison allowance in the matter of beds, having to rest their bodies on the bare stones.

Journeying through the East Riding along the Vale of York, by rail from York to Hull, the traveller will notice a range of hills to the left, running apparently parallel to the railway. These are the Yorkshire Wolds, which extend from Hull to Scarborough, and are famous in the annals of British agriculture.

The district, which is bounded by the Humber on the south, the German Ocean on the east, and the base of the Wolds on the west, is called Holderness, or "Hollow-derness." Much of this district, from Hull along the banks of the Humber, is warp-land reclaimed from the sea; and, though heavy strong land to work, in favourable seasons it grows very good crops.

The highest point in Holderness is only about 100 feet above the sea. On these higher grounds the soil is more friable, and is well adapted for growing roots. In driving through this district around Hedon, the Judges found the best grain-crops that they met with in Yorkshire. Many of the farms seemed well laid out, carefully fenced, with suitable buildings, and a good proportion of excellent grazing land. Mustard is grown for the mustard mills to some extent in this district. The Judges had their attention directed to some fields where the crop was in flower; but in no case was it grown on a competing farm, nor had they before them in any instance any *spécialité*, such as liquorice, chicory, &c., although in some districts these plants are extensively cultivated.

It will be readily inferred—the soil and situation of the Wolds being so different from those of Holderness—that the systems of agriculture pursued in the two districts are equally varied. On the Wolds the motto is, "grow all the seeds you can, all the turnips you can, and all the sheep you can;" while in the deep lands of Holderness, wheat-growing and cattle feeding are the farmer's mainstay. Turnips in Holderness are almost invariably grown on the flat, sown by a drill which deposits artificial manure and seed at the same time—a safe system in a dry season; while in the Wolds the practice is to ridge with double plough, put foldyard-manure in the ridges, sow in artificial manure by hand, cover these by splitting the ridges, and deposit the seed with a double ridge-drill. All over the county the first-sown turnips had done badly; the dry cold weather in May had either prevented the seed from vegetating, or had assisted the fly to carry off the young plants. The country from Bridlington to Scarborough is, however, an exception to this otherwise general rule. Mr. Robinson, of Sands House, Bridlington, had some excellent swedes, and all along the coast the plants appeared healthy and vigorous.

Fallows all over the county bore strong testimony to the effects of the late wet seasons in the harvest of couch, which was almost everywhere being gathered. Some of the competing farms were like their neighbours in this respect. On completing the inspection of one farm, the concluding note in the book of the Judge, whose pet aversion in matters agricultural is "twitch," runs thus:—"A waste of time and loss of money inspecting such a disgracefully filthy farm." This farm has, however, some redeeming features.

Notwithstanding the friction that has arisen in some quarters, the confidence of the tenantry in their landlords, and the mutual good feeling which prevails, were in many cases very marked. Proof of this was not far to seek, when on farm after farm the Judges found substantial permanent improvements in the shape of buildings, fences, draining, road-making, &c., done in no meagre fashion, entirely at the expense of the tenants without any more security than is afforded by six months' notice to quit. Yearly tenancies, so far as came under our notice, seem to prevail almost universally; notwithstanding which, the farmers have expended much more capital and labour than is usually done by tenants, the cases of Mr. Hutchinson and Mr. Watson being remarkable examples. Though not carried to the same extent, the same improving spirit prevailed on several of the other competing farms. These enterprizing men dropped occasional hints that, though they had great confidence in their landlords, they would welcome a good measure to secure to tenants "fair and reasonable" compensation for their improvements.

After inspecting several improvements of this nature on one of the farms, the following conversation ensued:—

Judge.—"Have you no security or agreement for compensation for all this?"

Farmer.—"Not a penny."

Judge.—"Do you think you are safe in doing these things?"

Farmer.—"It's all right; Squire's the best landlord in the kingdom."

Judge.—"But he may die."

Farmer.—"Doesn't matter a bit, as long as there's one o' t' owld stock left."

It is much to be regretted that the liberal prizes offered failed to elicit a single competition from any of the charming "dales" in the North Riding. These dalesmen and their cattle are so famous all through the north of England, that their system of cattle-raising and general farm management could not fail to be interesting. These dales are watered by the tributaries of the Ouse, running nearly east and west. The valleys are most fertile, the hillsides afford good grazing, and the high lands, which stretch out to the heathery watersheds, make excellent sheep-runs. These sylvan-shaded streams, which purl so sweetly in the ear of the summer tourist, occasionally behave like roaring madmen, and carry havoc and destruction through the generally peaceful valleys. The river Swale gives its name to one of the richest of these dales. The flood which swept through Swaledale in the beginning of this year will be long remembered. The following account is taken from a local paper, and is not overstated:—

"The remains of a heavy fall of snow had been lodged in masses on the distant hills. On the 28th of January the rain began to fall heavily, swelling the hillside rivulets and gills to streams; and the river crept stealthily over the low-lying meadow-lands. A south-west wind sprang up, driving the rain into the bedded masses of snow, percolating through them, tossing their sides, struggling and forcing its way beneath them, till, with a roar and a rush, they entered the gills and becks like miniature avalanches, and, like wild, seething rivers, came tearing down the hills, sweeping thousands of tons of massive boulder-stones, gigantic mounds of hillock, deposits from the lead-mines which abound in the dale, millions of tons of *débris*—consisting of sand, soil, timber, trees, roots, rubble, and tangled grasses—into the Swale, making it into a boiling ocean, which rushed and roared triumphantly over the rich meadow fields, hurling down miles of strongly-built stone fencing, and adding to its heterogeneous freight of *débris* by tearing at the stout, massive bridges, till with a fiendish roar it swept them away. When the waters sank in the evening, the inhabitants beheld their dykes demolished, hundreds of yards of land had disappeared, flocks of sheep were missing, and over all the inundated meadows a pernicious deadly settlement of sand and soil was deposited, which for years to come meant ruin to their land. The poisonous nature of this deposit is caused by the lead-mines. Fields that have never been flooded before have a deposit of sand not less than three feet deep. Over one field is strewn a huge shoal of stones, the size of large turnips."

A portion of the valley of the Swale is exceptional in its land division. There are a number of large landowners in the valley, but a considerable quantity of land is in small holdings, varying from 1½ to 10 acres. A field containing 2 acres, which took the hard-earned savings of an ordinary lead-miner to the amount of 404*l.* to purchase, is so covered with layer upon layer of boulders and *débris*, that the cost of the removal is estimated at more than the land is worth!

In addition to the demolition of the bridges, long lengths of highway have been entirely swept away, and their site become part of the river bed. This state of things has given rise to an important question, which is at present arousing considerable attention, "Whose duty is it to make new roads where the highways have disappeared?" The Highway Board objects to make a new road by the riverside, because unless they embanked the river, which would involve an enormous expense, the next flood might repeat the disaster. A deviation road has been surveyed, leaving a good margin between the river and the proposed road, but the landowners will not sell the land for the purpose. The Highway Board, unlike Rural Sanitary Authorities, have no compulsory powers to take land, and consequently there is at present a dead lock. If the Highway Board were compelled to embank the river to protect their road, the embankment would, of course, protect the landowners' property. The following report of this case has been supplied to the writer by an influential farmer in the district:—

"The corpus of the road having been completely washed away, brings us under the division in the case of 'Regina *versus* Hornsea,' which was that the corpus of the road having been entirely washed away by the sea, the Highway Board was not bound to make a new road. Although basing our case on the above, our Board is willing to purchase the land, make the road, and pay all surface damage assessed by arbitration. This we could do with the consent of all the landowners, by application to Quarter Sessions, at a trifling cost; but the landowners refusing their consent, our only course is to apply for a special Act of Parliament, which, if opposed, would probably cost 1000*l.* The Highway Board considers that, seeing under the advice they have taken they are not bound to make a road at all, they are not justified in spending an entire 1000*l.* in applying for a special Act to compel the landowners. There are *no compulsory powers* to take land in the *Highway Acts, such as are granted* to *Rural Sanitary Authorities*, which is evidently an *omission*, and ought to be altered.

"Then again, under the Act of 1878 the cost of all this will fall upon the whole district, and not upon the township, so that parties forty miles away will have to pay their full quota, the same as the ratepayers in the village of Brompton.

"We estimate the full cost of this at not less than 2500*l.* to 3000*l.* if we have to go to Parliament. Supposing we had to embank the river by building a sea-wall, it would cost some thousands more, having to contend with about 14 feet of water, and a cliff 20 feet deep of gravel on 4 feet of sand. The cost of repairing the damage in Swaledale *above Richmond* will be from 500*l.* to 700*l.* One great injustice in all this is that the ratepayers have to provide the money to replace the roads and bridges, which upholds the landowners' property at its full value at *principally* the expense of the tenants, the landowners, with few exceptions, getting off scot-free. The rateable value in the Richmond Highway District is 150,207*l.* Brompton-on-Swale is about a mile to the west of Catterick Station, and about one and a half to two miles north-west of Mr. Teasdale Hutchinson's farm."

Wensleydale gives its name to a breed of long-woolled sheep, which is much used in the North and West Ridings. They are bigger sheep than Leicesters, and are general favourites over the district for crossing with Cheviot or Scotch black-faced ewes. The shearling ram of this breed, which gained the prize at the York Show, was a really excellent sheep, combining great frame with good quality, clean-legged, well woolled, and of vigorous and active habit (see p. 495).

There appeared to be considerable haziness in the minds of some of the competitors as to the breed of sheep found on their farms. Those who kept a flying stock generally reported their sheep to be "Bamshires," which, after several inquiries, was found to be a contraction of "Bamboroughshire," a district on the east coast of north Northumberland. These sheep, as a rule, had been obtained in York market. The ewes were drafts from north-country flocks of Border Leicester and the various crosses of Leicester-Cheviots, and the hoggs were the produce of such ewes. In the East Riding, where regular breeding flocks are kept, the principal breed is Leicester, with a confession to a strain of Lincoln in it. Shropshire and Oxfordshire Down rams have been occasionally used, and, where the produce is sold as fat lambs, the cross is well spoken of. Where these crossbred lambs have been wintered, the sheep are said to be not quite so heavy as the pure breed, but the mutton commands a higher price per pound.

On the first inspection in January, sheep folded on turnips were in a most miserable plight on several of the competing farms; being confined in small folds, with such a weight of mud adhering to their legs and bellies, that they could scarcely drag their feet out of the knee-deep puddle from which there was no escaping. A more unnatural life than to compel sheep to lie on a mixture of nearly equal parts of soil and water it is difficult to imagine. The Judges were curious to find out the effect of this treatment on breeding-ewes that were getting no dry food, and had no outrake. The result was what they anticipated. At the next visit in April doleful reports were given of a most trying lambing-time, and large numbers of dead or weakly lambs. The close folding of ewes was perhaps more resorted to last winter than is the custom in ordinary seasons owing to the extraordinary crop of turnips which it was thought would be difficult to get consumed.

A breed of sheep called "Lonks," found in the hills of the West Riding, lead a totally different life from that I have been describing. This breed much resembles the Scotch black-faced; but they are larger, and the wool is not quite so hairy. Judging from the height of the stone walls which appeared to be necessary to set bounds to the roving propensities of these mountaineers, we gathered that this breed, unless very strongly guarded, only fed and slept where they had a mind to. Indeed, after seeking for some time in vain for a flock of newly bought Lonk wethers, we were told that they were "very likely in the hay-field." The produce of the cross between Lonk ewes and Oxford Down rams is evidently a great success. Some female yearlings of the second cross were really handsome sheep, coming out quite of Oxford Down character. Grey-faced ewes (cross between Scotch black-faced ewes and Leicester, or Wensleydale, rams) are favourites on the grazing farms in this district. They are said to be very prolific, and to make excellent nurses. The prevalence of foot-and-mouth disease, the consequent stopping of markets, and restrictions upon the movement of animals, with the general scarcity and high price of store cattle, made it a difficult task for those who had not been in the habit of wintering their summer-grazing cattle to obtain their supplies during the spring months of this year. As a rule, it is much safer to buy in the autumn or early winter cattle that are intended to be fattened on the pastures in the ensuing season. The wintering of a large number of cattle implies making a large quantity of hay. On the grazing farms in Skipton in Craven, the plough is almost unknown, hay is therefore the sole dependence for winter feeding. The system of storing it is peculiar to the district. A combination building—hay-barn and byre—appears to be essential, and such buildings are sometimes located on various parts of the farm. Large doors, capable of admitting a load of hay, are usually placed in the centre of the building. The cattle lairs are at the ends; they are boarded over, and the lofts above the cattle are filled with hay. After the lofts are full, the centre, where the loads were admitted, is also filled. This system has no doubt partly arisen from the difficulty of procuring thatch, and the prevalence of storms. The cattle tied up in these places, as a rule, have neither crib nor manger, the hay being placed in front of them on a simple continuation of the bare flags on which they stand.

The question of Book-keeping, which very properly formed a part of the inquiry, proved generally a crucial test. Only in exceptional cases, to which reference will be made hereafter, does there appear any approach to regular stocktaking. Unless this be done annually, it is obvious that a definite statement of either profit or loss for a given year is impossible. Cash accounts of receipts and payments were general, and these were placed at our disposal. We gathered that Yorkshire farmers have evidently not suffered so much as their brethren have done in some other districts. This has been due no doubt to the price of the meat which they so largely produce, and to some extent also probably to potatoes, to which one farmer at least attributed some measure of his success.

1879 was generally pronounced a disastrous year, and as a rule no headway had been made in recent years, but rather the reverse. Varying percentages of returns of rent had been made at rent days: had this not been done, some of the tenancies would have been terminated. With scarcely an exception, the competing farms appeared to be fully rented.

In a few instances the difficulty of dealing with clay lands was evident. When they had been laid to grass, the farmers had been hard hit by losses from fluke; and when cultivated, the crops had been by no means remunerative. The course of cropping pursued everywhere, except in the Wolds, admitted of successive white crops: a practice almost universally prohibited in the more northern counties. On the heavy lands this system has evidently arisen from the uncertainty of the root-crops, and also from the fact that such soils are not easily exhausted. The difficulty in pursuing this course is to maintain cleanliness, especially in wet seasons. Where this essential condition was fairly carried out, the capabilities of the soil—when assisted by a moderate top-dressing—to produce a second white-straw crop did not appear to be at all impaired. When such was followed by a fallow, it was said to ensure a good clover plant.

With the exception of the fallows on the Manor House Farm, Catterick, no steam-cultivation came under inspection. One competitor, who had employed a set rather freely some years ago, used strong language when describing results, concluding by the remark, "He wished the whole darned thing had been at the bottom of the Ouse."

Complaints loud and deep were met with, at every turn, of the sufferings entailed directly or indirectly by foot-and-mouth disease. On one farm a flock of 200 hoggs had been purchased in April at 60*s*. each, and had broken down immediately on arrival. On another, a flock of ewes on being brought home to lamb, caught the disease on the way, and consequently came out in May with a small crop of lambs, many of the ewes lame, and all out of sorts. Owing to restrictions upon the movement of animals, difficulty was often experienced in obtaining the usual quota of stock. When such measures are found to be absolutely necessary to preserve the healthy flocks and herds on British homesteads from contagion, we need not wonder that the manifest hardship and suicidal injustice of allowing diseased cattle to be landed on our shores was universally denounced in the strongest possible terms.

The influence which the numerous spirited local agricultural societies exert throughout the country, owing to the large amount of money in the aggregate distributed in prizes, creates an evident spirit of emulation amongst the farmers, and fires them with that keen desire for "blood" in sires which evidently exists, whereby their different breeds of cattle, sheep, and horses are improved.

This naturally leads up to the classical home of the Shorthorn. Through the kindness of Mr. Wm. Booth, the Judges had the opportunity of inspecting the grand herd of Shorthorns at Warlaby, where they were agreeably surprised to find many of these large-framed, heavy-fleshed cattle, showing excellent dairy qualities; so much so, that one of my colleagues has since hired a bull from Warlaby, to go to his large dairy herd in Dorsetshire. The production of such a herd, and the blood which it has disseminated, not only throughout the kingdom, but through every civilised cattle-raising country in the world, deservedly immortalises the name of Booth.

For some generations it has been the philanthropic custom at Warlaby to give the inhabitants of the district free service of their cows by a "Booth" bull. It is on record that in one season four hundred cows ranked on this free-list; but so much has the system of farming changed in the matter of breeding and dairying, that comparatively few now avail themselves of this privilege.

As an illustration of the dire effect of foot-and-mouth disease in a breeding herd, a cow was pointed out as the only heifer-calf that could be saved in a whole season when an outbreak occurred at Warlaby, and for this cow an offer of 2000*l.* had been refused.

One of the Judges, who has strong sporting proclivities, remarked several times during the inspection, that the Hares and Rabbits Act had not by any means exterminated fur in Yorkshire. We heard no real complaints of game damages; but on one farm wire-netting was placed between the woods and the crops. On another, a portion of a wheat-field, adjoining a wood, was much eaten; and a third tenant, who had evidently worked hard for a crop of mangolds, was reluctantly obliged to charge the hares with nipping off a large number of his young plants. The cordial relations existing between the tenants and their landlord or his agent on these estates evidently covered some sinning in this respect.

The system of boarding the farm-labourers, which was almost invariably met with, and their bill of fare—meat three times a day—was a surprise to our colleague from the far south, who remarked that it presented a striking contrast to the life of a Dorsetshire farm-labourer in the matter of beef-eating.

The Judges appointed to inspect the competing farms were invited to meet the Secretary, Mr. H. M. Jenkins, at York, on Monday evening, January 15th. Mr. Jenkins was prevented by sudden illness from keeping this appointment, but a carefully prepared order of procedure awaited us, which was literally followed throughout the first inspection.

The local talent who sketched the route must have been well up in the geography of the county. Emerging from the Station Hotel in the grey dawn on the morning of the 16th of January, we were met at the door by a choking fog, which called forth the remark, "It is as bad as the Hall at Islington when a fog visits a Smithfield Show." Four farms were inspected during the day, and after a return journey of seventeen miles, driven in the dark, confidence in our programme was established.

The competition was limited to tenant-farmers paying a *boná fide* rent for at least three-fourths of the land in their occupation, the whole of which required to be entered on the certificate. The Judges were instructed to take into full consideration any special advantage one competitor might have over another, and were also to consider seven points, which have repeatedly appeared in this 'Journal' in the reports of previous farm-prize competitions.

On page 518 will be found a Schedule of the farms in Yorkshire entered for competition, with the unanimous award of the Judges appended.

The second inspection was commenced on April 23rd, when all the competing farms were revisited. Owing to the frost and snow, which came of "winter lying in the lap of spring," farm-work was much behindhand. A considerable breadth of spring corn remained to be sown, and work was everywhere at high pressure on the arable farms. It was a time when the Judges had the best opportunities to judge of the normal condition of the farms in point of cleanliness. None of the corn was sufficiently forward to cover weeds, and the fallows were either in process of cleaning, or showing what they required in that line.

Fat hoggs were still receiving sliced roots on several of the farms, and this, in some cases, on land which was to be worked for barley. On the grazing farms in the West Riding, lambing was scarcely finished. We found a good crop of lambs there,

TABLE I.—SCHEDULE of FARMS ENTERED for the YORKSHIRE FARM-PRIZE COMPETITION, 1883.

	Acreage.	Nature of Soil as Entered in Certificates.	Awards.
CLASS 1.—For the best-managed GRAZING or DAIRY FARM, above one hundred and fifty ACRES in extent, at least two-thirds in PERMANENT GRASS. FIRST PRIZE, £75; SECOND, £25.			
William Henry Davis, of Holme House, Gargrave	358	Heavy	2nd Prize.
Henry Holden, of Halton East, Skipton	300	Do.	Commended.
William Taylor, of Nether Poppleton, York	350	Do.	
Robert Edward Turnbull, of Twyers Wood, Hedon, Hull	339	Do. principally	1st Prize.
CLASS 2.—For the best-managed ARABLE FARM, above one hundred and fifty ACRES in extent, less than two-thirds PERMANENT GRASS. FIRST PRIZE, £75; SECOND, £25.			
Richard Thomas Allan, of Compton, Collingham Bridge, Leeds	281	Heavy Limestone.	
Thomas Barnitt, of Birdforth, Easingwold, Thirsk	180	Light and Heavy.	
William Rhodes Bromet, of Cocksford, Tadcaster	270	Do.	
William Coverdale, of Lund Cote, Kirby Moorside	292	Loam	Commended.
James Lund Groves, of Kirk Deighton, Wetherby	160	Variable.	
T. H. Hutchinson, of Manor House, Catterick	249	Light and Heavy	1st Prize.
Thomas Palfreeman, of Kexby, York	240	Heavy.	
Thomas Robinson, of Sands House, Sewerby, Bridlington, Hull	196	Light.	
George Sigsworth, of Stilton House, Helmsley	312	Do.	
J. Watson, of Wood House, Brough	600	Do.	2nd Prize.
CLASS 3.—For the best-managed FARM, under one hundred and fifty ACRES in extent. FIRST PRIZE, £75; SECOND, £25.			
Benjamin Beevers, of Clay Shed Farm, Escrick, York	127	Heavy	1st Prize.
Charles Buckle, of Bilton, York	134	Light.	
William Scarth Dixon, of West Moor House, Marton, Middlesboro'	131	Heavy.	
Uttley Hartley, of Watkinson Hall Farm, Halifax	47	Light.	
Joseph Herner, of Morton, Bingley, Yorks	135	Light and Heavy	2nd Prize.

but grass was by no means plentiful. For this reason, most of the grazing cattle were still confined to the byres, getting hay and water, in some cases with the addition of a little cake.

A third inspection was made immediately before the York Show. A few of the farms that were clearly out of the running were not visited. It is due to the occupiers of these farms to state that there was attached to most, if not all, of their holdings, some points of interest, which would have made it a pleasure to the Judges to have gone over them again; but the interests of the Royal Agricultural Society had to be placed before personal gratification. On this inspection the farms could not be said to change their actual positions in the race, yet the distance between some of them did become a little more pronounced. The erratic nature of the season had told heavily in the East Riding. In the early part of the week of our visit, the Wolds had been visited by a succession of thunderstorms, which culminated in a terrific hailstorm. Evidence of the terrible havoc wrought was only too frequently presented to us. A more detailed account of the effect of the storm will be given in the Report on Mr. Watson's farm.

Speaking of the county as a whole, and excepting some of the competing farms, the grain-crops seen from the route of the Judges were disappointing. The most luxuriant crops which came under our observation were some large fields of potatoes in the Escrick neighbourhood, and their appearance was simply splendid. We at once put them down as grown with "Coleman's recipe." It would be interesting to know how far we were right in our conjecture. Another remarkable feature of this district was the prevalence of Dutch-barns, covered yards, and commodious comfortable-looking homesteads.

We should be wanting in courtesy if we omitted to acknowledge the hospitality which everywhere greeted us along the route, also the frankness, and, so far as we know, the honesty which characterised the answers to our inquiries.*

CLASS I.—FIRST PRIZE.

Mr. R. E. Turnbull's Farms:—Twyers Wood and East Park, Burton Constable.

THE following are particulars supplied by Mr. Turnbull, of the farms he at present occupies.

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* Application was made to the new Department of Agriculture for the Agricultural Statistics for Yorkshire for 1883. These were eventually promised to be forwarded by the middle of September, but up to this date, the 10th of October, they have not reached me. Hence in this Report no reference is made to the Agricultural Statistics for Yorkshire.—T. B.

TABLE II.—PARTICULARS OF MR. R. E. TURNBULL'S FARMS. TWYERS Woo

NAMES OF FIELDS.	Acreage. a.	r.	p.	CROP IN 1883.
Great South Field	26	3	1	Black Oats, "Webb's Prolific Tartarian"
South Cottage Field	10	0	2	Clover
North Cottage Field	23	2	10	White Oats, "Webb's Challenge"
West Field	8	3	35	Tares.—Turnips, "Sutton's Green Globe" Cabbages, "Robinson's Drumhead"
East Field	6	1	18	White Oats, "Webb's Challenge"
Preston Twyers	14	1	30	6 acres of White Oats, "Webb's Challenge," and 8 acres of Turnips, "Sutton's Imperial Green Globe," and "Sutton's Pomeranian White"
Hedon Twyers	6	2	1	White Oats, "Webb's Challenge."
Twyers Hill	28	0	33	Pasture
Middle Pasture	20	1	31	Pasture
Home Pasture	28	2	19	Meadow
Paddock	2	0	12	Pasture.
Orchard Plantations, &c.	3	2	16	
Homestead and Garden	1	2	36	
Acres	151	1	4	
				EAST PARK FARM, Burton Constable, near Hull.
East Park	35	0	0	Meadow
Calf Paddock	2	0	0	Pasture.
South Park	52	0	0	Pasture.
West Park	36	0	0	Meadow
Deer Paddock	15	2	29	Pasture
Acres	140	2	29	
				PRESTON FARM, near Hedon. Leased fro
1st Field	6	2	0	Wheat, "Hallet's Golden Drop"
2nd Field	6	0	0	1 acre, "Webb's Chevalier" Barley. 1 ,, Carrots, "Sutton's Long Red" and "Ne Yellow." 4 ,, Mangolds, "Sutton's Mammoth Long Re "Globe," and "Oxheart."
3rd Field	6	0	0	Swedes, 5 acres, "Sutton's Crimson King" Potatoes, 1 acre, "Webb's Schoolmaster" an "Scotch Regent"
Acres	18	2	0	
				BURSTWICK FARM, near Hedon. Leased for 19 Yea
	18	0	0	Swedes, "Sutton's Imperial Green Globe"
	4	0	0	Swedes, do. do. do &c. "Sutton's Pomeranian White."
	10	0	0	Barley, "Webb's Chevalier."
	2	0	0	Bare fallow
	10	0	0	Grass (about 7 acres Meadow).
Acres	44	0	0	

FARM, Hedon, near Hull. Leased for 21 Years, from 6th April, 1881.

NOTES.

Drained in 1881 with 3-inch pipes; limed in 1883 with 5 tons per acre.
Drained in 1881 with 3-inch pipes; 4 acres limed in 1882 with 5 tons per acre.
Drained in 1881 with 3-inch pipes; limed in 1882 with 5 tons per acre.

Limed in 1882 with 5 tons per acre.

4 acres limed in 1883 with 5 tons per acre.

5 acres drained in 1882 with 3-inch pipes; 8 acres limed in 1882 with 5 tons per acre.

12 acres drained in 1881 with 3-inch pipes; 18 acres limed in 1883, about 4 tons lime and 8 tons road scrapings per acre.
10 acres drained in 1882 with 3-inch pipes.
Drained in 1882 with 3-inch pipes; 14 acres manured in 1882 with about 12 tons farmyard-manure per acre, the whole field manured in 1883 with about 12 tons per acre.

Leased for 5 Years, from 6th April, 1880.

Manured each year with about 12 tons farmyard-manure per acre.

Manured each year with about 12 tons farmyard-manure per acre.
Manured in 1880 with 5 cwts. bone-meal per acre, and in 1882 with 20 tons farmyard-manure per acre.

6th April, 1883 (not in the Competition).

Limed in 1882 with about 4 tons per acre.

3 acres limed in 1883 with 5 tons per acre.

from 6th April, 1883 (not in the Competition).

Manured with 12 tons farmyard-manure per acre and 3 cwts. dissolved bone.

Turnips eaten by sheep on the land in 1882.
Manured with 12 tons farmyard-manure per acre.

Fig. 1.—*Plan of Twyers Wood Farm.*

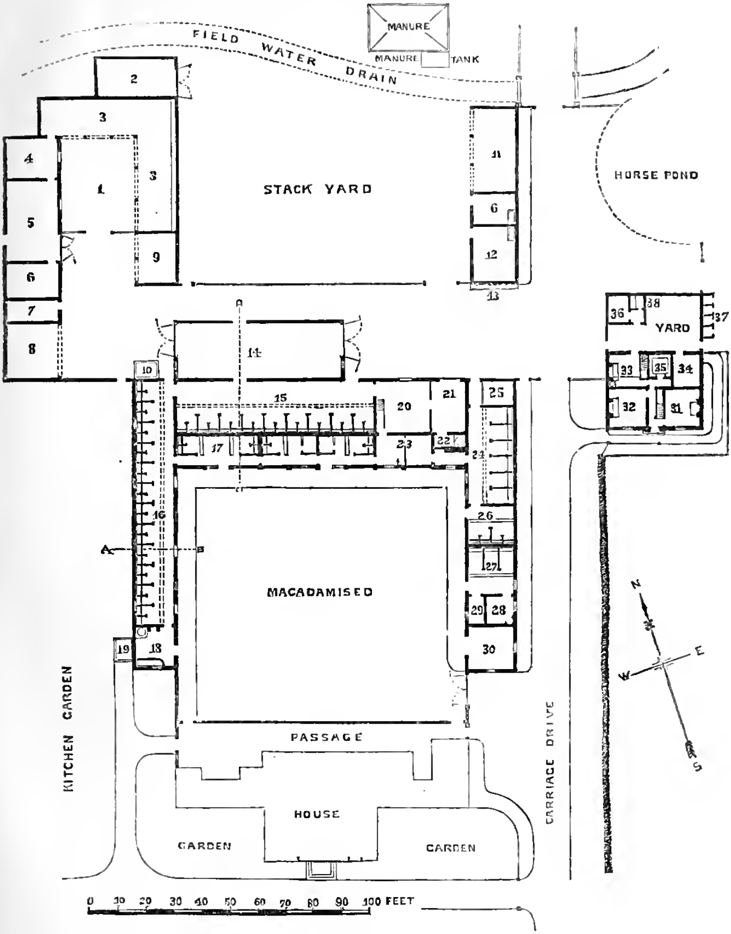
Reference to Plan of Twyers Wood Farm.

				A.	R.	P.
1.	House and paddock	Grass		2	0	23
2.	South Newlaid	do.		15	1	9
3.	North Newlaid	do.		13	2	8
4.	East Newlaid	do.		20	2	29
5.	Twyers Hill	do.		28	2	11
6.	Hedon Twyers	Arable		6	2	31
7.	Preston Twyers	do.		15	0	2
8.	Fresh Land	do.	East Field	6	1	21
9.	Fresh Land	do.	West Field	9	0	23
10.	North Cottage Field	do.		23	3	36
11.	South Cottage Field	do		10	1	20
12.	Great South Field	do.		27	1	18
				179	0	31

Hedon Road Land.

			A.	R.	P.
a.	Near Field	Arable	6	1	39
b.	Middle Field	do.	6	1	28
c.	Far Field	do.	5	3	29
			18	3	16

Fig. 2.—*Plan of Twyers Wood Homestead.*



REFERENCE TO PLAN OF TWYERS WOOD HOMESTEAD, PRESTON.

1. Cattle-yard.
2. Implement-house.
3, 3. Shelter sheds.
4. Hospital.
5. Straw-barn.
6, 6. Loose-boxes.
7. Chaff-house.
8. Waggon-shed, granary over.
9. Cart-shed.
10. Liquid-manure tank.
11. Straw-shed.
12. Bull-house.
13. Drinking trough.
14. Hay-barn.
15. North cow-byre for 18 cows.
16. West byre for 24 cows.
17. South byre for newly-calved cows and calves.
18. Milk-house, concrete floor.
19. Rain-water tank.
20. Pulping-house with hay-loft over.
21. Root-house.
22. Boiler.
23. Hay-house for south byre and stable.
24. Draught-horse stable for 6 horses.
25. Poultry.
26. East cow-byre, for new-bought cows.
27. Carriage-horse stable.
28. Saddle-room.
29. Store.
30. Coach-house.
31. Office.
32. Front kitchen.
33. Back kitchen.
34. Dairy.
35. Pantry.
36. Coal.
37. Poultry.
38. E.C.

The two first on the list only were entered for competition.

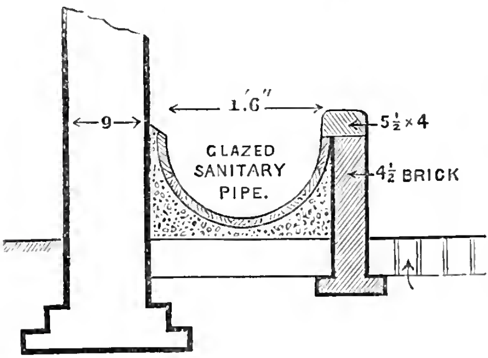
Twyers Wood Farm, of which a plan is given (Fig. 1, p. 522), is the property of George Dickenson, Esq., of Roos. It is situated in Holderness, about five miles east of Hull, and is intersected by the Hull and Hedon Road, as well as by the Hull and Hedon Railway.

The house and homestead stand on the north side of the highway, and are separated from it by a well-kept lawn and garden in front. The house is a square, neat, cosy-looking dwelling, flanked by a productive garden and orchard, and by a trim shrubbery.

The homestead has been entirely remodelled and considerably enlarged by Mr. Turnbull, as will be seen from the ground-plan (Fig. 2, p. 523). The whole of the work has been done in a substantial manner; the arrangement is good; all the stock can be fed and inspected without the attendant going out of cover. Ventilation without draught has been kept in view, and appears to have been secured.

There are no gangways in front of the cows for feeding, which appears to be a drawback; it is assuredly more convenient and expeditious to feed tied cattle in front than having to carry food up between each pair. The feeding-troughs, as seen in the sketch (Fig. 3), are an excellent arrangement, being simply a semicircle, and are really half 18-in. glazed sanitary pipes. The byres, in which there are stands for 54 cattle, are lime-washed, a "dado" of tar is run 4 ft. 10 in. high all round, which —apart from sanitary purposes — from an æsthetic point of view is rather effective. The hay-barn at the back of the square is not filled with hay, but has large doors at each end, which will admit laden waggons. It is used as a shed for hay, straw, &c., in process of being moved or marketed.

Fig. 3.—*Detail of Feeding Trough.*



The open square, surrounded by the stables, byres, &c., has a pavement all round the sides, and dips towards the centre, at which point there is a trapped drain to carry off rain-water.

On our first inspection some of the buildings were not completed; and at these points we could gather the amount of labour and expense incurred in ballasting roads and making foundations, seeing the bottomless condition of the unfinished parts.

The milk-house, into which all the milk is brought, is a small, simple, yet convenient building, with a copper in one corner for scalding and cleaning vessels, and a large cold-water tank, bath-shaped, on the opposite side, into which churns are plunged to cool the milk before its departure to Hull. The only other building into which milk is received is a small but beautifully equipped dairy, which forms a part of the bailiff's house, and is used for milk to supply the domestic requirements of the Twyers Wood household. This department is superintended by Mrs. Turnbull. Another room of this building is used by Mr. Turnbull as an office.

The extent of the farm is 181 acres, 3 roods, and 13 perches (exclusive of plantations), of which 96 acres, 2 roods, 17 perches are in tillage.

It is leased for 21 years from the 6th of April, 1881, from George Dickenson, Esq., of Roos, Holderness, at a rent of 46*s.* per acre, the tenant paying the rates and taxes, viz., poor rates, about 2*s.* in the pound (370*l.*); highway rate, 8*d.* in the pound; rectorial tithe rent-charge, vicarial tithe, and clerk's dues, 9*l.* 16*s.* 9*d.*; income tax, Schedule 'B,' 4*l.* 18*s.* 1*d.*; inhabited house duty, 12*s.* 6*d*; in all, about 7*s.* per acre.

Some of the conditions of the tenancy may be usefully mentioned:—

(*a*) *Sale of Hay and Straw.*—The tenant may sell hay and straw on the understanding that he shall first have brought on to the farm 2 cwts. per acre of guano, or its equivalent in other manure for each acre of hay or straw sold.

(*b*) *Sowing down to Grass.*—"If the lessee shall sow down any land to grass, the lessor will allow to the lessee the cost price of the seed used for the purpose; but if any such land, after being sown down as aforesaid, shall be ploughed up again by the lessee, the lessee shall immediately thereafter repay to the lessor the amount previously allowed for seed as aforesaid."

(*c*) *Buildings.*—"The lessee shall be at liberty to remove during the continuance of this demise any buildings which shall have been erected by him at his expense, if the lessor shall not, after receiving one month's previous notice in writing from the lessee requiring him to do so, and before the expiration of the said month, elect to purchase the said buildings at two-thirds the original cost thereof."

(*d*) *Drainage.*—"In case the lessee shall do any drainage works on the said lands and premises hereby demised, the lessor will allow to the lessee the cost price paid by him, the said lessee, for pipes which shall be actually used in any such drainage works as aforesaid, but exclusive of all cost for labour, leading, and other expenses."

A mainland open drain, about 10 feet deep, brought up from the sea, runs through the centre of the north side of the farm, and is brought up to the north of the steading through the shrubbery. This forms an outlet for the field-drains, and therefore must be kept in good order. This cutting was done about fifty years ago jointly by the owners of the land which it drains. A similar cutting for drainage divides two fields lying on the south side of the main road.

Mr. Turnbull has drained about 120 acres of this farm entirely at his own expense, the landlord finding tiles only.

The drains are from 8 to 12 yards apart, varying according to the width of the "lands," the average distance between the drains is 10 yards, the average depth is 2 feet. Most of the pipes are 3 inches in diameter. For the outlet, an iron pipe is used in all cases, with a trap-door (Denton's Patent), made by Barford and Perkins. The cost of cutting and laying the pipes in the furrows was 1*s.* 6*d.* per chain (22 yards), and for the main drain and outfall 4*s.* per chain.

The expense of carting the pipes, carting water for the drains, and superintendence, was estimated to be 1*l.* per acre.

Live Stock.—The following is a list of the number of animals on Twyers Wood on Jan. 22nd, 1883, the time of our first inspection:—

Cattle.

32	Shorthorn cows in-milk.
7	,, ,, dried for calving.
2	,, ,, for fattening.
3	,, heifers in-milk.
1	,, ,, spring calving.
1	Ayrshire cow in-milk.
3	,, cows dried for calving.
3	,, heifers in-milk.
1	Shorthorn and Galloway cross cow in-milk.
1	Shorthorn Bull, "British Boy" (44463), bred by Mr. W. Atkinson, Burneside Hall, Westmoreland; sire, "British Baronet" (39500); dam, "Jenny," by "Duke of Kirkby" (33682).

Horses.	*Pigs.*	*Fowls.*
6 Cart-horses. 2 Milk-cart horses. 1 Carriage-horse.	2 Pigs.	50 Fowls.

This being essentially a milk farm, I shall give the cows their proper position, and place them first. At our January visit they were, as a matter of course, confined in the byres.

From the 21st of October to the 30th of April the cows were allowed daily from 21 to 28 lbs. of hay, one-third long and two-thirds chaffed; 3 lbs. of linseed-cake, 3½ to 7 lbs. of rolled oats, and from 56 to 84 lbs. of turnips pulped and mixed with the hay-chaff.

The heifers in full milk were allowed about 21 lbs. of hay, long and chaffed, 2½ lbs. of linseed cake, 2½ lbs. of cotton-cake or rolled oats, and 56 lbs. of pulped roots.

The whole of the cows looked healthy, very clean, and in good milking condition. They were reported to give an average of about 9 quarts of milk per cow per day. The whole of the milking is done by the men on the farm. The milking hours are from 4 to 6 A.M., and 2 to 3.30 P.M. Each man milks from 6 to 8 cows. As the milk has to be sent off early, the milking has to be done by more hands than would be otherwise employed for the purpose. Each milker has a book, in which he enters the produce of each cow. The milk pails are marked on the inside with lines indicating their capacity in quarts up to the several lines; a register of what each cow gives is therefore easily obtained. The milk is taken, as drawn from the cows, into the milk-house, and there poured into churns, which are plunged into the cold-water cistern already mentioned. The supply of water for the cistern is obtained from a large underground rain-water tank immediately outside the building, and is pumped out of that into the cooler, which Mr. Turnbull says answers the purpose admirably. It is all-important that the milk should be properly cooled before being sent off. Mr. Turnbull supplies the Infirmary at Hull, which takes about 28 gallons per day. The remaining quantity is sent to East Park Dairy in Hull, where it is retailed to consumers. Mr. Turnbull states that he has now no difficulty in disposing of his milk and butter in Hull, but as he had the business to make, it was uphill work for a time. Mr. Turnbull looks upon his dairy business in Hull as part of the available assets of his farm, though he does not include it in his balance-sheet. The connection gained in the way of customers has really an intrinsic value, and would, no doubt, readily realize a considerable sum if offered for sale. Mr. Turnbull has, therefore, solved the problem of how to bring producer and consumer together by the success of his East Park Dairy in Londesbro' Street, Hull.

The "Dairy Report" of this farm for the month of January, 1883, which is appended (see Table IV., facing p. 536), will be found to be most exhaustive in detail. It was in course of preparation at our first inspection, and was forwarded to the Judges at the end of the month. The report speaks for itself, and does not require either explanation or comment.

It is only fair to state, however, that Mr. Turnbull being connected with business which requires him to keep a clerk, he is thus personally relieved from the labour of transcribing these reports; but the Judges have every reason to believe that sufficient personal superintendence is given to the details of the work which the reports record, to justify them in accepting the tables as substantially correct, and as such presenting them to the public.

On our second inspection, on the 1st of May, we found 40 cows grazing together on "Twyers Hill," where they were having a nice bite of grass. They were one and all in blooming condition. Many of the Shorthorn cows would have graced a showyard; and for dairy purposes some of the crosses might have been placed before them. Taking them together, they were a grand lot, and great care and judgment were displayed in their selection. They had generally a good show for milk. The best cow in the lot for the Dairy was said to be a cross between Alderney and Shorthorn. A massive blue cow, Galloway and Shorthorn cross, had the credit of being the best milker. She had produced a calf in each of three successive seasons, and had never been dry since having her first calf as a heifer, having always milked through, and was at that time giving 17 quarts per day.

It was stated that the cows did well all the spring when fed on swedes grown with farmyard-manure; but immediately they had swedes grown with artificial manure given to them, they scoured and went wrong. No other cause could be discovered to which the disordered condition of the cows could be attributed. There are, however, so many surrounding circumstances to be taken into account in connection with experiments in feeding, that results can only be said to be confirmed after frequent repetition. The calves from the Twyers Wood cows are reared at Burton Constable.

Mr. Turnbull takes an occasional run through Cumberland and Westmoreland for the purpose of buying cows and heifers. Home-bred heifers from Burton Constable are now coming in for cows; therefore not so much dependence has to be placed on importations. We think, however, that Mr. Turnbull will always remain open to buy a good young dairy cow.

No sheep have been on the farm for the last two years.

The following live-stock were on the farm at our second and third visits:—

May 1.

Cattle.

30 Shorthorn cows in-milk.
7 " " for fattening.
1 " " dry, for calving.
1 Ayrshire cow in-milk.
1 " " dry, for calving.
2 " heifers dry, for fattening.
1 Shorthorn-Alderney cow in-milk.
1 Shorthorn-Galloway cow in-milk.
1 Shorthorn bull calf under 4 months old.
1 Shorthorn-Ayrshire calf under 4 months old.
1 Shorthorn Cross bull, "British Boy."

Horses.

9 Cart-horses.
2 Milk-cart-horses.
1 Carriage-horse.

2 Pigs.

Poultry.

48 Fowls.
6 Ducks.
9 Ducklings.
80 Spring chicken.

July 6.

Cattle.

28 Shorthorn cows in-milk.
2 " heifers "
1 " -Galloway cow in-milk.
1 " -Ayrshire cow in-milk.
1 " -Ayrshire heifer in-milk.
1 Scotch Polled cow in-milk.
1 " " heifer, newly calved 5th July.
3 Shorthorn cows dry, for calving.
1 " cow dry, for fattening.
1 Kerry heifer in-calf.
10 Shorthorn steers, 2 years old.
1 " bull, "Warlock."
Bred by Mr. H. P. Holme, Mardale, Penrith; sire, "Warrior's Fame" (40889); dam, "Double-bred Rose," by "Monarch" (31,930).

Horses.

10 Cart-horses.
2 Milk-cart-horses.
1 Carriage-horse.
1 Foal.

Poultry.

144 Hens and chicken.
46 Ducklings.
6 Ducks.
60 Pigeons.

On our third visit, July 6th, the cows were again grazing on "Twyers Hill." This field had been covered during the winter with a dressing of lime and soil, which during the damp weather early in May made such a flush of white clover that several of the cows got blown, and required to be watched steadily. One cow was found lying dead, which half-an-hour before was grazing with the rest of the herd. The others that were affected were simply gagged with a piece of wood, to keep their mouths open, which allowed the gas to escape, thereby bringing about a speedy subsidence of the hoven bowels. The usual supply of cake was not given when grass was so abundant. About a week before our visit the rations had been commenced with cake, but no increase of milk had been produced by this added food. The cows were then averaging about 11 quarts per day.

The cows and heifers here and at Burton Constable are stated to average, one with another, fully 2 imperial gallons per day each, all the year round. Valuing the milk at 10*d.* per gallon, and the calves at 3*l.* each, the gross value of the produce of the herd is equivalent to over 33*l.* per head.

From the 1st of May to the 21st of October the cows are out on the pastures day and night, except during milking. The usual summer allowance of cake is from 2½ to 7 lbs. each per day, two-thirds cotton, and one-third linseed from the Driffield Cake Company. From July the cows have a daily allowance of green tares; and in September and October they have cabbage in addition to cake and grass.

Ten Shorthorn steers, two years old, recently bought in the North Riding at 22*l.* per head, were grazing with the cows and getting a linseed-cake each per day. The Judges expressed a unanimous opinion that these cattle were very dear at the price, but they were told that a fair profit could and would be made on an early day.

The farm-horses are heavy useful animals in high condition; they had hitherto been largely employed in carting for the buildings, road-making, tile- and lime-leading; but that department of labour was nearly completed, and on our last visit we found them all turned out to grass,—a luxury which, we were told, they had up to that time little enjoyed.

The cart-horses are ordinarily allowed 21 lbs. of rolled oats per day, with hay *ad libitum;* mixed chopped hay and straw occasionally. When hard worked, a proportion of beans is substituted for a portion of the oats, but the allowance of 21 lbs. is not exceeded. Two milk-cart horses for driving the milk to Hull are allowed 14 lbs. of oats per day, one milk-cart horse is kept at East Park Dairy for delivering the milk from Twyers, and butter from Burton Constable.

Two pigs are fed to provide home-fed bacon. Breeding or feeding for sale is not attempted.

The same remarks apply to poultry, although spring chicken looked healthy and numerous.

Grass Land.—Our observations led us to the conclusion that the character of the grass land, 80 acres in extent, had been very much changed during Mr. Turnbull's tenure. About 300 loads of tussocks had been pared off Twyers Hill and burnt. The ashes had been used for drilling with turnip manure, and on 18 acres of the grass a heavy coat of lime and road-scrapings had been applied; 12 acres of this land had been drained in 1881 with 3-in. pipes. The result was apparently very satisfactory; a clean good herbage covered the field. Half of the adjoining field of 20 acres had also been drained in 1882, and though it bore a somewhat coarser herbage, it was evidently improving. Nos. 2 and 3 on the plan (Fig. 1, p. 522), now one field, containing nearly 29 acres, were drained in January 1882. This field was dressed in 1882 with 12 tons of farmyard-manure per acre, and the whole field was again covered in 1883. This season it was meadow, bearing a very heavy crop of grass; and at the time of our visit was ready for cutting. Between No. 4 pasture and Twyers Hill there had been an ugly, dangerous, deep gutter, surmounted by a high straggling hedge. The gutter had been cleaned out, a large tile laid in the bottom, and the banks filled in. The old hedge had been cut and laid in a truly workmanlike fashion during the winter, and in July had made a wonderful shoot, giving promise of speedily becoming a good fence. It was protected by the cut thorns, which were so strong that they furnished stakes as well. This work was very neatly done, and chiefly by the farm labourers. Another hedge, which had attained a great height, but was not so rugged, had been cut off close to the roots; it was also protected by stakes and thorns on each side. Though well and neatly done, this is a more questionable improvement. The cutting down of the hedge for a time destroyed a valuable shelter, an important consideration in grazing. These fields are watered by large ponds which are neatly fenced round, one side being left open to admit the cattle. A small paddock of 2 acres adjoining the homestead completes the area of grass land.

Cropping.—No regular system of cropping is followed, as will be apparent from the following Table (p. 532), which gives the crops in each field for the past six years. It will be noticed that wheat is frequently followed by oats, and *vice versâ.*

We entered the farm, off the main road, first into a clover field of 9½ acres. The crop, sown with 21 lbs. of red clover and Hampshire cow-grass, was very heavy; it was sold as grass at 12*s.* 6*d.* per ton, loaded on to waggons in the field and driven off by the purchaser; it was yielding about 15 tons per acre, estimated to be equal to 3 tons of hay. The stems of the clover were of extraordinary thickness; no rye grass is sown. A new road through the field has just been completed, made for the purpose of leading 500 tons of manure next winter to the adjoining field on the banks of the Humber. The road has been made with 60 tons of chalk, costing 4*s.* per ton. This road cut off half an acre which had been sown down about 14 days previous to our visit, with the mixture for Permanent Pasture as recommended by Mr. De Laune in the pages of a recent volume of this 'Journal.'

In January, some wheat-stubble in the warp land adjoining the Humber was being ploughed with 2 teams of 3 horses each. This field had been drained with 3-in. tiles 2 ft. deep in 1881, and

TABLE III.—CROPPING of the ARABLE LAND ON TWYERS WOOD FARM from 1877–1883, inclusive.

NAME OF FIELD.	Quantity.			1877.	1878.	1879.	1880.	1881.	1882.	1883.
	A.	R.	P.							
Great South Field ..	26	3	1	Wheat ..	Oats.. ..	Peas and Beans	Mustard	Bare fallow	Wheat	Black Oats, "Webb's Prolific Tartarian."
South Cottage Field	10	0	2	Clover ..	Wheat ..	Oats ..	Peas ..	Turnips ..	Oats	Clover.
North Cottage Field	23	2	10	Bare fallow	Wheat ..	Clover ..	Wheat	Black Oats	Bare fallow	White Oats, "Webb's Challenge."
West Field ..	8	3	35	Oats ..	Wheat ..	Barley ..	Turnips	Black Oats	Wheat	Tares, Turnips, "Sutton's Green Globe Cabbages," "Robinson's Drumhead."
East Field ..	6	1	18	Wheat ..	Turnips ..	Wheat ..	Barley	Wheat ..	Carrots, Potatoes, and Swedes.	White Oats, "Webb's Challenge."
Preston Twyers	14	1	30	Peas ..	Bare fallow	Wheat ..	Clover	Wheat ..	6 acres Mangolds and Swedes, and remainder Black Oats ..	6 acres White Oats, "Webb's Challenge," 8 acres Turnips, "Sutton's Imperial Green Globe," "Sutton's Pomeranian White."
Hedon Twyers	6	2	1	Wheat ..	Oats ..	Peas ..	Wheat	Swedes and Mangolds	Swedes	White Oats, "Webb's Challenge."

was dressed last spring with 5 tons of lime per acre. The lime is obtained at Knottingley, and costs at Hedon Haven 10*s.* per ton; in January it was lying in large heaps covered with soil, and was applied in the spring previous to the corn being drilled. In July the black oats were coming into ear; they did not look at all a heavy crop, but were healthy and vigorous, and Mr. Turnbull said would yield 8 quarters per acre. This field was stated to be wretchedly foul on entry, but was now in a very creditable condition.

The field north of the Hedon Road, containing 23½ acres, was drained in 1881, had been bare fallow in 1882 after oats, and had received 5 tons of lime as a dressing. Mr. Turnbull had in the autumn intended to sow this field down to permanent grass, and therefore did not plant wheat, which accounts for no wheat crop this season. Having determined to continue it in tillage, Webb's Challenge white oats were sown, which in July were quite out, and were a magnificent crop. The east field, containing about 6 acres, previously cropped with roots, was also carrying a crop of Webb's White Challenge oats, which were nearly, if not quite, equally luxuriant. Another 6 acres in Preston Twyers was bearing a big crop of the same sort of oats after mangolds and swedes. The whole of the grain crop consisted of about 70 acres of oats, no wheat or barley being grown this year on Twyers Wood.

The remainder of the arable land, with the exception of three acres of spring tares, was in roots; only a few potatoes are grown for the use of the household. These, with Sutton's Green Globe turnips and four acres of Robinson's Drumhead cabbage, cropped a field beyond the railway. Most of this land is lying in high-backed ridges which are not attempted to be levelled. The cabbages were planted three feet apart every way, and the earliest planted were looking as if they would soon cover the whole of the ground. Turnips were sown on the flat 32 inches between the rows, which we thought wider than was necessary.

Nine acres beyond the railway were lying with manure ploughed in and rolled down ready for sowing with turnips. This would have been completed some days previous to our visit, but thunderstorms had intervened. Considerable care had been taken in the cleaning of the fallows; and though they cannot be described as absolutely free from couch, they were in a highly creditable condition, seeing that this was the first opportunity that could be got to clean what had been evidently foul land when taken in hand. The arable fields were cultivated and cropped up to the hedge roots, the corners being dug and cleaned close up. Hedges were carefully trimmed and cleaned, ditches and dykes scoured, and the refuse mixed with lime, which, with the accumulated cleanings of former generations piled on the roadside, were made into compost heaps for dressing meadows and pastures.

Labour.—The foreman has been at Twyers Wood since January 1881. The hours for labourers who do not milk are from 6 A.M. to 6 P.M., with an hour for dinner. No second breakfast or tea-time. The foreman said, "Three times a day was plenty for any man to be eating that had to work."

Mr. Turnbull supplied the following particulars concerning his labourers:—"My foreman at Twyers has 21*s.* per week in cash, cottage and garden rent free, free coals and firewood, one pound of butter per week, one quart of new milk per day, and as much skim-milk as he requires for the use of his family and the men that board in his house. He has also potatoes free of charge, and I pay him 9*s.* per week for each man that he boards."

"My cattlemen have 30*l.*, and ploughman 25*l.*, a year and free board and lodging. I get the best men I can find. I spare no pains to secure for every department on my farms the best men I can meet with. I cannot speak too highly of the faithful way in which I have been served by my men, especially by my farm stewards, William Watson and Thomas Jordan. As a dairywoman, Mrs. Watson has few equals. I feel that any success that I have had is greatly due to the energy, ability, and faithfulness with which I have been served at all times by my work-people."

EAST PARK, BURTON CONSTABLE, is about six miles distant from Twyers Wood, but the two places are worked in conjunction. As already mentioned, East Park supplies the butter sold at the East Park Dairy in Hull.

This farm is all grass, and is simply the eastern portion of the fine park at Burton Constable. It contains 140a. 2r. 29p., and is leased for five years from Sir Talbot Constable, Bart., from the 6th of April, 1880, at 40*s.* per acre, the tenant paying all rates and taxes.

"The tenant to have the right to remove any additional fences made by him."

Burton Constable Park is situate in what is said to be the richest and flattest part of Holderness. It lies nearly equidistant between Hull and the east coast.

This park is famous as having been inhabited by one of the few herds of wild cattle, supposed to be the direct descendants of the ancient *Bos urus.* Hamilton Smith writes: "The individuals of the Scotch Urus in the Park of Burton Constable were all destroyed in the middle of last century by a distemper." Bewick, writing of this race of cattle in 1790, states: "Those at Burton Constable, in the county of York, were all destroyed by a distemper a few years since. They varied slightly from those at Chillingham, having black ears and muzzles, and the tips of their tails of the same colour. They were also much larger, many of them weighing 60 stone, probably owing to the richness of the pasturage at Holderness, but generally attributed to the difference of kin between those with black and with red ears, the former of which they studiously endeavour to preserve."

I have several times visited the herd of wild cattle at Chillingham, each time with increasing interest, especially when surrounded by them, when they were being fed out of the historic hay-cart. The head of a wild bull, that for eleven years shared the honours of this herd, is now in my possession, and is not a little prized.

A most interesting account of Burton Constable, and the lineage of the Constable family, is given in 'The History and Antiquities of the Seigniory of Holderness,' by George Polson, Esq., published in 1841. It contains the following description of the park:—"To George Clifford, Esq., Burton Constable owes a considerable portion of its thriving woods, the result of his unwearied attention to planting and draining during the period of the minority of the present possessor. The lake covers sixteen acres of ground. The circuit of the park and ornamental pleasure-grounds, about five miles and a half. The lake, or sheet of water, is situated a quarter of a mile from the mansion; it extends along the slope which forms the gradual rise towards Roe Hill, and at one end is terminated by a building called the Menagerie; the other termination is concealed by a hanging wood, through which it has the appearance of continuing its course. In the widest part is a small wooded island, the resort of swans and wild fowl, which are numerous, from being unmolested. A considerable portion of the park is allotted to fallow-deer, of which there are generally about 500 head. There are two deer paddocks for red-deer, of which there are between eighty and ninety. These are kept for the chase, and have for the last five years been trained and hunted by Sir Clifford Constable. The walled garden, hot-houses, and conservatories, which occupy about seven acres, are situated at a short distance from the head of the lake. There is a good avenue of ancient elms; and a walk, deeply shaded with horse-chestnuts, runs parallel with it, from whence an excellent view of the house is obtained; and some idea of its extent may be formed from these points. A beautiful garden has been formed on the west lawn, laid out in the French style, ornamented with statues, and many rare and curious birds are kept in roomy aviaries; others, which have become attached to the place from being regularly fed, are allowed to be at large, and display their native plumage in a climate foreign to their habits.

"The stabling, the kennels, and other buildings, are on a scale quite in unison with an extensive establishment of this description. There are twenty hunters kept in training for the field, and about forty-five couple of dogs. Burton Constable stag-hunting, however, is so celebrated, that it would be impossible to dismiss the subject without a passing description of the noble animals which are trained for the sport. The species is the old English red-deer, with the exception of a few, a cross of the bossac mountain-deer; by which cross the old English breed is greatly improved, and better fitted for the chase. The most suitable age is from four to ten years old. When young they are turned out in some secluded spot, free from observation, and where they have a line of country as much as possible exclusively to themselves; those which are thus trained are found by experience to be the best runners. The method used for preparing them for the chase is, to take them from the grass in the month of August, and enclose them in pens, with a shed attached, in as solitary a place as possible; this also is the time for taking off their antlers. In these pens they are fed in the following manner:—3 quarts of old oats per diem, for every head, during the first three weeks; afterwards, 2 quarts, mixed with a small quantity of linseed and isinglass: they are also provided with 1½ lb. of old hay or rye-grass, which is sufficient food for a deer that is to be hunted throughout the season; with the addition of a few ivy leaves once or twice in the week, and fresh soft water to drink."

Alas! *Sic transit gloria mundi.* The *Bos urus* seems to have anticipated the decline of this once truly magnificent manorial residence, and determined not to survive its downfall. The stables which held these "twenty hunters" are now the inconvenient though comfortable home of Mr. Turnbull's cows. The Riding School, which still contains remnants of its former glories, in the shape of gaseliers, mirrors, stags' heads, &c., is now a hay and straw shed. The rooms which were wont to contain the superb mountings of four-in-hand teams, and other high-mettled occupants of these stables, are now furnished with pails, churns, and other simple dairy utensils, and the only stamp of nobility left in the place is the present famous butter stamp "East Park Dairy."

After completing our inspection of the farm and dairy we were shown over the mansion. It is very richly furnished, but

[To face p. 536.

TABLE IV.—DAIRY RECORD OF TWYERS WOOD FARM FOR JANUARY, 1883.

No. of Cow.	Description of Cow.	Age last Lady Day.	Date of last Calving.	Date when Served.	Cow Served by	Date when next due to Calve.	No. of Cow.
93	Shorthorn	4 Years	November 1	December 12	British Boy	September 18	93
215	Do.	2½ ..	Do. 17	..	..	..	215
100	Do.	3½ ..	April				100
181	Do.	3½ ..	November				181
131	Do.	1½ ..	October				131
85	Shorthorn and Galloway Cross	5½ ..	August	Do. 20	Do.	Do. 23	85
221	Ayrshire	1½ ..	Spring, 1882			..	221
178	Shorthorn	5½ ..	October	Do. 12	Do.	Do. 18	178
137	Do.	3½ ..	September	January 17	Do.	October 21	137
67	Do.	1½ ..	Do.			..	67
13	Do.	7½ ..	November 23	Do. 1	Do.	Do. 8	13
211	Do.	1½ ..	Do. 15	Do. ..	Do.	Do. 8	211
12	Do.	5½ ..	March 6	..			12
29	Do.	6½ ..	Do. 27	May 26	Do.	March 2	29
220	Ayrshire	3½ ..	Spring, 1882	December		September	220
191	Do.	4½ ..	Do.	May 20		March 6	191
210	Do.	3½ ..	Do.	July		April	210
161	Do.	2 ..	October			..	161
155	Do.	2 ..	Do.				155
156	Do.	2 ..	Do.			..	156
149	Shorthorn	1½ ..	Do. 12			..	149
41	Ayrshire	5 ..	June			..	41
160	Do.	2 ..	October			..	160
127	Do.	2 ..	Do.			..	127
18	Shorthorn	6½ ..	April	May 23	Do.	February 27	18
135	Do.	6½ ..	September	..		..	135
188	Do.	3½ ..	November 10	..		..	188
1	Do.	7½ ..	March 22	June 17	Do.	March 21	1
142	Do.	6½ ..	November 24	January 6	Do.	October 13	142
130	Do.	1½ ..	October			..	130
68	Do.	1½ ..	November 1	Do. 31	Do.	November 7	68
185	Do.	1½ ..	October 21	December 30	Do.	October 6	185
111	Do.	2½ ..	Do. 9	January 11	Do.	Do. 21	111
14	Do.	7½ ..	April	July 14	Do.	April 17	14
114	Do.	3½ ..	October 19	January 19	Do.	October 26	114
150	Do.	4 ..	November 17	Do. 11	Do.	Do. 18	150
216	Do.	2½ ..	October			..	216
51	Do.	4½ ..	December, 1881	June 23	Do.	March 30	51
18	Do.	4½ ..	October	November 14	Warlock	August 20	18
213	Do.	3½ ..	November 3			..	213
182	Do.	6½ ..	October 14			..	182
217	Do.	1½ ..	Spring, 1882	May		February	217
19	Do.	1½ ..	December			..	19
132	Do.	5½ ..	January, 1883		..	..	132
87	Do.	7½ ..	December 20			..	87
140	Do.	4½ ..	October			..	140
183	Do.	2½ ..	1st Calf, Jan. 1883	April	..	January, 1883	183
52	Do.	4 ..	April		..	..	52
76	Do.	3½ ..	Spring, 1882		..	..	76
50	Do.	4½ ..	Do.		..	..	50
99	Do.	3½ ..	Do.		..	..	99
95	Do.	3½ ..	Do.		..	..	95

QUANTITY OF MILK GIVEN DAILY BY EACH COW DURING THE MONTH.

No. of Cow.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.
	Qts.	Qts.	Qts.	Qts.	Qts.	Qts.	Qts.	Qts.	Qts.	Qts.	Qts.	Qts.	Qts.	Qts.	Qts.	Qts.
93	18½	18	18	18	17	17	16½	16½	16	17	17	18	18	17	16½	12½
215	11	13½	11½	11	11	13½	11	12½	13	13½	13½	13½	11	14	11	14
100	1	1	..				..	..	..	..	..	..	..	..	..	..
181	8½	7	7	7	7	7	6½	7	7	7	7	8	8	7½	7½	7
131	9	9	9	9	8½	7	6	7	7½	7½	7	6	6	6	7	7
85	13	13	15	15	14½	14	14½	14½	14½	14	14½	15	14	12	13	13
221	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
178	11	10	10	10	10	10	10	10	10	10	9½	10	10	10	10	10
137	11	11	11	10	10	10½	10	10½	11	10	10½	11	11	11	11	11
67	12	12	12	12	12	12	11½	11½	12	12	12	12	10	11	9½	7
13	8	8	9	8	8½	8½	8	8½	9	8½	8½	8½	8½	8½	9	8
211	13	11	13	12	11½	11½	11½	12	12	13	13	13	12½	12½	12	12
12	6½	6	5½	5	4	4	3½	3½	3½	3½	3½	3½	3½	3½	3½	3½
29	6½	7	7	7	8	8	7½	8	8	8	8	8	8	8	8	8
220	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
191	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
210	1	1	1	1	1	1	..	..	..	..	..	..	..	..	..	
161	7	7½	7	7	7	7	6½	7	7	7	7	7	6½	7	7	6½
155	5	4	5	5	5	5	5	5½	5½	5	5	5	5	5	5	5
156	7	7	7	7	7	7	6½	7	7	7	7	7	7	7	7	7
149	11	11	11	10	11	11	11	11	11	11	11	11	11	11½	12	11½
41	10	9	9	9	9	9	9	9	9	9	9	9	9	9½	10	9½
160	6	6	6	6	6	6	6	6	6	6	5	5	5	6½	6	6½
127	7½	8	8	7	8	8	8	8	7½	7½	7	7	7	7	7	7
18	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
135	12	13	12	11	12½	12	11	11½	12½	12½	12	12½	12	12	12½	12½
188	13	13	13	12	12½	12	12	12½	12½	11½	12	12	11	8	9	10
1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
142	12	12	11½	12	13	13½	12	12	12	12	12	12½	12½	12½	12½	10
130	5	6	6	5	5½	5½	6	6	6	6	6	6	5½	5	5	4½
68	16	16	15½	15	15	15	14½	14½	14½	14½	15	15	15	14½	14½	15
185	13	11	15½	15	15	15	14½	15½	15½	15	14½	15	15	15	15	15
111	13	11	11	11	13½	13½	12½	12½	12½	13	13	13½	11	11½	13	12
14	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
114	13	13½	13½	13	14	13	13½	13½	13½	13½	13½	11	11	14	11	14½
150	11	13½	13	13½	11	13½	13½	13½	13½	13	13	13	11	11	12	11
216	10	10	10	10	10	10	9	9	9	9	9½	9½	9	9	9	9½
51	3	2½	2½	2	2½	1½	1½	1½	1½	1½	1½	2	1½	1½	1½	1
18	12	11½	11½	11	10½	10½	10	10½	10½	10½	11	11	10½	10½	10½	9½
213	13½	13½	11	11	11	14	11	11	11	11	14	14	11½	14	15	11
182	11	11	11	11	11	11	11	11	12	12	12	11½	11	11	12	10½
217	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
19	7½	12	12	12	12	11½	11½	11½	10½	10½	10½	12½	12½	13	13	12
132	8½	8½	9	8	8½	8½	8	8	8	8	8½	9	9	8½	8½	7
87	9	10	11	11½	13	13	13½	12½	12	12	11	11	14	14	15	14
140	6	6½	6	7	7	7	7	7½	7½	7	7	7½	8½	9	9	8
183	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
52	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
76	6½	6½	7½	7	7	7	7	7½	7½	7½	8	6½	7½	7	7	7
50	6	6½	6½	6	7	7	7	6½	6½	6	6½	6½	6	6½	6	6
99	6½	6	6½	6	6½	6	6	6½	6½	6½	6½	6½	6½	6	6½	6
95	6	5½	5½	5	6	6	5	5½	5½	6	6	6½	5½	5	6½	6
..	406	403	413	401	409	401	394½	399	401	399	402	409	401	397	403	385
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.

No. of Cow.	17.	18.	19.	20.	21.	22.	23.	24.	25.	26.	27.	28.	29.	30.	31.	Totals.	No. of Cow.
	Qts.	Qts.	Qts.	Qts.	Qts.	Qts.	Qts.	Qts.	Qts.	Qts.	Qts.	Qts.	Qts.	Qts.	Qts.	Qts.	
93	15	14	11	13½	15	18	13	20	18	18	13	19	19	19	15	531	93
215	13	13	13	13	13	11	11	14½	13½	12½	11	15	15	15	15	426	215
100	..	..	..	..	..	..	..	..	..	..	..	..	..		..	2	100
181	8	7½	6½	6½	6½	7	7	6½	6½	6½	7	6	7	7	7	218½	181
131	7	6	6	6	6½	6½	7	6½	6½	4½	8	7	8	7½	8	221½	131
85	13	13	13	11	12	13½	11	11	11	11½	16	17	17	17	17	429½	85
221	..	..	..	..	..	..	..	..	..	..	..		..	..	..	..	221
178	10	10	11	10	10	11	11	11½	12	10	10	10	11	9	9	316	178
137	11	10	10	10	10	12	13	13	12½	12	12	12	12	12	11½	343½	137
67	4	..	..	..	1	2½	1	1	5	5	5	6	6½	7½	8	230	67
13	8	9	9	8	8	9	10	9	10	10	9	10	9	9	9	261	13
211	12	12	12	12½	13	13	13	12	12½	12½	13	11	12	13	13	388	211
12	3½	3½	3½	3½	3½	3½	3½	4	4½	4½	4	4	4	4	4	123½	12
29	8	8	8	8	8	8	8	8	8	8	8	8	8	7	3	244	29
220	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..		220
191	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..		191
210	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	6	210
161	6½	6½	6½	6½	6	6	6	6	6	7	6	6	6	6½	6½	205	161
155	5	5	5	5	5	5	5	5	5	5	5	4	4	4	4	151	155
156	7	7	7	7	7	7	7	7½	7½	7½	7	7	6	6½	6½	216	156
149	12	12	12	12	11½	11½	11½	11½	10	9	10	11	10½	11½	10½	343½	149
41	9½	9½	9½	9½	9½	9½	9	9	9	8	9	8	10	11	..	277	41
160	6½	5½	6½	6½	5½	6½	6½	6½	6½	7	8	8	7	7	6½	191	160
127	8	7½	7	7	7	8	8	8	8	8	7	8	8	8	7½	234½	127
18	..	..	..	..	..	..	..	..	..	..	..	..	..	..		..	18
135	12½	12	12	12	12	12	12	12	12	12	12	12	12	12	12	371	135
188	11	12	12	12	12	12	12	12	12	12½	11½	12	12	12	11½	361½	188
1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1
142	11½	11	12	12½	12	12	12	12	12	12	11½	11½	12	12	11½	371½	142
130	4½	4½	4	4½	4½	4½	4½	4½	4½	4	5	5	5½	6	5	159½	130
68	15	15	15	15	15	14½	13	12	13½	13½	13	13½	14	14	14½	450	68
185	11	11	14	15	14½	14	13	13	13	11	13	11	11½	11½	11	417	185
111	13	13	12	12	11½	11½	11½	11½	10	11	11	11	11½	12	11	386	111
14	1	½	½	..	..	..	..	..	..	..	..	..	..	..	..	18	14
114	13½	12½	12½	12	12	13	12	12	12	12	12	12½	12½	13	11	401½	114
150	13	12	12	12	11½	11	12	12	12	12	12	12	12	12	11	384½	150
216	9	9½	9½	9	9	9	9	9	9	8	9	9	9	9	9	285½	216
51	1	1	1	1	1	1	1	1	1	1	1	1	1	..	..	42	51
18	10	10	9	10	9	10	9½	9½	9½	10½	10	9	9	9	9	313½	18
213	14	11	13½	11	13½	12½	11	11	11	13	13½	11	15	15	11½	431	213
182	10½	10½	10½	9½	9½	10½	10	10	10	10	10	10	11½	12	11½	336	182
217	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	217
19	12½	12½	10½	12	12	12½	13	13	12	12	12	12½	12½	12½	12	368	19
132	7½	8	8	7	7	7½	7	7	8	6	9	9	9	9	9	254½	132
87	14	14	11	14½	15	17	18	17	15	16	16	16	17	16	16	438	87
140	7	7	7	7	8	8	10	10	9	9	8	8	8	8	8	239½	140
183	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	183
52	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	52
76	6½	6½	6½	6½	6	6½	6	7	8	8	8	8	7	7½	7	213	76
50	6½	6½	6	6	6	6½	6	6	7	6½	7	7	6½	6½	7	199½	50
99	6½	5½	5½	6	6	6	5½	6	6	6	6½	6½	6½	6½	6½	192½	99
95	5	5½	4½	6	6	6	5½	6	6	6	6	6½	6	6	6	178½	95
	386	376	371	374	371	389	393	393	390½	384½	395	400	401	406	390	12219½	
	17.	18.	19.	20.	21.	22.	23.	24.	25.	26	27.	28.	29.	30.	31.		

APPROXIMATE QUANTITY OF FOOD SERVED DAILY TO EACH COW DURING THE MONTH.

No. of Cow.	Linseed-cake.	Bruised Oats.	Roots.	Hay.	Straw.	NOTES. PARTICULARS OF SICK CATTLE, DEATHS, ETC., ETC., [illegible] DURING THE MONTH.	No. of Cow.
	lbs.	lbs.	cwts.	stone.	stone.		
93	3	7	¾	1½	½	..	93
215	3	7	¾	1½	½		215
100	3	7	¾	1½	½	Fattening	100
181	3	7	¾	1½	½	Do.	181
131	3	7	¾	1½	½	Do.	131
85	3	3½	¾	1½	½		85
221	3	7	¾	1½	½		221
178	3	3½	¾	1½	½		178
137	3	7	¾	1½	½		137
67	3	7	¾	1½	½	Fattening. Took a bad cold on the 14th	67
13	..	3½	¾	1½	½	..	13
211	..	..	¾	1½	½		211
12		..	¾	1½	½	Fattening	12
29		..	¾	1½	½		29
220	..	..	¾	1½	½		220
191		..	¾	1	½		191
210		..	¾	1½	½		210
161	3	7	¾	1	½		161
155	3	7	¾	1	½	Fattening	155
156	3	7	¾	1	½	Do.	156
149	3	7	¾	1½	½	Do.	149
41	3	7	¾	1	½	Do. Sold 30th January	41
160	3	7	¾	1½	½	Do.	160
127	..		¾	1½	½	Do.	127
18	3	7	¾	1½	½		18
135	3	7	¾	1½	½		135
188	3	7	¾	1½	½	Fattening	188
1	..	..	¾	1½	½		1
142	3	7	¾	1½	½		142
130	3	7	¾	1½	½	Fattening	130
68	3	7	¾	1½	½		68
185	3	7	¾	1½	½		185
111	3	7	¾	1½	½		111
14			¾	1½	½		14
114	3	7	¾	1½	½		114
150	3	7	¾	1½	½		150
216	3	3½	¾	1½	½		216
51			¾	1½	½		51
18	3	7	¾	1½	½		18
213	3	7	¾	1½	½		213
182	..		¾	1½	½	Fattening	182
217	.	.	¾	1½	½		217
19	3	7	¾	1½	½	Fattening	19
132	3	7	¾	1½	½		132
87	3	7	¾	1½	½		87
140	3	3½	¾	1½	½	Fattening	140
183	3		¾	1½	½		183
52	3	7	¾	1½	½	Fattening	52
76	3	7	¾	1½	½	Do.	76
50	3	7	¾	1½	½	Do.	50
99	3	7	¾	1½	½	Do.	99
95	3	7	¾	1½	½	Do.	95

COWS IN THE STRAW-YARD.

No. of Cow.	Description of Cow.	Age last Lady Day.	Date of last Calving.	Date when Served.	Cow Served by	Date when next due to Calve.	Notes, Food, &c.
112	Shorthorn	7½ Years	April	June 7	Warlock	March 14	½ cwt. of Roots, 3 lbs. of Linseed-cake, 1st Hay and Straw *ad libitum* each, per day.
193	Do.	3½ ..	Spring, 1882	May	.. ..	February	
107	Do.	2½ ..	Do.	May	.. ..	February	
218	Do.	1½ ..	..	February	.. ..	May	
104	Do.	2½ ..	..	May	.. ..	February	

Shorthorn Bull "British Boy" (44,463), bred by Mr. W. Atkinson, Burneside Hall, Westmoreland. Sire, "British Harvest" (30,500). Dam, "Jenny," by "Duke of Kirkby" (33,682).	3 lbs. Linseed-cake, 3½ lbs. Oats, ½ cwt. Roots per day

CATTLE FOOD ACCOUNT.

Description of Food.	Stock on Hand, 1st January, 1883.	Stock received during the Month for Cattle.	Stock consumed during the Month by Cattle.	Stock on Hand, 31st January, 1883.	Notes, &c.
Linseed-cake	1 ton 15 cwts.	1 ton	1 ton 13¾ cwts.	1 ton 1¼ cwts.	
Oats	8 quarters	25 quarters	24 quarters	9 quarters	
Oatmeal	1 sack	..	½ sack	½ sack	
Swede Turnips	100 tons	..	46½ tons	53½ tons	
Mangolds	50 tons	..	..	50 tons	
Carrots	7 tons	..	..	4 tons	3 tons used by horses.
Meadow Hay	18 tons	..	15 tons 15 cwts.	..	Balance used by horses.
Wheat Straw	35 tons	..	..	20 tons	3 tons used for Bedding, 11½ tons sent to Farm Produce Warehouse, Hull.
Oat Straw	15 tons	..	5 tons	10 tons	

MILK—HOW DISPOSED OF.

Day of Month.	Sent to East Park Dairy.	Sent to the Infirmary.	Reserved for College Dairy.	Total.
	Gallons.	Gallons.	Gallons.	Gallons.
1	68½	30	4	102½
2	69½	28¾	4	102¼
3	70½	28¾	4	103¼
4	67½	28¾	4	100¼
5	69½	28¾	4	102¼
6	68	28¾	4	100¾
7	65	28¾	4	97¾
8	66½	28¾	4	99¼
9	67½	28¾	4	100¼
10	67	28¾	4	99¾
11	69	27¼	4	100¼
12	69½	28¾	4	102¼
13	67½	28¾	4	100¼
14	66½	28¾	4	99¼
15	68	28¾	4	100¾
16	63½	28¾	4	96¼
17	63½	28¾	4	96¼
18	62½	27½	4	94
19	60	28¾	4	92¾
20	60	28¾	4	92¾
21	60	28¾	4	92¾
22	64½	28¾	4	97¼
23	65½	28¾	4	98¼
24	65½	28¾	4	98¼
25	66	27¼	4	97¼
26	64	28¾	4	96¾
27	66½	28¾	4	98¾
28	68½	27½	4	100
29	69½	27½	4	101
30	70	27½	4	101½
31	66	27½	4	97½
..	2035½	882½	124	3042

TIME THE MILK-CART LEFT TWYERS WOOD FOR HULL.

Day of Month.	A.M.	P.M.	Name. Who [illegible] by.
1	6.30	2.30	Ellerington
2	6.35	3.40	Do.
3	6.50	3.15	Do.
4	6.40	3.30	Do.
5	6.30	3.30	Do.
6	6.35	3.30	Do.
7	6.35	3.35	Do.
8	6.35	3.40	Do.
9	6.40	3.40	Do.
10	6.30	3.35	Do.
11	6.35	3.30	Do.
12	6.35	3.10	Do.
13	6.40	3.30	Do.
14	6.40	3.45	Do.
15	6.30	3.40	Do.
16	6.35	3.50	Do.
17	6.35	3.40	Do.
18	6.35	3.45	Do.
19	6.30	3.30	Do.
20	6.30	3.35	Do.
21	6.30	3.35	Corless
22	6.30	3.30	Do.
23	6.35	3.30	Do.
24	6.30	3.35	Do.
25	6.30	3.30	Do.
26	6.30	3.30	Ellerington
27	6.35	3.30	Do.
28	6.35	3.35	Do.
29	6.30	3.35	Do.
30	6.30	3.30	Do.
31	6.30	3.30	Do.

WEATHER REPORT.

Day of Month.	[illegible] Weather during the Month.
1	Thick, misty morning. Showery day.
2	From 2nd to 11th, dull, showery weather, misty in the early morning, with an occasional fine day.
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	Fair.
13	Dull and misty weather.
14	Foggy, very dull.
15	Showery.
16	Fine, with frost.
17	Fine.
18	Fine.
19	Showery.
20	Very fine and cold.
21	Fair; very cold in the afternoon.
22	Frost; very cold wind and misty morning.
23	Hoar-frost; rather misty; very cold except in the sun's rays. Very fine day.
24	Fine, cold, clear, frosty morning, dry until 3 P.M., when it rained. Stormy night.
25	Calm, clear morning. Soil very wet from last night's rain.
26	Very stormy strong winds; very little rain. South-west winds. Stormy night.
27	Cold, frosty morning. 11 A.M. snow, sleet, and rain. S.-west wind and fair afternoon.
28	South-west wind, warm until night, when it was a perfect hurricane.
29	Hard frost and dry day. South-west and south-east winds.
30	Hard frost. Cold south-west wind. Clear starlight night.
31	Frosty, cold, misty and dull, without rain. South-west and southerly winds.

TABLE V.—DAIRY RECORD OF EAST PARK FARM, BURTON CONSTABLE, FOR JANUARY, 1883.

No. of Cow.	Description of Cow.	Age last Lady Day.	Date of last Calving.	Date when Served.	Cow Served by	Date when due to Calve.
167	Ayrshire ..	3 Years	October 1 ..	.. ..	.. ..	.. ..
163	Do. ..	2½ "	November 1	January 12..	"Warlock"	October 19 ..
39	Do. ..	4½ "	.. ..	.. ..	.. ..	.. ..
124	Shorthorn	2½ "	August 4 ..	.. ..	.. ..	.. ..
125	Do. ..	2½ "	" 25 ..	January 18	Do. ..	October 25 ..
171	Ayrshire ..	2½ "	October 22 ..	December 27	Do. ..	September 4
152	Shorthorn ..	2½ "	" 1	.. ..	.. ..	.. ..
153	Do. ..	2½ "	" 3	October 29 ..	Do. ..	August 5 ..
111	Do. ..	2½ "	May 14 ..	June 9	.. ..	March 16
109	Ayrshire ..	4½ "	March 19 ..	May 28 ..	.. ..	" 4
120	Shorthorn ..	2½ "	July 12 ..	September 8	Do.	June 15 ..
122	Do. ..	2½ "	August 5 ..	January 27 ..	Do. ..	November 3
96	Do. ..	3½ "	January 7 ..	March 27 ..	.. ..	January 1 ..
175	Do.	2½ "	October 9	November 7	Do. ..	August 11 ..
126	Do. ..	2½ "	September 5	.. ..	.. ..	.. ..
162	Ayrshire ..	2½ "	October 18 ..	January 26 ..	Do. ..	November 2
113	Shorthorn ..	2½ "	May 12 ..	July 25 ..	.. ..	May 1 .. ..
190	Do. ..	2½ "	October 8 ..	January 11 ..	Do. ..	October 21 ..
171	Ayrshire ..	2½ "	" 17 ..	" 17 ..	Do.	October 21 ..
191	Shorthorn ..	2½ "	" 21 ..	.. ..	..	.. ..
128	Do. ..	2½ "	September 17	.. ..		.. .. ..
117	Do.	2½ "	July 12 ..	September 1	Do.	June 11 ..
139	Do. ..	2½ "	October 30 ..	January 22 ..	Do.	October 29 ..
27	Do. ..	5½ "	March 22 ..	May 2 ..		February 26
58	Do. ..	5½ "	June 28 ..	August 10 ..	.	May 17 ..
59	Ayrshire ..	4½ "	March 5 ..	September 12	Do.	June 19 ..
121	Shorthorn ..	3½ "	August 27 ..	October 11	Do.	July 18 ..
116	Do. ..	2½ "	April 4 ..	August 2 ..	.. ..	May 9 ..
158	Ayrshire ..	2½ "	October 4	January 7 ..	Do. ..	October 11 ..
168	Do. ..	2½ "	November 2	.. ..	.. ..	.. ..
189	Shorthorn ..	2½ "	" 6	January 11 ..	Do. ..	October 21 ..
192	Do. ..	3½ "	" 15	" 17 ..	Do. ..	" 21 ..
193	Do. ..	3½ "	" 18	.. ..	.. ..	.. ..
172	Ayrshire ..	2½ "	" 13	.. ..	.. ..	.. ..
81	Shorthorn ..	4½ "	" 23	January 21 ..	Do. ..	October 31 ..
11	Do. ..	7½ "	Spring, 1882	June 6 ..	.. ..	March 13 ..
181	Do. ..	2 "	December ..	.. ..	.. ..	.. ..
143	Do. ..	3½ "	November 11	January 21	Do. ..	October 28 ..
199	Do. ..	3½ "	.. ..	.. ..	.. ..	February ..

QUANTITY OF MILK GIVEN DAILY BY EACH COW DURING THE MONTH.

No. of Cow.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.
	Qts.	Qts.	Qts.	Qts.	Qts.	Qts.	Qts.	Qts.	Qts.	Qts.	Qts.	Qts.	Qts.	Qts.	Qts.	Qts.
167	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
163	9	9	9	9	9	9	7	9	9	9	8	8	8	9	7	7
39	6	6	6	6	6	6	7	7	7	6	7	6	6	5	5	5
124	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
125	7	7	7	7	7	7	6	7	7	7	7	7	7	7	7	7
171	7	6	6	6	6	6	6	6	6	6	6	7	7	6	6	6
152	10	10	10	10	10	10	9	10	10	11	11	11	10	10	9	9
153	7	7	7	8	8	7	7	7	7	7	8	8	8	8	7	7
111	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
109	3	3	3	2	2	2	3	2	2	2	2	2	2	2	2	2
120	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
122	5	5	5	5	5	5	5	6	6	5	5	5	5	5	5	5
96	..	..	..	..	..	..	..			..	..	..	..		11	11
175	9	10	9	9	9	9	9	9	9	9	9	9	9	9	9	9
126	7	7	7	7	7	7	6	7	7	7	7	7	7	7	7	7
162	11	11	11	11	11	11	11	11	11	11	11	11	11	10	10	10
113	3	3	3	3	2	2	3	2	2	2	2	2	2	2	2	2
190	9	9	9	9	9	9	9	9	9	9	9	8	9	9	9	9
171	9	9	9	9	10	9	9	9	9	9	8	8	8	8	9	8
191	9	9	8	9	10	9	9	9	9	9	8	9	9	9	9	8
128	12	12	11	11	11	11	11	11	11	11	10	11	11	11	11	11
117	3	3	3	3	3	2	2	2	2	2	2	2	2	2	2	2
139	9	9	9	9	9	9	9	9	9	9	9	9	8	9	9	9
27	2	2	2	2	2	2	1	1	1	1	1	1	1	1	..	.
58	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
59	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
121	5	5	5	5	5	5	5	5	5	5	4	5	5	5	5	5
116	3	3	3	3	3	3	3	3	3	3	2	3	3	3	3	3
158	7	7	7	7	7	7	5	7	7	7	7	7	7	7	7	7
168	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13
189	9	9	9	9	9	9	9	9	9	9	9	8	8	9	9	9
192	13	12	12	12	12	12	12	12	12	12	10	10	5	9	8	11
193	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11
172	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11
81	10	11	11	11	11	11	8	11	11	11	14	12	15	11	15	15
11	4	4	4	4	4	4	4	4	4	4	1	2	2	4	2	2
181	..	..	..	..	..	..	..		.	..	..	.	..	..	..	
143	12	12	11	11	11	11	11	11	11	11	11	11	11	11	10	11
199	..	..	..	..	..	..	..	..	..	..	..	.	..	..	..	..
..	272	271	267	268	269	265	257	261	263	268	262	260	261	262	266	271
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.

No. of Cow.	17.	18.	19.	20.	21.	22.	23.	24.	25.	26.	27.	28.	29.	30.	31.	Totals.	No. of Cow.
	Qts.	Qts.	Qts.	Qts.	Qts.	Qts.	Qts.	Qts.	Qts.	Qts.	Qts.	Qts.	Qts.	Qts.	Qts.		
167	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	155	167
163	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	210	163
39	5	5	5	5	5	5	5	5	3	3	3	3	3	3	3	158	39
124	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	155	124
125	7	7	7	7	7	7	7	7	7	7	7	7	7	7	6	215	125
171	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	189	171
152	11	10	10	10	10	10	9	9	9	9	10	9	9	9	9	303	152
153	8	8	8	7	7	8	7	7	7	7	7	7	7	7	7	227	153
111	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	155	111
109	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	66	109
120	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	155	120
122	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	157	122
96	15	15	15	15	15	15	15	15	17	11	15	15	15	15	15	249	96
175	10	9	9	9	9	9	9	9	9	9	9	9	9	9	9	281	175
126	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	216	126
162	10	10	10	10	10	9	9	9	9	9	9	9	9	9	9	314	162
113	2	2	2	2	2	2	.	..	.	..	..	..			..	49	113
190	8	8	9	8	7	9	8	7	7	8	8	8	9	8	8	263	190
171	8	8	8	7	7	7	7	7	6	6	6	6	6	6	6	241	171
191	8	8	8	7	7	9	8	7	7	8	8	8	9	9	9	262	191
128	11	11	11	11	11	10	11	11	9	11	11	11	10	11	11	338	128
117	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	66	117
139	9	9	9	9	9	9	9	9	9	9	9	8	8	8	6	272	139
27	..			..		.	..		..	..					.	20	27
58	8	8	8	6	6	7	6	6	6	6	6	6	6	6	6	225	58
59	8	8	8	8	8	8	8	8	8	8	8	8	9	9	9	251	59
121	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	154	121
116	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	92	116
158	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	215	158
168	13	13	13	13	13	13	14	13	13	13	13	11	13	13	11	406	168
189	9	9	9	9	8	9	9	9	9	9	9	9	9	9	9	277	189
192	11	10	10	9	9	10	10	9	9	9	10	10	10	10	9	324	192
193	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	341	193
172	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	341	172
81	17	14	15	15	11	11	13	13	13	11	14	13	13	13	12	407	81
11	2	2	2	2	2	2	..	.		.	..			.	..	68	11
181	..	..	.		.	..	..				..	..			..	..	181
143	12	11	11	11	11	11	11	11	11	10	11	11	11	11	11	342	143
199	.	..			..	..	..	..		..	..	.	.		..	.	199
	278	271	273	266	263	269	261	257	252	255	259	257	258	258	253	8185	
	17.	18.	19.	20.	21.	22.	23.	24.	25.	26.	27.	28.	29.	30.	31.		

APPROXIMATE QUANTITY OF FOOD SERVED DAILY TO EACH COW DURING THE MONTH.

No. of Cow.	Linseed-cake.	Cotton-cake.	Roots.	Hay.	NOTES. PARTICULARS OF DAIRY CATTLE BOUGHT, SOLD, OR TRANSFERRED, &c., DURING THE MONTH.	No. of Cow.
	lbs.	lbs.	cwts.	stones.		
167	2½	2½	½	1½		167
163	2½	2½	½	1½		163
39	2½	2½	½	1½		39
124	2½	2½	½	1½		124
125	2½	2½	½	1½		125
171	2½	2½	½	1½		171
152	2½	2½	½	1½		152
153	2½	2½	½	1½		153
111	2½		½	1½		111
109	2½	2½	½	1½		109
120	2½	2½	½	1½		120
122	2½	2½	½	1½		122
96	2½	2½	½	1½		96
175	2½	2½	½	1½		175
126	2½	2½	½	1½		126
162	2½	2½	½	1½		162
113	2½	2½	½	1½	Dried for Calving, 22nd January	113
190	2½	2½	½	1½		190
171	2½	2½	½	1½		171
191	2½	2½	½	1½		191
128	2½	2½	½	1½		128
117	2½	2½	½	1½		117
139	2½	2½	½	1½		139
27	2½		½	2	Dried for Calving, 11th January	27
58	2½	2½	½	2		58
59	2½	2½	½	1½		59
121	2½	2½	½	1½		121
116	2½	2½	½	1½		116
158	2½	2½	½	1½		158
168	2½	2½	½	1½		168
189	2½	2½	½	1½		189
192	2½	2½	½	1½		192
193	2½	2½	½	1½		193
172	2½	2½	½	1½		172
81	2½	2½	½	2		81
11	2½	2½	½	1½	Dried for Calving, 22nd January	11
181	2½	2½	½	1½	Dried immediately	181
143	2½	2½	½	1½		143
199	2½	2½	½	1½		199

CATTLE NOT INCLUDED IN ABOVE LIST.

Nos. and Description.	Notes, Daily Quantity of Food served, &c.
12 Shorthorn Heifers (Nos. 200–211), 18 to 24 months old, in-calf to "British Boy," served last Autumn	1½ st. Hay each per day.
12 Shorthorn Heifers (Nos. 222–233), 13 to 18 months old	1 st. Hay "
12 Shorthorn Heifers, 6 to 12 months old	¾ st. Hay "
12 Shorthorn Heifer Calves, under 4 months old	¼ st. Hay "
8 Shorthorn Bull Calves, under 4 months old	¼ st. Hay "
1 Shorthorn Bull "Warlock," bred by Mr. H. P. Holme, Maudale, Penrith; sire, "Warlock's Fame" (40,880), dam, "Double Bud Rose," by "Monarch" (41,930)	1½ st. Hay per day.

CATTLE FOOD ACCOUNT.

Description of Food.	Stock on Hand, 1st January, 1883.	Stock received during the Month.	Stock consumed during the Month.	Stock on Hand, 31st January, 1883.
Linseed-cake		4 tons	2 tons	2 tons
Cotton-cake	2 cwts.	2 tons	2 tons	2 cwts.
Bran	..	1 ton	15 cwts.	5 cwts.
Oats	5 quarters	5 quarters	5 quarters	5 quarters
Barley	1 quarter	.	1 quarter	..
Oatmeal	4 stones	46 stones	28 stones	22 stones
Barley-meal	..	18 stones	15 stones	3 stones
Linseed-meal	5 stones	10 stones	13 stones	2 stones
Swede Turnips	..	35 tons	31 tons	4 tons
Meadow Hay	112 tons	2 tons 6 cwts. 2 qrs.	19 tons 2 cwts.	95 tons 4 cwts.
Barley-straw	10 cwts.	4 tons 1 quarter	3½ tons	1 ton
Wheat-straw		5 tons 16 cwts. 2 qrs.	5 tons 6 cwts.	½ ton
Sharps	.	18 stones	15 stones	3 stones

MILK—HOW DISPOSED OF.

Day of Month.	Set for Cream.	Served to Calves.		Sold to Private Families.	Used by Men in Bailiff's House.
	Gallons.	Gallons. New.	Gallons. Skim.	Gallons. New.	Gallons. Skim.
1	68	..	58½	..	3
2	67½	.	58	.	3
3	66½	..	56½		3
4	67	..	57	..	3
5	66½		57½	..	3
6	65½		56	¾	3
7	62½	2	52½	.	3
8	62½	2	55½	.	3
9	65½	2	55½	..	3
10	63	1	53½	..	3
11	61½	4	52	..	3
12	61	4	52	.	3
13	60½	4	51½	¾	3
14	61½	4	52½	..	3
15	62½	4	53	..	3
16	63½	4	51½	..	3
17	65½	4	56	..	3
18	60½	4	51½	..	3
19	64½	4	51½		3
20	61½	4	52½	¾	3
21	61½	4	52½	..	3
22	63½	3	51½	½	3
23	62½	3	53½	.	3
24	61½	3	52½		3
25	59½	3	50½	½	3
26	60½	3	51½	..	3
27	60½	3	51½	1	3
28	61½	3	52½		3
29	61	3	52	½	3
30	61½	3	52½	..	3
31	60½	3	51	..	3
	1958	81	1660	4¼	93

BUTTER—HOW DISPOSED OF.

Day of Month.	Quantity Churned.	Sent to East Park Dairy.	Sent to [illegible].	Sent to [illegible] Wood.	Sold to Private Families.	Used in Bailiff's House.	Sent to Burton Hall.	Allowed to Milkmen.	Totals.
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
1	100½				.	1	.		1
2		30	51	1½	14	.	.		96½
3		..	..			..	.		
4	80	.				..	.		
5		30	42½	1	5	..	1	½	80
6		..	.		.	..	.		..
7		..	.		..	.	.		..
8	103	..	..		..	1	.		1
9		30	57½	1½	12	.	.		101
10		..	..	..	..		.		
11	82	..			..	.	.		
12	..	30	44	1	6½	..	1	½	83
13	..	..	..	..	..		.		
14	..	.	..		..		.		.
15	109½		.	..		1	.		1
16	..	30	65	1½	12		.		108½
17	..	..	..	..	..		.	..	
18	79	..			..		.		
19		30	41	1	5½	.	1	½	79
20		..	..	..	..	.	.		
21		.	..	..	..	..	.		
22	86				..	..	.		
23		35	35½	1½	13	1	.		86
24	..	..	..	..	..	..	..	..	
25	75½					..	.		
26		30	37½	1	5½	.	1	½	75½
27		..	..		..	..	..	..	.
28		.	..	..			.		
29	111	.	.	..		..			
30	..	35	60½	1½	13	1	.		111
31	..	..	..		..	..			
..	826½	280	437½	11½	86½	5	4	2	826½

STATE OF THE WEATHER DURING THE MONTH.

Day of Month.	
1	Foggy in the morning. Showers and drizzle during the day.
2	Wet, drizzling day. Dull.
3	Dull, but no rain.
4	Dull misty weather, occasionally fine in the middle of the day.
5	
6	
7	
8	
9	
10	
11	
12	Fine.
13	Dull, misty, and damp.
14	Foggy, but otherwise fine.
15	Showery, dull day.
16	Fine, with sharp frost.
17	Fair.
18	Fair.
19	Showery and cold.
20	Fine.
21	Fair; very cold in the afternoon.
22	Hoar-frost; rather misty; very cold except in the sun's rays. Fine day.
23	Hoar-frost; misty morning, clear, cold; day very fine.
24	Fine, cold, clear, frosty morning; fine until 3 p.m., when it rained.
25	Calm, clear morning. Ground very wet from last night's rain.
26	Very stormy strong winds from south-west; very little rain. Stormy night.
27	Cold, frosty morning till 11 a.m.; snow, sleet, and rain, with south and south-west winds, and fine afternoon.
28	South-west winds; no rain until night, when it was a perfect hurricane.
29	Hard frost; dry day.
30	Hard frost. Cold south-west winds. Clear starlight night.
31	Frosty, cold, misty and dull, without rain. South-west and south-east winds.

has not been occupied for fifteen years. It contains, among other valuables and rarities, a fine collection of paintings, and what is said to be one of the finest libraries in Yorkshire.

The Rev. John Storrer, M.A., in 'The Wild White Cattle of Great Britain,' says of this library: "Therein is a collection of MSS., written about the middle of last century by the learned William Constable, upon various subjects; horses, cattle, agriculture, and county history; and which, in all probability, contain some valuable references to the herd of white cattle which then inhabited the park. I write this for the benefit of those who pursue such studies after me, the library at Burton Constable being at present a sealed book. This is the *only* case in which I have been refused information."

This house must have at one time held high rank among "The stately homes of England." The "tall ancestral trees" are not dependent on frail humanity for their continued existence, and therefore, though they may sigh out wintry dirges over the prevailing desolation, *their* glory remains.

Enough of these echoes of the past: let us come back to the "living present"—Mr. Turnbull's cows and heifers.

Butter being now the *summum bonum* here, it deserves first attention. About 40 cows are milked, but they are chiefly young cows and heifers, and do not produce so much milk as those at Hedon; the average in January, as will be seen from the appended dairy report (Table V.) for that month, was about 7¼ quarts per day.

In July they were giving 10 quarts each per day.

The milking hours here are from 5 to 7 A.M. and 4 to 6 P.M. Each man milks from 12 to 15 cows or heifers. In addition to Watson, the steward, 3 men are regularly employed at East Park.

The milk is set in the dairy in leaden bowls, 36 inches by 26 inches, and about 7 inches deep, fixed in shelves. Each lead has a covered plug in the centre; the milk usually stands 36 hours, in very hot weather 24 hours. About half an ounce of "Glacialine" (compound salt) is mixed with 10 gallons of milk, which is said to keep the milk sweet for a longer time. It is then run off, the plug being withdrawn; the cover, which is indented at the bottom, allows the milk to run through into pails below, but retains the cream. After the milk is all through, the plug is re-inserted, and a pail is placed below to receive the cream; both plug and cover are then withdrawn, the cream is expedited in its passage to the centre outlet by a piece of fine horn, which is used finally for scraping adhering cream from the sides of the leads; this is done expeditiously, but so effectively that, on completion, the leads have the appearance of having been washed.

Taylor's Eccentric Churn is used, and butter is usually got with about half an hour's churning. It is made twice a week, and is made up into long, round, and square pound and half-pound stamps, all bearing the impress "East Park Dairy;" on two occasions we saw about 100 pounds finished off ready for despatch. This department is worked by Mrs. Watson, the foreman's wife, who must take high rank as an artist in the honourable profession of butter-making.

The "Cooley Creamer" was tried after the Swartz system, but these churns are now laid aside. With this system it took 14 quarts of milk to make 1 pound of butter, whereas with the shallow leaden bowls 10 quarts gave a pound; such were the results of two personally superintended experiments. Mr. Turnbull says: "The larger portion of my butter is sold by contract to a provision merchant at 1*s.* 7*d.* a pound, the year round. He offered to take all I produce at this price. My trade mark is 'East Park Dairy.' I have found it a great advantage to have a distinct trade mark of this kind. The butter has gradually risen in price as the brand has become known. The first year the price averaged about 1*s.* 5*d.* per pound. The second year I obtained 1*s.* 6*d.*, and now I could sell more than I now produce at 1*s.* 7*d.* the year round."

The plan (Fig. 4, p. 539) will afford a general idea of the position of the park. The clumps of trees, which stand in small scattered enclosures, give a rich sylvan appearance to the landscape.

The park has been subdivided by Mr. Turnbull. Two fields, of 35 acres and 36 acres respectively, are meadow, and are dressed each year with about 12 tons of farmyard-manure per acre. The deer park, of 15½ acres, always in pasture, was dressed in 1880 with 5 cwt. of bone-meal, and in 1882 with 20 tons of farmyard-manure per acre.

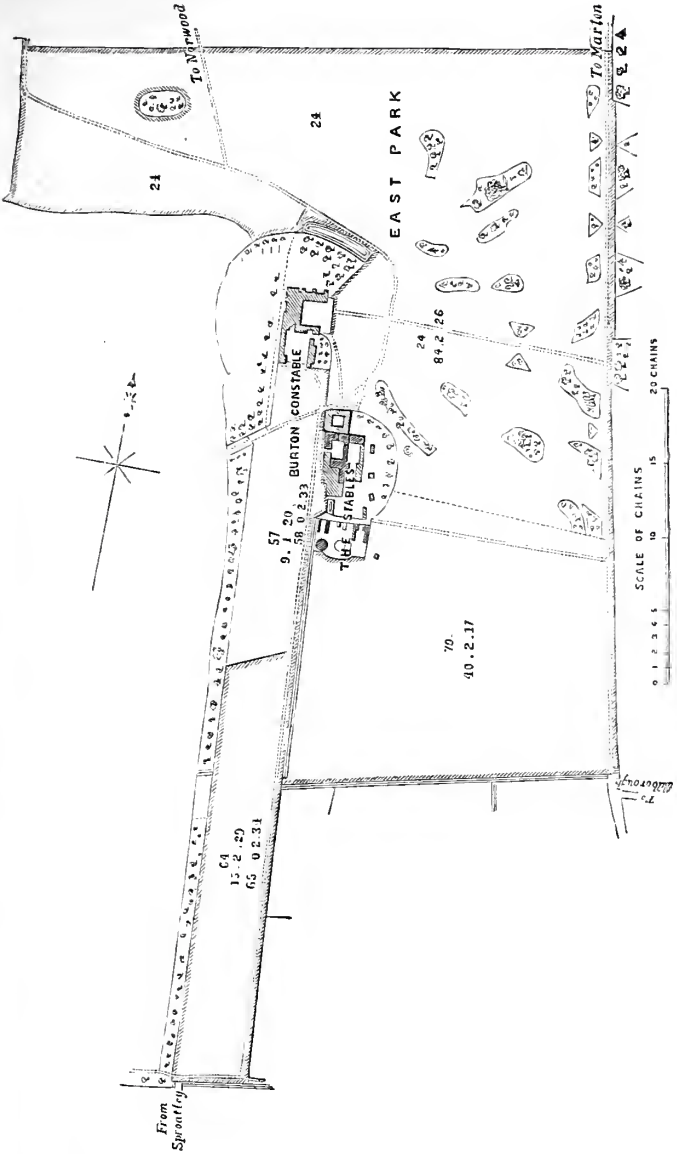
Two haystacks were standing, each computed to contain 52 tons of old hay; one of these was intended for sale.

The fences erected were made with creosoted posts and rails, costing about 1*s.* 6*d.* per yard fixed, and could be removed on the termination of the tenancy.

The following Table (p. 540) shows the number of cattle on East Park at the dates of the several inspections.

This Table shows that there were 5 cows and 31 heifers in-milk in January. After a second calf, the cows are usually taken to Hedon. Twelve in-calf heifers, from 18 to 24 months old, were strong, beautiful cattle, and the younger heifers were nothing short in quality.

Fig. 4.—*Plan of the Home Farm at Burton Constable.*



REFERENCE TO PLAN OF HOME FARM AT BURTON CONSTABLE.

		A.	R.	P.	
24.	East Park. Grass	84	2	26	
57.	Stable Close. Grass	9	1	20	*Note.*—No. 57 is not in the occupation of Mr. Turnbull.
58.	Road	0	2	33	
64.	Deer Paddock. Grass	15	2	29	
65.	Road	0	2	34	
70.	Pigeon Cote Field (and buildings). Grass	40	2	17	
		151	2	39	

TABLE VI.—NUMBER of CATTLE on EAST PARK at the DATE of each INSPECTION.

January.	*May.*	*July.*
3 Shorthorn Cows in-milk. 2 ,, ,, dried, for calving. 22 ,, Heifers in-milk. 1 ,, ,, dried, for fattening. 12 ,, ,, 18 to 21 months old, in-calf to "British Boy," served last autumn. 12 Shorthorn Heifers, 13 to 18 months old. 12 ,, ,, 6 to 12 ,, 12 ,, Heifer calves, under 4 months old. 8 ,, Bull calves, under 4 ,, 2 Ayrshire Cows in-milk. 9 ,, Heifers ,, 1 Shorthorn Bull, "Warlock," bred by Mr. H. P. Holme, Mardale, Penrith; sire, "Warrior's Fame" (40,889); dam, "Double Red Rose," bred by "Monarch" (31,930).	5 Shorthorn Cows in-milk. 5 ,, ,, dry, for calving. 11 ,, Heifers in-milk. 1 ,, Drape Heifer, fattening. 1 Ayrshire Cow in-milk. 5 ,, Heifers in-milk. 1 ,, Drape Heifer, fattening. 17 Shorthorn Heifers, 18 to 24 months old. 8 due to calve in the Spring and Summer; 4 due to calve in the Autumn; and 5 still to be served. 11 Shorthorn Heifers, from 9 to 12 months old. 1 Guernsey Heifer, 12 months old. 1 Ayrshire Heifer, 12 months old. 2 Shorthorn Steers, about 9 months old. 8 ,, Heifer calves, from 4 to 6 months old. 5 ,, Steer calves, from 4 to 6 months old. 6 ,, Steer calves, under 4 months old. 5 ,, Heifer calves, under 4 months old. 1 ,, Bull, "Jack Frost," by "Prince Christine" (vol. xxvi. p. 347), by "Royal Butterfly 17" (22,774); d. "White Frost." 1 ,, Bull, "Warlock."	31 Cows and Heifers, viz.:— 16 Shorthorn Cows in-milk. 8 ,, Heifers in-milk. 2 Ayrshire Cows in-milk. 2 Shorthorn Heifers in-calf, due to calve 24th July. 1 Shorthorn Cow, newly calved, 2nd July. 1 Shorthorn Cow, dry, for calving. 1 Ayrshire Cow ,, ,, 18 Heifers in Deer Paddock, viz.:— 16 Shorthorns 1 Guernsey 1 Shorthorn-Ayrshire Cross } 15 to 21 months old, served to calve next spring. 19 Shorthorns in East Park Paddock, viz.:— 11 Heifers 8 Steers } 8 to 10 months old. 10 Shorthorn Calves in the Buildings, viz.:— 5 Steers 4 Heifers 1 Bull } 3 to 6 months old. 13 Shorthorn Calves in the Buildings, viz.:— 8 Steers 5 Heifers } Under 3 months old. 1 Shorthorn Bull, "Jack Frost."

Mr. Turnbull's system of rearing calves, as illustrated by the young stock on this farm, is so successful, that I must describe it in detail in Mr. Turnbull's own words: "When a cow or heifer has calved, we place the calf within reach of the cow for about ten minutes, so that she may lick it as nature teaches her to do. If the calf be removed after the lapse of ten minutes, the cow is rarely unsettled for more than a few minutes; but if the calf is left longer, the cow may be unsettled for days.

"We give the calf new milk for the first month, gradually increasing the quantity up to 2 gallons per day. In the next month the calf is fed on boiled skim-milk, 8 to 10 quarts per day; to prevent the milk being burned, the vessel in which it is heated is suspended in a copper of water. From the end of the second month the calf gets a mixture consisting of two-thirds oatmeal and one-third crushed linseed, made into porridge and mixed hot with skim-milk. The quantity of mixed meal is gradually increased from 1 lb. to 2 lbs. per day.

"The calf is taught to eat sweet hay, crushed oats, and linseed-cake, as early as possible.

"In the early stages of its growth I never allow a calf to be kept more than a few weeks in the same house. I attach great importance to this, and to fresh air without draught, also to regularity in feeding."

The youngest calves occupy the stalls in the stables, and are moved forward and hardened off in sheds as they get older. They were all full of flesh and had beautiful coats. Those in the sheds were getting a little mixed linseed and cotton-cake with hay *ad libitum;* a lump of rock-salt and another of chalk were found in every manger.

An old shed at one side of the building had been extended by Mr. Turnbull so as to form nearly a circle, with an open court in the centre. The older heifers were placed here, and, like the rest, were doing admirably. On our last inspection 19 of the oldest calves were out at grass, weaned, and had this building for a shelter shed, where they were receiving a mixture of cotton- and linseed-cake. Mr. Turnbull had refused an offer of 14*l.* for the heifers, 8 to 10 months old. 20 heifers, from 15 to 21 months old, were grazing in the Deer Park of 15 acres, getting nothing but what they pulled, and were in excellent condition. Two of them were nearly due to calve, and the others would come forward at different stages. Heifers in-calf run out on grass both in summer and winter. In winter they are brought into a straw-yard at night, when they are supplied with from 14 to 21 lbs. of hay each, according to their age and size. Heifers due to calve in spring are allowed about 2½ lbs. of linseed-cake each per day for two months previous to calving.

An Ayrshire-Shorthorn cross, and her calf a few days old, were confined together in a loose box. This cow had a wonderful show for milk; her calf was allowed to suck for a few days to soften the udder, but this is not generally practised. An attack of milk-fever had been much dreaded in this case previous to calving. A three-gill bottle of linseed-oil had been three times administered at intervals, also 1 lb. of salts and treacle, and a "red drench" (Day, Son, and Hewitt's). Two quarts of blood had also been taken from the nose. These precautions seemed to imply a quantity of physic; but the fact was before us that the cow and calf were both in good health, and promised to bring good profits to their owner. During summer, when the cows are at grass, half a stone of treacle in warm water is given from 12 to 24 hours before calving, and a quarter of a stone of treacle in oatmeal-gruel immediately after calving. All cows are bled about two days before they calve by opening the nose-vein; not a cow has been lost by milk-fever since this practice was adopted.

Much has been spoken and written for and against the application of purely commercial principles to farming. In Twyers Wood and East Park farms we have a practical illustration of the working of those principles. Mr. Turnbull was told, when negotiating the lease of Twyers Wood farm, that if he would give a rent of 46*s*. per acre he might crop the arable land as he liked, and sell what he chose. The landlord so far has certainly not suffered from this freedom of cropping and sale, and the tenant expresses himself satisfied with the results.

The annexed stock-taking particulars of valuation and farm balance-sheet (Tables VII. and VIII.) will show that book-keeping is systematically carried out. It is difficult to determine the exact profit or loss on a farm so near the beginning of a running lease; a certain amount of the capital expended in improvements requires to be written off annually, and assets in growing crops are also difficult to estimate; but I think that this balance-sheet conscientiously explains the financial position of Mr. Turnbull's farming interest; and as such I give it to the readers of this Report, and leave them to draw their own conclusions from it.

It might be stated, in confirmation of Mr. Turnbull's belief in the profitable nature of his investment in agricultural improvements at Twyers Wood, that he has recently refused an offer for his lease from a public company, although it would have at once recouped him for all his outlay, and left a balance which, if placed to the credit of an ordinary farmer, would at the present time be considered a tangible improvement in his position with his banker.

In regard to the nett value of the growing corn-crops, esti-

TABLE VII.—PARTICULARS OF VALUATION OF R. E. TURNBULL'S STOCK.

1st MAY, 1883.

		£	s.	d.	£	s.	d.
CATTLE AT EAST PARK:—							
5 Shorthorn Cows in-milk							
5 „ „ dry for calving.							
11 Heifers in-milk							
1 Drape Heifer, for fattening							
22 Shorthorns	@ £25 each	550	0	0			
1 Ayrshire Cow in-milk.							
5 „ Heifers ..							
1 „ Drape Heifer, for fattening.							
7 Ayrshires	@ £18 each	126	0	0			
17 Shorthorn (in-calf) Heifers, 18 to 21 months old .	@ 20 guineas	357	0	0			
11 „ Heifers, from 9 to 12 months old	£11 each	121	0	0			
1 Guernsey Heifer, 12 months old		11	0	0			
1 Ayrshire „ 12 „		10	0	0			
2 Shorthorn Steers, about 9 months old .. .	@ £10 each	20	0	0			
8 „ Heifer Calves, 4 to 6 months old	£7 „	56	0	0			
5 „ Steer Calves, 4 to 6 „	£7 „	35	0	0			
6 „ „ „ under 4 ..	£5 „	30	0	0			
5 „ Heifer „ „ 4 ..	£5 „	25	0	0			
1 „ Bull, "Warlock" ..		35	0	0			
1 „ „ "Jack Frost" ..		25	0	0			
					1401	0	0
CATTLE AT TWYERS WOOD:—							
30 Shorthorn Cows in-milk.							
7 „ „ dry, for fattening.							
1 „ „ dry, for calving.							
1 Ayrshire Cow in-milk.							
1 „ „ dry, for calving.							
2 „ Heifers dry, for fattening.							
1 Shorthorn Alderney Cross Cow in-milk.							
1 „ Galloway .. „							
44 Cows and Heifers	@ £25 each	1100	0	0			
2 Calves (viz., 1 Shorthorn and 1 Shorthorn Ayrshire Cross)	@ £3 10s. each	7	0	0			
1 Shorthorn Bull, "British Boy"	.. ..	35	0	0			
					1142	0	0
CATTLE HIRED OUT TO COTTAGERS, &c.:—							
14 Ayrshires.							
6 Killarneys.							
1 Kerry.							
21 Cows and Heifers .	@ £15 each	..			315	0	0
HORSES:—							
11 Cart Horses	@ £50 each	550	0	0			
(viz., 8 at Twyers Wood, 2 at Burstwick, 1 at East Park).							
4 Milk Cart Horses	£30 „	120	0	0			
(viz., 2 at Twyers Wood, 1 at East Park, 1 at East Park Dairy).							
1 Carriage Horse at Twyers Wood		30	0	0			
1 Foal at Twyers Wood		10	0	0			
					710	0	0
PIGS:—							
4 (viz., 2 at Twyers Wood, and 2 at East Park) ..	@ £3 each	..			12	0	0
FOWLS:—							
48 Hens, &c., at Twyers Wood . .	@ 5s. couple	6	0	0			
6 Ducks „	6s. „	0	18	0			
9 Ducklings „	1s. „	0	9	0			
80 Spring Chicken „ . . .	1s. „	4	0	0			
60 Pigeons at East Park	1s. „	3	0	0			
					14	7	0
HAY AND STRAW:—							
About 65 tons Hay at East Park .. .	@ £3 10s. per ton	227	10	0			
„ 10 „ Straw „	£2 „	20	0	0			
„ 15 „ „ Burstwick	£2 „	30	0	0			
„ 15 „ „ Twyers Wood ..	£2 „	30	0	0			
					307	10	0
CAKE:—							
½ ton at East Park ..		5	0	0			
2 tons at Twyers Wood (1 ton Cotton, 1 ton Linseed)		16	0	0			
					21	0	0
CORN, BRAN, MEAL, &c.:—							
4 quarters Oats at East Park . ..		4	18	0			
7 cwts. Bran „		2	6	8			
					7	4	8
ROOTS:—							
About 10 tons at East Park		..			9	0	0
COMPOST:—							
About 300 tons	@ 2s. per ton				30	0	0
		..		£	3969	1	8

TABLE VIII.—MR. R. E. TURNBULL'S BALANCE-SHEET, FROM 6TH APRIL, 1880, TO 6TH APRIL, 1883.

INCOME.

			£ s. d.	£ s. d.
VALUATION, 1ST MAY, 1883 ..	Cattle at East Park and Twyers Wood Farms		2543 0 0	
	Dairy Cattle hired to Cottagers		315 0 0	
	Horses		710 0 0	
	Pigs		12 0 0	
	Fowls		11 7 0	
	Hay		227 10 0	
	Straw		80 0 0	
	Cake		21 0 0	
	Corn and Bran		7 4 8	
	Roots		9 0 0	
	Manure (Compost)		30 0 0	
				3969 1 8
IMPLEMENTS			..	864 16 10
GROWING CORN CROPS	Estimated value after deducting Rent, Rates, Taxes, and estimated cost of hoeing, harvesting, threshing, and marketing—			
	68 acres of Oats			
	6 do. Wheat } 85 acres @ £8 per acre		..	680 0 0
	11 do. Barley			
GROWING GREEN CROPS	10 do. Green Clover @ £10 per acre		100 0 0	
	4 do. Green Tares £5 per acre		20 0 0	
				120 0 0
FALLOW	Cost of Seed sown this Spring		..	50 17 6
MEADOW	100 acres manured for Hay @ £3 10s. per acre		..	350 0 0
ROOTS	50 acres cultivated and manured for Roots @ £10 per acre		..	500 0 0
LIME	(Applied to Land)		..	260 3 0
SALE OF CATTLE		1880–81	2020 8 11	
		1881–82	1150 3 3	
		1882–83	4166 13 0	
				7337 5 2
SALE OF HORSES		1880–81	171 0 3	
		1881–82	..	
		1882–83	67 12 6	
				238 12 9
SALE OF SHEEP		1880–81	..	164 3 0
SALE OF PIGS		1880–81	28 12 0	
		1881–82	59 9 3	
		1882–83	49 17 11	
				137 19 2
SALE OF POULTRY		1880–81	4 9 4	
		1881–82	34 19 8	
		1882–83	10 1 2	
				49 10 2
SALE OF CORN	Twyers Wood Farm	1881–82	192 0 0	
	Do. do.	1882–83	520 18 6	
				712 18 6
SALE OF HAY	East Park Farm	1880–81	28 0 0	
	Do. do.	1881–82	157 6 4½	
	Do. do.	1882–83	232 5 3	
				417 11 7½
SALE OF STRAW	Twyers Wood Farm	1881–82	89 0 10	
	Do. do.	1882–83	61 7 6	
				150 8 4
SALE OF ROOTS	Twyers Wood Farm		..	2 7 7½
SALE OF MILK	East Park Farm	1880–81	326 1 4	
	Twyers Wood Farm	1881–82	1311 11 4	
	Do. do.	1882–83	1872 9 8	
				3510 2 4
SALE OF BUTTER	East Park Farm	1880–81	287 16 6	
	Do. do.	1881–82	456 2 9½	
	Do. do.	1882–83	714 7 6	
				1458 6 9½
SALE OF EGGS			..	9 10 3
SALE OF WOOL			..	17 8 6
HAY AND STRAW	Supplied to Farm Horses (see Wages, &c.)		263 8 0	
CORN	Do. do. do. do.		614 12 0	
				878 0 0
HIRE	Received for Hire of Dairy Cattle	1880–81	160 9 6	
	Do. do. do.	1881–82	202 2 8	
	Do. do. do.	1882–83	127 10 0	
				490 2 2
BUILDINGS	East Park Farm		105 4 10	
	Twyers Wood Farm		1266 14 1	
	East Park Dairy		20 19 5	
				1392 18 4
GATES AND FENCES	East Park Farm		100 15 6	
	Twyers Wood Farm		84 0 2	
	Burstwick Farm		2 14 4	
				187 10 0
DRAINAGE	Twyers Wood Farm		..	372 19 9
ROADS	Twyers Wood Farm		..	123 16 5
RENT ACCOUNT	(Amount debited to Mr. Turnbull's private account for House and Garden (Twyers Wood), £50 a-year, 2 years)		..	100 0 0
RENT ACCOUNT	Rent of Cottages occupied by Workmen, debited to Labour account		..	39 9 8
WAGES ACCOUNT	(Amount debited to Mr. Turnbull's Private Account for proportion of Wages of Coachman and Gardener)		..	30 0 0
			£	24,615 19 6½

			A.	R.	P.
FARMS ..	East Park Farm	from 6th April, 1880	110	3	32
	Twyers Wood Farm	„ 6th April, 1881	180	0	0
	Burstwick Farm	„ 6th April, 1883	41	0	0
	Preston Farm	„ 6th April, 1883	18	2	0
DAIRY ..	East Park Dairy (Hall)	„ 1st September 1880			

EXPENDITURE.

			£ s. d.	£ s. d.
RENT	East Park Farm, 3 years @ £282 a-year		846 0 0	
	Twyers Wood Farm April 1881 to April 1882 (160 acres)		338 0 0	
	Do. do. do. do. 1882 do. 1883 (180 „)		411 0 0	
	Do. do. Cottages do. 1881 do. 1882		12 16 6	
	Do. do. do. do. 1882 do. 1883		26 13 2	
	East Park Dairy, 1st September, 1880, to 30th April, 1883		53 6 8	
				1690 16 4
RATES AND TAXES	East Park Farm for 3 years		78 0 11	
	Twyers Wood Farm „ 2 years		131 13 1½	
	East Park Dairy „ Water Rate		0 10 6	
				213 4 6½
WAGES	Manual Labour		2533 5 8½	
	Clerk's Salary and Office Expenses, 2 years @ £1 per week		104 0 0	
			2637 5 8½	
	Less amounts charged to Capital Accounts		529 8 0½	
			2107 17 8	
	Keep of Horses.—This item is charged under purchase, and is entered here to show the total cost of Labour, both Horse and Manual. This amount is therefore entered on the Income side of the Account under the headings Hay, Straw, and Corn supplied to Farm Horses		878 0 0	
				2985 17 8
IMPLEMENTS			..	861 16 10
PURCHASE OF CATTLE		1880–81	3173 13 1	
		1881–82	1400 9 3	
		1882–83	3171 16 6	
				7745 18 10
PURCHASE OF HORSES		1880–81	382 0 9	
		1881–82	412 0 0	
		1882–83	67 5 0	
				861 5 9
PURCHASE OF SHEEP		1880–81	..	149 12 2
PURCHASE OF PIGS		1880–81	15 4 0	
		1881–82	6 15 6	
		1882–83	10 9 0	
				32 8 6
PURCHASE OF POULTRY		1880–81	3 10 0	
		1881–82	37 16 10	
		1882–83	2 5 6	
				43 12 4
PURCHASE OF CAKE	East Park Farm	1880–81	225 10 0	
	Do. do.	1881–82	226 14 8¼	
	Do. do.	1882–83	316 19 6	
				769 4 2¼
	Twyers Wood Farm	1881–82	224 12 10	
	Do. do.	1882–83	307 5 0	
				531 17 10
PURCHASE OF CORN, MEAL, &C.	East Park Dairy		..	2 12 9
	East Park Farm	1880–81	290 18 10	
	Do. do.	1881–82	302 12 11	
	Do. do.	1882–83	249 0 9	
				842 12 6
	East Park Dairy		..	69 12 0¾
	Twyers Wood Farm	1881–82	550 2 2	
	Do. do.	1882–83	409 8 5¼	
				959 10 7¼
PURCHASE OF HAY AND STRAW	East Park Farm	1880–81	181 7 1	
	Do. do.	1881–82	239 15 6¼	
	Do. do.	1882–83	209 17 4	
				630 19 11¼
	Twyers Wood Farm	1881–82	130 14 3	
	Do. do.	1882–83	153 1 9¾	
				283 16 0¾
PURCHASE OF ROOTS	East Park Dairy		..	21 8 1½
	East Park Farm	1880–81	55 12 3	
	Do. do.	1881–82	69 8 3	
	Do. do.	1882–83	106 9 11	
				231 10 5
	Twyers Wood Farm	1881–82	62 13 3	
	Do. do.	1882–83	126 4 4	
				188 17 7
PURCHASE OF MANURE	East Park Farm	1880–81	61 4 1	
	Do. do.	1881–82	17 16 8	
	Do. do.	1882–83	8 4 5¼	
				87 5 2¼
	Twyers Wood Farm	1881–82	35 10 9	
	Do. do.	1882–83	125 19 0¾	
				161 9 9¾
PURCHASE OF LIME	Twyers Wood Farm (417 tons 6 cwt.)	1882–83		260 3 0
PURCHASE OF SEED	Seed Corn		167 7 4	
	Clover Seed, Plants, &c.		100 18 11	
				268 6 3
PURCHASE OF COAL				73 13 7
TRADESMEN'S ACCOUNTS	Revenue—Blacksmith		87 11 7	
	do. Saddler		7 11 6	
	do. Wheelwright		17 5 0	
				112 11 1
DAIRY EXPENSES			..	41 10 0½
VETERINARY EXPENSES			..	69 9 1
MISCELLANEOUS EXPENSES			..	214 17 11
VALUATION OF DAIRY CATTLE	Hired to Cottagers, 6th April, 1880		..	632 10 0
EXPENSES ON DAIRY CATTLE	Hired to Cottagers		..	51 7 0
BUILDINGS	East Park Farm		105 4 10	
	Twyers Wood Farm		1266 11 1	
	East Park Dairy		20 19 5	
				1392 18 1
GATES AND FENCES	East Park Farm		100 15 6	
	Twyers Wood Farm		84 0 2	
	Burstwick Farm		2 14 4	
				187 10 0
DRAINAGE	Twyers Wood Farm	1881–82	..	372 19 9
ROADS	Twyers Wood Farm		..	123 16 5
AMOUNT WRITTEN OFF	Cost of Buildings, &c., viz.:—			
	East Park Farm Buildings 3 years @ 20 per cent. per annum		63 3 0	
	Do. Dairy do. 2 do. 20 do. do.		8 8 0	
	Do. Farm Fencing 3 do. 10 do. do.		30 4 6	
	Twyers Wood Farm Buildings 2 do. 5 do. do.		126 13 6	
	Do. do. Fencing 2 do. 10 do. do.		16 16 0	
	Lime 10 do.		52 0 0	
	Drainage 5 do.		37 6 0	
	Roads about 20 do.		24 10 8½	
	Implements, 5 per cent. per annum on the expenditure		96 5 4	
				455 7 0½
BALANCE	Equal to—			
	2½ per cent. on £2500, being Capital employed the 1st year		62 10 0	
	7½ do. £5000, do. do. do. do.		375 0 0	
	10 do. £5500, do. do. do. do.		550 0 0	
				987 10 0
				£ 24,615 19 6½

mated to give—at the time of taking stock—8*l.* per acre all round, and so credited in the balance-sheet, Mr. Turnbull writes on the 13th of August: "To-day the promise is that the nett proceeds will largely exceed this estimate. My white oats will probably yield 10 quarters per acre, and I have a good deal of the corn bespoken, for seed purposes, at 30*s.* per quarter. The straw will average 1½ tons per acre:—

	£	s.	d.
10 quarters oats, at 30*s.*	15	0	0
1½ tons straw, at 40*s.*	3	0	0
Gross proceeds per acre ..	£18	0	0

"The Black Tartarian oats will average at least 8 quarters per acre; they will be worth 24*s.* per quarter; there will be 1 ton of straw per acre, if not more; corn, 9*l.* 12*s.*; straw, 2*l.*; gross proceeds, 11*l.* 12*s.* I propose beginning harvest the day after to-morrow."

Although these farms have been only a comparatively short time in the occupation of Mr. Turnbull, yet, taking them as a whole, they are in a highly creditable condition. Against the whole of the seven points which the Judges were "instructed especially to consider," the word *excellent* might be written.

In completing the details of what may still remain to enable Twyers Wood to be characterised as a model farm, Mr. Turnbull may yet have to devote a little more of his unbounded energy. He has now the honour of gaining, and the Judges have great satisfaction in unanimously awarding to him, this well-earned prize.

In connection with farming business, Mr. Turnbull originated a system of hiring out cattle to cottagers. The reporting Judge, after hearing the details of the working of this system, requested Mr. Turnbull to furnish him with the particulars in writing. Believing that they would prove of considerable interest to many of the readers of this Report, they are appended.

HIRED DAIRY CATTLE.

An Account *of the Origin and Working of the* Hire System.

Seven years ago, when staying at my father's home at Hackness, near Scarborough, I observed that a cottager, who had had the misfortune to lose his cow, and who was not a member of the district Cow Club, had great difficulty in raising the necessary funds to replace it. His children, in the meanwhile, suffered by not getting an adequate supply of milk.

I found, too, that cottagers were often greatly inconvenienced and disheartened by their cows not being in-calf. A cow that might have been worth 20*l.* had it been in-calf, would probably not realise more than half this sum as a store "drape." Cow Clubs do not insure against risks of this kind, though they often prove to be very serious in cold wet seasons, such as we have had lately. I observed also that losses were frequently sustained by cows not proving to be good for dairy purposes.

The small amount allowed by the Cow Club, in the event of the death of a cow, viz. from 9*l.* to 12*l.*, or about two-thirds of its value, and the risk which membership involved, kept many cottagers from joining the Club.

Several families who had the right to graze a cow in the lanes were unable to take advantage of this privilege, in consequence of their savings being insufficient to buy one.

No one can have resided long in the country without observing that the children of cow-keeping cottagers can almost invariably be distinguished by their rosy cheeks. These are the children who, in after life, make the best cattlemen and dairymaids.

The advantage and comfort to a country labourer of having a good cow, convinced me that capital could be usefully and profitably employed by purchasing cows and hiring them out, under an agreement, to cottagers and small farmers.

In the spring of 1876 I bought nine Kerry heifers, which were near calving, at a cost of 12*l.* each, and I hired them out by the year in the Hackness district. The annual charge made for each heifer was 2*l.* 10*s.*, and the hire, except in one instance, was paid in advance.

One of this little herd of Kerries is still hired out.

The first cottager to whom I explained my proposed system was Alexander Cranstone, of Harwood Dale, a fine old man, who occupied a cottage on the edge of the moor, under Lord Derwent of Hackness. Alec had lost his cow, and had no means to buy another. He thanked me for calling, and invited me to have a cup of tea; but at first he did not fall in with my plan for enabling him to replace his cow. "Ye see, sir," he said, "the coo wadn't be me own!" I replied: "The land you occupy is not your own, Alec." "Vary true," he said, "but I'm too auld, sir, to tak' up new plans." As I was riding away from the cottage, Alec called out from the top of the pasture bank, "I deant think it's sike a fond idea efther all! Will ye still let me hev a coo, sir?" I consented, for I knew Alec to be a good "keeper," and I was convinced that the arrangement would prove mutually satisfactory.

That evening Alec selected a promising Kerry heifer, which did credit to his judgment, for it proved to be an excellent dairy cow. He had it from the spring of 1876 up to the time of his death, which took place a few weeks since.

I called to see old Alec in the autumn of 1878; speaking about the cow he said, "The little coo has paid you, sir, and she has kept me; so we ought both to be satisfied."

After hiring out the cow to old Alec, I appointed Mr. Richard Marshall, of Hackness, to act as my agent. The first man that applied to him was Mark Jeffels, of Mount Misery, a carrier, who occupied a small moor-edge farm near Hackness. He had been unfortunate, having lost most of his live-stock. At the time he applied to Mr. Marshall for cows, he had only 1 cow, 1 horse, and 12 sheep left. How to meet his rent he knew not; he had ten young children to maintain, and for their sake he determined, if possible, to overcome his serious difficulties.

Mr. Marshall let Jeffels have two cows in 1876, and two additional ones in 1878. The cows proved to be excellent milkers. The profit that he made by his cows he invested in sheep and calves. I regret to say that in the spring of 1879 Mark died of congestion of the lungs. He had the satisfaction on his deathbed of feeling that by his perseverance and industry he had made a provision for his wife and children. At the time of his death his stock consisted of 50 sheep, 3 horses, 2 cows, and 6 heifers, and some little stacks of corn and hay.

In November 1878 my agent hired a cow to John King, of Strensall, near York. King owned a threshing-machine, and was getting on very well; but unfortunately he became bound for a brother: the brother failed, and John King was ruined by the failure. He feared the creditors might seize my cow, and to prevent the risk of this, he set off from Strensall one cold winter night and drove the cow to Hackness. He walked forty miles between sunset and sunrise to save me, as he believed, from the risk of losing the cow.

My experience of the cottagers and farmers of the North Riding of Yorkshire is, that they take quite as much care of a hired cow as if it were their own; indeed, in proof of this, I may mention that though I have hired out over 150 cows since I established the system nearly seven years ago, I have only lost one of these in calving, and only seven cows have died from every cause, whilst in the hirers' care.

I have received great assistance from my agent, Mr. Marshall. He is a man who never tires of working for the benefit of his poorer neighbours. I am also indebted to Lord Derwent of Hackness for considerately placing his park at my disposal, on reasonable terms, without which I should have found it difficult, before I rented the farms which I now occupy, to carry out the hire-system satisfactorily.

My practice has been to purchase 10 or 12 heifers at a time, in the spring and summer months, and to send them to the Hackness Park; when ready to be hired out, my agent has usually given notice to that effect by having bills posted up on the doors of the blacksmiths' shops in the villages in the district.

Cows that are returned as "drapes" I now have fattened on my own farms.

In 1878 I made the mistake of buying several four-year-old cows instead of buying heifers only, as hitherto. This mistake cost me fully 100*l.*

A good Ayrshire cow cost, in that year, 20*l.*, whilst a good heifer only cost about 16*l.* I obtained 5*l.* for the use of the cows, and 4*l.* to 4*l.* 10*s.* for the use of the heifers. In the spring of 1879 most of the cows hired out in 1878 proved not to be in-calf, and consequently were not worth more than about 10 guineas each as store "drapes;" whereas the heifers, that missed being in-calf, were worth about 12 guineas each, being younger and therefore better adapted than the cows for grazing purposes. After taking hire and interest into account, there was a loss of about 5*l.* per head on the cows, but on the heifers there was no loss.

It is a very important matter in hiring out dairy cattle to begin by buying heifers. Cattle bred in a district north of the point where they are to be kept will be found to thrive the best.

In Holderness, where the pastures are usually good, I find that Cumberland and Westmoreland Shorthorns are well adapted; but for the lanes of the North Riding, Ayrshire and Kerry cows are more suitable.

Cottagers can afford to pay a rate of hire equal to one-third the cost of a cow.

Cows kept for supplying the hirer's family with milk and butter are healthier than cows that are kept by milk-sellers; milk-sellers being apt to sacrifice the constitution of their cows in their efforts to stimulate the supply of milk.

After paying all expenses, and notwithstanding many mistakes, the capital invested in this business yielded 5 per cent. per annum, on the average, for the first five years. In the sixth year it yielded 15 per cent., and the probability is that the return for the current year (the seventh) will be equally satisfactory.

I have found that half-bred three-years-old Shorthorn heifers, bred in the district of Killarney are very suitable for hiring out to cottagers. These can usually be purchased in the spring months at from 12*l.* to 14*l.* each, carriage paid to Hull.

ROBERT E. TURNBULL.

TWYERS WOOD, HEDON, NEAR HULL,
22nd January, 1883.

CLASS I.—SECOND PRIZE.

Mr. Davis's Farm, Holme House, Gargrave, Skipton-in-Craven.

This farm presents a striking contrast to its more successful rival. Instead of the rich flat lands of Holderness, we have the mountain crags and rolling hills and valleys of the West Riding.

Holme House is situated 3½ miles north-west of the market-town of Skipton. The Settle and Skipton turnpike-road passes through the farm, which is also intersected by the Leeds and Liverpool Canal. A portion of the homestead joins the highway. The farmhouse stands pleasantly on a slight elevation, back a little distance from the turnpike. It is a substantial roomy dwelling, with well-appointed kitchens, into which water is brought from the Gargrave Waterworks.

The buildings seem adapted to the requirements of the holding, and do not need to be specially described. There are stands for 32 cattle at the homestead, besides calf-house and stable, and stands for 28 cattle at the hay-barn in the barn-meadow, situated about halfway between the house and the eastward boundary of the farm.

The holding, which belongs to Lord Hothfield, consists of 358 acres, all in grass. It has been held by Mr. Davis since the death of his father, which took place in 1869. The executors received notice to quit, and the farm was offered to the present tenant, then 19 years of age, at a rise of 175*l.* a year. It was taken by Mr. Davis at that rent, and he states that up to 1879 he made his way; but between that time and last year, like many of his neighbours, he "lost seriously." The agent took the bad times into account; and Mr. Davis frankly states, "Altogether, these last few years I consider I have been met fairly by my landlord."

The farm is held under a yearly tenancy, and is not under the Agricultural Holdings Act.

The house is 350 feet above the sea, but the highest point of the farm is 800 feet above the sea-level. It will therefore be readily conceived that the land varies much in quality. Indeed, it may be graded by its elevation.

The lowest part of the farm, through which the canal passes, lying to the south of the turnpike-road—about 60 acres—is a rich loam, and is excellent feeding-ground. The higher lowlands, of which about 54 acres are in meadow, are not quite so good; but the latter, with manuring, grow good crops of hay, and the pastures, if they do not quite finish off the feeding-cattle, leave only the polishing to be done in the canal pastures. The "crag" of 80 acres, which stretches along the whole of the north side of the farm, rises rather steeply, and, as its name indicates, is interspersed with jutting crags. This is again surmounted by a range of crags, which, though not belonging to the farm, afford shelter from the north winds to the otherwise exposed pasturage. During the winter months no stock is kept on this highest land; the cattle are occasionally grazed on it in summer, to relieve the other pastures, but its chief stocking is blackfaced ewes. The description of the farm may be given under the seven heads which the Judges were instructed especially to consider.

1st. *General Management with a view to Profit.*—Only under good management could this place possibly take rank as a prize-farm. It is obvious that the profits depend entirely on the stock; therefore, very much on how the stock is managed; and in this department Mr. Davis excels.

The stock is varied to suit the gradations in quality of the pastures. The best cattle and earliest lambs are turned on to the canal pastures, as soon as they afford a good bite of grass, and are pushed with cake, to get them finished and off to market. Cake is not given to the cattle in troughs, but simply laid in small heaps on the pastures.

The first cut of lambs had been sold the last week in June for 42*s.* a head; the mothers were turned out on to the crag, and the next best ewes and lambs then drawn in from the adjoining pastures. Only two cattle had been sold, but these were managed in a similar way. As the fat animals are cleared out, the next best are drawn in. Sheep and cattle are grazed together in all the feeding pastures.

The cattle are tied up in the hay-barns, as I said before, lying on the bare stones, with not even a manger to eat from; their food is simply hay and water, with a small allowance of cake to those most forward. These were, on our visit, on the 30th of April, full of flesh, and in excellent condition for turning out to grass: 11 cross-bred heifers, costing 16*l.* each, were already lying out.

The quantity of hay grown enables a large proportion of the cattle that are to be fattened in summer to be bought in the preceding autumn, and wintered on the farm. This the Judges considered better management than having so many cattle to buy in spring, when suitable stock is generally difficult to obtain.

The hay-barns already described are surrounded by a small courtyard, in which watering-troughs are placed. A visit to these troughs twice a-day is the only exercise allowed to the best cattle during the winter months.

About one-third of the breeding-ewes are usually sent to turnips for three months. This is a double advantage; a better crop of lambs is secured, and those of greater strength, while the ewes at home have more room, and thereby have better wintering; besides keeping the pastures cleaner and fresher for the lambing season. On our first visit, 80 greyfaced ewes (mules) were away eating turnips. Unfortunately, this lot on their way home contracted foot-and-mouth disease. Abortion, weakly lambs, chronic lameness, and general loss of condition, were the results; but only two ewes died. Fortunately, the disease did not spread to any other animals on the farm.

The sheep are all smeared in October with a mixture of tar and butter. The materials for the whole flock cost about 8*l.* To the uninitiated, some explanation of this process may be necessary. A tub containing the preparation is placed by the side of a sheep-stool, on which the operator sits with the sheep lying in front of him. The wool is divided in a straight line from the head to the tail; the dressing is then lifted with the forefingers of the right hand and rubbed on the skin the whole length of the division. Another parting in the wool is then made about two inches from the last, and the operation is repeated until the whole skin of the sheep is thus covered. One man does 10 sheep in a day. This dressing undoubtedly gives greater power of resistance to the sheep against the winter storms than the modern system of dipping. The latter mode has, however, almost entirely superseded both smearing and pouring on the hill farms of the Borders. The Judges can say this for Mr. Davis's ewe flock, that, with the exception of the greyfaces which had foot-and-mouth disease, they were turned out of hand in spring in good condition, with a fair crop of healthy lambs following them. We were grieved to hear that in 1880 the ewe flock had fluke, and died almost wholesale.

At the commencement of the tenancy "the crag" was separated from the land below it by a ragged thorn fence, which at best was no certain barrier against the stock descending on to the finer land. This and a number of other fences of the same description were taken out, and stone walls substituted. That around the crag was built by the landlord, the tenant doing the quarrying and leading; the latter had to be done with sledges, the ground being too steep for carts. On other parts of the farm the tenant has built about 1300 roods of stone wall entirely at his own expense.

On the field below the crag there is a "dene," or what Border farmers call a "cleugh," at the bottom of which ran an old water-course. Only three years ago this was a rookery. Mr. Davis cleared off the wood, put a twelve-inch pipe up the water-course and drained the spongy sides of the "dene," which is now a useful pasture and very snug shelter. The uneven nature of the ground makes draining difficult work. A good deal of skill has been displayed in draining those patches that needed it and were likely to pay. Much of the draining has been done by the tenant, but since the bad times came, the landlord has done a portion. A part of the poorest clay-land undrained grows rushes, which detract something from the look of the farm, but this proves that profit is not sacrificed for the sake of appearances.

2. *Productiveness of Crops.*—Hay, of which 54 acres is grown, is the only crop on the farm except what is grown in the garden. When we visited the farm in July, cutting had not commenced; the weather was unsettled, or a start would have been made. Mr. Davis has since reported that the hay was all secured by the 7th of August, the quality being first-rate, and has not been so well got for years. The crop is, however, under the average.

3. *Goodness and Suitability of Live-Stock.*—As has already been stated, this is Mr. Davis's *forte*.

The following is a list of the animals on Holme House in spring and summer:—

List of Stock, 30*th April*, 1883.

SHEEP.

24 Gimmer Hoggs.
5 Rams.
1 Tup Hogg.
20 Ewes, geld and without lambs, through abortion.
173 Ewes, with 240 lambs sucking.
42 Ewes to Lamb.

265

CATTLE.

7 Autumn-bred Bull and Heifer Calves.
1 Spring-bred Bull Calf.
4 Spring-bred Heifer Calves.
1 Yearling Bull.
18 Two-year-old Heifers, in calf.
20 Cows, bulled to calve during the autumn.
39 Heifers and Cows, for feeding during the summer.
12 Highland Heifers, ditto.

102

List of Stock, 11*th July*, 1883.

SHEEP.

23 Gimmer Shearlings.
5 Rams.
1 Tup Shearling.
20 Ewes, geld.
213 Ewes, with 275 Lambs.

262

CATTLE.

7 Winter Calves.
5 Spring Calves.
1 Yearling Bull.
20 Heifers, bulled and for bulling.
21 Cows, bulled to calve in the autumn.
1 Heifer, due to calve.
12 Scotch Heifers, for feeding.
37 Heifers and Cows, for feeding.

104

List of Stock, 30*th April*, 1883 (*continued*).

HORSES.

2 Mares, for farm work and breeding.
1 Pony, for running the milk-cart.
1 Cob.
1 Four-year-old Gelding.
2 Two-year-old Carting Colts.
—
7

List of Stock, 11*th July*, 1883 (*continued*).

HORSES.

Same as before.

The gimmer hoggs were home-bred, chiefly a cross between Scotch blackfaced ewes and Wensleydale rams. The latter are the only kind of rams used on the farm. The hoggs were wintered on the grass; in summer they were out on the crag, and looked well. About a score of home-bred gimmers are thus brought in for ewes in each year. These "mule" ewes make admirable nurses and bring a large proportion of twins. The lambs are, however, not so level as in the first cross; the best lambs are bred from the mule ewes, but there are often a few ewes that breed back to their mountain ancestors and disgrace the flock. After having had three crops of lambs, these ewes are good to sell for stores. They generally go to Lancashire to have another crop, after which they are fattened off. Forty Cheviot ewes, costing 40*s.* each, were bought in October, and 66 blackfaced ewes off Priesthill cost 33*s.* The remainder of the ewes are mules of various ages; the ewes that are not sent to turnips have the run of the grass during winter. After lambing, the blackfaces are turned out to the crag, and make most of their lambs fat. The Cheviot and Scotch ewes are fattened off as soon as possible in the autumn on the low lands.

From 10 to 14 milking cows are kept: they prove not the least profitable animals on the farm. In winter they are fed with malt-culms and pea-meal, in addition to hay. In summer they live on the pastures exclusively.

In July we found, in addition, 12 grand young cows, due to calve in the autumn, that had been bought, and were intended to be sold before calving; 20 heifers were also coming forward to calve at different stages; 10 excellent shorthorn heifers were found in the field hay-barn. They had cost 22*l.* 10*s.* each, were then ready for turning on to the canal pastures, where we found them in July ready for market. Two had been sold for 29*l.* and 26*l.* respectively, the latter before being ripe, owing to her unsettled behaviour on certain occasions. Sixteen heifers of good quality were running with the bull on the higher lowland, and four which were too young to go with the latter lot were out on the crag.

About 12 calves are reared annually. They are timed to come in September and March. The September lot are ready to wean on the arrival of those in March; the auxiliary food is oatmeal and linseed-cake. Ferns grown on the crag are dried, and make good litter both for the calf-house and stable.

The heifer calves are retained for cows, and the steers are sold as yearlings.

Two mares are kept to breed and do the farm work. Mr. Davis does not consider horse-breeding to any extent profitable. All the winter keep is needed for the cattle; and young horses running out take what the ewes should have, besides treading up the pastures. Two very promising two-year-old colts, which had been put out to winter, were running on the crag in July.

4. *Management of Grass-land.*—As previously stated, much of the farm that needed draining has been done. During the lifetime of Mr. Davis's father a portion of the clay land that had been under the plough was sod-drained and sown down to grass; this part of the farm requires re-draining. Sod-draining is much practised in this district. The drains are first cut with an ordinary spade to the depth of 2 feet, the next footing is then taken out with a narrow spade, which leaves a shoulder on which the top sod is laid, the under-footing remaining entirely open These drains on clay subsoils are called "wedge drains," and are said to stand good for twenty years or more. Mr. Davis now drains with pipes. A bog in a meadow was being drained at the time of our visit. The drains were 3 ft. 6 in. deep, 7 yards apart, and cost 1*s.* 3*d.* per rood of 7 yards.

Any meadow-ground which requires more liberal treatment is given a good coating of home-made manure as soon as the hay is taken off. This sacrifices the fogg, but it keeps the land warm through the winter months, is nice picking for the hoggs, and ensures a crop of hay for the ensuing year. Gas-lime is brought by the canal. It is used as a compost, mixed with soil, to top-dress the pastures. Mr. Davis states "that it brings a lot of useful grass, but he finds that it has a tendency to reduce the quantity of fine herbage if put on too strongly, otherwise it suits the strong land of the neighbourhood."

5. *State of Gates, Fences, Roads, and General Neatness.*—These were all in fair working condition; there was no appearance of a spurt having been made to get them up in show form. The roadside hedges had been cut and laid, and were fairly trimmed, and miles of stone walls were without a gap or break. The farm, taken as a whole, and considering character and situation, was presented in a highly creditable condition, though, as previously stated, Mr. Davis does not sacrifice profit for appearance.

6. *Mode of Book-keeping followed.*—This is simple, yet explicit. Stock is taken regularly at the end of the year. Every beast is entered singly on the left-hand page of the book; those bought have the cost of keep added. When sold, the price is entered on the opposite page, which at once shows the profit on each beast. When stock is taken, those not sold are entered on the sale side at the price at which they are valued in the stock-taking account. When the columns are summed up, the balance shows the total profits on cattle for the year, the dairy excepted.

The different lots of sheep and other stock are entered in the same manner.

The redeeming feature in grazing farming is the absence of items on the expenditure side of the balance-sheet; 20*l.* covers the whole expenses on the farm, other than rent, rates, wages, and artificial food.

It was gratifying to the Judges to find that the balance-sheet for last year was satisfactory, and that the good management exemplified on the farms will in average seasons yield a fair profit.

The great saving clause in this sort of farm is no doubt the small labour bill. In busy seasons Mr. Davis must do the work of two men himself, otherwise it is difficult to conceive how the farm wages account for the twelve months should stand at *only* 105*l.*, on a turn-over of above 4000*l.*

Management of the Dairy.—Though this is strictly a grazing farm, the facilities for dairying which the holding possesses, owing to its contiguity to Gargrave, is not lost sight of. The produce of the cows is sold principally as new milk at 10*d.* per imperial gallon. On reference to the balance-sheet the Judges found this item realised in 1882 the sum of 211*l.* 7*s.* 9*d.* A little butter is also sold.

CLASS I.—COMMENDED.

Mr. Henry Holden's Farm, Halton East, Skipton.

This farm, though differing in some respects from Holme House, is of much the same character.

Halton East is situated about four miles north-west of the town of Skipton. The house and buildings are in the village of East Halton.

This holding consists of 300 acres of meadow and pasture land. It is the property of George Lane Fox, Esq., and has been held for eleven years by Mr. Holden under a yearly tenancy. The time of entry to the land is at the New Year, to the house and buildings on May 13th. It is described on the certificate of entry as "heavy land in general, with clay subsoil."

The house is old, but the buildings are good, well-arranged, and kept in good condition. As usual on farms of this kind, they are scattered; hay-barns being placed in fields some distance from the house. Mr. Holden has recently built at his own expense a stable and saddle-room, at a cost of 175*l.*

The farm does not lie well; 98 acres on the north side, lying up to Halton Moor, are detached from the main portion of the holding; and again, on the south-east side, there are several small fields detached from each other by intervening land belonging to other proprietors. These latter fields, lying on the outside of the farm, are ridiculously small for grazing; they were each carrying only about 3 ewes and double lambs. This entails much inconvenience, besides extra work for the shepherds.

The fields on the north side are rough useful grazing. The nearest to the house is the pasture for 6 milking cows. The remaining fields were lightly stocked, chiefly with in-calving cows. At our January visit the wettest of these fields was in process of being drained. The main drains were laid with pipes; the branches, 7 yards apart, with sods; the whole costing about 4*l.* an acre, of which the landlord pays one half. This field was much improved in appearance when we revisited it in July. Mr. Holden has drained a considerable acreage at his own expense, but some additional draining is still required. Draining is usually followed by liming, or a dressing of compost made of lime and soil. About 50 acres have received these applications; 9 acres that had been drained last year were afterwards dressed with ground bones. A portion of the meadow is dressed with nitrate of soda and superphosphate, which, Mr. Holden states, gives better results than the Peruvian guano previously used. Mr. Holden occupies two other farms, besides 150 acres of his own property. The stock is moved from one farm to another; it is therefore somewhat difficult to ascertain what number of stock this particular farm actually carries.

Cattle.—Not many cattle had been wintered. At the January inspection we took note of only about 30 head, including 11 calves and stirks. This system, though it does not require so much hay to be grown, necessitates buying too many cattle in the spring, which are at that season generally scarce and dear; and as a rule these do not feed so quickly as those wintered on the farm. In April we were told by Mr. Holden that he had great difficulty in obtaining suitable cattle. The numbers had then risen to 65, and in July they had further increased to 96 head; the last additions were chiefly Irish heifers of a good sort, but they had cost stiff prices.

In July, 9 of the best heifers and 8 ewes with double lambs occupied the best field of 18 acres. The heifers were nearly fat, and were each having an allowance of 6 lbs. of linseed-cake per day, put down in small heaps on the grass. The best land is calculated to be stocked with rather less than a beast and 2 ewes and lambs for every two acres. This season the farm was said to be carrying fewer cattle than usual, but no grass was going to waste.

Sheep.—Eight score of Cheviot ewes had been bought in October; 100 of these, with 36 mule ewes and 15 hoggs were out at grass in January. Lambing commenced on the 6th of April. The numbers given in July were the following:—

95 Ewes with 190 lambs.
66 ,, ,, 66 lambs.
21 ,, off which 21 lambs had been sold first week in July.
7 Barren ewes.
3 Wensleydale rams.

These numbers show an excellent crop of lambs. The single lambs were all intended to be fattened. The keeping lambs were castrated the last week in June, and would be sold as stores about the last week in July.

Mr. Holden did not show any accounts, but stated that this farm had made a fair profit last year, but had lost him money for three years previously.

The whole occupation presented a tidy appearance. Fields were free from thistles; buildings, roads, fences, and gates were all in excellent condition. An old hedge by the roadside had been taken out and a neat iron fence substituted; this work was so satisfactory to the agent that he voluntarily paid for the materials used.

Although there is nothing about the management of this farm of especial merit, yet, taken as a whole, it was found in a highly creditable condition, and was therefore commended.

Class I.

Mr. Wm. Taylor's Farm, Nether Poppleton.

This, the only other farm which competed in Class I., is of a totally different character from those previously described. It requires to be noticed as the only competing farm on which arable land has to any extent been sown down to grass. It contains 360 acres, of which 110 acres are still arable and 250 pasture; of this latter portion 112 acres of poor clay land have been laid down to grass in recent years. The landlord found seeds; and if the land sown down was neither mown nor grazed for the first year, no rent for it was charged. One field had been dressed with 4 qrs. per acre of ½-in. bones, supplied by the landlord; the results were not satisfactory. Richardson's grass manure, applied at the rate of 6 cwt. per acre, had been used with visible advantage.

Some of the first sown-out land had been covered with fold-yard-manure, but the herbage was still thin and poor.

Another field which had been sown down two years, had the bags standing in it, containing a sowing of 4 cwt. per acre of bone-meal.

The prospect of any of these fields speedily becoming good permanent pasture was not very hopeful, but in their present condition they are still to be preferred to poor clay fallows, which have of late years brought to their respective occupiers a crop of unproductive labour. Mr. Taylor has suffered the penalty which is generally paid for grazing these newly laid-down clay-lands with sheep in autumn: within the last 10 years he has lost 237 sheep from fluke-rot. The ewes and lambs running on the farm at the time of our May visit were apparently sound and doing well.

Like several of the farms we visited, this was indebted to its occupier for several permanent improvements. Mr. Taylor had led all the materials for the commodious buildings; part of the stones had been brought a distance of 12 miles. He had also made a mile of road leading from the highway to the house.

Class II.—First Prize.

Mr. Hutchinson, Manor House, Catterick, near Richmond.

This farm is on the estate of Sir John Lawson, whose mansion at Brough Hall lies a short distance outside the western boundary of the farm. The house and buildings may be said to form part of the village of Catterick, which stands on the south side of the river Swale, distant about 5 miles from the town of Richmond.

The farm is situated in the beautiful "Vale of Mowbray," which is said to commence at Catterick Bridge, and finally lose itself in the great Vale of York; it is altogether a fine agricultural district.

When the Show of the Royal Agricultural Society was held at York in 1839, a prize was offered by the Yorkshire Agricultural Society for the best-managed 100 acres of arable land. This prize was won by Mr. John Outhwaite, of Bainesse, whose farm joins Manor House on the east. Mr. Outhwaite told the Judges, when they called to shake hands with him, that he had for one of his competitors on that occasion a proprietor who farmed 1300 acres, and who selected 100 acres of his best land and had it all hand-dug.

Manor House comprises 249 acres, 145 of which are arable, and the remaining 104 acres permanent grass. It is held under a yearly tenancy, without any agreement for compensation for improvements, and subject to six months' notice to quit. The present tenant succeeded his father in 1865.

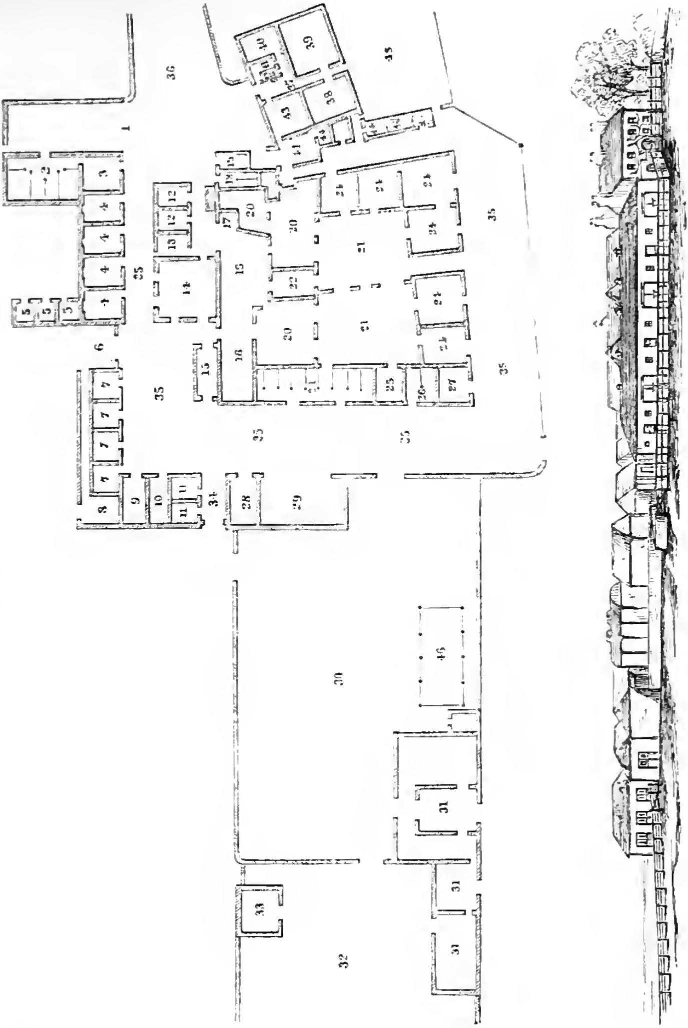
The surface is slightly undulating. The larger portion of the farm is a gravelly soil, but the higher part is a strongish boulder clay-loam, requiring careful treatment for root-growing.

The Judges, as I have already stated, were surprised to find so many permanent improvements executed by many of the occupiers of competing farms without any security, but here they were more than surprised.

The ground-plan (Fig. 5, p. 557) will give a good general idea of the size and arrangement of the homestead. The stables and boxes, Nos. 1, 2, 3, 4, have been only recently built, and are completely furnished with Musgrave's best fittings. No. 21, in the centre of the main block, was formerly an open yard, but was covered in last summer with substantial open slated roofs. The yard is a trapezium, measuring 76 feet × 40, and 66 feet × 49 feet. The roofs are supported by two pillars in the centre, with short brick pillars built on the surrounding walls, and are surmounted by overlapping ventilators. The total cost was 175*l.* The sheep-houses, No. 31, are substantial stone structures, also comparatively new, as is also the horse-shed, No. 33. The paddock in which this shed stands has been surrounded by a stone and lime wall. At the January inspection we noticed No. 46 as a newly erected galvanised-iron stack-shed. The open sides did not please Mr. Hutchinson, and on our next inspection we found this enlarged, by side-walls being run up 6 feet outside the metal pillars, and the eaves extended to rest on these walls; it was thus wholly closed in. Large sliding doors, to admit laden carts, are placed in the centre of each side. On our July visit it was full of implements, but it can now be used as a sheep or cattle house, will also make a capital lambing-shed, or, as was originally intended, a stack-shed or hay-house. Besides considerable improvements to the old Manor House, the whole of the foregoing buildings, with many additions and re-arrangements to the other portion of the homestead, have been executed solely at the expense of the present occupier, who, having no security beyond six months' notice to quit, may well be likened to one of his own hunters when following the hounds, taking the bit in his teeth and running straight away, but landing his owner to get the brush.

The barn-power was originally a six-horse wheel; this is still

Fig. 5.—*Plan of Homestead at Manor House Farm, Catterick.*



Reference to Plan of Homestead at Manor House Farm, Catterick.

1. New stable-yard.
2. New stable.
3. Saddle-room.
4. Loose-boxes.
5. Chicken-houses.
6. Gateway.
7. Cow-houses.
8. Turnip-house.
9. Loose-box.
10. Steaming-house.
11. Cow-houses.
12. Out-houses.
13. Chopping-shed.
14. Horse-wheel.
15. Pig-house.
16. ¹ Straw-barn. ² Threshing-shed.
17. Steam-engine.
18. Two-stalled stable.
19. New saddle-room.
20. Fold-yard.
21. Covered-in fold-yards.
22. Chopping-shed.
23. Carthorse stables.
24. Cow-houses.
25. Bull-house.
26. Two-stalled stables.
27. Loose-box.
28. Carriage-house.
29. Cart-sheds.
30. Stack-yard.
31. Sheep-sheds.
32. Paddock.
33. Horse-shed.
34. Gateway.
35. Road through farm.
36. Entrance-road.
37. House.
38. Drawing-room.
39. Dining-room.
40. Smoking-room.
41. Pantry.
42. Cellar.
43. Kitchen.
44. Out-houses.
45. Garden.
46. Galvanized-iron stack shed.

standing, and is occasionally used as a horse-power for pulping or chaff-cutting when steam is not up. An eight-horse portable engine by Marshall now drives the whole of the machinery, which consists of Hornsby's threshing- and dressing-machine, grinding-mill, pulper, chaff-cutters, and hoist,—the whole of which are conveniently arranged. The horse-wheel house is lofted, and will hold a few loads of oats, or anything that has to be chopped. Economy in the use of straw is an important point where such a large head of stock is kept. The covered yards, together with chaff-cutting and pulping, all help much in this direction, and are all highly approved of by Mr. Hutchinson.

Cropping.—No definite course of cropping is followed, but the usual rotation is seeds, oats, wheat, roots, barley, which if not sown with clover-seeds is again followed with oats.

The arable land is cropped this season as follows:—

Wheat,	11 acres	Cabbage,	2 acres
Barley,	33 ,,	Potatoes,	½ ,,
Oats,	43 ,,	Seeds,	16 ,,
Turnips,	29 ,,	Mangold,	2 ,,

Wheat.—Webb's Challenge, grown after oats, after clover. It had been manured with 14 loads of home-made dung, and 3 cwt. of wheat-manure per acre; was fully shot out on our July inspection, and though not a thick crop, was well headed, and looked like yielding well.

Barley.—This was every bit of it a grand crop. "Kinver Hill" barley, got direct from Messrs. Webb and Son, appeared especially promising, and if well secured will no doubt furnish seed for many Yorkshire farmers. Hallett's was almost too heavy to stand, and looked very prolific.

Oats.—Last year's clover-lea was limed at the rate of 5 tons per acre. It was then ploughed and pressed, and hand-sown in February. The oats were well up at our April visit; in July they proved really a splendid crop, only too heavy for standing. An old fence had been taken out, and two acres of tough old grass were thus laid to a tillage-field which was ploughed out in early winter, and in July was carrying a gross though wonderfully level crop. Seven acres of black Tartarian oats, after barley-stubble, dressed with 3 cwt. of Peruvian guano, were not healthy; a portion of them had lost plant, though the greater part of the break would yield a fair crop.

Seven acres of Longfellow's on the same rotation, with similar treatment, were vastly superior. Another break of barley-stubble that had been originally intended for roots, and therefore very deeply ploughed, was carrying a fine crop of Webb's white Tartarian oats.

Seeds.—About one-sixth of these are cut for soiling. The mixture sown for pasture is 8 lbs. of red and 6 lbs. of white clover, with a few pounds of Italian rye-grass added for cutting. Those pastured had carried ten sheep to the acre since the beginning of May, and they were in July going knee-deep in a perfectly level and most luxuriant bed of clover.

Roots.—At the January inspection we found the turnips all stored; and a goodly lot they were. The swedes—judging from the enormous size of those seen in the turnip-houses, which turned out to be no bigger than those hunted out of the heaps at the steading and in the fields—could not have been less than 30 tons per acre. A portion of those on the gravel are eaten off by sheep. The probability is that this season's crop will not reach half the weight, though fed as richly and cultivated more carefully than the crop of last season. Thirteen acres of the strongest portion of the fallow break were never ploughed, but steam-cultivated 11 inches deep, out of barley stubble, and afterwards cultivated with horse-grubber and drag-harrow.

Besides a heavy manuring from the covered yards, 3 cwt. of Peruvian guano and 4 cwt. of dissolved bones to the acre were applied, which is, to say the least, liberal fare. On July the 13th there was a regular plant on this portion just ready for setting out.

The remaining fallow was fine friable soil; when visited on the 26th of April this was ready for ridging up; potatoes and cabbages had been planted, and a few ridges of swedes already sown: the field looked then in the pink of condition, as fine as meal, not a weed to be seen, and the drills we saw were as straight as the course of a rifle-ball. But, alas for human foresight! on our return in July we found the turnips sown at our previous visit had been totally eaten off by the fly, and the next half-dozen acres sown were ragged and weak, not having been able to withstand the cold dry weather in May. The later sown part of the field drilled with hybrid and white turnips had a regular plant. By far the most vigorous was a square of 3 acres, which at the time of our January visit was an old grass field not in the occupation of Mr. Hutchinson. It formed an awkward corner in this fallow field. This was pointed out to the proprietor, and Mr. Hutchinson was put in possession. At our April visit we found that the fences, and the old trees with which they had been studded, were all cleared out, the field steam-cultivated, limed, and in process of being drained. Horse-cultivation was going on, and the small impression made on the sods by the harrows made this piece a matter of interest to the Judges on their next visit. When this occurred in July, to our surprise the only difference that was apparent between this and the field to which it had been laid was, that on the new portion the young turnip plants were thinned and vigorous; while on the land formerly in tillage the plants were barely fit for thinning. The dressing applied to the new piece, besides the liming, was 3 cwt. of salt, 1 cwt. rape-cake, 1 cwt. guano, and 3 cwt. dissolved bones per acre. Mangolds, of which there were two acres, had not suffered nearly so much as the early swedes. Though they had been kept back by the cold, the plants were strong and healthy.

Potatoes are not grown for sale. With the exception of the early-sown swedes, and an acre or two of black oats, the whole of the crops were excellent; the land was perfectly clean, and cultivated close up to the fences.

Two acres of cabbage had suffered from drought, but were like furnishing a lot of autumn food.

Draining.—A large portion of the heavy land had been recently drained. A hilly pasture was being drained in July 4 feet deep and 7 yards apart. The money is borrowed, and the interest, 6*l.* 12*s.* 6*d.* per cent., is wholly paid by the tenant. A brook which intersects the tillage-fields on the south side was attacked last winter, had its course straightened, and the broken banks levelled and filled. In July it looked like an artificial canal, minus the water.

Fences.—Miles of old crooked hedges have been grubbed out and levelled. On the tillage land a number of fences have been altogether abolished. Where the clearing off has taken place between arable and pasture land, or through pastures where fences are still needed, strong creosoted post-and-rail fences have been substituted, at a cost of 1*s.* 3*d.* per yard. These may be counted on to last for 15 years; and though not affording any shelter, they neither harbour weeds nor require cleaning; and, taken all round, are neat, economical, effective fences. All this has been done wholly at the tenant's expense.

Grass-land.—14 acres of mowing meadow is all the hay made on the farm. This field is dressed with 1 cwt. of Peruvian guano, 2 cwt. of bones, and 12 cwt. of rape-dust, every alternate year.

The old pastures joining the house are covered with a rich herbage and are clean; not a thistle or a dock, dead or alive, was anywhere visible, and I may here extend this latter remark to include the whole farm.

The pastures carry a numerous head of stock; they are no doubt well supplemented with artificial food, and to this they are largely indebted for the present herbage. The average of the cake and manure bill for the past four years is 418*l.*, not including other foods. These are purchased from H. Richardson and Co., of York, who, as merchants, have evidently gained the confidence of Mr. Hutchinson.

Live Stock.—The character of the horses, cattle, and sheep on Manor House is now so well known throughout the United Kingdom, that it is quite unnecessary for me to make use of superlatives in describing them.

I think, however, it is due to Mr. Hutchinson that a few of the honours which his animals have borne away from national and local showyards should be recorded here.

Prizes won.—The total amount won in prizes since 1873 by animals belonging to this farm is 6639*l.* 1*s.* They have won all the last three Champion prizes given at Royal Shows for the best female Shorthorn, viz., Champion Plate of 100 guineas at Kilburn, with "Gainful"; Champion at Derby, "Gratia"; Champion at York, "Lady Pamela." Champion for the best Hunter in the yard at the Royal Birmingham, won with "Jester." This horse won in the aggregate upwards of 1550*l.* At the Taunton Meeting, 7 animals were shown, which took 4 first and 3 second prizes. At that Show three first prizes were awarded to Mr. Hutchinson in the different rings at the same time; viz. first for Shorthorn Cow; first for Leicester Ram; first for Three-Year-old Hunter; and the first-prize Aged Shorthorn Bull "Duke of Aosta" at the same Meeting was bred and sold by Mr. Hutchinson. This bull was also the sire of the first-prize two-year-old Bull, and first-prize Yearling Bull. At the Carlisle Meeting three first prizes were won in succession, viz. first for Bull-calf, "Knight of Kars"; first for Cow, "Grateful"; first for Two-Year-old Heifer, "Gainful." Besides, first and third prizes were won for aged Leicester Rams; first and third for Leicester Shearling Rams; and two prizes for Four-Year-old Hunters. At Derby, "Gainful" took third prize; "Gratia" took first for Two-Year-old Heifer, and Champion Cup for the best female Shorthorn. Five sheep took first, second, and third for Shearlings, and first and second for Aged Rams. At Reading, three Shorthorns were shown, which took first and third in the Cow Class, and first in the Yearling Heifers, said to be the largest and best class of yearlings ever shown at the Royal. At the same meeting, the second prize was gained for a Shearling Ram, and first for an Aged Ram. Such a catalogue of successful exhibits speaks for itself.

The following is a list of the number of animals on the farm at the time of our three respective visits:—

	January.	April.	July.
CATTLE.			
Cows in-Calf or in-Milk	23	28	29
2-year-old Heifers	7	11	10
Yearling "	8	4	3
Heifer Calves	8	5	10
Aged Bulls	2	1	1
Young "	9	13	10
Bullocks	2	..	..
Total	59*	62	63
SHEEP.			
Tups	12 aged 73 hoggs	49	31
Ewes	80	75	75
Gimmer Hoggs	54 hoggs	51	51
Lambs	..	93	99
Total	219	268	256
PIGS.			
Boar	1	1	1
Sows	2	2	6
Stores	15	14	8
Feeding	4	..	..
Total	22	17	15
HORSES.			
Cart Horses	7	7	7
Clydesdale Mares	3	3	3
2-year-olds	2	2	2
Foals	..	3	3
Other Horses	20	16	18
Total	32	31	33
Dogs	..	5	8
Bitches	..	6	5
Total	..	11	13

* 50 of these were eligible for entry in the "Shorthorn Herd-book."

Cattle.—In January we found some of the dowagers comfortably enjoying comparative freedom in the new covered yards. The nursing matrons with their precious charges, and the reigning belles, had each exclusive possession of a white-washed well-ventilated box.

It might be invidious to particularise any of these famous beauties, but we may mention the "G.'s" and "Ladies" as two tribes, the members of which rarely fail in distinguishing themselves. The former is descended from a cow called "Gerty," which cost 42 guineas, and from her have descended "Gratia," "Grateful," "Gratification," and many other "G.'s;" she produced 8 heifer-calves, twice twins in succession. Mr. Hutchinson's success as a breeder is not to be attributed to high-priced importations into his herd, but rather to judicious mating. Mention must, however, be made of a particularly sweet two-year-old heifer, recently bought from Mr. St. John Ackers. The Judges were agreeably surprised to find that several of these high-bred cows have a capital show for milk, which is, to say the least, not an invariable characteristic of Pedigree Shorthorns.

Though some of the calves were with their dams, a number were reared by the pail.

In July, the cattle—excepting some bulls and Show animals—were all out on the pastures. They looked a handsome lot, and in proper breeding condition. A two-year-old bull ("Riby Star"), brought from Ireland, is in service at present; he is out of "Riby Marchioness," which cost 1300 guineas at the late Mr. Torr's sale. Mr. Hutchinson has not had his usual good-fortune with his own young bulls this season. They have suffered from cripple felon,—in other words, chronic rheumatism,—which partially destroys both their appearance and their usefulness.

Sheep.—The flock is pure Leicester; no other sort of sheep are allowed to set foot on Manor House Farm. As might be expected, uniformity of type characterises the flock. Eighty breeding-ewes were acting the part of scavengers on the swede-field when we saw them in January. Tup- and ewe-hoggs were folded on turnips in separate lots. About half a score of tup-hoggs—one of which took the first prize at York for shearlings—were being house-fed: this practice is not followed with females. Three old veteran prize-takers were roughing it in the park, and looked as if they were still good for service in that line. Seventy-five ewes produced 99 lambs. This is not a large crop, but the strain are evidently good nurses; the lambs were strong and healthy, and in July were having a good time of it on the clover. Even on this luxuriant and truly wonderful pasture the cake-troughs were standing.

Several rams have been sold from this flock at 100 guineas each, and one sheep was twice let for the season at that sum.

Pigs.—These are chiefly pure Berkshires; a few of the large white breed are also kept. The stores seemed to pick up a good living in the covered yards.

Horses.—Seven work-horses are kept; they are heavy-legged active animals. Three fine Clydesdale mares are bred from.

One of these was brought from Mr. Tweedie; one is by his famous horse "Tam o' Shanter." Another, with a colt-foal by "Statesman," was from the Marquis of Londonderry's stud, by "The Swell."

Mr. Hutchinson's successes with horses have been with hunters, as witness "Jester" and "Glengyle." A rather strong detachment of these cattle seems to be generally on hand. Two fine chestnuts, three and four years old, were to be shown at York. The latter blemished his knee on the manger, and this prevented his appearance; the other took second prize.

Some young blood relations to "Jester" were running out in the fields; and these, I venture to say, are likely to give trouble to their competitors in future Showyards.

Perhaps I should not omit to notice a kennel of fox-terriers, which are said to be quite as good of their class as the hunters.

Fowls, ducks, and geese, are kept, and take form as items of revenue on the balance-sheet.

Gates and Fences.—Every gate was fitted so as to be readily opened from horseback, and all were in perfect working order. Fences, ditches, and roads, were as clean as the most fastidious critics could wish, and a general air of tidiness and system pervaded the entire holding.

Labour.—As may be expected, this is a heavy item. Last year it reached the aggregate of 542*l.* 18*s.* 5*d.*, exclusive of 15*l.* for steam cultivation, and 56*l.* 11*s.* for blacksmith and carpenter; the outlay for the past four years has steadily increased, but with all these improvements going on this was to be expected. Most of the men in Mr. Hutchinson's service have been on the farm for many years, and the adage, "like master, like man," is true in their case. Ploughing, sowing, drilling, and thatching, are all alike carefully and well done.

Book-keeping.—This is not perfect; there is no yearly stock-taking, so that the profits for any single year (there are never any losses) cannot be definitely ascertained. Stock-taking on this farm certainly presents some difficulties; the value of such high-bred young stock is not easily computed, so much depending on how they come out; and also on customers turning up at the proper time.

Stock and crop books appear to be carefully kept; also a detailed and classified account of income and expenditure. The latter shows a turnover varying from 3000*l.* to over 6000*l.* a year during the last four years.

The results on the balance-sheet of the cash account indicate good profits; and further, Mr. Hutchinson states that the whole of the extensive improvements and permanent works executed on the farm have been paid for out of its proceeds.

A large revenue is no doubt derived from selling animals at what are called fancy prices.

This may be called Speculation, and not farming; but it only affords additional proof of profound judgment and careful general management.

Is the system pursued on this farm one to be held up as a model to British farmers? is a question that has been asked.

We must leave our readers to answer it, each in his own way. This much is certain, that the foundations of the success achieved at Manor House—which are knowledge, judgment, perseverance, and indomitable energy—are worthy of universal *imitation.*

CLASS II.—SECOND PRIZE.

Mr. J. Watson, Wood House, Brough, East Yorkshire.

Wood House Farm is situated in the East Riding, on the lower part of the Wolds, about eight miles west of Hull.

The house, which is a square modern structure resembling a merchant's suburban villa, stands on rising ground about a quarter of a mile from the Cottingham turnpike-road, and is approached by a private road, lined on each side by most perfectly kept hedges, of which more hereafter.

The farm comprises 600 acres, of which 450 acres are arable and the remainder pasture land. It belongs to the trustees of C. P. Sykes, Esq., of Raywell Hall, a beautiful residence on this estate, the grounds of which lie close up to this farm, and is occupied by Mr. Barkworth, who has also the sporting rights over the estate. It is usually most trying to hold a farm upon an estate on which the game is let to a third party. Notwithstanding, however, the fact that an immense number of pheasants are reared on the skirts of Wood House farm, the relations between Mr. Barkworth and Mr. Watson are of the most cordial character.

Mr. Watson has occupied Wood House since 1876. He at present holds four other farms, containing, in the aggregate, about 700 acres of arable and 160 acres of pasture land. He has besides recently given up to his two sons each a large farm fully stocked and in working condition.

The soil of this farm, which rests on the Chalk, is light and naturally dry; draining is therefore unknown. Though not hilly, the surface is undulating.

Excellent riding-stables, harness-room, and coach-house, are passed on the way from the house to the steading. The accommodation for the stock is arranged with a view to the quickest method of getting straw made into manure; for this reason the buildings are not spouted. Two large open folds with shelter sheds are used for cattle-feeding. These are surrounded by the cow-byre, boxes, and stables. There is no fixed threshing-machine, nor much hand-machinery of any kind.

Cropping.—As appears to be the fashion in Yorkshire, no fixed plan of cropping is pursued, though a six-course shift is the usual system, commencing with seeds, followed by oats, white turnips eaten off, wheat, swede turnips—one-third drawn, the rest eaten off—then barley and clover.

Mr. Watson says that for the last few years he has let a seed-field stand for two years. He finds the best way to do that is to pull turnips off near the homestead and give the land extra manure. Mr. Watson gives as reasons for pulling off turnips, that the land can be sown with barley in good time, and barley sown early is far better in quality and there is more of it ; also, the land near the homestead is stronger, and will grow beans. After harvest, every acre of the barley-stubble, where the turnips were pulled off the previous winter, is manured and sown with beans. After beans come white turnips, which are eaten off with sheep in the autumn and sown with wheat ; it is then very fresh to grow clover-seeds, and no place is found better than this to get a good strong plant.

The acreage of the crops for the present year is as follows :—

Beans,	15 acres	Wheat,	28 acres.
Barley,	101 „	Oats,	142 „
Seeds,	119 „	Turnips or rape,	156 „

Beans were a capital crop in July. They are not hoed, but a few ewes and lambs called weeders are run in amongst them until the stalks get too big to travel amongst without being damaged ; these ewes are said to pick out most of the weeds, but certainly not all.

Barley was all a capital crop. Mr. Watson's motto in regard to change of seed is "wheat ever, barley never," and with him this *unchanged* sort of barley does well ; it is tall, stiff in the straw, and very prolific ; in February, 14½ acres were just threshed, yielding 91½ qrs., and sold at 35*s.* per qr.

Wheat, after two years' seeds, was a fair crop, well headed, but not thick. The seeds are ploughed out in the course of the summer, as opportunity offers, and the land is cultivated, manured, and sown in the autumn, if possible.

Mr. Watson states that he gets at least 3 sacks more of barley per acre than of wheat, the former selling for 35*s.* per qr., and the latter for 38*s.* ; he is convinced that wheat takes more out of the land than barley, and that the land can be kept much cleaner when sown in spring.

Oats.—Black oats are principally grown. They stand better, grow less straw, and are found to be most prolific. Polish and black oats are sometimes grown together, and are locally known as Watson's mixture. Sixty-eight acres were sown this spring, after barley; this was not heavy, but it was a nice level crop. Mr. Watson has not previously grown two white crops in succession, and says he will not do it again. Fifteen acres of black oats were after seeds which had been marled last winter. The first crop after marling is usually lighter, but this was good, though not so heavy as that on an adjoining field.

Marling or Chalking.—Some of this work is done nearly every season; the field just referred to was commenced the last day of the year 1882. A part of the field is selected where the chalk is nearest the surface; the soil—of which there may be from 3 to 12 inches—is cleared off, and then operations are commenced. The work is occasionally let, but is more frequently done by the farm-horses and men. When let, it costs from 4*l.* 10*s.* to 6*l.* 10*s.* an acre. The chalk is quarried out and reduced into pieces not more than 6 inches square, and simply carted on to the field at the rate of about 40 tons an acre. After having been spread, it is allowed to lie exposed to the atmosphere as long as possible before ploughing, so that it may fall like lime. Its action is most favourable to root-crops, preventing finger-and-toe and other bulbous diseases. After all the chalk required has been obtained, the sides of the pit are neatly sloped in all round, and ploughed over as before, without much apparent difference to the crops. When the fields are pastured, straw is often placed in the bottom of these old chalk-pits; and in rough weather the stock finds comfortable shelter in them. Mr. Watson has marled about 180 acres of this farm, compensation for which runs out in 12 years.

Turnips.—This crop is looked upon as the crowning glory of a Wold farm. On it depends in a great measure the winter food for both cattle and sheep, and also the condition of the land for future crops. Last year the crop was superb. In January we found upwards of 1000 sheep confined to turnips in one field, and Mr. Watson was then almost despairing of their ability to get through the crop. This year the crop has been a source of great anxiety. Swede-sowing commences about the 3rd week in May; the turnips are all sown in ridges 24 inches apart; about two-thirds of the entire crop is dunged at the rate of about 10 tons to the acre, with the addition of 3 cwt. of dissolved bones. The remaining one-third of the crop, for which there is no dung, receives 6 cwt. of dissolved bones per acre. At our visit on the 7th of July we saw the fallows under most unfavourable circumstances; the previous ten days had brought a succession of thunder-storms, which culminated in a terrific storm of hail on the 4th of July. Though the full force of the storm had spent itself a little to the south of Wood House, yet the farm was dreadfully washed; in the hollows the turnip drills were covered more than level with the soil run off the hill-sides, and one newly ploughed field had a breadth of soil entirely washed off down to the chalk. If further proof had been needed of the violence of the storm, we saw it in the roof of Mrs. Barkworth's conservatory, which had been completely riddled with the hail. A meter kept in the neighbourhood had registered 10½ inches of rainfall in ten days, commencing on the 25th of June. A large field of swedes that had been sown more than five weeks was in a wretched plight. The plants had at first been nearly devoured by the fly, and now they were washed and battered almost beyond recovery. Another field sown a little later was a good plant, and nearly ready for thinning.

A field of 34 acres was ready for ridging-up when the storms came; on the 7th of July we found 8 pairs of horses reploughing it. We were told that these light ploughs would turn it over in two days, and the pace looked as if it would be done in that time. Sixteen acres besides this field were still to be sown with turnips, in addition to another field that was to be sown with rape for early feed for the lambs. When we visited this farm in May we found about 600 hoggs—stock ewe and fattening, in one lot—eating cut swedes; and a large part of the field of 18 acres was still standing to be eaten. Of this field Mr. Watson writes:—

"On the last eaten-off turnip-land it is too late to sow spring corn, and costs more than it is worth. At that time we are busy preparing for sowing turnips again. We let the land remain until a wet day comes, and we can do nothing else; we plough it over and sow a little rape, and sow the land with wheat in the autumn: this is an excellent way to get good clover, by sowing the seeds among the wheat the following season."

Seeds.—These are all invariably pastured. The mixture sown is white clover and trefoil and a very little Italian rye-grass. No red is sown, as it is said to give sheep the "yellows."

The first year's seeds were an excellent pasture carrying a heavy stock of sheep. The second year's field was not quite so good; half of it was already ploughed out, in preparation for a wheat crop.

Live-Stock.—Sheep are looked upon as having golden feet on the Wolds. Leicester ewes, with a strain of Lincoln, are the foundation of the flock. A Shropshire ram has been occasionally used, and the produce is much preferred by the Hull butchers, who are willing to give a penny per lb. more for this cross than for fat Leicester mutton. In January we found:—

303 Ewes in-lamb.
564 Wether and gimmer hoggs.
141 Fat sheep.
6 Rams.

Total .. 1014

All these sheep were eating turnips in one field. The ewes were going behind the hoggs and fat sheep. Though the weather had been wet, the whole of them seemed to be doing well.

On our visit in May we found:—

557 Ewe and wether hoggs.
247 Ewes with 324 lambs.
37 Geld ewes.

Total .. 841

The ewe and wether hoggs and the geld ewes were in one lot eating cut swedes. Those fat were to be sold off the shears when the turnips were finished. The ewes had not been fortunate; there was a heavy percentage of weakly lambs and too many barren ewes. This the Judges attributed to the big turnip crop and want of dry food. The ewes were on the seed pastures and looking well.

On the 7th of July we found:—

245 Ewes suckling 322 lambs.
129 Shearling gimmers for breeding.
133 Feeding shearlings.

Total .. 507

302 shearlings had been sold off the shears, and realised 65*s.* 1½*d.* each. Ewes with couples and the feeding-sheep were getting cake on the pastures.

Cattle.—In January we found a lot of 28 Irish bullocks feeding in a large open fold. Two of the same lot were in a box; the 30 cost 22*l.* each in November. They were a good lot, and most of them were fit for market.

Another yard held 10 fat Irish heifers, which had been bought the previous July at 8*l.* 15*s.*, and were now valued at 20*l.* each. They were fed with cut swedes the first thing in the morning, one linseed-cake each at noon, turnips about 3 o'clock, and a small feed of hay at night, with straw *ad libitum.*

The numbers of the cattle at the time of our several inspections were as follows:—

January.

30 Bullocks feeding.
11 Heifers feeding.
5 Cows ,,
15 Heifers and Cows in-calf.
7 Cows in-milk.
1 Cow suckling 2 calves.
1 Bull.
6 Calves 1 year old.
2 ,, 8 months old.
9 ,, 6 ,,
—
87

May.

7 Cows in-milk.
2 Cows suckling 2 calves each.
2 Cows suckling 1 calf each.
8 In-calvers.
9 Calves 1½ year.
13 Calves under 12 months old.
6 Calves suckling as above.
—
47

July.

9 Feeding heifers.
1 Bull.
13 Cows suckling.
18 Calves.
6 Cows milking.
1 Calf fed by hand.
13 Calves weaned.
17 Heifers 1½ year old.
15 Steers.
1 Cow near calving.
—
94

The cattle bought to graze on the seed-pastures in summer, and to be fed off in the folds during winter, appear to be bought more with a view to leave money than to please the eye, and therefore do not come up to the quality of the rest of the stock.

The cows, heifers, and calves, the regular breeding-stock of the farm, are excellent, wealthy, unpedigreed Shorthorns, with good dairying qualities. These are grazed in the park which lies between Wood House and Raywell Hall. Amongst them the lambs are weaned. Another part, about 5 acres, of the park is cut for hay. The only dairying attempted is supplying the Hall with milk and butter, which yields a revenue of about 70*l.* a year.

Horses.—These consist of 8 pairs for draught purposes; they are an active, quick-stepping, powerful lot, well adapted for their work; four two-year-old carting-colts, two foals, and a nag cart-foal have been bred; besides, a horse is kept for the shepherd, and two nags and a pony are in the riding-stable.

Pigs are kept in the open fold during winter, and pick up a good living among the cattle. Eight sows, pigged and with pig, were the breeding-stock in May.

Labour.—Mr. Watson kindly made out a statement of his labour account, which should be most interesting if presented verbatim, as follows:—

The Cost of Labour per Year upon Wood House Farm.

	£	*s.*	*d.*
Foreman's wage per year	52	0	0
A present yearly	10	0	0
House rent free, milk found for the farm lads, 2 lb. butter per week, and potatoes, worth at the least	10	0	0
I also pay him 9*s.* per week to board 7 lads, total	163	16	0
Waggoner's wage yearly	21	0	0
Second waggoner do.	17	0	0
Third lad do.	16	0	0
Carried forward	289	16	0

	£	*s.*	*d.*
Brought forward	289	16	0
Fourth lad's wage yearly	14	0	0
Fifth lad do.	12	0	0
Sixth lad do.	12	0	0
Least lad do.	8	0	0
Shepherd's wage per year	52	0	0
House rent free	5	0	0
1 lb. butter per week and milk found, worth	4	0	0
Beast-man, 17*s.* per week	44	4	0
Extra for harvest	5	8	0
6 constant labourers, 40 weeks at 16*s.* per week	192	0	0
Ditto, about 6 weeks hoeing turnips at 8*s.* per acre twice over, they earn about 28*s.* per week per man	50	0	0
Ditto, 6 weeks in harvest at 24*s.* per week, and I pay the foreman 9*s.* per week to board them, amounting to 33*s.*	60	0	0
1 man slashes the hedges, they cost about 20*l.* per year	20	0	0
The rest of the hedge-slasher's time is taken up in cleaning hedges, mending up gaps, &c., and other odd jobs, costs say other	25	0	0
Extra labour, weeding corn, at 1*s.* per acre	15	0	0
Extra labour on threshing days, about 30 days' work	20	0	0
A few days before harvest I let the Irishmen who do the harvest work 3000 bundles of straw to draw, at 2*s.* 6*d.* per 100	3	15	0
I also let the said Irishmen, 12 of them, the corn to tie up, stook, fork upon the waggons, load and team upon the stack—the farm lads drive the waggons to and from the field—for 8*s.* per acre; they earn upon an average for the last 7 years 9*l.* per man for about 5 weeks' labour; they work very hard indeed. We cut all the corn with Bamlett's reapers (manual delivery); every sheaf is tied up and stooked before the men leave the field	108	0	0
Harvest ale costs about	30	0	0
The other part of the year	25	0	0
	£995	3	0

About an average cost per year of a little over 30*s.* per acre.

The amount expended upon cake for the last seven years has been on the average 608*l.*, or about 20*s.* per acre.

The hedges are simply excellent. They are the work of one man who has trained many of them from the time they were planted; miles of them are perfectly wedge-shaped and without a flaw, clean, and having the land cultivated and cropped up to their roots: 1150 yards of strong iron fencing, costing 3*s.* per yard, has been erected in the park by Mr. Watson.

The gates and roads are in excellent condition. Most of the gateways are laid with chalk, and all the gates can be opened on horseback.

The stackyard and homestead are the embodiment of tidiness. Order and system seem to pervade the premises.

Book-keeping.—No annual stock-taking is attempted. But a strict cash account of receipts and expenditure is kept.

An interesting record is also kept of any permanent works executed on the farm, with their cost, such as chalking, building, &c. Mr. Watson writes: "I succeeded to my father's farm in 1855 at the age of 21. The Russian war was in the way just then, which helped me a good deal. In the year 1859 I took another farm of about 400 acres; in the year 1866 I took about 100 acres more on a lease for seven years—it was very good grass-land. In 1867 I took about 300 acres more, and I did not take any more until I took Wood House and about 700 acres more at the same time. From 1876 to 1882 I farmed on my own account about 3000 acres." All this extension of business, and the capital required to carry it on, have been acquired by pure farming, with an entire absence of speculation. Mr. Watson states that he always sells his grain immediately after threshing, and his wool directly after clipping. Arable farming may, therefore, in this case be credited with bestowing on one of its votaries in the person of Mr. Watson a rich pecuniary reward.

CLASS II.—COMMENDED.

Mr. William Coverdale, Lund Cote, Kirby Moorside.

Lund Cote Farm is situated in the North Riding, 2 miles west of Kirby Moorside. It forms part of the extensive estates of the Earl of Feversham, and comprises 292 acres, of which 232 acres are arable and the remainder pasture land. The farm has been held by the present tenant for a period of thirteen years, and under a yearly tenancy, at a rent which Mr. Coverdale says has been too high for recent seasons. On account of these bad times, 10 per cent. has been considerately returned at rent-days for the past two years. The terms of agreement include a tenant-right of half the cost of the cake consumed during the last year of the tenancy, calculated on the average consumption of the last three years.

The land is described in the certificate of entry as "loam," resting on limestone and sandstone. There are a few patches of strong clay, part of which requires draining; but as a whole the soil is that kind of fertile loam which is easily spoiled by being worked out of condition. The fields lie well, are pretty level, but are rather too thickly studded with old trees, which, though a fine feature in the landscape, always appear to a farmer's eye to be out of place in a tillage field.

The homestead is well situated in the centre of the farm. The old thatched farm-house is a relic of a bygone age. Had the farming not kept better abreast of the times than the house and buildings have done, there would have been little to commend. Stones were, however, being laid down for a new house, which is, no doubt, by this time being built.

Cropping.—This is literally a corn-farm. About 140 acres, or nearly two-thirds of the arable land, is annually in grain-crop. No regular course of cropping is prescribed or pursued. Part of the clover-leas are sown with wheat, and the remainder with oats. One field of wheat was a thin plant; several acres were not good enough to stand, and were scarified down and sown with oats. A field of wheat after oats, dressed with soot, at a cost of 20*s.* per acre, was a really good crop.

Barley generally succeeds wheat. One field, dressed with 2 cwt. of guano per acre immediately after the drill, looked especially promising. Another field, grown on wheat-stubble, had no dressing, and was carrying a good level crop, which says much for the natural fertility of the land. The best samples of barley are obtained as a second white crop. After turnips the crop is often too gross. Barley and oats were capital crops all round. One field of black oats after seeds grazed, looked like yielding 10 quarters per acre.

The following is the acreage of the several crops grown in 1882 and 1883:—

	1882.	1883.
	Acres.	Acres.
Wheat	50	49
Barley	44	55
Oats	42	37
Beans	6	..
Turnips	52	56
Seeds	32	28

It will be seen that potatoes are not enumerated; only 10 drills were grown this year, and they are not good.

Seeds are always grazed with sheep eating cake, and this year they were grand pastures; they only stand one year.

Swede turnips were sown on the flat in 1882, and, owing to the wet season, they were very difficult to clean. This year they were ridged, and the ridges losing their moisture in the dry weather, the seed did not vegetate until the rain came, thus showing how varying seasons may upset the best systems.

In January we found here, as elsewhere, a grand crop of turnips. In July the prospect for a crop this season was far from good. Sowing had been completed, but no swedes were thinned. White turnips after beans had been sown on the flat, and were appearing above ground. These had been put in with 3 cwt. of bone-meal and 2 cwt. of superphosphate, mixed with 2 tons of ashes drilled with the seed. Nine acres of fallow were intended to be sown with rape. The fallows were all well done. A six-acre field, which has only recently come into Mr. Coverdale's occupation, showed a good deal of couch in January, but at the last visit the whole was turned out of hand clean, and in fine condition.

Live-Stock.—In January we found 140 very good ewes close-folded on a big crop of white turnips, and were not getting any other food supplied to them. Previous to our visit there had been a spell of wet weather, which had converted the sheep-folds on this loamy land into a puddle. The ewes looked uncomfortable; but the feeding-hoggs in the same field, eating cut white turnips, looked miserable. The mud adhering to the long wool had formed into balls all along the lower line of their bodies; fresh relays of mud were being added every day, and were getting too heavy for many of the poor sheep to carry; they did look unhappy. Fifty ram-hoggs were getting cake, 175 feeding-hoggs had turnips and a little hay. At the May inspection the hoggs were still folded on the turnip-land; they had now comfortable quarters, but many of them were lame, and, as a lot, they did not look well. About 7 scores were sold off the shears shortly after our visit, making an average price of about 50*s.* per head. The ewes were looking well, but had been most unfortunate in their crop of lambs: these looked dry in the skin and stunted; not at all like the produce of such a fine lot of ewes. In July the numbers given were only 108 lambs for 120 ewes. They were then going on good seed-pastures, getting cake. The ewes were big and fat, but the lambs were very uneven.

The Judges found that wherever ewes had been folded on turnips without having a run over grass, or supplied with dry food, the crop of lambs, though numerous when dropped, were delicate, difficult to rear, and died off in large numbers.

The shearling rams, 40 in number, going in grand clover and eating cake, were not a credit to Leicester and Lincoln crossing: they did not warrant any further experiments in that direction; at least such was the opinion of the Judges.

Ten milking-cows, showing good dairy qualities, are usually kept, and their calves reared. The heifers are brought in for cows, and the steers are fed off at three years old. Eight capital bullocks were being fattened in an open fold, and were getting, in addition to white turnips, 7 lbs. of linseed-cake and barley-meal each per day. Three had gone off fat out of the lot at 27*l.* 10*s.* each. The young stock—excepting calves—were all in open folds, getting a little cake with turnips and straw, and were like growing into useful cattle. Pedigree bulls are used. A four-year-old bull going off fat was by "5th Duke of Treguntер," and a yearling to take his place was by "7th Baron Oxford."

A strong contingent of pigs—38 all told—were chiefly living in the yards amongst the cattle, and were apparently faring well.

The draught-horses—nine in number — were not heavy animals; they looked as though they might have a strain of Cleveland blood in their veins. Two two-year-olds, besides, were broken to work; and four of the mares were bringing foals. The stalls in the stables are made to hold two horses each, which to a Northern farmer always looks a dangerous arrangement.

The whole of the men working on the farm are boarded in the house. This system is not thought likely to spread, if the feminine members of the farming community are taken into counsel. The staff here consists of a foreman, five ploughmen, and three labourers; the latter of whom have 9*s.* a week and their board. Wages have fallen about 20 per cent. from what they were in the good times. The amount in the aggregate for labour is 270*l.* per annum.

Soot is largely used for dressing corn-crops. The manure bill is under 100*l.*, and that for cake amounts to nearly 300*l.* per annum.

A complete set of farm-books is kept, showing details of cropping, sales, and expenses. An inventory is taken and a balance-sheet drawn out on the 23rd of March in each year, in which Mr. Coverdale charges the farm with 100*l.* per annum for personal supervision, and 3 per cent. on a capital of over 4000*l.* employed. After this had been done in 1883, a small balance had to be placed on the wrong side of the sheet.

CLASS III.—FIRST PRIZE.

Mr. Benjamin Beevers, Clay Shed Farm, Escrick.

The competition in this class was limited to farms under 150 acres in extent.

Mr. Beevers, who had a clear lead in the competition, is the kind of man for whom the prize was evidently intended. He began life as a farm-servant, and, like the energetic yet prudent man that he continues to be, he married when very young. The united fortunes of the pair being very limited, draining was resorted to for a living, which led to contracts for draining in winter, and "beck" cutting and cleaning in summer. This work brought in some money, and a small holding of 15 acres was taken under Lord Wenlock. There vegetables, chiefly early potatoes, were grown with considerable success.

After occupying this place for eight years a shift was made to a 70-acre farm under Lord Leconfield, rented at 50*s*. per acre. After a year's trial this was found to be too dear, and was promptly given up.

Mr. Beevers entered on his present occupation in 1880, and, though the seasons have been unfavourable, he says he "has held his own." There is an air of prosperity about the holding. The crops are good, many of them excellent; with a few tons of old hay in the stack-yard, the cattle are in good condition, and the horses young and full of life. There was no end of fine poultry running everywhere, and the best litter of pigs we saw during our travels.

The farm, which is the property of Lord Wenlock, lies 7 miles south-east of York, and 2 miles from Escrick Railway Station. It consists of 127 acres, of which 55 are arable and the remainder meadow and pasture. In the entry-sheet it is correctly described as "heavy, with a clay subsoil." The land lying along the side of the Escrick and Wheldrake road, which bounds the farm for about three-quarters of a mile, rises a little. The arable land here is a useful loam, fair corn land, and will grow roots, but is too heavy to allow any of them to be eaten off. A large portion of the grass-land is poor clay, and worth very little.

The farm is held under a yearly tenancy, with an agreement for payment of one-third of the last year's cake bill, and also on a proportionate scale for liming and marling. The labour on permanent works, which is chiefly draining, for which the landlord supplies pipes, is to be paid for on a six years' scale at the end of the tenancy. The rent has been reduced 20 per cent. owing to the bad times, and this the tenant states has enabled him to hold his own; some draining has also been done, and a large Dutch barn built, free of interest.

The homestead is comparatively new, and is well placed in the centre of the holding, a field-breadth from the highway. The house, which has a neat patch of gay flower-garden in front, is in keeping with its surroundings: the best room is the kitchen. The buildings are commodious and well-arranged. They consist of cow-byre, stable, two boxes, cart-shed, and piggery, and two shelter-sheds for open yards, the latter of which will now require to be covered in, as this place must for the future take rank as a model farm.

Mr. Beevers has great faith in potatoes; last year he grew Magnum Bonums and Champions, which proved very remunerative. Regents had been chiefly grown previously, but they were not so productive and had more disease. Magnums and Champions are again planted on a 4-acre field, which the tenant has drained. The manure applied was 18 cartloads of foldyard and 4 cwt. of artificial manure to the acre. This field was neatly finished in July; well set up with the plough, clean, and the plants were growing vigorously, though a very few drills in the middle of the field, owing to some unexplained causes, were patchy.

Fallow wheat, of which there were 3 acres, was a really splendid crop; the best we saw out of Holderness. Four acres after potatoes in the same field was little, if any, behind; the whole had been dressed in spring with ½ ton of soot and 1½ cwt. of salt to the acre; this had evidently had good results. The variety is "Scholey's Square Head," and is sure to yield well.

A formerly unproductive corner of this field at the entrance from the road, where a straggling old fence had been grubbed, is now doing duty as a productive vegetable garden.

Barley, after turnips—13½ acres—dressed with 2½ cwt. of Peruvian guano per acre, was very forward in April; and was very clean and equally promising in July. The seed was the famous "Kinver Hill" variety, direct from Webb and Sons. Seven acres of black oats, grown after barley, were equally promising. The stubble had been cleaned and worked last autumn, and the crop had been dressed in spring with ½ ton of soot per acre.

The crop from 6 acres of seeds was safe in the hay-shed at our July inspection; the hay was a little weathered, but strong in the bone. A mixture of nitrate of soda and superphosphate was standing in the field, ready for application, to give the fogg a lift for a second crop: three acres at the foot of this field, which had been too foul to sow with seeds, was being ploughed for the sixth time.

Another fallow field of 15 acres, after oats, was not a good subject. Nine acres had been intended for roots, which were all sown excepting an acre that was lying ridged with the tillage sown on it: a heavy thunderstorm had stopped the proceedings and spoiled the piece for roots for this season. Two acres of mangolds had suffered from the drought, and were poor and patchy; while 4 acres of swedes had been resown with white turnips, and might still have made a crop, if the season had not been most unfavourable for root growing, especially on soils of this description. Six acres of the same field had been left for bare fallow, and was very foul to begin with. The oat-stubble was skim-ploughed and well harrowed in the autumn. The whole of the fallows were in good order at the July inspection, and reflected great credit on their management.

A field of 14 acres of the poorest clay, which lies near to the house, had been sown down to permanent pasture about two years ago. The landlord found the seeds, and also paid for one-half of the dressings of bone-dust; the herbage is not thick, and will require generous treatment to make a good sward, but it is a great improvement on bare fallow. A meadow field which lies nearest to Escrick was half cut at our visit in July, and on it was the largest crop of grass we had seen, although the hay was perhaps not of the best quality. Half a ton of soot had been sown on an acre in the centre of the field, and had told with marked effect on the crop. The remainder of the field had been dressed with 2 tons of dissolved bones. Excepting a little patch of useful grass near the house, the remaining 27 acres of pasture is poor clay. A field of this rough pasture had been dressed with 4 cwt. of dissolved bones to the acre; half of it was done in 1880 and the remainder last year, with a ridge left between undressed. This ridge was distinctly noticeable; the herbage was much coarser, and left uneaten by the stock.

Eight dairy cows were in the byre in January; these were getting daily half of a linseed-cake and a mash of oatmeal mixed with cold water, in addition to turnips and hay, and looked as if they throve on their diet. Some of them were being fattened off, and were in the meantime a source of revenue, being milked and fattened at the same time.

About 120*l*. had been received for stock sold between our April and July visits. From 10 to 12 calves are annually reared. Fourteen young cattle, from 6 to 18 months old, were grazing in the rough field before mentioned, all reared on the farm. Ten very good Shorthorn bullocks and 4 Irish, not so good, were grazing in the newly laid-down pasture.

Sheep are a critical stock on this poor clay-land, as the tenant had found out by sad experience. Two years ago a lot of 50 ewes had died nearly wholesale from rot, and this year five out of a score of Cheviot ewes, bought in October, were lost from the same cause. The 15 remaining ewes had 19 lambs, and, with one exception, were doing them well. Four lambs were sold at the end of June, and made 42*s*. each.

Four clever horses work the farm; three of them reared foals last season, and one foal was bought. These are all growing into horses on the farm.

An excellent white sow and her litter of seven were all in prime condition, and several "heavysides" were made into bacon during the winter. These, with about 200 head of poultry, are indebted to Mrs. Beevers and her daughter—worthy women both—for their fine appearance.

Cash out of pocket for labour does not exceed more than 20*l.* a year, inclusive of hoeing and harvest. The whole of the ordinary farm work is done by the tenant, his two sons, and a small boy, who is paid at the rate of 6*l.* a-year and board.

This little concern affords a fine example of a frugal, industrious, hard-working family—well backed by the landlord and his agent—making the best of rather a poor farm and greatly increasing its fertility. It would be well for the country if such cases could be indefinitely multiplied. One phase of this question must, however, always be borne in mind. The man who rolls up his shirt-sleeves at half-past four in the morning, and does not put them down until he goes to bed at night, with a family following in his footsteps, must be credited with the labour thus expended, and the farm debited accordingly.

CLASS III.—SECOND PRIZE.

Mr. Joseph Horner, Morton, Bingley.

Morton Farm lies on the hill two miles north of the town of Bingley. The house and homestead are in the village of Morton. This holding may be said to be a conglomeration of atoms. It belongs to no less than six different owners, and lies in as many detached pieces. Forty acres, about two miles distant from the homestead, lie at a high elevation. A six-acre piece of this has been made into meadow, and carries a good crop of grass. The highest land is covered with a rough coarse herbage. Several acres of the best part have been drained and dressed with soil and lime and gas-lime, and have evidently been much improved by the dressing. The road leading to this land is a very steep gradient. It is most heroic work to lead tiles and lime on to the top of this hill. The stock kept there—besides ewes and lambs—consisted of five black calving cows and a young blue bull, by a pedigree Shorthorn bull.

The buildings, which are neither compact nor commodious, are made the most of, and are kept clean and tidy. A six-horse portable engine drives a grinding-mill, chaff-cutter, and cake-crusher, and is occasionally let out to thresh for hire.

A small portable poultry-house is located in the lower grass fields in summer. Young chicken are thus reared, and get a run out on clean ground.

The entire holding, as entered for competition, consisted of

135 acres, of which 11 acres are arable, and the remainder meadow and pasture land.

About 6 acres were sown with Webb's Black Tartarian oats, and looked a crop that would yield well. Four acres of swedes, mostly thinned before the July inspection, were clean and well done. Half of a small field of about 1½ acre was potatoes and the remaining half a mixture of peas and beans. The potatoes were very neatly done up, and were a perfectly regular and luxuriant crop.

About 16 acres are permanent meadow, and, besides this, 15 acres that were sown down about five years ago were to be cut for hay. The land had come well to grass; it was a thick herbage, and would yield a large crop of hay of good quality.

A large proportion of the pasture land had been dressed with a compost of lime and soil, and had a close fine herbage, thick with white clover, with an absence of thistles or other weeds. During the dry weather the fine pasture had evidently got very bare, but the rain had sent the grass away with a rush, as it was now abundant.

The produce of eleven cows, good dairy cattle, is sold chiefly as new milk: about 20 gallons per day are sold at the door, making 10*d.* per gallon. Butter is also made and sold, and the skim-milk not required for calves and pigs is sold at 4*d.* per gallon. A grand blue cow had died of milk-fever in early summer. Three useful heifers were in-calf. Four black polled heifers had not grown at our last visit so well as we expected; they were getting cake, and will no doubt come out nice cattle in the autumn. Heifer calves are reared, and are kept for cows. A well-bred bull is always kept; the one in service at present is by the "Earl of Doune" (36,579), dam by "Edwin" (21,671). Forty head of cattle, all told, were all useful stock, and looked like leaving money for keeping.

A flock of 50 good Lonk ewes had 64 lambs by an Oxford Down ram. This seemed to the Judges to be the greatest success in crossing that they found anywhere. The second cross were really fine sheep, and had much of the Oxford Down character. The best of the single lambs were fattened. Four had been sold at 45*s.* each. The ewes with keeping lambs were out on the highest land, and were feeding their lambs well. 48 shearlings were grazing among the cattle on the lower land, and were likely to make useful sheep. An excellent Oxford Down ram, bred by Mr. Fawcett, and descended from the Winchenden flock, went far to account for the fine lambs we could not cease to admire: 30 three-year-old Lonk wethers, costing a little over 30*s.* per head, had been bought in to feed off.

The fences are all stone walls; many of them over 6 feet high; and most of them had been erected by the present tenant and his father. They had been mostly built as substitutes for old ragged thorn fences, were well done, and kept in excellent repair.

The farm, as a whole, is very creditably managed, and that, too, under apparently very adverse circumstances.

XXV.—*Report of the Senior Steward of Implements.* By J. Bowen-Jones, of Ensdon House, Shrewsbury.

The valedictory Report of the retiring Steward necessitates no lengthened statement from him, the detailed description of the Miscellaneous Implements, and of the trial of those selected, having been placed in the experienced and competent hands of Mr. John Coleman, one of the Judges.

He has the satisfaction of recording that the Society's Exhibition at York, favoured for the most part by good weather, held on an excellent site in admirable condition, and arranged, both as regards Implements and Stock, with great foresight and judgment, proved one of the most instructive and successful meetings the Society has ever known.

The Working Dairy, for the first time under the exclusive *management* of the Society, fully sustained the interest that for the past few years has been manifested in this branch of British Agriculture. The competition for the best equipped Dairy was limited to two entries. The prize of 50*l.* was taken by Mr. Eduard Ahlborn, of Hildesheim, Germany; while his unsuccessful opponents, Messrs. Bradford and Co., were solaced by a silver medal for their excellent Butter-worker.

The Stewards somewhat reluctantly endorsed the emphatic recommendation of the Judges in the award of nine other silver medals for Miscellaneous Implements, which completed the maximum number permitted by the Society. They feel that a too profuse distribution of these medals will much diminish the value of their award; and, while recognising the merit of the inventions receiving such honours this year, they can scarcely imagine all of them to be of equal value to the agricultural community.

The Stewards have to express their acknowledgments to the Lord Mayor and Corporation of York, the Local Committee, and the Chairman and Directors of the North-Eastern Railway Company, for their cordial co-operation in promoting the success of the Show.

In rendering an account of his Stewardship, the writer desires to express his thanks to all the officers of the Society, and to his colleagues, for their uniform kindness and assistance. One cloud alone has obscured an otherwise agreeable three years of office—the death of Lord Vernon, the last retiring Steward. All connected with the agricultural world lament his loss; but those alone who had the privilege of personal association with him, who observed his untiring patience, his indefatigable energy, and his conscientious determination to advance ne interests of Agriculture, can fully realise the irreparable gap created by his removal from amongst us.

XXVI.—*Report on Implements at York.* By JOHN COLEMAN, of Hollycroft, York.

Judges.

T. P. OUTHWAITE, Goldsborough House, Knaresborough, Yorkshire; GEORGE GIBBONS, Tunley Farm, Bath; and JOHN COLEMAN, Hollycroft, York.

THE exhibition of machinery at rest and in motion on Knavesmire was the most extensive and complete, in every sense, that has been held since the alterations as to fees and the exclusion of duplicates. Derby was very successful in this respect, but York excelled it as to the number both of stands and exhibits. Thus—

	Stands.	Articles.
Derby	377	5960
York	401	6058

It is not, however, by size alone that a judgment should be formed. The quality of the exhibition and its interest in the way of useful novelties are important elements; and judging by the medals awarded, no fewer than nine in number, for novel or improved appliances, it is evident that implement-makers have not been idle during the past year; and this activity of design is surely the index of an improved state of trade. By slow, but we trust sure, steps, Agriculture is recovering from the severe trials which have paralysed her movements for some years, and we may hope that the outcome of so much trouble will be a greater demand for such machinery as is proved to be labour-saving and practical. New ideas are constantly coming to the front. Last year we were much excited about hay-dryers. A large trade was driven in some quarters, and all go-ahead people bought a fan, and, either by power or manual labour, tried to convert wet grass into sweet hay. To ascertain how many of these fans have been used this season would be rather interesting. The utter inability of the scheme to effect that which enthusiasts declared it capable of, diverted the attention of the public, in too many instances, from the really useful auxiliary work which a properly driven and constructed fan can effect. The Society were impelled by the force of public opinion to make costly experiments, which, though negative in results, were of great service to its members, and saved them from useless outlay and disappointment. A large sum of money was spent in the Reading meadows, but I cannot think that such outlay was either wasteful or useless, because the large constituency of members look to the Council to carry out from time to time such tests as shall determine the value or uselessness of new inventions.

At York there was a distinctly new departure, viz., a Compound Condensing Engine for agricultural purposes. This was shown by Messrs. Riches and Watts (Article No. 5139), and as a most important introduction deserves notice. It comprises a tandem engine and vertical boiler, cheap and simple in construction. Wherever a run of water is available, this is a most useful engine. It is said to be about 10 actual horse-power, and, costing 150*l.* complete, it is certainly cheap, and is probably capable of being very much developed. It is fitted with an ordinary jet-condenser and simple air-pump.

The merits or demerits of Caloric Engines and Hot-air Engines is a most interesting question. No fewer than eight firms exhibited at York Meeting these comparative novelties; although several employed the same invention, viz. that known from the name of the inventor as the Buckett Caloric Engine. It is said that with this engine brake trials have shown that an effective horse-power can be obtained by 2·54 lbs. of ordinary gas-coke per hour. It requires no water, and therefore, if practical, could be used when water is scarce or bad. And the risk of accidents is, I should imagine, very much less than with water. Of course it may prove quite unsuitable for agricultural purposes, but we have in this form engines working up to 16-horse power and down to ½-horse power. It would be very desirable to have reliable information from the Society's Engineers as to the possible advantage or otherwise of caloric engines. Possibly this could be determined without even a trial.

The efforts of the Society might, in my opinion, be advantageously directed to test the comparative merits of the various applications of springs to agricultural locomotives. There is very little doubt that an efficient spring adds to the life of these increasingly valuable savers of animal power. The trial system, as it was pursued during the earlier life of the Society, has very wisely been abandoned. It would be a useless expenditure of time and money to go over ground which has been so thoroughly investigated; but it is a most important branch of the Society's usefulness to guide its members as to the practical value of novel discoveries in mechanical science, and a strong feeling exists that information is urgently needed as to this new introduction in agricultural mechanics.

On the occasion of the York Meeting a prize of 25*l.* was offered, as at Reading, for the most efficient portable straw-compressing and binding machine, to be worked in conjunction with a threshing machine; and though on this occasion there were two entries, viz. John S. Ladd and Co.'s Perpetual Press (Article 5003), described in the entry form as a "Straw-compressing Machine, 14 × 18, variable length, extra strength iron-lined, No. 1, extra belt, perpetual press, mounted on wheels for travelling, price 230*l.*" (this machine, which received a silver medal at the Derby Show in 1881, was illustrated and described in my Report of Miscellaneous Awards, and was farther referred to by Mr. W. C. Little last year); and Messrs. J. and F. Howard's (Article 4609), described in the entry form as a Straw-trussing Machine, worked in combination with a threshing-machine, price 45*l.* Both were ineligible for the prize:—Ladds' machine because, just as last year, it was not worked in conjunction with a threshing-machine; and as the Reading experiments showed a consumption of about 8-horse power, it is quite certain that such a combination could not practically be adopted. Messrs. Howard and Co.'s valuable invention because it was not a compressing-machine at all, though an excellent trussing-machine, and as effecting a saving of three to four hands when straw is tied up as threshed, which is the general custom in the county of York, and wherever straw is prepared for sale. The Judges were so satisfied as to the merits of the application, and the ability of the machine to deal with the material as rapidly as it could be put through the drum of the threshing-machine, that they advised the award of a silver medal. It seems probable that the combination which the Society desired to encourage may not be possible,—the power required for such compression as would render the straw sufficiently reduced in size for export purposes being too great to be supplied by an engine having to drive a threshing-machine as well; but the offer of the prize has not been without fruit, since it has led to the ingenious and successful combination of a threshing and straw-trussing machine, of which I proceed to give a detailed description, which, with the aid of a drawing supplied by Messrs. Howard, will, I trust, be readily understood.

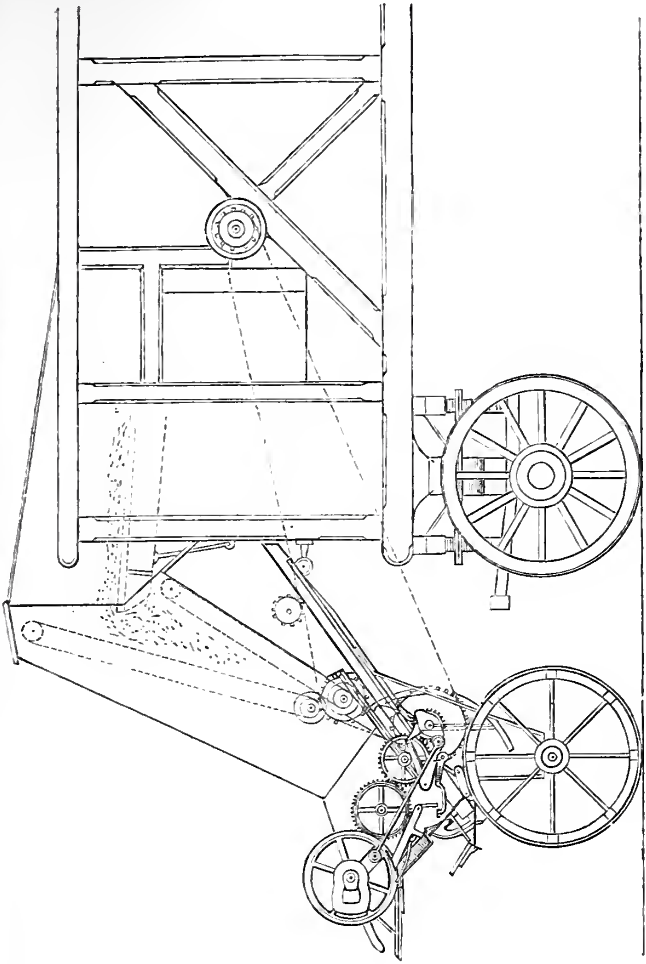


Fig. 1.—*Howard's Straw-Trussing Machine.*

It will be seen from the above that the machine is attached to the tail of a portable threshing-machine; also that the straw as delivered from the end of the shakers falls between two revolving aprons, which carry it forwards and downwards much in the same way as the cut corn is carried up to the binding-table of an American self-binder. The apparatus is light and easily transported, being mounted on an axle and a pair of travelling-wheels. Light movable shafts are attachable to the axle for convenience of transport; and when the machine is to be set to work, it is simply hooked on to the threshing-machine.

Motion is obtained from the shaker spindle by means of chain-gear and sproggle-wheels. The threshed straw, on leaving the shakers, passes between the aprons or conductors to the collectors, which receive and compress it against weighted levers, and when the required quantity of straw is collected, to balance and move the weighted levers; the binding mechanism is thereby started, the pair of binding arms from below the collected straw rise up, enclose and bind it with two bands, whilst the truss is under compression. In other words, the mechanism is almost exactly similar to that of the Appleby knotter, which is now so frequently adopted for corn-binding machinery; only the parts are stronger, and the straw is bound with two strings instead of one. The compressors are also more powerful; but as the straw is fed loose, and more or less twisted, it is not compressed to any great extent. The size of the trusses can of course be regulated by adjusting the weighted levers; but it is found that trusses of about 18 lbs. weight are the most convenient for general purposes. Messrs. Howard state that the average cost of twine to bind a ton of straw is a shilling. I should have thought that it would have been more, calculating the average cost of tying sheaves of corn as worked out at the trial at Derby; for though probably each acre of corn would yield 1½ ton of straw, yet inasmuch as there are here two strings to each truss, and, owing to the straw being more or less twisted, the straw cannot be bound so tightly as the sheaves, I should have expected a cost of not less than 1*s*. 6*d*. an acre; but I quite agree with them that the cost of string would not exceed the labour of making bands, whilst the whole of the labour for trussing is saved; and this labour, including making bands, was generally estimated by practical men at from five to six hands. I do not consider there would be much, if any, saving in money by using this machine, as the following figures will show:—

	s.	*d.*
String for tying 12 tons of straw (which equals a good day's work) of oats or wheat . . .	12	0
Interest and depreciation on 45*l*. at 15 per cent. per annum, spread over 30 days' work . .	4	6
	16	6
Cost of wages for 5 men, extra hands, hired by the day at 3*s*. 6*d*.	17	6

If machinery were kept for hire, and more frequently used, there would be a considerable gain in money, and the hirer would probably gladly pay from 5*s*. to 7*s*. 6*d*. a day extra hire, besides the cost of the string, for the use of such a labour-saving machine. But the value is not only or principally in the saving of expense; but mainly in the fact that, as fewer hands are required, the work on farms of moderate size could be done more within their own resources; and we should not have to scour the country preparatory to a threshing day to get extra hands, who are frequently of very indifferent quality, and who by means of such occasional work manage to exist, often filling up their time in a much less innocent manner. A great and well-deserved interest was shown in this machine by the spectators, and I do not doubt that the ingenuity of the inventors will be rewarded by a large sale.

The two prizes of 50*l.* each for Dairies suitable for Butter and Cheese making, offered by the Rev. T. Staniforth, M.A., of Storrs Hall, Windermere, resulted in two entries only under the first head, there being no competition for cheese-making appliances. It is to be regretted that this liberality was so little appreciated, especially as the importance of Dairy interests are so generally recognised. The wording of the offer of the prize was as follows:—

> "The best equipped Dairy suitable for a Farm on which not more than 20 milch cows are kept, and where the principal object is Butter-making."

The following conditions were issued in reference to the above:—

1. Every competitor must send to the Secretary a ground plan of his proposed Dairy drawn to scale, showing exactly the area and shape of the ground which it will occupy, as well as a specification of the Implements and Utensils with which it will be furnished, and a statement as to the motive power which he will employ, so as to reach 12, Hanover Square, London, W., on or before April 1st.

2. Members of the Society may compete without payment, but Non-members must pay an entry fee of 1*l.*

3. There will be no charge for space, but in the event of any competitor failing to erect his Dairy, and to furnish it according to his specification by the last date of arrival for agricultural implements, he will be compelled to pay a fine at the rate of 6*d.* per square foot for the ground space which he had asked for.

4. All work connected with the erection of the Dairy, its foundation, floors, &c., will be executed by the Society's Superintendent of Works at the prices stated in the ordinary Schedule, provided that at least one month's notice of their requirements is given by the competitors. In default of such notice the competitors will be themselves responsible for the incompleteness of their Dairies at the time when the Judges commence their inspection.

5. The Society will provide a continuous supply of cold water from a hydrant in a convenient position contiguous to each Dairy; but the competitors must arrange for an efficient drainage therefrom and for all heating arrangements and working power.

6. Each competitor must make his own arrangements for the supply of

milk, ice, and other necessaries, so that they may be delivered to his competing Dairy not later than 9 A.M. on each day of the Show, and all carts, waggons, and other vehicles bringing such materials must be out of the Yard before 9 A.M.

7. Every competing Dairy must be at full work for at least two hours on each day of the Show, according to a Programme to be furnished to the competitors by the Secretary of the Society, under a penalty of 10*l.* for each default.

8. The Judges will be instructed to disregard the nature and cost of the structure of the Dairy, so far as the walls and roof are concerned, these being essentially temporary as an Exhibition.

9. The Judges will be instructed to pay special attention to the completeness of the furniture of the Dairy in each class, having due regard to the principal object in view as well as to the utilization of the refuse products.

10. The Judges will also take into account the materials and construction of the floors of the competing Dairies, and any arrangements for drainage and ventilation which in their opinion may be easily and economically applied to existing Dairies.

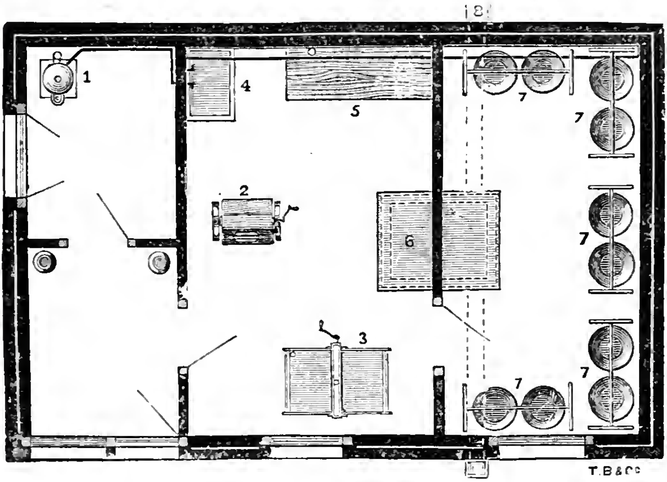
11. The Judges will be specially directed to take into consideration the price of each implement and appliance, and the cost of the whole equipment in each competing Dairy, economy being deemed an essential point of merit.

Two competitors entered, viz. Thomas Bradford and Co., The Crescent Iron Works, Manchester, and Eduard Ahlborn, of Hildesheim, Hanover. Neither entirely fulfilled the conditions, for whilst the former contented himself with showing a Butter Dairy, without any appliances whatever for the utilisation of the refuse products, the latter had neglected in his arrangements to deal with the question of flooring and ventilation, his exhibits being shown in a large shed with one side open, which, though very convenient for exhibition, did not certainly show how the Dairy should be kept cool and airy, whilst the floor was of lattice boards.

Messrs. Bradford's building was divided into three compartments. The design will be understood by a glance at the subjoined ground-plan.

The first compartment was subdivided, forming a small entrance chamber, where churns and milk-pans are kept ready for use; beyond this was the boiler room, with necessary piping for supplying hot water and cold water from a small tank, the circulating pipes being so arranged as to warm the milk-setting room when required, and also to assist in ventilation by rarefying the air in the ventilators above the ceilings. The materials here comprised a Tortoise circulating boiler with copper cylinder, small cold-water tank, and necessary piping, the whole of which may be estimated as costing 20*l.* A full list of all the articles which Mr. Bradford considers necessary, and the prices of the same, are given below. The middle room is the Working Dairy. The third room was for setting the milk. Both these rooms were ventilated by means of pipes from the outside, which admitted cold air, whilst the ventilation above the ceiling, aided by the radiation of the air by the hot-water pipes, secured a constant current. Having a supply of water, Mr. Bradford, to improve the process, made a stream to flow through the ventilating pipes, but this is not a necessary feature of his system. At the top of the building was fitted a "Walness" ventilator or extractor. Mr. Bradford thus describes his ventilating arrangements:—"The Dairy building is designed and constructed with a view to its internal atmosphere being as cool and as pure as possible, a constant current of air being carried through it. This current is created by means of a simple and efficient ventilator or extractor, called the Walness, which is placed in the roof, and the current is maintained by means of an air-chamber built in and upon the floor, the chamber above the floor-level being of table height, with sliding air-bricks built in the side and end walls. The chamber below the floor-level being an excavation of suitable depth, the greater the depth the better. The fresh air is conveyed into the bottom of the chamber by means of glazed earthenware pipes carried underground any required distance; and it is a noteworthy feature of this ventilating arrangement that wherever a down-flow of water in these pipes is available, a correspondingly increased up-current of cold air

Fig. 2.—*Ground Plan of Bradford's Dairy.*



No. 1.—Boiler and Hot Water Cistern.
„ 2.—"Diaphragm" Churn.
„ 3.—"Albany" Butter-Worker.
„ 4.—Washing-Trough.
No. 5.—Table.
„ 6.—Ventilating Chamber, with Slate Top.
„ 7.—Revolving-Disc Milk-Pan Stands.
„ 8.—Fresh Air Inlet.

is created with most desirable results." Now the question arises whether this is not a very unnecessary complication to arrive at the desired result. If the ventilator in the ceiling and roof acts properly, a sufficient number of air-gratings above the floor of the building at both ends, which could be regulated according to the direction of the wind, would secure a circulation of air quite as well as the somewhat costly arrangement which was exhibited. The amount of cold air is regulated by a simple hit-and-miss ventilator, which extends the whole length of the ceiling, and which is actuated by a lever-handle. The floors are paved with blue and red tiles, which Mr. Bradford states should be 12 inches square, carefully set in cement, and laid on concrete. They were actually one-half the size, and the joints were very imperfectly filled, so that moisture would remain and evil be caused. The floors have a fall of one in forty towards an open earthenware channel. The cubical contents of this room is 1152 ft.; dimensions, 16 ft. long, 8 ft. wide, and 9 ft. high.

The working-room, which is in the centre, has a similar ventilation, is larger, 1600 cubic ft., 16 ft. long by 10 ft. wide, and 10 ft. high.

The milk is carried into the milk-setting room, where it is sieved and placed in the shallow block-tin pans, of which there are 24, six standing on each of the four patent revolving disc milk-pan stands which are ranged round the room. The special advantage of this arrangement is that the pans can be revolved and the milk skimmed without any disturbance, as the hand holding the skimmer remains perfectly still. In the working-room is a Patent Diaphragm Churn, having a removable dasher, the butter being easily gathered, and the churn cleansed and scalded without difficulty. The great merit claimed for this comparatively new form of dasher is that the alternate angles of its divisions cause the granules to be aggregated without bruising or injuring the butter. I saw the butter removed from the churns and worked, and it certainly appeared excellently made. After being washed, the butter is removed to the "Albany" Butter-worker, to which the Judges awarded a silver medal, and which is illustrated and described with the other silver medal awards. Suffice it here to say that it did its work efficiently, and, being reversible, makes a useful table on which the butter could be made up if desirable. In the corner of the room is a trough, made of pitch pine, of sufficient capacity, supplied with hot and cold water, and arranged so that, besides serving for ordinary washing-up and scalding purposes, it is available for inserting pans therein for raising or lowering the temperature of the milk. Underneath the trough is a drainer for the pans. The actual apparatus exhibited, and the prices, are as follows:—

	£	s.	d.
Boiler, hot cylinder, and service pipes, estimated value	20	0	0
Three milking pails, at 5s. 6*d.*	0	16	6
Two milk churns, at 25s.	2	10	0
Four revolving disc stands complete, each holding 6 (4-gallon) pans	8	8	0
Twenty-four block-tin pans, at 2*s.* 6*d.*	3	0	0
One hair-sieve strainer and ladder	0	3	6
One skimmer	0	0	6
Three cream crocks, at 2*s.* 6*d.*	0	7	6
Diaphragm Churn (40 quarts) made of American maple	4	15	0
Two wooden hands for butter-making	0	2	0
Albany Butter-worker and Dairy table	5	0	0
Can for receiving butter-milk	0	12	6
Butter board	0	2	6
„ print	0	1	9
Weight and scales	0	4	6
Two Thermometers	0	3	0
Brushes, mops, &c.	0	6	0
Wash-up trough and drainer	2	10	0
Total	£49	3	3

The Judges were pleased with the fittings and apparatus of the Dairy so far as they went, but inasmuch as the manufacture stopped short at the production of butter, and no attempt was made to deal with the skim-milk—a very important item of revenue—it was clear that one of the main conditions of the competition was omitted. Mr. Bradford's explanation, that he proposed to use the skim-milk for calves and pigs, did not improve matters; as though in the spring of the year calves can be obtained, and may be reared profitably on skim-milk, the latter being worth 4*d.* a gallon for this purpose, there are long periods in summer and autumn when much of the produce of twenty cows would find its way into the pig-troughs, when it will not pay half that sum. It is probable that Mr. Bradford's trade lies amongst those who are able to bring up calves all the year round; but in the great dairy districts of the Middle and South-West of England, the disposal of skim-milk as cheese, or in some other manner, is a matter of such vital importance to a profitable issue, that its omission by Mr. Bradford was regarded as a very serious defect in the completeness of his exhibit. The building was very well designed, but the working-room was certainly small, and it would have been more convenient as well as more airy if all the work had been carried out in one large room.

Mr. Ahlborn, of Hildesheim, Hanover, placed his exhibits in a canvas-covered shed, the front-side of which was open; a convenient arrangement as regards the public, but entirely ignoring the questions as to floors and ventilation. It is quite true that according to the conditions such matters were not absolutely insisted on, but the Society expected that they would be considered and exemplified by the competitor. In the Catalogue Mr. Ahlborn divides his entries under three heads: Milk-setting Room; Butter-room; and Means of Utilising Skim-milk for Cheese-making. I will follow his divisions:—

MILK-SETTING ROOM.

	£	s.	d.
Three milk-pails, made in one piece, each holding 3 galls., at 4*s*.	0	12	0
One milk-carrying vessel (14 galls.)	0	14	0
Swartz cooling-vat, with ten oval pans, of 7½ galls. each, with strainer, skimmer, &c. (pans 10*s*. each)	9	5	0
Two thermometers and one milk-tester apparatus, with graduated glasses	0	12	0
Total	£11	3	0

As an alternative scheme for setting milk, three of Ahlborn's Patent Cooling Vats, with square milk-pans, strainer, and skimmer (each 33 galls., 18*l.* 15*s.*).

These vats are simply large shallow pans with cavities below and around for the circulation of hot or cold water, according to the season of the year. They appear suitable for the purpose, though somewhat costly, as milk set in them would probably throw up more cream than in the deep oval pans of the Swartz system. Mr. Ahlborn, when put to the question, preferred to enter the Swartz cooler. A Refrigerator is mentioned, price 6*l.*, but I am not aware of having seen anything of the sort.

BUTTER-ROOM.

	£	s.	d.
Ahlborn's Holstein Churn, for 9 galls. of cream ..	5	10	0

This churn, which was so successful at the Society's competition at the Bristol Show in 1878, has been improved in detail, principally by the barrel being made to tip, so that the butter is more readily removed. The barrel is placed upright and is stationary, furnished with two projecting pieces, and a revolving shaft worked by gear, which carries the dashers. When the butter has formed it is removed by means of a sieve. The butter is now placed in a trough cut out of the stem of a lime-tree and worked with patters. No washing, either in the churn or otherwise, takes place. The butter-milk is worked out as far as possible in the butter-trough, and then placed on the circular butter-worker.

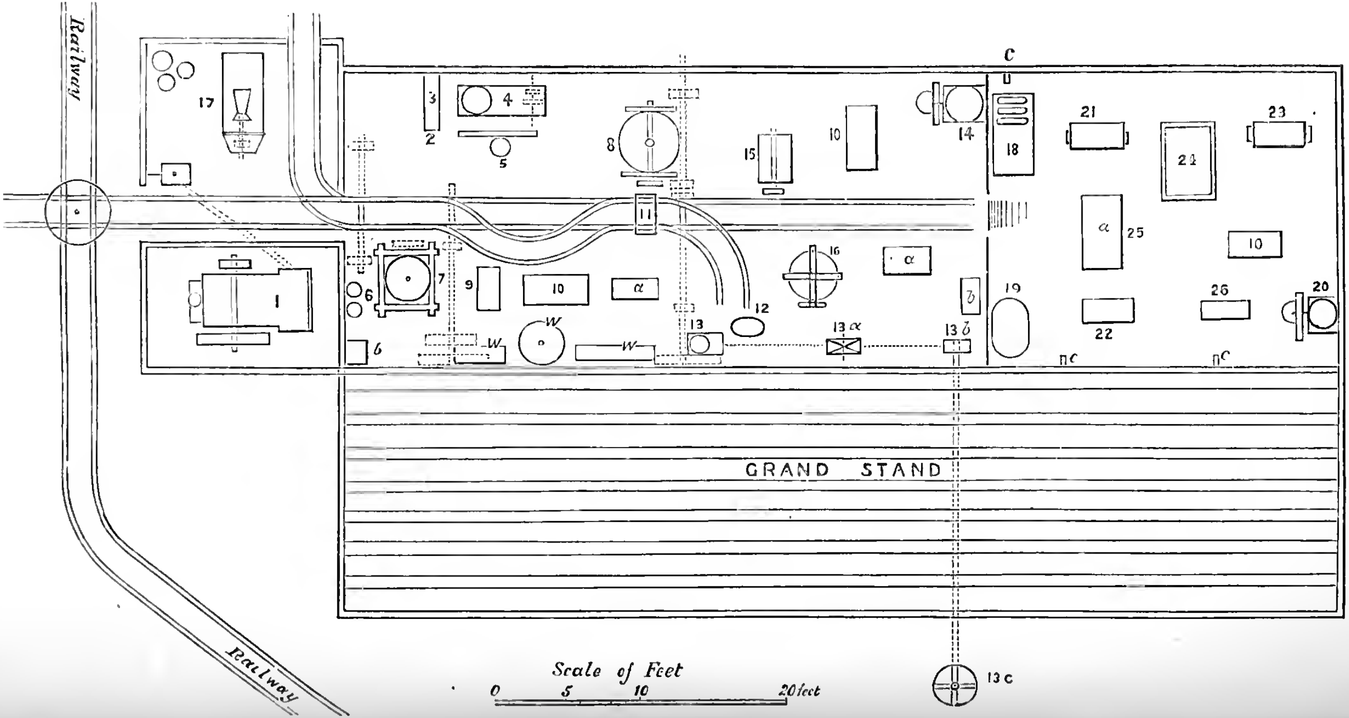
	£	s.	d.
Butter trough and frame	1	5	0
Butter-worker	7	7	0
Hair-sieve for removing butter	0	3	0
Butter table with marble plate	2	8	0
Pair of boxwood patters	0	3	0
Salt-mould and measuring-glass	0	3	0
Butter-print	0	1	0
Butter scale, with marble top	1	3	0
	£12	13	0

No price is charged for the hot-water apparatus. If we add 20*l.*, as in Bradford and Co.'s, we get a total cost for butter-making appliances of 49*l.* 6*s.*, which approximates very closely to that of Bradford's. A number of costly appliances were shown for the purpose of utilising the skim-milk, principally for cheese-making. Thus, there was a copper steamer (25*l.*); metal steam cheese-vat (10*l.*); two curd knives and agitator (3*l.* 10*s.*); cheese thermometer (4*s.*); curd mill (2*l.*); double cheese press (8*l.* 10*s.*); cheese shelf (1*l.*); rennet glass (2*s.*); six cheese hoops and cloths (1*l.* 2*s.*); curd scoop and curd pail (12*s.*); decimal scale, 5 cwt. (5*l.*); two brushes, each hair screwed; two scrubbers, two Holstein scrubbers, and one cheese brush (1*l.*). All the above, which total up to 54*l.* 18*s.*, are for cheese-making, which, if managed properly, should realise 4*d.* to 5*d.* a gallon for skim-milk.

The great novelty exhibited by Mr. Ahlborn was an apparatus for making sparkling milk, price 40*l.*, which is similar to the machinery for making ærated waters; only in this case the gas is introduced into skim-milk, and the result is a pleasant refreshing beverage which will keep good for many weeks. Mr. Ahlborn said it would pay well to sell the bottles (ginger-beer size) at 1*d.* each, and it is probable that, when once the public are accustomed to this novel drink, they would gladly pay for it as much as they do for ginger-beer. Not only can skim-milk be thus dealt with, but the whey from the cheese-tub can also be converted into a pleasant wholesome beverage. It was chiefly on account of the attention paid to the utilising of the refuse products, which were entirely overlooked by Mr. Bradford, that the Judges awarded the prize of 50*l.* to Mr. Ahlborn.

Ever since the great Kilburn Meeting, the Working Dairy has been a feature of increasing interest, and at York there was a decided advance upon previous efforts at instruction, inasmuch as the object was to show a butter factory worked by steam power in this case, but equally adapted for horse power, as well as a dairy for hand power, suitable for a small farm. The public had an excellent opportunity of seeing what was going on, and

Fig. 3.—*Plan of Working Dairy in the York Showyard.*



Reference to Plan of Working Butter Dairy.

1. Clayton and Shuttleworth's Steam-engine.
2. Denison's Suspended Weighing Machine.
3. Bellamy's Water Cistern.
4. Nielson and Petersen's Separator.
5. Lawrence's Refrigerator.
6. Ahlborn's Cream-casks.
7. Ahlborn's Holstein Churn.
8. Ahlborn's Butter-worker.
9. Ahlborn's Butter Trough.
10. R. A. S. E. Danish Hardening Boxes.
11. Avory's Platform Weighing Machine.
12. Rainforth's Sack Lifter.
13. Laval's Separator.
14. Lawrence's Refrigerator.
15. Bradford's Diaphragm Churn.
16. Bradford's "Springfield" Butter-worker.
17. Pocock's Milk-can Cleaner.
18. Swartz Cooling Vat.
19. Bradford Milk-pan Stand.
20. Lawrence's Refrigerator.
21. Taylor's Eccentric Churn.
22. Hathaway's Churn.
23. Swing Churn.
24. Bradford's "Albany" Butter-worker.
25. Ahlborn's small Butter-kneader.
26. Ahlborn's Double-cone Butter-kneader.

a, *a*, *a*. Tables.
b, *b*, *b*. Desks and Racks.
c, *c*, *c*. Water-taps.

hearing from the dairy-woman the reasons for the various operations. The daily programme was as follows:—

WORKING DAIRY.

9 A.M. to 11 A.M.—Dairy open for the inspection of Implements used.

11.30 A.M. to 12.30 P.M.—Danish separator at work in the Dairy factory, and Butter made on the Danish system.

12.30 P.M. to 1.30 P.M.—Swedish separator at work in the Dairy factory, and Butter made on the French system.

1.30 P.M. to 2.30 P.M.—Cream separating and Butter-making in the small Dairy.

The manufacture of different kinds of Cheese from skim-milk will also be illustrated during a portion of the time when the Dairy is at work.

3 P.M. to 6 P.M.—Dairy open for the inspection of Implements used.

Guide to the Working Dairy, Price Threepence.

Admission to the Stand at the Working Dairy by Non-transferable Day Ticket, 1*s.*

The form of the building and the position of the different machines will be most readily understood by reference to the Plan, &c., taken from Mr. H. M. Jenkins's admirably written descriptive Guide, which was on sale in the Yard at 3*d.*

The floor was made of artificial stone, and supplied by the Patent Victoria Stone Co., of 283, Kingsland Road, London, delivered at York at 6¼*d.* per superficial foot; it is composed of fine granite and Portland cement steeped in a solution of silicate of soda, and appears a very durable, clean, and even flooring material—a point of great importance. The milk is conveyed into the Power Dairy in cans or churns, on small waggons running on a Greig's Patent Miniature Railway; which was so contrived that whilst the rails were sunk below the floor, no interstices were left for the accumulation of filth. The tare of each churn was painted on them. They were hooked to a suspended weighing-machine hoisted by means of Brewer's blocks, and during the operation the gross weight was registered. On arriving at the top platform, the milk was poured into a large tank, holding sixty or seventy gallons. From thence it descends into a receiving tank fitted with a simple warming apparatus, so that the milk may be raised to about 70° Fahrenheit—which is the required temperature for the separator (Neilson and Petersen), which was placed on the upper floor. This machine was fully illustrated and described in Mr. Little's Report of the Working Dairy at Derby. The principal improvement since introduced was a special contrivance by Professor Fjord for regulating the flow of milk into the separator.

This separator is designed to remove the cream from about 120 gallons per hour, with an expenditure of force equal to that of two horses. The cream was delivered into one of Ahlborn's cream cans, and the skim-milk flowed into an ordinary churn, fitted with a tap, whence it was conveyed to a large Lawrence's refrigerator, and from thence collected in a large railway churn, which, when full, was placed on the truck and transferred to the cheese-room outside the main building. The skim-milk during the Meeting was partly used as a beverage, and partly for the manufacture of skim cheese on various continental systems. The cream, being always fresh, can either be churned at once, or kept till it is ripe, according as butter for immediate use or for keeping is required. The practice at the working dairy was to keep the cream from the Danish separator until it was ripe, and then churn it in Ahlborn's Holstein Churn—whilst the cream separated by Laval's Separator was dealt with at once in a rotary churn, but these arrangements could have been reversed if desired. And it may be as well to point out here as regards the Hand-power Dairy, that whilst the English system of shallow setting was associated with appliances for making butter from ripe cream, the Swartz system of setting milk in deep cans immersed in ice-water was associated with appliances for making butter from sweet cream, but the processes could equally well have been reversed. The cream, then, to return to our description, having been churned in about 20 minutes, was removed by hair sieves, placed in a butter-trough, and worked with wooden hands,—no water being used in order to remove the butter-milk. After having been a short time in the trough, it was put into the butter-worker, a circular revolving table, with a fluted roller also revolving. Here the butter was very thoroughly worked, and when all the butter-milk was expressed, it was removed into the hardening-box. And as these useful appliances are novelties in an English showyard, though described by Mr. Jenkins in his "Report on Denmark to the Royal Commission of Agriculture," I give an extract from his report which will be explanatory:—"Saddle-shaped pats of butter are in the best dairies placed in a long wooden box, fitted with movable laths resting on a ledge about a couple of inches from its solid bottom. This arrangement not only admits of drainage from the butter, but it also allows a current of air to sweep beneath as well as above and around the butter. The box is covered with a tin tray filled with ice or very cold water; and thus the butter is left to harden for about two hours as a rule." The butter was finally made up into pounds and half-pounds, stamped with the R. A. S. E. Brand.

I have mentioned that the Laval separator was associated with the making of butter from sweet cream. This machine is much smaller than the Danish separator, revolves with greater rapidity, operates on about half the quantity of material in a given time, and takes 1 horse-power to drive. Messrs. Hald and Co., of 24, Great Winchester Street, London, the agents, supplied a specially arranged horse gear, and this is a point which the public apparently did not thoroughly understand at the Show, viz. that, though for convenience steam-power was usually employed, the work could have been equally well done at all times by horse-power. In Mr. Jenkins's Guide an illustration is given showing the horse-gear applied.

The Laval separator was fixed to the floor, and the milk delivered by the railway, but first weighed on one of Avery's platform weighing machines, then raised to the necessary height by one of Rainforth's jack-lifters, and placed in a suitable tank, from whence it was supplied to the revolving cylinder by a tap. This machine is so well known, and is so well described in Mr. Jenkins's pamphlet, that further notice is unnecessary, except, perhaps, to remark that Messrs. Hald and Co. have introduced some alterations in the cover, by which the products are discharged more readily. A double case allows of hot water being introduced, which warms the cream and causes it to become thicker. The form of the discharge orifices also facilitates the process. The cream from this separator was churned at once in one of Bradford's Diaphragm Churns. The skim-milk was refrigerated in one of Lawrence and Co.'s machines. The butter when taken from the churn was manipulated with Bradford's "Springfield" Butter-worker, worked either by hand or power. The power was supplied by a twelve-horse power portable engine with plenty of boiler space. A copious supply of hot water was provided by a tank over the engine, fitted with a ball-cock for cold water inlet, a one-inch steam-pipe, perforated, passing round the bottom of this tank. In a few minutes after steam was turned on, 200 gallons of water was raised to boiling heat, and hot water supplied to all parts of the factory. I must not omit to note that Pocock's Patent Milk-can Cleaner, made by the Reading Iron Works Co., which received a medal last year, was shown in operation. It comprises a tank or trough, with three revolving brushes: the two outer ones in an opposite direction to the centre brush, on which the cans are run, and held for a few seconds by one attendant, while his assistant, standing on the other side of the trough, removes them, and stands them on end to dry. This is an ingenious arrangement; but in order to insure absolute cleanliness and the destruction of any germs, the cans are placed over a perforated steam cap, supplied by a half-inch steam-pipe from the boiler. The steam is certain to destroy any germs that might escape the washing and scrubbing process. It is not suggested that the arrangement of the working dairy was entirely the best that could be contrived; but it was arranged so as allow the public to see as much as possible of the various operations. In that part of the building which represented the farm dairy, milk was set in Swartz vats, deep oval cans, skimmed after 12 hours for the production of sweet cream, and in Bradford's shallow pans on revolving disc-stands for ripe cream. Here the skimming takes place after 22 hours, and the cream is kept for 24 hours. The skim-milk was cooled by passing over Lawrence's refrigerator. Three churns were shown in work — E. Taylor's Eccentric, George Hathaway's Prize Churn, and the American Swing Churn, sold by the Aylesbury Co. A small hardening box was used, and the Albany Butter-worker, and Ahlborn's kneading boxes, &c. The following very interesting account of the produce of the working dairy, kindly supplied by Mr. Jenkins, may well conclude this branch of my subject:—

"A slight sketch of the work done in the Society's Dairy may be interesting, as an illustration both of possibilities and difficulties. It was intended to commence work with about 200 gallons of milk on Thursday, July 12th, and the contractor delivered exactly that quantity according to arrangement; but, as some of the machinery was not in working order, it was found necessary to dispose of it otherwise. On Friday, 216 gallons of milk were received, and most of it was set for cream, either in shallow pans or in the Swartz deep cans, but the separators were not then ready to work. For the first day to which the public had access to the Implement-yard, 400 gallons of milk had been ordered, and 390 gallons were received. By this time the dairy was in full working order, and everything went well thenceforth, with the exceptions to be mentioned presently.

"The milk received from July 14th until the close of the Show was as follows:—

July 14th, Saturday	390	gallons.
„ 16th, Monday	403	„
„ 17th, Tuesday	373	„
„ 18th, Wednesday	467	„
„ 19th, Thursday	409	„
„ 20th, Friday	399	„
Total	2441	„

"To this must be added a considerable portion of the milk received on Friday, which was set for cream as already stated; and it will not be far from the truth if the dairy is debited with a total of 2600 gallons of milk.

"It was intended that a complete record should be kept of the yield of cream and butter from each portion of milk treated in the four different ways illustrated in the dairy; but, unfortunately, the clerk in charge disappeared after Tuesday, the 17th, and although another was put in his place, he did not possess the knowledge of what was required; and the books of the previous clerk, when recovered, were found too loosely kept to give the results recorded in them any scientific value.

"However, it is quite certain that a total of 686 lbs. of butter was actually sold and paid for, that 48 lbs. was given away in 1 lb. packages, and that cream and milk equal to about another 50 lbs. of butter were sold to the exhibitors of the competing dairies. We thus arrive at a total of 784 lbs. of butter accounted for. But the desire of the public to taste the butter is a factor that should not be forgotten; and the quantity consumed in this way would easily raise the total to more than 800 lbs. of butter made.*

"In a permanent dairy on the old type this result would not be considered anything to boast of, as it represents as much as $3\frac{1}{4}$ gallons of milk to 1 lb. of butter; and in a dairy where cream-separators are exclusively used it would be looked upon as exceedingly bad, and as indicating a defect somewhere. In a Showyard, however, the case is different. First of all, it must be remembered that a large quantity of milk is there required daily for a very short time, and must be bought whereever it can be obtained. The milk received at York was found very poor in butter-fat, ranging between 6 and 8 per cent. only. Then the separators, under the conditions imposed for the benefit of the public, could not work continuously for more than an hour, and a certain loss of cream was the inevitable result. Again, a large proportion of the milk was set for cream in either shallow pans or deep cans, and the total result just mentioned is about what would be expected from those methods, by the use of milk so poor in quality.

"The skim-milk was partly sold to the Refreshment Purveyors, partly made into two varieties of skim-cheese by a German dairyman in a detached shed, and partly given to the pigs in the Showyard. It was considered desirable to show how to make hard skim-cheese and soft skim-cheese—the former having a certain Gruyère character, and the latter (Backstein cheese) a remote resemblance in flavour, when properly ripened, to the well-known Camembert. The latter experiment was, however, completely frustrated by the voracity of the public on the first shilling day (Thursday, July 19th). During the temporary absence of the attendant, hundreds of people worked their way into the shed and ate up the whole of what had been made in that manner.

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* On one day about half the milk did not arrive until late in the afternoon, and had therefore to be dealt with in a very hurried and imperfect manner, thus reducing materially the yield of butter.

This alone was registered in the books as 302 lbs., and the public finished this extraordinary gastronomic performance by eating two of the hard cheeses, the weight of which had been entered as 31 and 37 lbs. respectively.

"Fortunately they were stopped at this point, but the Backstein experiment, as I have said, was at an end. Several of the hard cheeses were, however, taken by one of the Judges of Cheese and Butter—Mr. G. W. Burrows, of 36, Snow Hill—and his report of their reception on the London Market, when they are ripe enough to be sold, will be looked forward to with interest by those who find a difficulty in making a profitable use of their skim-milk. But it is unfortunate that circumstances of weather, and the exigencies of a Showyard, must always prevent a fair trial being given to any system of Cheese-making at one of our country meetings. Such rain, for instance, as fell from Friday evening until Monday morning, almost without intermission, was enough to ruin any newly made cheese kept in a temporary shed.

"It is eminently satisfactory to be able to state that there was but one opinion as to the quality of the butter. Although 800 lbs. made in a Showyard in six days is rather a large quantity, there was not the least difficulty in selling it at fair prices wholesale, and high prices retail. The refreshment purveyors had been offered it in certain equitable quantities per diem at 1*s.* 2*d.* per lb., and most of them gladly seized the offer. It was considered desirable to reserve a proportion for the public, who willingly paid 2*s.* per lb. on the first three days, and 1*s.* 6*d.* per lb. on the shilling days. The Manager of the Station Hotel, belonging to the North Eastern Railway Company, took as much as could be spared, and he stated that the visitors began to complain when they had any other butter given to them after they had once been served with that from the Society's dairy. But the highest testimony, probably, was that given by those refreshment purveyors who had *not* agreed to purchase any of the Society's butter. On the evening of the first day (Monday, July 16th), they begged to be allowed to have some, as the visitors complained so much of the inferior quality of what was served them, as compared with what had been given them at the other sheds."

SILVER MEDALS.

The following novelties, in addition to Messrs. Howard's Straw-trussing Machine, already described, were considered sufficiently meritorious to justify recommendation to the Implement Stewards for Silver Medals, which were granted:—

5061. Threshing Machine, with Exhaust	E. Foden, Sandbach, Chester.
227. Steam Plough	C. Cattley, York.

2551.	Screen for Corn, Seeds, &c.	Shield & Crockett, Nottingham.
5962.	Small Dredger	Priestman Bros., Hull.
4762.	Straw Yealming Machine	R. Maynard, Whittlesford Works, near Cambridge.
844.	Horse Hoe	Fred. Savage, King's Lynn, Norfolk.
2075.	"Albany" Butter-worker	T. Bradford & Co., Manchester.
3879.	Rope for Steam Cultivation ..	Geo. Cradock & Co., Wakefield.

Foden's Threshing Machine.—The novelty in this machine consists in the employment of an exhaust fan so arranged as to carry out the work usually performed by the first and second winnowers, and which also acts as a chaff-lifter and chaff-cleaner. The advantage is, in the first construction, in the saving of power for a given result—inasmuch as both blast-fans, as well as shafts, pulleys, and straps, are dispensed with,—and in the excellence of the work due to the arrangements for regulating and controlling the current of air according to the nature of the grain to be dealt with. Minor merit is found in the construction of the scourer or hummeller-chamber, which has a ribbed lining separate from the casing, and is cast in two parts of half-cylindrical form, capable of being reversed in position, so that when the ribs get worn out on one side, the lining can be removed and reversed, and so present the other edge of the ribs to the scourer. In connection with this portion of the machine must be mentioned a valve on the under-side of the tunnel or creeper by which the grain travels to reach the scourer, by means of which corn can, if required, be withdrawn without passing into the scourer. This is an advantage where the sample contains smut and damp grain, which would, if worked through the scourer in the former case, impregnate the sample through the breaking of the smut balls, and in the latter cause the choking of the cleaner. By means of the drawings used by Mr. Foden in his specification I shall hope to make the character of this valuable and ingenious invention clear and understandable.

The blocks for Figs. 4 and 5 have been kindly lent by the editor of the 'Engineer,' in whose issue of July 20 a description of Mr. Foden's invention appeared.

The easiest mode of explanation will be to follow the passage of the air, which is drawn into the machine by the inlets A A, Fig. 5, at the base of the exhaust box B, and close to the mouth of the revolving screen D. The air, as it rushes up on its way to the exhaust fan on the opposite side of the machine, meets with the grain, light corn, and such particles of chaff, as have escaped the first action of the wind, as corn and chaff fell from the drum into the dressing-chest T, or have been separated from the grain by the scourer P. The descending corn, &c., is weighed by the ascending wind; and the light grain and other light particles are carried along with the current in the direction of the arrows through the passage C (which is arranged in this case inside the framing C^1 of the machine) into the light corn pockets D, when the pressure is reduced owing to the increased area, the

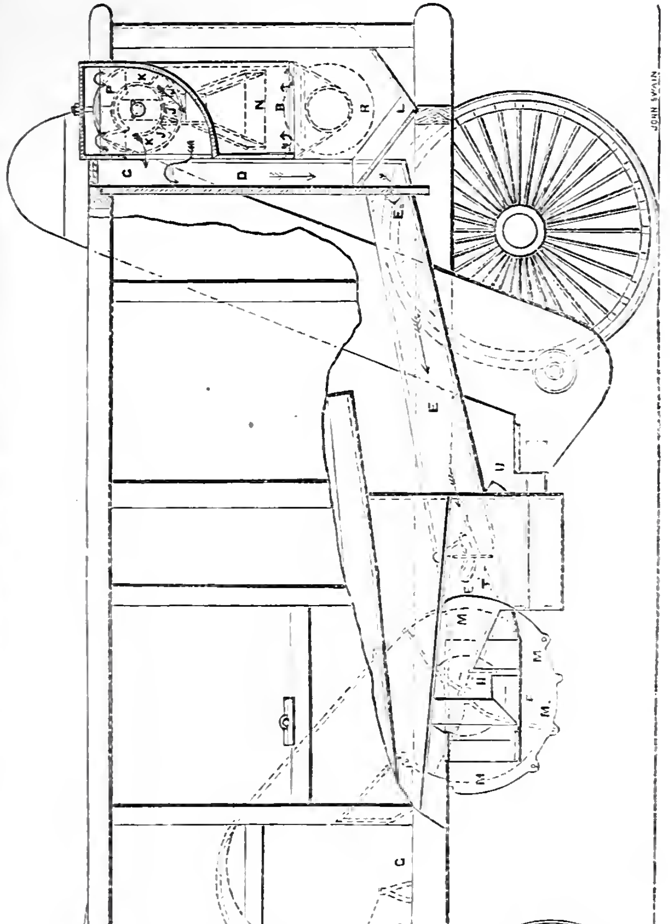
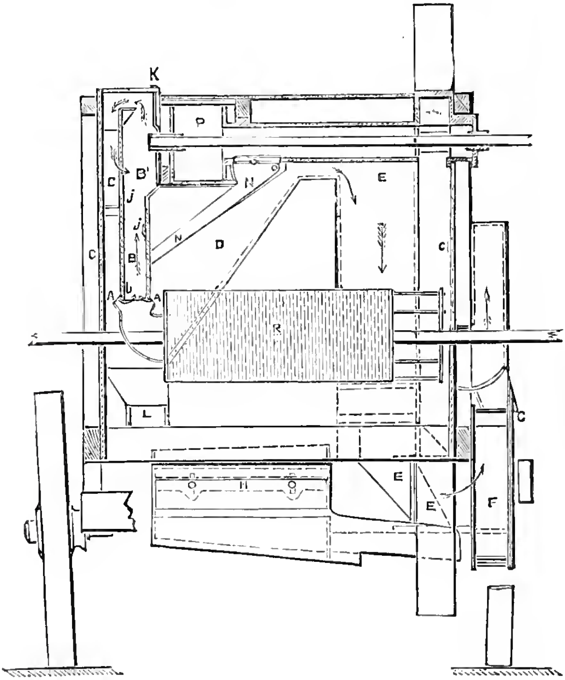


Fig. 4.—*Side elevation partially in section.*

consequence of which is that the light corn, short straws, &c., instead of being carried forward with the air, are liberated, drop down, and reach the light spout L (Fig. 5), and are so separated without going into the circular screen at all. It should here be noticed that the exhaust box B is enlarged considerably at the part B¹. The object of this is, that any portion of heavy corn which may have been carried up with the lighter portions by the action of the air, when it reaches this point falls back again, owing to the reduced pressure due to the enlarged area. This is a very ingenious and important detail. In the machine exhibited at York a portion of the wooden covering was replaced by glass, allowing the spectator to witness the balancing action of the wind, which, as will be seen, is under delicate control, so that we have the perfect action of a blower removing light corn before the size of the grains are made the means of separation by the revolving cylinder R. Pursuing our enquiry, we find the air plus the chaff scales, &c., drawn from the pocket D through the tubes D and E into the exhaust fan F. The first winnowing operation is performed in the dressing-chest by means of the fan, which draws the chaff through a pipe or extra chamber, and blows it up a tube to the spouts G G, when it falls into chaff-bags, or is otherwise removed. But as it passes through the fan it is cleaned from dust by means of the perforated casing M M (Fig. 4), and the sliding valve H (Fig. 5) in the air-chamber of the riddle-box, and the air inlet at U (Fig. 4).

Fig. 5.—*End view partially in section.*



Reference has been made to the nature of the scourer. The following figures, which accompanied the first specification of Oct. 21, 1881, will more fully explain the details of this important portion of the machine.

In Fig. 6, J is the ribbed lining which is secured by bolts L to the outer covering K; by removing the bolts the lining can be taken out and reversed, and thus its efficiency and durability is doubled. Fig. 7 shows the valve H, which opens outwards, and is useful in the case of wet or smutty grain, which should not go into the scourer C. M is a valvo which can be set more or less open, and by which the passage of the corn from the scourer is regulated, so that the degree to which the corn is scrubbed is to some extent under control, although of course this will mainly depend upon the capacity of the box and the rapidity of the supply. More important than the valve are the dividing ribs or plates fixed at the mouth of the scourer N (Fig. 7) and J J (Figs. 4 and 5), which serve to divide the grain and disperse it as equally as may be over the entire surface of the exhaust box B, so that the ascending current may have a uniform influence over the grain as it falls from the scourer. Such is a brief description of Mr. Foden's inventions, which appeared to the Judges to be of great merit, in simplifying without lessening efficiency. That a machine so constructed may be made for considerably less cost than an ordinary finishing machine is evident from the reduction of working parts. Equally apparent is the considerable saving of power in driving a machine in which the gear is so much simplified. Then comes the all-important question of efficiency. The Judges tried the machine with wheat and oats, which presented great contrasts as to weight, quantity of chaff, &c., and the results were entirely satisfactory, and in the case of oats the chaff did not contain a particle of grain, whilst the corn was entirely free from chaff. Considering the comparatively light nature of the oats, this fact proves the capability of the machine for delicate adjustment. The Catalogue price of the machines, with a 5-ft. drum, was 155*l.*

Fig. 6.—*End sectional view of Scourer.*

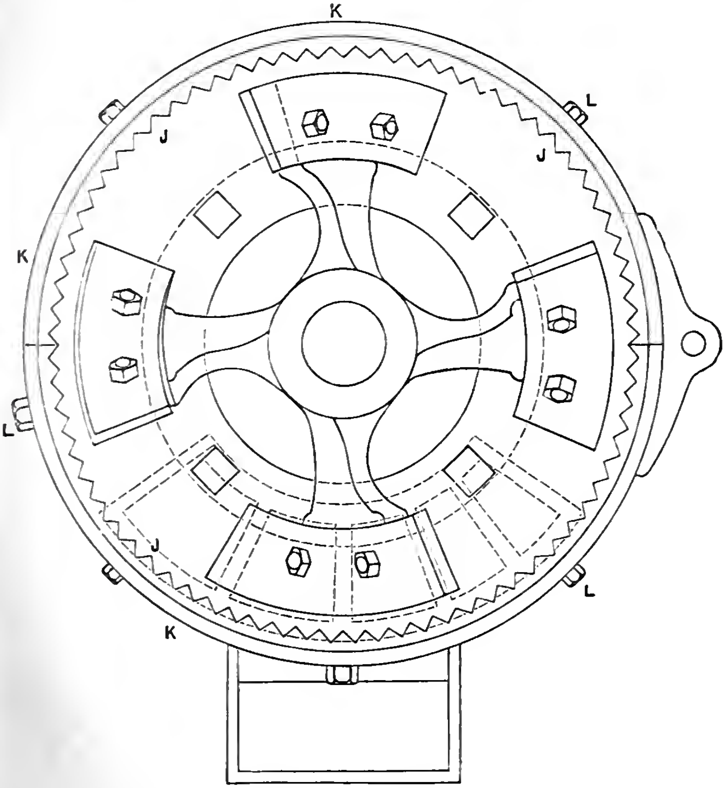
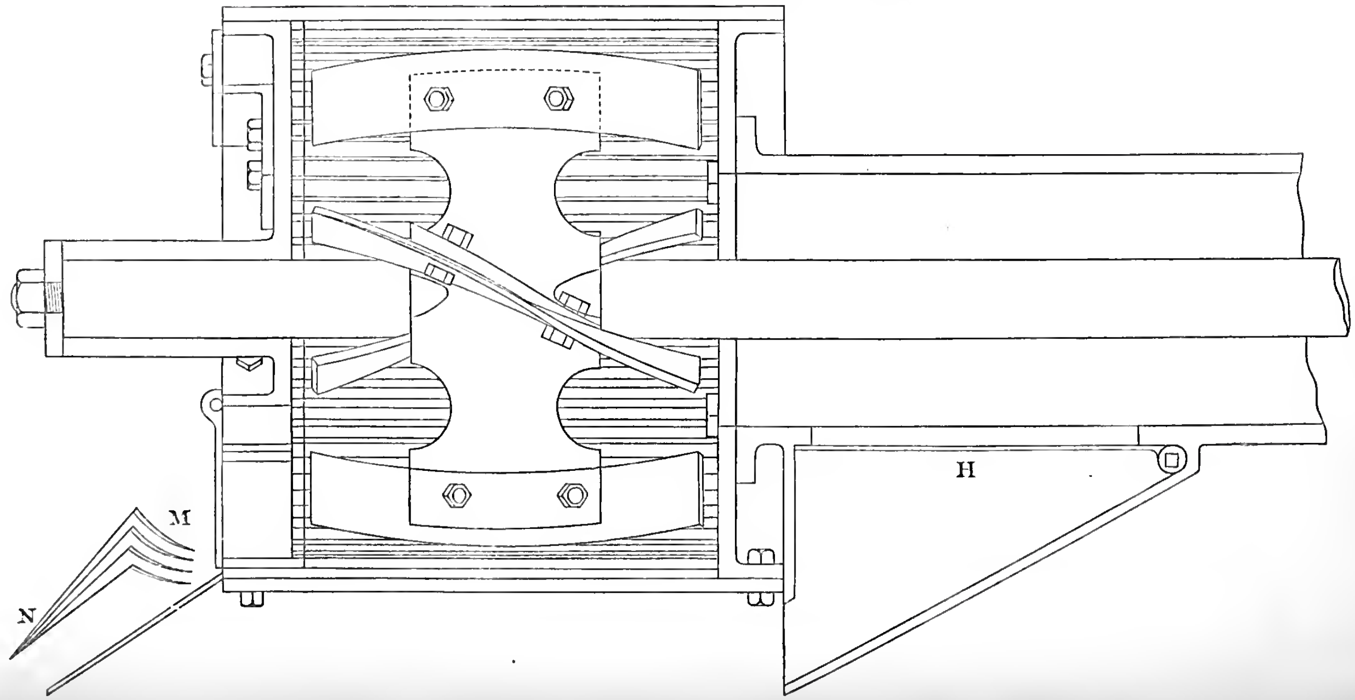


Fig. 7.—*Front sectional view (enlarged) of Scourer.*



Cattley's Steam Plough.—This patent dates back to June 19, 1877, and therefore is a novelty only as regards the Society, not having been exhibited at any meeting prior to York, although a familiar object in the Showyards of the Yorkshire Agricultural Society on more than one occasion. Mr. Charles Cattley, the patentee, is the manager of the York and East Riding Steam Cultivation Company, a position which he has occupied ever since the formation of the company in 1877. His practical experience of the balance plough, which has long been considered as an implement with such serious defects that its employment is now very limited, led him to consider the possibility of a machine free from the inherent defects of the balance principle; a principle which necessitated unprofitably slow work, as otherwise the effect of the ploughs out of ground and in the air made the machine unsteady, and had a tendency to draw the working ploughs out of the ground—a defect especially noticeable in crossing ridge and furrow, and in ploughing down steep hillsides. To be compelled to travel at two and a half to three miles an hour, when the engine power allowed of double that speed, is a serious drawback, rendering the operation too costly to compete with horse labour, or with the rapid movements of the Turning Cultivator, a machine which was introduced in 1868 by Messrs. Fowler and Co., and which has rendered more recent improvement practicable. In Cattley's plough advantage is taken of the cranked axle which carries the frame to allow of the ploughs being raised out of and dropped into work, and this part of the arrangement is very similar in principle to that of the turning cultivator, which will be readily gathered by reference to Fig. 9, which shows a plan of the front part of the plough, the general form of which will be understood by a study of Figs. 8 and 9, giving plan and elevation of the plough.

By the help of those drawings (p. 608), kindly lent by the 'Field,' in whose issue of Nov. 9, 1868, the plough was described and illustrated, I trust to make the more noticeable features of this invention perfectly understood. By reference to Fig. 8, it will be seen that the machine comprises a strong frame, with two sides sloping away at an angle, and nearly meeting behind. Each side carries a strong shaft, to which are attached the plough frames (three, four, or five in number), which are so made as to slide on the shaft, being attached by set screws. The shafts may be made rotating, and by turning them in one or other direction, the ploughs are turned *up from* the ground or brought *down to* the ground. It will be understood that these shafts are perfectly independent of each other. They have on their contiguous ends bevel pinions, both in gear with one and the same bevel wheel,

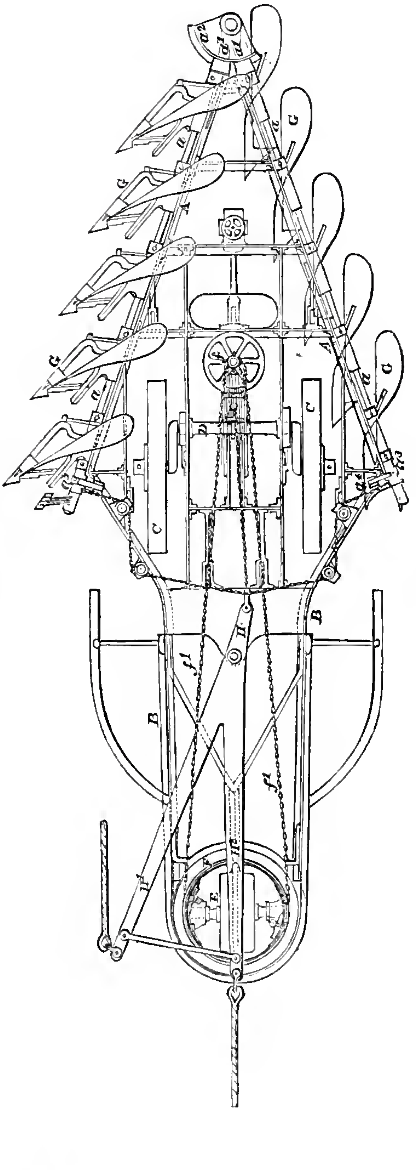


Fig. 8.—*Plan of Plough.*

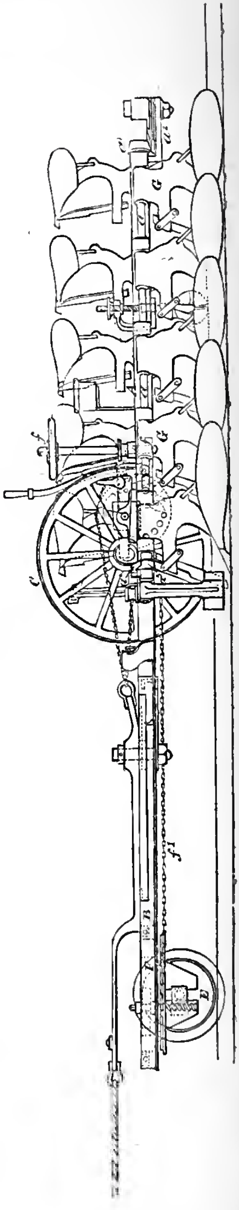
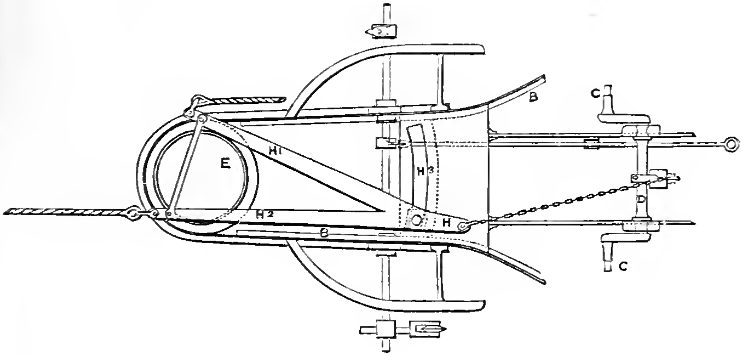


Fig. 9.—*Elevation of Plough.*

so that when one shaft is turned so as to raise its ploughs, the other shaft will be turned so as to lower the other set. On the other end of each shaft is a disc, having a notch at one end of its periphery, into which, when the shaft is turned so as to bring the ploughshares into their lowest position, a pawl on the frame catches so as to hold the shaft in that position. By this arrangement it will be evident that the uplifted ploughs do not act as a counterpoise to those in the ground; and hence, however rapidly the implement travels, there is no tendency to jerkiness, or jumping out of work. The mode of turning the implement and raising the frame by means of the cranked axle are too well known in connection with the turning cultivator to require description. The pawl referred to, as holding the operative ploughs to their work, is released as the implement is being turned; and the attendant pulls down the uplifted ploughs, which he does quite easily. Formerly, as is shown in the drawing, this was done mechanically by connecting the end of the lever H by chains, a^5, working round friction pulleys attached to each end of the rotating shaft to the pulleys, a^3. This answered quite well; but as an attendant is required for travelling, it was considered desirable to utilize his services, and thus slightly reduce the cost and complication of the machine. Originally, the plough frames or skaifs were of cast iron, and their great weight was objectionable. Now steel is used, and the lowering of the ploughs is a very simple business. It may be as well to very briefly describe the different parts by reference to the letters on the drawings.

Fig. 10.—*Plan of front part of Plough.*



A A B B show the back and front portions of the frame, carried on a pair of travelling wheels C C, with broad tires; these wheels are placed under the centre of the frame, and are covered by the ploughs, so that any injury to the surface from the weight of the implement is minimized by the fact that the wheel-tracks are at once destroyed. Moreover, the wheels travel on the hard ground, and the increased surface of the tires causes a distribution of the weight, so that though the plough is considerably heavier than the balance implement, the pressure on the ground is not greater, and it has the great advantage that the wheel does not travel in the furrow. The wheels are on a cranked axle, D, mounted in bearings on the framing. E is the front steering-wheel, mounted on the turning-frame F, worked by a chain, f^1, from the hand-steering wheel f. $a\,a$ are the rotating shafts carrying the ploughs G, and at their ends the bevel pinions a^1 gearing into the bevel wheel a^2, and on the front end of the said shafts discs a^3, which a pawl, a^4, engages. As some doubt arose as to the steering properties of the plough, the fulcrum of the lever H was made to shift if required by the pin sliding in a transverse slot H^3 (Fig. 10), but practical experience has shown that this arrangement was quite unnecessary, as the steerage is excellent. The depth of the furrow can be varied from four to ten inches by raising or lowering the frame; this is done by altering the position of a pin in reference to certain holes in the quadrant on the cranked axle: the lower end of the quadrant is also made to come into contact with a stop when in its lowest position. The level position of the plough is secured by making the front portion of the frame adjustable in height on the bearings of the steering-wheel. An arrangement for marking out, and also guiding the steersmen is provided; and recently two feet have been added, which enable the ploughs to take ground more rapidly, which is a noticeable improvement over the balance principle.

The frame is made to receive cultivating tines, so that the implement may be used either for ploughing or cultivating. All that is necessary is to remove the ploughs and fit the cultivating tines into their sockets in the frame.

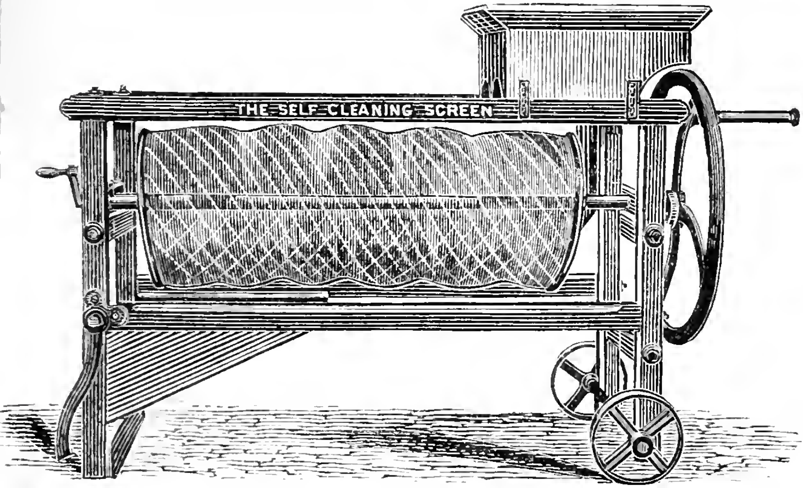
A trial was arranged on Wednesday, July 18th, in a small field at Bishopthorpe, of strongish loam, which was rather hard and dry. The distance between the engines actually worked was 190 yards. This was not a favourable trial, inasmuch as the short distance necessitated such frequent stoppage and slacking at the ends. The mean time of a number of actual runs was 1′ 8″, which equals a mile in 10½ minutes, or 5¾ miles per hour. During portions of each run the implement travelled at from seven to eight miles per hour, and was perfectly steady in work, turning over four ten-inch furrows six to seven inches deep with great regularity. Indeed, the work was excellent; and the limit of speed appeared to be the power of the engines. The average time occupied in turning the plough at the land's end was 30 seconds. A trial was made by working the plough for half-an-hour, with the following results:—

Length of furrow, 9·45 ch.; width of work, ·76 ch. = 0 a. 2 r. 34·9 p., which gives 1 a. 1 r. 2 p. per hour.

It is fair to assume, as the turnings occupied nearly one-third of the time, that with 400 yards of rope—in other words, double the length of furrow—one-third more work would have been done in the time. If, however, we assume an average of 1½ acre per hour, with a four-furrow plough, we have certainly an efficiency as to quantity double that of the balance-plough; and I do not believe that even at its slow rate of travel the balance-plough could make such excellent work as was made by Cattley's plough travelling at fully six miles an hour. Indeed, the rate of speed appeared to have no effect upon steadiness. And all who witnessed this trial must have been as much impressed as the Judges with the great superiority of Cattley's plough over balance implements. Working so steadily, it is well adapted for shallow work, as it made a good furrow when only four inches deep. This is the first machine that has been made, and both price (150*l.*) and weight may eventually be considerably reduced.

Shield and Crockett's Corn-Screen.—This is a circular corn-screen on a novel principle, and highly ingenious, inasmuch as the helical form of the wires and the corrugated outline of the screen secure the passage of the grain with great regularity without the aid of a sheet-iron worm, so that the whole of the interior is screening-surface. But the most noticeable feature is, that the screen is so attached to the spindle that the upper portion is more extended than the lower, and consequently the wires are close together during the operation of screening, which of course is only whilst they are below the spindle. They open sufficiently, when performing that portion of the revolution above the spindle, to allow any grains that are held between the wires to fall away, and thus this screen is self-cleaning, brushes or metal discs being done away with. In two important points, therefore, this screen is a decided advance, viz. in doing away with the internal worm and with the external brush. The screen heads have heavy rims projecting considerably beyond the bosses, which fit loosely upon a disc on the shaft.

Fig. 11.—*View of Shield and Crockett's Self-cleaning Corn-screen.*

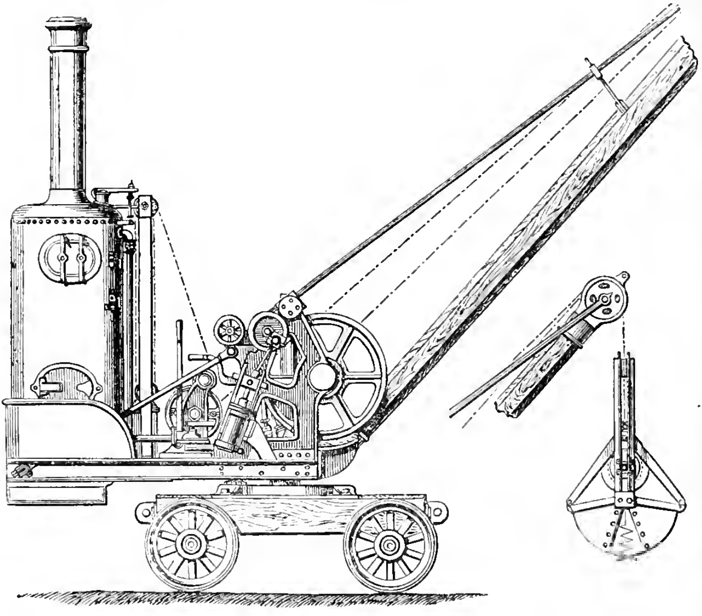


They are thus allowed to "wobble" on the shaft, which causes the wires of the screen always to be closer together at the bottom than at the top. The appearance of the screen, and the peculiar arrangement of the upper and under surface, will be understood by the drawing on p. 611.

The difference of length above and below is about four or five inches. A trial was made with a mixture of grain and weed-seeds, which was quite satisfactory as to efficiency. The price of screen and frame for hand-power is 15*l.*

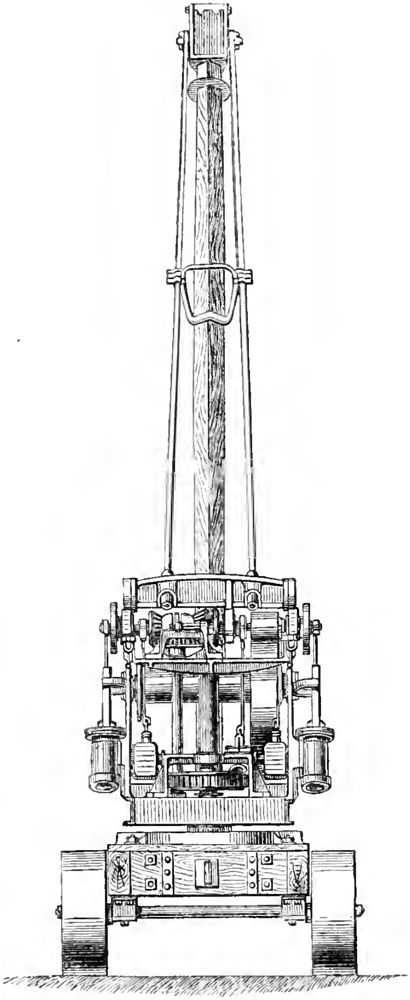
Priestman Brothers' Dredger (No. 5962).—Messrs. Priestman Brothers, of Hull, have exhibited their well-known Dredging, Excavating, and Elevating Machines in the Showyard of the Royal Agricultural Society for many years, but this is the first occasion on which they have shown a machine which, both on account of its capacity and price, could be properly regarded as adapted to agricultural work: the larger machines hitherto shown being suitable for contractors' works, and not for private enterprise. The cleansing and deepening of narrow water-ways, drains, dykes, and small streams, is work of such vital importance in flat outfall districts, that the value of any invention which expedites and cheapens such operations cannot easily be

Fig. 12.—*Side view of Priestman's Dredger.*



overrated. Such a machine was used during last autumn and winter in removing obstructions from the small streams near Minety, on the borders of Gloucestershire and Wiltshire, which constitute some of the sources of the Thames. The valleys in contiguity with these streams had suffered severely from floodings for some years; but so effective was the work, and such the amount of deposit removed, that not a single flood has occurred since the work was done. One great merit of the Dredger is that, worked either from the bank or from a barge, according to the size of the stream, it not only removes the mud, but deposits it on the bank, and thus a double operation is performed—the river-bed is cleaned, and the banks are raised simultaneously.

Fig. 13.—*End view of Priestman's Dredger.*

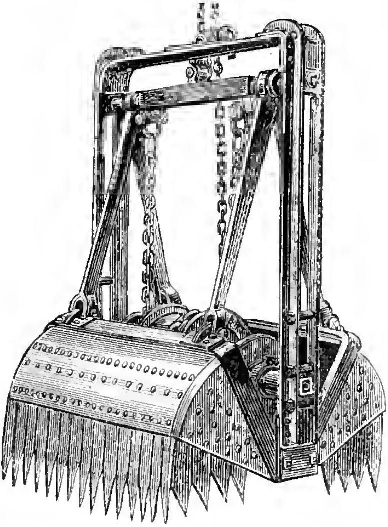


The drawings represent side and end views of one of these dredgers on strong bogie frame, as it would be worked from the bank, and moved forwards as the work proceeds; but it can be equally well fixed on a narrow barge.

The weight of the machine is 90 cwts., cost price, 295*l*. It is carried on a strong wooden bogie on four wrought-iron wheels, 9 inches broad, for travelling over soft land, fitted with two cylinders, 4 inches diameter by 7 inches stroke, with all the necessary gearing for lifting, lowering, and turning round the bucket or grab upon a jib, making a radius of 13 feet from the centre pillar. The boiler is of the ordinary vertical cross-tube type, with a hot-water feed-tank below. A portion of the exhaust steam is passed into this tank, and the water is taken from it by means of a force-pump worked direct from the engine-shaft, and is put into the boiler at a high temperature.

The grab or bucket, of which the following is an excellent illustration (Fig. 14), is capable of holding 3 to 4 cwt. of deposit; it is faced on the cutting edges with interlocking steel plates, and is a most efficient as well as a very quaint-looking implement, which, as it descends into the water with its formidable steel-teeth in an open position, has been well likened to the jaws of some gigantic animal taking a huge bite out of the soil, a resemblance which is certainly strengthened when it is seen with what rapidity and ease the sides of the grab close on its prey. When the soil is secured by the closing of the jaws, the grab is raised out of the water and rapidly swung round to its destination, when the unloading is even more speedily performed. From a trial made by the Judges, it appears that this machine can make two complete lifts per minute, travelling round half the circle, filling and discharging its load each time. This gives an average work equal to fifteen cubic yards of soil or mud per hour. The working expenses of labour and coals are estimated at 1*d.* a cubic yard, as one man can work the machine. The whole cost, including interest on outlay, depreciation, and reasonable profit, would not bring the cost of removing the mud and placing it on the bank at more than 3*d.* a cubic yard. And this is possible in a drain full of water, which is a point of great practical importance; by no other machine of this description can we take the liquid mud from the bottom of the river and place it on the bank at one operation. It should be mentioned that, by the addition of a pulley, this machine can be used as an ordinary engine with great advantage.

Fig. 14.—*Grab of Priestman's Dredger.*



Maynard's Straw Yealming Machine.—Mr. Robert Maynard, of Whittlesford Works, near Cambridge, exhibited a complete novelty in the form of a straw yealming or straightening machine, to be used as an assistant mechanical feeder to his large power chaff-cutters. These latter are well known and largely employed on the large stock farms of the Eastern Counties, and as this novel addition saves the labour of three men, at a cost of 22*l.*, it was considered worthy of a silver medal.

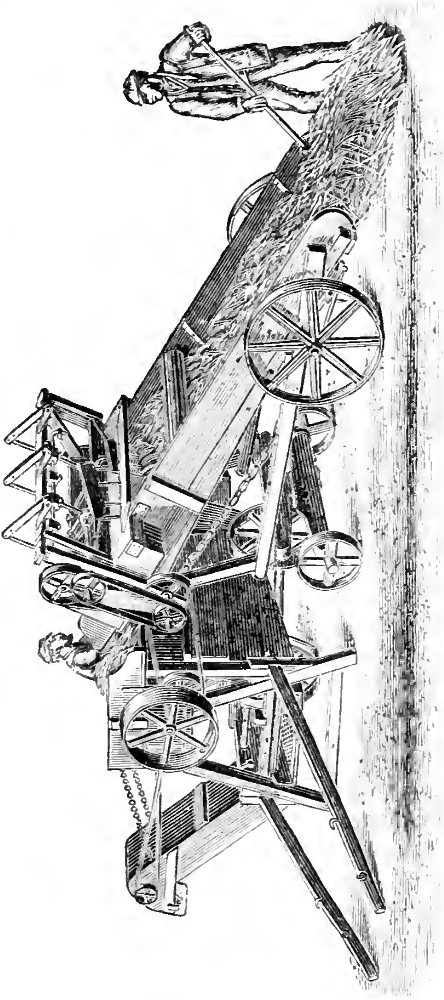


Fig. 15.—*View of Maynard's Straw Yealming Machine.*

Fig. 15 shows the yealmer attached to a chaff-engine. It will be seen that one man forks the loose straw on to the elevator just as it falls from the shakers of the threshing-machine, or as it is obtained from a stack if the two operations are conducted separately, one feeder is able to take the straw as delivered by the yealmer and place it in the box.

Figs. 16 and 17 show a side elevation and plan of the machine.

Fig. 16.—*Side elevation of Maynard's Straw Yealming Machine.*

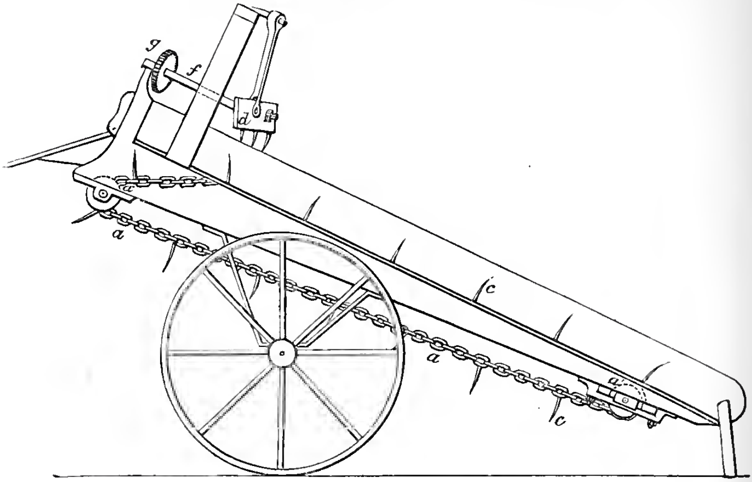
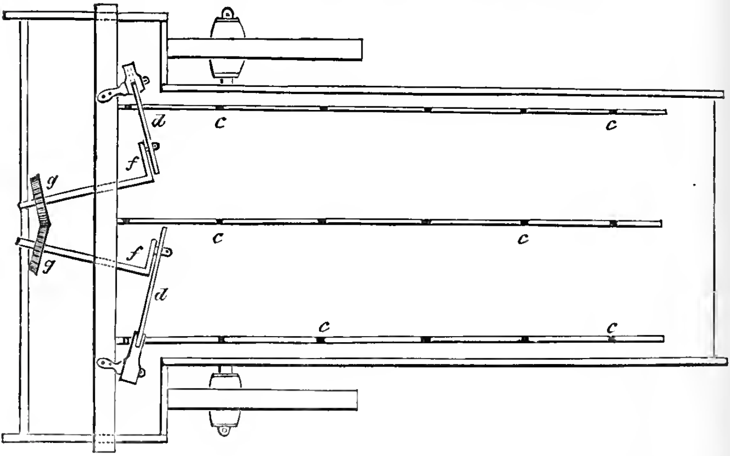


Fig. 17.—*Plan of Maynard's Yealming Machine.*

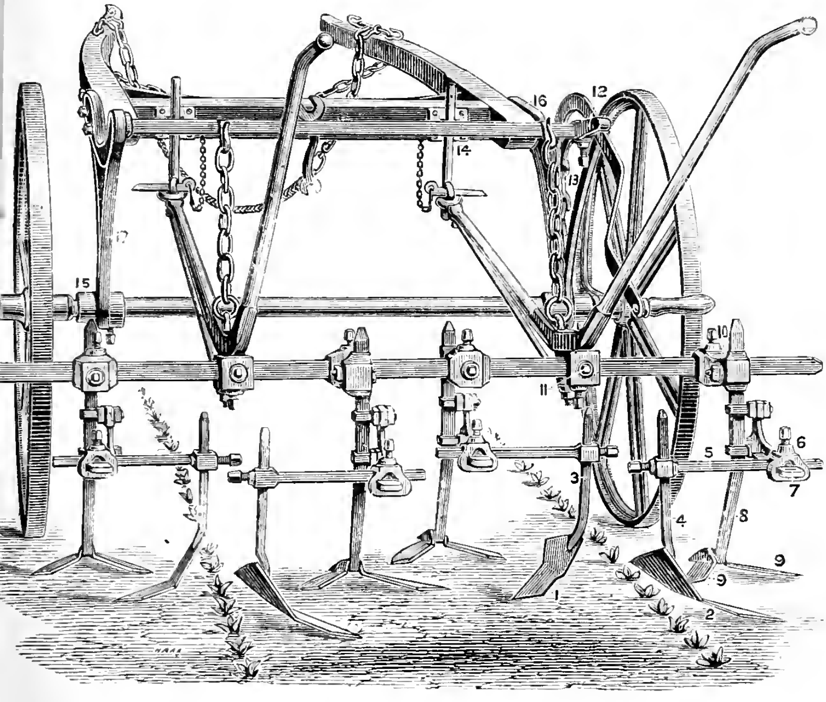


a is a chain working over chain-drums, a^1, and carrying a number of tines or spikes, *c*. Three such chain-gear compose the elevator-apron, and very efficiently carry up any straw that is thrown on them. As the straw reaches the upper end of the elevator, it is acted upon by two combs, which, by means of cranks, have a backward and forward motion at right angles to the travel of the straw. These combs are remarkably efficient; and, without any tendency to arrest the motion of the straw, straighten it out most successfully. Its final discharge from the combs, and on to the box of the chaff-engine, is aided by a series of reciprocating forks; *f f* are the cranks, with cog-wheels, *g g*, driven from the chaff-engine. The whole arrangement is very simple and effective.

In Fig. 17, the positions of the cog-wheels, cranks, and arms of the combs are very clearly shown.

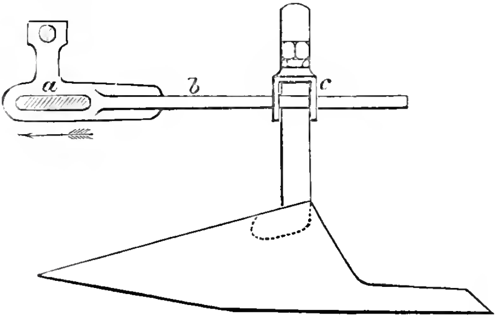
Goss and Savage's Horse Hoe.—This valuable novelty, exhibited by Mr. Frederick Savage, of King's Lynn, is specially designed for working between the drills of root-crops at the very earliest period of growth; indeed, where the drill mark is plainly discernible, before the plants actually appear, if desirable —and this is possible owing to the form of the side hoes, which

Fig. 18.—*Back View of Hoe.*



are so contrived that the soil is drawn away from the drills instead of being, as is generally the case, brought up to and on to the plants. This is a most important matter, as with accurate drilling the ordinary manual work of side-hoeing, which is usually the first operation previous to setting out the plants, is dispensed with. This work costs 1*s.* 6*d.* to 2*s.* an acre, and can be done cheaper, better, and more rapidly by the hoe. The hoe was tried in a field of young turnips at Bishopthorpe, on the farm of Mr. A. Lofthouse, and afterwards on an older crop belonging to a cottager, which was in very dirty condition, so that its efficiency, both for close-hoeing in an early stage and for dealing with strong-rooted weeds, was tested to the entire satisfaction of the Judges, who were very favourably impressed with the merits of the implement. Fig. 18 (p. 617) and Fig. 19 (below) will enable the reader to understand the construction of the machine.

Fig. 19.—*Sketch of Side Hoe.*

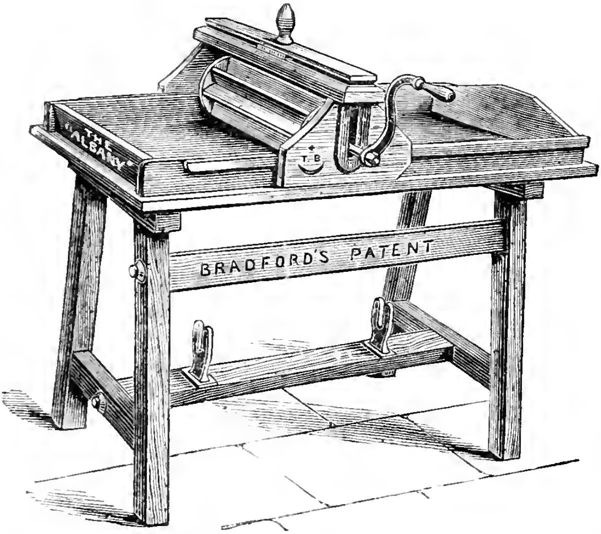


It will be seen from Fig. 18 that the hoe is designed to cover one whole interval and two half spaces, and thus all the ground is disturbed; and, provided the drilling is accurate, there is no fear of injury to the plants. The outer hoes can be removed, and one space only hoed. This is only necessary if the space between the drills is irregular. The hoe is equally adapted to deal with crops on the ridge or on the flat; and this is possible, owing to the variation of pitch that can be given to the side hoes. For flat work the front and side hoes are set at one level; the pitch of the side hoes, to raise the point to a proper height above the ground, and so ensure the soil being drawn away from the drills, is regulated by the slot *a* in the carrying arm *b* (Fig. 19). In ridge work the front hoes are lowered to the depth of the furrow, and the side hoes raised in the regulating box *c*, and adjusted for pitch in the slot *a*, as before.

The hoes may be regulated to suit any width of drill, by sliding the castings to the desired position on the main square bar, and fixing them with set screws—the side hoes are equally capable of regulation, as will be readily seen by Fig. 18. The hoe is well made; the construction is strong, and the material of the best; yet, making due allowance for these facts, the price, 13*l.* 10*s.*, appears unduly high. If some reduction could be made, a large demand might be anticipated.

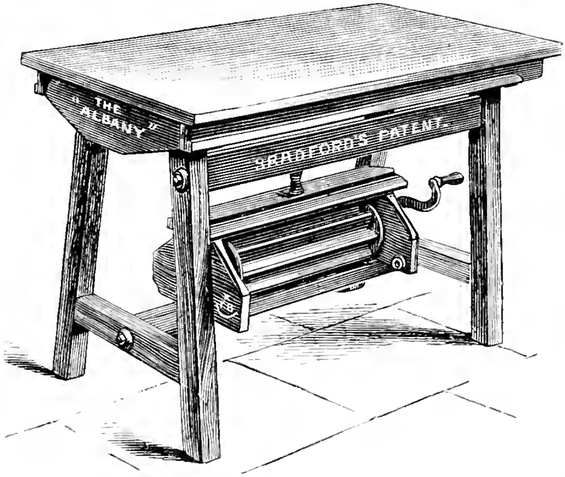
Bradford's "*Albany*" *Butter-Worker.*—The form of this novel arrangement will be at once seen by the illustrations, which represent (Fig. 20) the worker as in operation, and (Fig. 21) the same fitted as a table, the roller, &c., having been removed, and placed in standards in the bottom of the frame. The tray reversed forms the top of the table.

Fig. 20—"*Albany*" *Butter-Worker.*



The worker consists of a fluted roller made of sycamore, which operates in a rectangular tray, carried on a strong frame. The tray and frame are made of American maple,—a close-grained, non-absorbent wood, capable of being worked to a beautifully smooth surface. This wood is both cheap and well adapted for the purpose. It is used in Bradford's Diaphragm Churn, and also for the washing-up tray in the Model Dairy. The carriage carrying the fluted roller works in grooves on the outside of the tray; both hands are used in the operation. The left hand moves the roller backwards and forwards from end to end of the tray by means of a vertical handle on the top of the carriage, while the right hand revolves the fluted roller by means of a crank handle. The pressure is given by an improved patent wood-spring, which adjusts itself to the quantity or consistency of the butter on the tray. The forward movement rolls out the butter into a fluted layer, and the backward either repeats this rolling-out process, or, as may be desired, rolls up the butter into a lump, ready either to be again operated upon, or to be removed from the table. During the working the necessary quantity of salt is added, and, by means of the worker, thoroughly incorporated with the butter. The Albany Butter-Worker is simple in construction, efficient in operation, and has the advantage of acting both as a butter-worker, and a table on which the butter may be made up if desired. Price 5*l*.

Fig. 21.



G. Cradock and Co.'s Wire Ropes.—At the Derby Show in 1881, these ropes, made under John Lang's patent, were exhibited for the first time. The Judges were favourably impressed with the merit of the new invention, but having no actual experience of durability, were not in a position to recommend a medal. The evidence that has been forthcoming in the interval has proved so conclusively the superiority of wear for this rope over the ordinary construction, that on this occasion the Judges had no doubt as to the propriety of awarding a silver medal.

The difference in construction and wear will be readily understood by reference to the accompanying illustrations, which represent old and new ropes.

These excellent illustrations, which are taken from actual ropes, will speak for themselves. But it may be well to point out, that whilst a soft material like hemp must be twisted in opposite directions, in order that the particles may cohere together, the rigid character of steel renders this unnecessary. In looking at the two ropes, it must be evident that in Lang's Patent there is a much larger wearing surface, and that more equally exposed to friction. Again, under the ordinary twist, the strands of the rope and the rope itself are "laid" in opposite directions, and the wires are worn on the crown of the strand; a small part only of the rope being thus exposed to friction, the wires on each side of the worn part retain their full strength. The result is that many ropes have to be taken off, consequent upon the wires breaking upon the crown of the strands when otherwise only slightly worn. This is seen in Fig. 25; all the broken parts being on the crown of the strands. By Lang's Patent the strands and the rope are laid in the same direction. There is thus a much larger surface exposed to friction, and the cause of wires breaking upon the crown of the strand is removed. The working of the rope round drums, pulleys, and curves, bends the wires obliquely, and thus the greatest possible amount of wear is secured, since the wires will not break until they become too weak for their work.

Lang's Patent Wire Rope.

Fig. 22. WHEN NEW.

Fig. 23. WHEN WORN.

Ordinary or Old Construction.

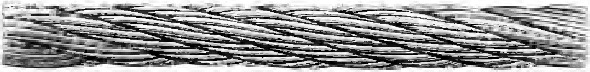


Fig. 24. WHEN NEW.

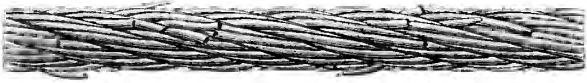


Fig. 25. WHEN WORN. SHEWING HOW THE WIRES BREAK ON THE CROWN OF THE STRAND.

Messrs. Cradock exhibited at York:—

No. 1. A reel containing a piece of worn rope made on the old system, which had been in use 1 year and 5 months, and a piece of worn rope made upon Lang's Patent, in use 2 years and 5½ months, both having been employed upon similar work. This was a most valuable illustration of comparative durability.

No. 2. A coil of rope (Lang's Patent) which had been in constant use for 2 years and 2 months, having done twice as much work as any previous rope of the old construction under the same conditions.

No. 3. A coil of Lang's Patent plough steel rope, worn down from $\frac{3}{4}$ to $\frac{9}{16}$ diameter, having done twice as much work as any previous rope of the old construction under the same conditions.

No. 4. A coil of plough steel rope (Lang's Patent), 5600 yards long, weighing 6 tons, made for the Earl of Durham. I was informed by the exhibitors that, since the introduction of the rope in 1880, it has been applied at many of the largest colliery and mining works in the country, and I am permitted to introduce the following report from Mr. Thomas Watson, the manager of the Stores Department of the firm of Pease and Partners, Darlington:—"I have pleasure in stating that your ropes of Lang's Patent manufacture, a great many of which are in use at the collieries and mines here, are giving entire satisfaction, and will bear a very favourable comparison with ropes from other makers in use under the same conditions." The manager of another large colliery firm states, "that the 'Lang's Patent steel wire rope,' 6200 yards in length, which was supplied last year, has worked for a period of fifteen months on an engine plane which has several curves, and is of varying gradients, to our entire satisfaction." For agricultural work the rope has not as yet been extensively manufactured. Ploughing ropes have, I believe, been sent out since 1880, and appear to have given satisfaction. There is one other point that should be named as favourable to this patent. It allows of the use of wire of the hardest class, without danger of breaking. The wire that is used averages 125 tons strain per square inch (*i.e.* 13½ wire gauge), the size used for ploughing ropes is equal to 1850 lbs. breaking strain.

Roberts's Rain-water Separator.—This apparatus was illustrated and fully described by Mr. T. F. Jackson in his Report on Miscellaneous Implements at Reading. The Judges were very favourably impressed with the ingenuity of the apparatus, the object of which is to separate the water first collected from a roof—and which, varying in degree according to the situation and period of drought before the rain, contains impurities—from that which falls after the roof is washed clear of such foreign materials. It is not necessary to repeat the description or drawings. It is sufficient to explain that the apparatus is suspended on a pivot, and is divided into compartments, in such a manner that the water passes into the waste-pipe below the machine, until such time as the water, rising to a given height in the receptacle, passes through a hole or holes, which can be regulated to pass more or less rapidly according to whether the situation is town or country, and, accumulating in a large receptacle, overbalances the machine and cants it over to the orifice of the clean-water pipe; and that, by a very ingenious contrivance in the form of an auxiliary pipe which conveys a portion of water direct into the larger receptacle, the balance is maintained until the rain ceases, when of course the water from the balance compartment gradually finds its way back into the receiver; and as the weight is reduced, the machine cants over, ready to discharge the first portion of the next rain into the waste. In order that the merits of Mr. Roberts's Separator might be thoroughly tested, machines were supplied to Mr. Copperthwaite, the Engineer of the North-Eastern Railway, to be used on a building at York Station, as representing to some extent a town roof, and to myself at Escrick Park, as for a country house. Mr. Copperthwaite was able to collect the water in two tanks, and a comparison of results with indications of a neighbouring rain-gauge are given in the following Table:—

Date.	Weather.	Clear Water.	Dirty Water.	Total.	Rainfall by gauge × 1670 gal.	Rainfall by gauge.	REMARKS.
1883.		galls.	galls.				
Apr. 16	Rain ..	nil	116	116	116·90	·07	
„ 19	Rain ..	173	34	207	200·40	·12	
„ 20	Rain ..	392	120	512	517·20	·31	
„ 21	Rain ..	nil	33	33	41·75	·023	
„ 24	Rain ..	163	330	493	501·00	·30	Snow-storm.
„ 25	Fair ..	..	..	..	..	..	
„ 26	Fair ..	..	..	..	..	..	
„ 27	Fair ..	..	..	..	..	..	
„ 28	Rain ..	135	70	205	217·00	·13	
„ 29	Rain ..	586	100	686	701·40	·42	
„ 30	Rain ..	385	125	510	501·00	·30	
May 1	Rain ..	165	155	320	317·30	·19	
„ 2	Fair ..	..	..	..	..	..	
„ 3	Fair ..	..	..	..	..	..	
„ 4	Fair ..	..	..	..	..	..	
„ 5	Fair ..	..	..	..	..	..	
„ 6	Rain ..	nil	15	15	33·40	·02	Hail-storm.
„ 7	Fair ..	..	..	..	..	..	
„ 8	Rain ..	160	45	205	250·00	·15	
„ 9	Rain ..	nil	182	182	233·80	·14	
„ 10	Rain ..	nil	70	70	116·90	·07	
„ 11	Rain ..	175	170	345	417·50	·25	
„ 12	Rain ..	65	45	110	116·90	·07	
„ 13	Rain ..	95	15	110	100·20	·06	
„ 14	Rain ..	18	55	73	75·15	·045	
„ 15	Fair ..	..	..	..	..	..	New Washer put into Separator.
„ 16	Fair ..	..	..	..	..	..	
„ 17	Fair ..	..	..	..	..	..	
„ 18	Fair ..	..	..	..	..	..	
„ 19	Fair ..	..	..	..	..	..	

Date.	Weather.	Clear Water.	Dirty Water.	Total.	Rainfall by gauge × 1670 gal.	Rainfall by gauge.	REMARKS.
1883.		galls.	galls.				
May 20	Fair ..	..	..	..	..	..	
,, 21	Fair ..	..	..	..	..	..	
,, 22	Fair ..	..	..	..	..	..	
,, 23	Fair ..	..	..	..	..	..	
,, 24	Fair ..	..	..	..	..	..	
,, 25	Fair ..	..	..	..	..	..	
,, 26	Rain ..	85	105	190	217·10	·13	
,, 27	Fair ..	..	..	..	..	..	
,, 28	Fair ..	..	..	..	..	..	
,, 29	Fair ..	..	..	..	..	..	
,, 30	Rain ..	15	60	75	116·90	·07	
,, 31	Fair ..	..	..	..	..	..	
June 1	Fair ..	..	..	..	..	..	
,, 2	Fair ..	..	..	..	..	..	
,, 3	Fair ..	..	..	..	..	..	
,, 4	Fair ..	..	..	..	..	..	
,, 5	Fair ..	..	..	..	..	..	
,, 6	Fair ..	..	..	..	..	..	
,, 7	Fair ..	..	..	..	..	..	
,, 8	Fair ..	..	..	..	..	..	
,, 9	Fair ..	..	..	..	..	..	
,, 10	Fair ..	..	..	..	..	..	
,, 11	Fair ..	..	..	..	..	..	
,, 12	Fair ..	..	..	..	..	..	
,, 13	Fair ..	..	..	..	..	..	
,, 14	Rain ..	45	68	113	133·60	·08	
,, 15	Rain ..	155	102	257	283·90	·17	
,, 16	Rain ..	nil	10	10	41·75	·025	
,, 17	Rain ..	200	45	245	283·90	·19	
,, 18	Fair ..	..	..	..	..	..	
,, 19	Rain ..	35	20	55	66·80	·04	
,, 20	Rain ..	nil	13	13	41·75	·025	
,, 21	Rain ..	nil	22	22	30·06	·018	
,, 22	Fair ..	..	..	..	..	..	
,, 23	Rain ..	130	80	210	217·10	·13	
,, 24	Rain ..	nil	45	45	33·40	·02	
,, 25	Rain ..	nil	20	20	33·40	·02	
,, 26	Rain ..	say 1240	65	..	1386·10	·83	
,, 27	Rain ..	340	160	500	434·20	·26	
,, 28	Rain ..	505	25	530	501·00	·30	
,, 29	Fair ..	..	..	..	..	..	
,, 30	Rain ..	say 1310	105	..	1503·00	·90	
July 1	Rain ..	245	55	300	350·70	·21	
,, 2	Fair ..	..	..	..	..	..	
,, 3	Rain ..	724	125	849	968·60	·58	
,, 4	Rain ..	235	120	355	367·40	·22	
,, 5	Rain ..	95	95	190	183·70	·11	
,, 6	Fair ..	..	..	..	..	..	
,, 7	Fair ..	..	..	..	..	..	
,, 8	Fair ..	..	..	..	..	..	
,, 9	Fair ..	..	..	..	..	..	
,, 10	Rain ..	30	25	55	50·10	·03	
,, 11	Rain ..	nil	25	25	33·40	·02	
,, 12	Rain ..	105	50	155	83·50	·05	
,, 13	Fair ..	..	..	..	..	..	
		5409	1335	6744	7144·26	4·278	85 days

It will be seen from the above valuable records that the quantity of waste water over the whole period amounted to about 20 per cent., or one-fifth of the rainfall. But if we eliminate the heavy rainfalls of June 26th and 30th, then the waste was nearly 30 per cent., viz., 2859 gallons of stored water, and 1165 gallons of waste water; and by reference to the table it will be seen that the lighter the rain the greater the waste. Take as an example the 14th and 15th of June. On the first day ·08 fell after 14 days of dry weather. Of a total of 113 gallons, only 45 gallons of clear water was secured, and 68 gallons went down the waste. The roof would then be washed; but on the following day, when the rain was more considerable, viz. ·17, of the 257 gallons which passed through the machine, 102 were dirty and 155 clean, so that in these two days out of a total of 370 gallons, 170 gallons would be lost, except we have a tank for dirty water, which, of course, would require frequent cleaning out. The reason why the proportion of waste is so much greater when the rainfall is light in character and small in volume is, that a great deal of water trickles through the machine before the requisite quantity reaches the counterbalancing-chamber; and on the cessation of the rain, if only for an hour, the machine returns to its original position, because the water in the counterbalancing-chamber passes slowly away through the holes and is discharged. Hence, with occasional showers, a large portion of the water, which may be very precious, is wasted, although perfectly clean, inasmuch as the roof has been washed by previous rain. In the case of a real soaking rain, the Separator answers admirably, but unfortunately this is just the time when a little waste would not be material. If this tendency to too great waste could be obviated, as we think possible, then the Separator would acquire great additional value, and for use in smoky towns could be highly recommended. I much question if it is adapted for the roofs of agricultural buildings. It must also be borne in mind that, in order to use this machine, all the spouting must be so arranged as to bring the whole roof-discharge to one point, and the tank must be so far below the spouting as to allow of the fixing of the apparatus. Then, lastly, cannot the object be sufficiently obtained for ordinary agricultural purposes by passing the water from the tank through a filter-bed of gravel without any waste at all. It should be explained that during the heavy rains of 26th and 30th Jan. the clear-water tank overflowed from incapacity to hold the quantity of rain. Therefore the amounts were calculated from the rainfall, and are a close approximation of the reality. At Escrick Park the water was discharged into small tubs and overflowed into drains. Samples of the clean and dirty water were taken, with a view to analysis; but on several occasions during showery weather little difference was perceptible, and observation fully confirmed the experience of Mr. Copperthwaite, derived from actual measurement. The Society are much indebted to this gentleman for thus enabling the Judges to arrive at conclusions which they regret were not more favourable to Mr. Roberts's ingenious apparatus. The value of such in densely crowded and dirty towns will indeed be great whenever he is able to reduce the proportion of waste water, and I am glad to hear that the Sanitary Association has awarded him a silver medal.

Messrs. F. and J. S. Bust, of Winterton, Lincolnshire, exhibited a power "Ensilage" Cutter, so arranged that the cut material could be delivered direct into the silo. The fly-wheel, being provided with a series of fans, and working in a close-fitting cover, to which air is admitted below, acts as a blower, and throws the cut grass for a considerable distance—of great value in filling a silo. The fly-wheel carries 5 knives, which work very close to the face of the box. The feed-rollers are specially arranged to prevent clogging, and apparently this is a highly efficient cutter, but the question arises, for what crops it will be required? Inasmuch as nearly the whole of our storage material is grass, which packs closely, and cuts out easily, why go to the expense of reducing such material by passing it through a chopper? We can understand that where coarse woody material is used, such as corn-stalks, then a powerful cutter may be very necessary.

This firm also exhibited a Chaff Elevator and a Salt Sprinkler. The former consists of a long chamber in communication with a small fan, which forces the chaff out of the spout with great violence, and is said to convey it to a distance of 15 feet, a useful appendage to their power chaff-cutter, where the store-room is at an elevation from the ground. The salt-sprinkler consists of a small box, fixed at the head of the chaff elevator, with a revolving spindle furnished with a number of short arms, and a false bottom, the opening of which can be regulated according to the quantity of salt which is to be added. The salt mixes with the chaff as the latter falls from the elevator into the sacks. The advantage of using a certain proportion of salt with the food for all our farm stock should be more generally recognised. Sheep-stock, especially, have been preserved in health during recent wet seasons by this means, and this simple method of adding the salt is very practical and efficient. The cost of the Salt Sprinkler is 4*l.* 10*s.*

Mr. Thomas Constantine Fawcett, of Burmantofts Foundry, Leeds, who is well known in connection with brick-making machinery, exhibited a complete novelty in a Safety Valve for

Figs. 26 and 27.—*Fawcett and Hargreave's Patent Safety-valve for Steam-boilers.*

Fig. 26.—*Transverse Section.*

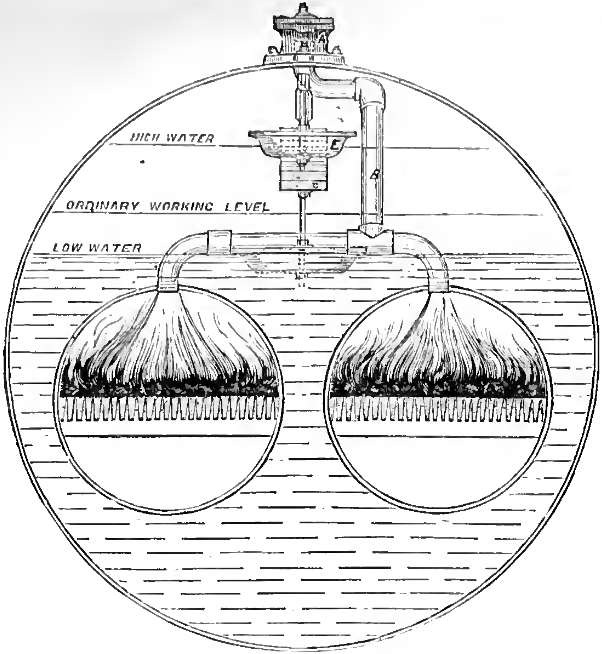
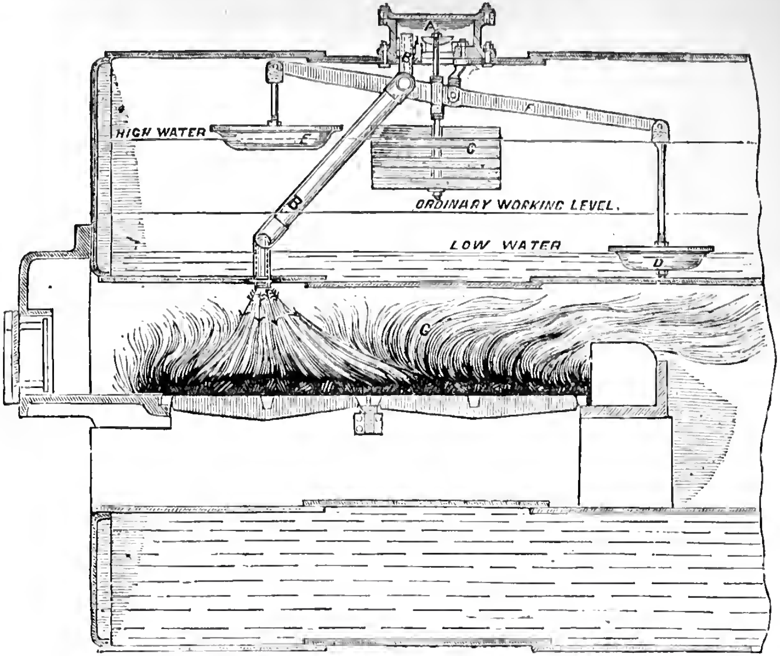


Fig. 27.—*Longitudinal Section.*



A. Valve case, fixed to the top of the boiler, and containing the valve and end of the outlet pipe to furnaces.
B. Outlet pipe to convey steam to furnaces.
C. Dead weight on safety valve spindle.

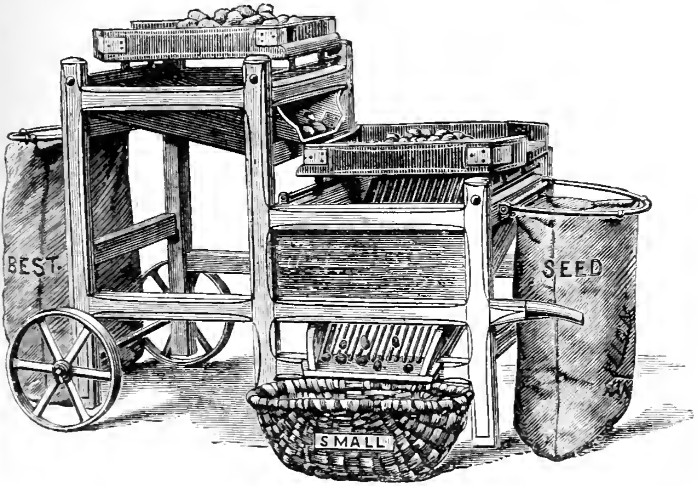
D. Low-water float.
E. High-water float.
F. Lever with floats at ends for lifting valve at high or low water.
G. Boiler furnace.

Steam-boilers (Fawcett and Hargreave's Patent). The valve itself is an ordinary dead-weight safety valve, but is attached to a lever inside the boiler, with floats at either end, which cause the valve to lift when the water is either at too high or too low a level. The valve is contained in a lock-up box, and the liberated steam, instead of escaping into the air, finds its way by a pipe to the crown of the flue, discharging its steam over the hottest part of the fire, and thus at once damping down the fire. If the escape is due to too high pressure, the damping down of the fire at once has the desired effect of lowering the pressure of the steam ; fuel is economised, and directly the steam discharge ceases, the fire brightens up again. If it occurs from either the water being too low or too high, the engine-driver's attention is directed to the fact, and he regulates the pumps accordingly. The drawings and details on p. 627 will fully explain this very ingenious invention.

It will be gathered from above that the safety valve of Messrs. Fawcett and Hargreaves not only provides for the escape of steam which otherwise might become dangerous, but utilises the steam to correct the cause of excessive pressure, and thus prevents useless consumption of fuel, and at the same time the noise of the escaping steam calls the attention of the engineer to the reason for the escape. If by any carelessness the driver was absent and the water had become too low, and might, if unchecked, result in an accident, it is quite evident that long before any of the heating surfaces could be uncovered the fire would be extinguished ; and therefore, so long as the apparatus is in working order, its action is perfect. The danger of automatic appliances is that they tend to make the attendants careless, and, being entirely depended on, if through any cause they fail to act, accidents may occur. It is not, however, easy to see how such simple mechanism could get disarranged, and we think, for fixed boilers especially, the arrangement is excellent. The price for a single flue boiler is 10*l.*, for a double flue boiler, 12*l.*

W. Lightfoot, of Stockton-on-Tees, exhibited an Improved Potato Riddler, which has this advantage over circular revolving screens like that of the East Yorkshire Wagon Co., exhibited at Reading, and figured and described in the 'Journal' of last year, that diseased potatoes can be hand-picked off the screen. By means of two screens we get a triple division, viz., best, seed, and small. The arrangement will be gathered from the drawing, which gives an excellent miniature of the machine (Fig. 28). The two screens work backwards and forwards, or rather to and fro across the frame, running in a groove on friction wheels; the requisite shaking motion is thus obtained with much less fatigue than when the operator holds the screen or sieve, and has all the weight of the load to agitate. The action is easy and rapid. Three or four movements of the large screen ensure the separation of seed and small, which, falling through the meshes of the sieve, are conveyed by an inclined plane to the second sieve. The best potatoes are delivered into a sack by tilting the screen, and a fresh supply is received. The process is rapid and effectual. The second sieve, after being duly agitated, which allows of the small sets passing through to a basket, is tilted up, and its proceeds delivered into a second sack. The frame, of strong construction, is carried on two small iron wheels and axle in front, and raised by handles behind, and so moved like a common two-wheeled barrow. The price is 5*l.* The riddles being loose in riddle-boxes, any sized riddle can be used. Thus for Regents, $1\frac{3}{4}$-in. to $1\frac{1}{4}$-in. are suitable; for Champions, 2-in. and $1\frac{3}{8}$ in. Kidney potatoes may be worked by altering the size of mesh. If potatoes are free from disease, the patentee states that 30 cwt. per hour can be screened; if moderately free, about 25 cwt.

Fig. 28.—*View of Lightfoot's Improved Potato Riddler.*

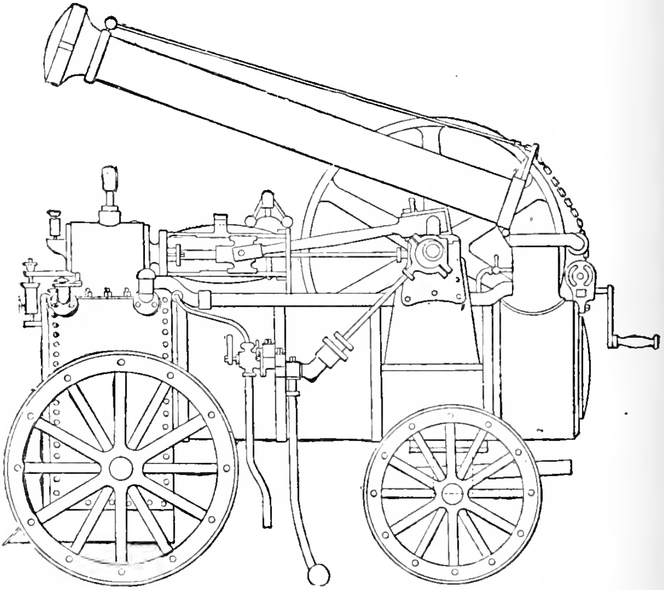


Mr. James Coultas, of Grantham, exhibited a patent apparatus by means of which the chimneys of Portable Engines can be raised or lowered with great ease. To show the utility of this novelty it is only necessary to remind our readers that hitherto, when this operation has to be performed, the attendant must get on the top of the engine. The chimney is often very hot, and it is not an easy job either to raise or lower. It is farther possible that an accident might occur during the operation, and there is the continual risk of damage to the working parts of the engine by the carelessness of the attendant. Securely fastened to the smoke-box is an endless screw, worked by a handle, which actuates a small windlass, and thereby winds up the chimney by means of a chain which passes through an eye in a plate at the bottom of the chimney, and is attached to a rod which terminates at the top of the chimney. The advantages claimed by the patentee are:—

The great saving of time; prevention of accidents; no risk of damage to the working-rods and other parts of the engine by the attendant standing on them; no bolts required for holding chimney up.

The cost of the apparatus complete is 4*l.* 17*s.* 6*d.*

Fig. 29.—*Coultas's Chimney Elevator.*



Messrs. R. J. and H. Wilder, of Wallingford, exhibited a Patent Elevator and Horse Gear which had some novel features. The motion is communicated from the horse gear by a wire rope through an improved clip drum gear. The clips are attached to the drum without nuts or bolts, being hung on and easily removed. This arrangement is possible in the case of drums of small diameter. There is an ingenious adjustment to compensate for the stretching of the rope, by altering the position of one drum. In the elevator, which as to general construction follows the ordinary pattern of folding elevators, is a simple and efficient self-acting tightening rod to lengthen the carrying chains for work, by an adjustable screw. The axle of the chain-drum works in a slot, and is capable of moving 10 or 12 inches. The lower end of the rod comes against a stop on the lower half of the frame; the upper end is in contact with the adjustable screw which actuates the axle of the chain-drum. As the front portion of the elevator is unfolded into position, the rod acting on the screw pushes the chain-drum into a position to insure a proper condition of tension to the travelling chain. The elevator costs 45*l.* and the horse gear 7*l.* 10*s.*

Mr. Henry Denton, of St. Peter's Iron Works, Wolverhampton, exhibited a Two-Horse Gear with Intermediate Motion, which may be noticed as an adaptation of the capstan principle to a horse gear. The bell-cover is cast in one piece with the teeth, but the latter are so arranged that broken teeth can be replaced. The upright shaft is stationary, having a steel boss on the top welded on. A set pin revolves on the boss. The motion is easy, no friction wheels being required.

The frame of the intermediate gear is bolted together and bored as a whole, doing away with glands, which cannot be tampered with by the attendant. Of course by this arrangement it is impossible to adjust the brasses; as they wear away they must be removed and reground. The advantage of this arrangement is therefore somewhat doubtful. Price complete, 14*l.* 15*s.*

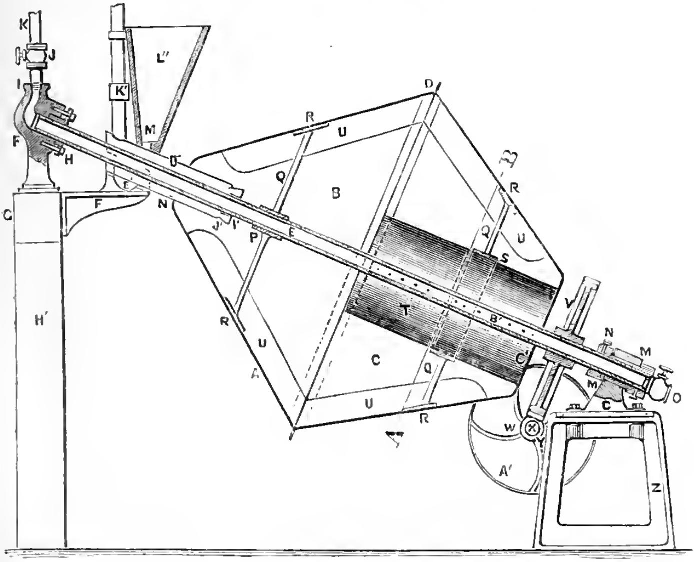
A Steam Digger, by *Cobham and Co.*, of Stevenage, was ordered out for trial, but, unfortunately, a breakage affecting the motion of the diggers prevented the machine being seen in work, although the travelling powers were not impaired. This was the more to be regretted, as there were good points about the machine—notably, compactness of form; reduction of weight; distribution of that weight by means of broad travelling-wheels; independent carriage of the digger proper on small wheels of its own, allowing of equally good work across ridge and furrow, or upon a level surface; easy detachment of digging-frame, when the engine is available for ordinary farm work, travelling, threshing, &c. All these were meritorious features of this machine, which rendered it very desirable to have carried out careful tests. Mr. Cobham did all in his power to have his machine in working order on Thursday morning, but, notwithstanding indefatigable exertions, the arrangements could not be carried out, which was a great loss for himself and the public. One man can work the machine, with the help of the water-cart lad in starting the engine. As the digger-frame is independent of the engine, and carried on its own wheels, an even depth of work is secured. The Catalogue price of this machine is 600*l*.

It is not usual to notice in the Report the admirable display made by our leading seedsmen, a display which, as a rule, has hitherto been more striking than instructive, especially as regards the specimens of growing grasses. We see most verdant plots, which we are told comprise such and such mixtures, but it is quite impossible to distinguish the component parts, and beyond an impression of great luxuriance and rapid growth, there is really nothing to be learnt from such specimens, which in their preparation have doubtless occupied time and attention. Dried specimens of the grasses are little better, for they do not show accurately distinctive features. *Messrs. Carter and Co.* deserve recognition for a distinct advance in the art of exhibiting, inasmuch as they showed plots of all the leading nutritious grasses as nearly as possible at the flowering stage, when their distinctive characteristics are most marked, clearly labelled, and in such quantities as allowed of easy study. At another part of the stand were similar specimens of undesirable grasses and weeds of pastures, also shown in a flowering stage. Messrs. Carter and Co. commenced this innovation at the Reading Show last year, but have considerably developed the features of the system.

The Scarborough Grain Dryer and Purifier (invented by *Edward Keighley*), occupied much of the Judges' attention, as they were anxious that a thorough trial of so novel an apparatus should be made. Unfortunately, anything like definite results were impossible, in consequence of difficulties in working, due in great measure to the fact, that a new motive power had to be used, as that provided by the patentee was condemned by the Superintendent Engineer as unsafe. In this engine the revolving cylinder was driven by rope-gear, and it was found difficult to rig up the necessary pulleys to fit the fly-wheel of an ordinary portable engine, which was afterwards adopted. The whole affair was very imperfectly constructed; but it is probable that, if properly made, it is capable of efficiently dealing with damp grain, and that at a cost that might allow of profitable use on a large scale; but it is rather a merchant's than a farmer's implement. Foreign grain that has been under water is frequently on sale at our large ports; the drying of such might be carried out in Keighley's machine, a short description of which brings this Report to a conclusion.

This apparatus consists of a double-conical cylinder (pentagonal), B and C. The two portions are joined together by means of angle irons, D, riveted on the parts, B and C, and bolted together. Through the centre of this cylinder is a hollow shaft on which the cylinder revolves. The hollow shaft supplies steam (or water) to numerous serpentine coils of pipes covered by plates (having about 120 square feet of surface), these being also fixed upon the shaft and inside the "conical cylinder," which contains the grain or other material for treatment, and which, when turning on its axis, gives such complex motion to its loose contents (the force of gravity and that of centrifugal motion being brought into opposition by the shape, speed and position of the machine), that the grain gets rubbed at the same time that it is being dried. The vessel holds about 4½ quarters, and the drying is effected partly by the heat developed from the hollow shaft and the serpentine coils of pipes, and partly by a blast of hot air (300 to 600 cubic feet per minute), which is blown in through a stuffing-box fixed at the foundation of the cylinder direct upon the grain by a small fan. The products of combustion are conducted from the smoke-box by a long tube, 9 inches in diameter, which, after making the necessary travel, returns to the chimney. Outside this is a larger tube, about 12 inches in diameter, connected with the fan and open at one end, close by the chimney. The air in its passage to the fan becomes heated to a high temperature, in which condition it is forced into the cylinder. If cold air is required, the hot air can be shut off from the tube

Fig. 30.—*Keighley's Grain Dryer and Purifier.*



by a damper. This alteration is useful for cooling the corn. The hot air escapes, together with dust, &c., by the strong current, through the open neck at the top of the conical cylinder, along with the evaporated moisture. In the drawing, T represents a steam-drying cylinder, into which steam is admitted by holes in the hollow shaft, an alternative arrangement with the serpentine coils of pipes. Inside the conical cylinder are fitted plates, U, for the purpose of lifting and turning the grain, so as to cause it to fall over and over. On the shaft, E, is secured a worm-wheel, V, actuated by a worm, W, fitted on a shaft, X, which works in bearings, Y, cast on the side of the frame, Z, on which frame is secured the bearing, G, which carries the lower half end of the hollow shaft. The hollow shaft is connected with the steam-pipe by a flexible expansion joint, H. The cylinder is provided with an arrangement of sieves, which can also be used as doors for filling or discharging contents. These sieves are useful for separating cockles, dirt, &c. It should be mentioned that the invention provides for the application of a jet of steam and a rose of water, which may be desirable in certain cases for cleansing dirty grain, preparing brittle grain for millstones, &c. It is stated by the inventor that in 1881 wheat of Lord Londesborough's was improved in value 20*s.* per quarter by being put through this machine. The Catalogue price of the Dryer is 50*l.* The Judges were inclined to view this invention favourably; and when it is improved in construction, as to which there is plenty of room, they can readily believe that this machine may be valuable for drying grain.

I cannot conclude this brief description of some of the novelties of the Machinery Department of the York Show without expressing our grateful sense of the valuable assistance given us by Mr. Robert Neville, who was at the head of the Engineering Staff; and our best thanks are due to the Stewards of Implements for their unvarying kindness and ready attention to all our requirements.

XXVII.—*Report on Wheat-Mildew.* By W. C. Little, of Stag's Holt, March, Cambridgeshire.

Among the numerous diseases which affect the cultivated crops of this country, there is probably not one which is more disastrous to the farmer than wheat-mildew is in those parts of the country where it is frequently prevalent. Potato-blight and hop-mould may sometimes entirely destroy crops which are more costly, and potentially much more valuable, than a crop of wheat; but the growers of these crops have generally some compensation for their losses; occasionally they make large profits, and they are therefore better able to bear their loss, and with them the part is often greater than the whole, for not unfrequently a deficient crop realises more money than a full crop would have done, because the price has risen in consequence of the short crop; but the grower of wheat has no handsome profits to fall back upon, and the foreign supply prevents that advance in prices which might in some degree make up for a diminished yield. The yield of his crop may be reduced by 75 per cent. by mildew, and what remains is scarcely saleable.

Widely spread as this disease is, and great as is the damage done by it, there would seem to be many farmers who have never suffered serious injury from it, and some who do not even know what it is. It may desirable, therefore, to give some idea of what a mildew year means in the East of England.

In 1881 nearly all the white-corn crops in the low lands of Cambs, Hunts, Lincoln, Norfolk, and Suffolk, were more or less mildewed. Many crops of wheat were almost entirely destroyed; the oats were greatly diminished in yield and quality; and in some cases the barley was considerably injured. The district most severely injured may be defined roughly by the following boundary: From Cambridge, N.E., to Mildenhall; thence N. to Stoke Ferry; thence W. by Downham Market to Wisbech; thence N.W. to Spalding; thence S. by Peterboro' to Huntingdon, and S.E. to Cambridge again. This area comprises at least 600,000 acres of land, a large proportion of which is under the plough, and wheat is the staple crop. Probably 25 per cent. of the total area, or 150,000 acres of wheat, are harvested every year in the district described. In the middle of the month of July 1881 there was on all the best wheat-lands of this district the promise of a fine crop, which seemed, as it were, within the grasp of the farmer. Then an attack of mildew came, and the consequence was that the crop of that year was one of the most wretched ever gathered. In a large parish adjoining that in which I live, one which is noted for its fertility, the wheat-crops were described to me by an excellent judge and experienced farmer as being in July as good as anything he had ever seen. At harvest many of the best of those crops, which would under more favourable circumstances have yielded from 40 to 48 bushels to the acre, produced only 5 sacks, or 20 bushels; and some of the very best yielded only 12 bushels of wheat, which weighed only

43 lbs. a bushel. On the 15th of July in that year I inspected all my crops, in company with a friend, who, after walking through every field, asked me, "What is the greatest crop of wheat you have ever grown?" I said: "In 1863 and 1864 I had, on an average of the whole farm, 50 bushels an acre, within a very small fraction." "Is there any reason why you should not have as much this year?" said he. "None but the uncertainty of the weather. However, I think I am safe now for 5 quarters round," was my reply. Three days later, having heard a rumour that mildew had been seen in the neighbourhood, I went over the same ground and found every field attacked with the disease. The result was, that I grew barely 25 bushels of wheat to the acre, and that of wretched quality. What had been throughout the spring and summer the best and most promising crop, yielded barely 20 bushels of 53 lbs. each (= $17\frac{3}{4}$ bushels of 60 lbs.). I sold this wheat at 1*s.* a stone, and realised 3*l.* 16*s.* an acre, and the straw was literally worthless. It would not be difficult to find instances of even more serious loss than this. On one farm of fairly good land, which I know, the average value of the wheat-crop was only 2*l.* 15*s.* an acre, a sum which did little more than cover rent, rates, and taxes. In some instances the corn was never threshed, but thrown in sheaf to the pigs; and probably many farmers would have done a good stroke of business if they had set fire to their most mildewed crops and burnt them as they stood.

If we estimate that throughout the district of which I have spoken the wheat-crop was damaged to the extent of 4*l.* an acre, we have an aggregate loss to the farmers of that district amounting to 600,000*l.* on the wheat alone, leaving out of sight the damage done to other crops.

Happily, such visitations as that of 1881 are not frequent, and we must go back some 60 years to find such a general and complete destruction of the corn-crop. One of the oldest farmers in the Isle of Ely tells me that he remembers only one such year, and that was "somewhere in the twenties" (1820–1829); but very considerable damage has frequently been done by this disease. Within my own recollection the years 1850, 1852, 1855, 1859, 1860, 1865, 1872, 1875, 1877, 1878, 1879, 1880, 1881, were years of mildew, which was sometimes widely spread, and sometimes only locally and partially developed.

It is probable that no part of England suffers so much and so frequently from mildew as the low lands of the Eastern Counties, but there are many districts where the disease is well known and dreaded. Nor is it confined to this country or to this quarter of the globe. It is said, I know not with what truth, to have been known to the ancient Egyptians.* The Romans offered sacrifices to propitiate their deity Robigus, and avert the disease. In the 'Annals of Agriculture' will be found a long account of a visitation which destroyed the crops in Sicily in 1804.† In France, the aid of the Law Courts has within the last few years been invoked to obtain the removal of a barberry hedge which was credited with having produced extensive mildew in the neighbouring crops. In the New World we find the State of Massachusetts, as long ago as 1755, making a provincial law for the complete extirpation of barberry bushes, because it had been found that the blasting of wheat and other English grain was occasioned by them;‡ and at the present moment the wheat-growers of Australia are anxiously inquiring into the origin and nature of the disease.

Considering the wide distribution of mildew, and the fearful destruction which so frequently results from it, it is not surprising that it has long been the subject of inquiry by scientific men. The attention of these seems, however, to have been almost entirely devoted to the biology of the parasitic fungus (*Puccinia graminis*), which causes the malady. Important as this branch of the subject is, and much as we owe to the botanists and mycologists who have pursued their investigations so diligently, I venture to suggest that further inquiry in other directions is desirable; and since it seems to be admitted that the study of the life-history of this mischievous fungus has suggested no effective means of preventing or mitigating the disease, it is worth while to ask whether the observation and experience of practical farmers cannot furnish some information which may enable the chemist or the physicist to assist them in lessening the damages to which they are now liable.

Physicians, when they have to study disorders which affect mankind, or the live-stock of the farm, do not content themselves with a diagnosis of the disease; they proceed to ascertain what are the conditions under which the disease is generated, propagated, or malignantly developed; and they inquire whether any habits of life, any inherited predisposition, any accidental surrounding, either spread the disease or make it more malignant in its character. Why should not the same system be followed in the case of plant-diseases?

I have implied in what I have said previously that the observation and experience of farmers may give a clue to

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* In Wicliff's Bible, the seven years of scarcity which Joseph foretold to Pharaoh were attributed to Mildew.

† Vol. xliv. p. 324.

‡ A copy of this law will be found at p. 692.

scientific men for further inquiry. I am aware that, as a rule, farmers are not scientific observers, and no one would expect to receive from them conclusive evidence; but if any considerable number should be found to concur in the opinion that some particular system of management increases the chances of mildew, and that a different system has been found less dangerous, it is surely worth while to inquire whether these opinions have any scientific basis. It is certainly no new thing for agricultural chemists to discover that the accumulated experience of generations has enabled farmers to arrive at conclusions which may have been empirically formed, but which are, nevertheless, scientifically sound and good. If I wanted an instance to prove that science may derive some aid from the observations of farmers, I could find it in connection with this very subject. It was by farmers that the association of the barberry with mildew was suspected. At first, as is frequently the case, scientific men derided the idea; later on, they condescended to examine it more closely; and within the last few years it has, I imagine, been conclusively proved that, after all, the farmer's instinct or his observation had led to a right conclusion, and that the barberry-tree does play an important part in the life-history of the mildew fungus.

Having laid my views as to the possible benefit to be derived from a collection of the opinions of experienced farmers on this subject before the Council of the Royal Agricultural Society of England, I was requested by the Journal Committee to collect such information as I could, and to lay the result of my inquiries before the readers of this 'Journal.' In order to carry out this object, I drew up, with the assistance of Mr. H. M. Jenkins, the Secretary to the Society, a Circular of Inquiries, a copy of which will be found appended to this paper.* When I prepared this circular I was not aware of the fact which was afterwards brought under my notice, viz. that Arthur Young had in 1804 issued a similar circular of inquiries on the subject of mildew. As it may be interesting to compare the two sets of questions, I have given a copy of his queries.† My circular having been widely distributed throughout the country, I have received from numerous correspondents interesting and valuable communications in reply. I regret, however, to have to state that a large majority of those who received copies of the circular did not give any answer to it.

I am quite aware that many of the questions which I asked could only be answered by those who had made careful observations and kept a record of them; in point of fact they repre-

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* App. I., p. 664.

† App. III., p. 685.

sent what one would like to know, and what ought to be systematically observed and noted in the future, if we are to discover in what degree the disease is encouraged or promoted by the surroundings of the crop and the conditions under which it is grown. I have to offer my thanks to those who did endeavour to assist me. An abstract of the replies will be found in an Appendix[*] to this paper. I have also abstracted from the 'Annals of Agriculture,' published by the Board of Agriculture, some of the replies which Arthur Young received to his questions eighty years ago, when farmers were still suffering from the virulent attack of mildew which occurred in 1804.[†]

Before proceeding to notice these replies, I purpose to give a brief and popular account of the nature of the disease known as wheat-mildew, and in doing this I shall avail myself of Mr. Carruthers's paper on the subject contained in last year's 'Journal,'[‡] and also of a paper contributed to the 'Gardener's Chronicle' in August 1882, [§] by Mr. C. B. Plowright, of King's Lynn, who is well known as an authority on British Fungi, and who has given special attention to this particular disease.

Wheat-mildew is caused by a parasitic fungus, known as *Puccinia graminis*, which attacks both oats and barley, as well as many of the natural grasses of this country.[‖] This parasite lives within the cellular tissue of the plant, sapping its vitals, and converting to its own use the sap which should nourish and mature the grain. The presence of this fungus in the infested host-plant is evidenced only by its fruit or repro-

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[*] App. II., pp. 665-684,

[†] App. IV., pp. 685-690.

[‡] 'Journal R.A.S.E.,' vol. xviii. pp. 495-503 : 1882.

[§] "On Wheat-Mildew and its Connection with the Barberry;" 'Gardener's Chronicle,' August 1882.

[‖] Mr. Plowright gives the following list of grasses upon which *Puccinia graminis* has been known to occur.

Phleum pratense.
Alopecurus pratensis.
,, fulvus.
Phalaris arundinacea.
Agrostis vulgaris.
,, alba.
Calamagrostis epigejos.
Aira cæspitosa.
Avena sativa.
,, fatua.
,, pratensis.
,, flavescens.
,, elatior.
Poa annua.
,, nemoralis.
,, pratensis.
Molenia cærulea.
Holcus lanatus.

Dactylis glomerata.
Festuca gigantea.
,, spectabilis.
,, tenella.
Bromus mollis.
,, tectorum.
Triticum vulgare.
,, repens.
,, caninum.
Secale cereale.
Lolium perenne.
Elymus arenarius.
,, glaucifolius.
Hordeum vulgare.
,, sylvaticum.
,, murinum.
,, distichum.

ductive organs, which burst through the cuticle and appear in red or black patches, disposed in rather irregular lines on the leaves, straw, or chaff. The life-history of this fungus is remarkable, as "it has no less than five kinds of reproductive forms . . . ŒCIDIUM, *Spermogonia*, UREDO, PUCCINIA, and *Promycelium*."* Of these five forms three only, ŒCIDIUM, UREDO, and PUCCINIA, come under the notice of the ordinary observer; the *Œcidium* of *Puccinia graminis* being the rust which is so conspicuous on the leaves of the common barberry in spring; *Uredo*, the dark orange-coloured rust found on the wheat, &c.; and *Puccinia*, the mildew. The wheat-rust in question must not, however, be confounded with the spring-rust which has been so common during the last two seasons, 1882, 1883. This rust is earlier in its appearance, and of a much lighter colour than the *Uredo* of *Puccinia graminis*. It is connected with another form of mildew, *Puccinia rubigo vera*, which is not often injurious to corn-crops, at least in England. It has been observed that years in which rust is prevalent are not always years of mildew; and in the fen districts, which suffer most from mildew, the prevalence of this spring-rust is believed to be rather beneficial than otherwise, as it reduces the excessive luxuriance, which is the usual result of a mild winter, and which is popularly supposed to make the wheat-crops more liable to mildew. On stronger soils, and where the growth is less luxuriant, this rust is, however, much dreaded; and it is said that the yield of corn is always much diminished by an attack of it. Mr. Plowright is the only writer on this subject whom I have met with who has pointed out that this common rust is not connected with the destructive mildew *Puccinia graminis*.

To return to the last-named, the real and fatal mildew of our experience. As this is the only form in which the spores (called *Teleuto-spores*, or rest-spores) are capable of lying dormant, and retaining their vitality for more than a few hours, we may regard it as the culminating point of the series, the final development of the plant and the completion of the cycle of growth.

Starting then from this point, that is, with the blackened straw of the previous year, we find that in the spring the *Teleuto-spores* are quickened into life, and from them are produced another kind of spores (*Promycelium-spores*), which are said to be unable to retain life and bear fruit unless they can meet with a barberry-tree. Having settled upon a leaf of one of these shrubs, the spore bores into the interior and there de-

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* Plowright.

velops into mycelium, which in the course, &c., of about eight days produces rusty patches on both the upper and under sides of the barberry-leaf. From these spots of rust two different kinds of spore are shed, *Œcidium-spores* from the under, and *Spermogonia* from the upper side of the leaf; and it is supposed by Mr. Plowright that they are of different sexes, the smaller spores or *Spermogonia* playing the part of the male. The *Œcidium-spores* (perhaps fertilized by the *Spermogonia*) are distributed in the air in incalculable numbers, and those which fall on plants adapted to fulfil the office of host-plants, germinate under favourable atmospheric conditions,—that is to say, in damp weather,—and throw out a germ tube which enters the host-plant through one of its stomata or breathing pores. Having effected an entrance, mycelium is again developed in the tissue of the plant (wheat or grass), and the fungus has now obtained possession of a home in which it can complete its life cycle. In the course of ten or twelve days *Uredo-spores* are produced on the outside of the leaf. These are distributed, and germinate and reproduce their kind. The reproduction of *Uredo* is repeated generation after generation until the host-plant approaches maturity, when the mycelium throws out *Teleuto-spores* or mildew, and the life cycle is completed.

In the foregoing account the identity of the fungus which produces barberry-rust with that which afterwards produces a rust on wheat, and eventually mildew, is assumed as indisputably proved. There are, however, circumstances which lead some to doubt whether the barberry-tree is indispensable for the development of mildew. Let it be admitted that the mildew-spores will germinate on the barberry and produce œcidium-spores, which will germinate on wheat and other grasses, and there generate *Uredo* and *Puccinia*, does it follow that the barberry is the only plant which can act as a foster-parent?

The advocates of the barberry theory adduce facts to prove that mildew is particularly prevalent in the immediate vicinity of such trees, and that the removal of them has at once caused a diminution of the disease.*

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* Sir Joseph Banks, in the 'Annals of Agriculture,' tells of a village in Norfolk "where barberries abound and wheat seldom succeeds, called by the opprobrious appellation of Mildew Rollesby" (xliii. p 521); and Cooke and Berkeley in their work on 'Fungi' (King's Int. Scientific Series) say: "There is a village in Norfolk, called Mildew Rollesby, because of its unenviable notoriety in days past for mildewed corn, produced it was said by the barberry bushes, which were cut down, and then mildew disappeared from the corn fields, so that Rollesby no longer merited its *sobriquet*" (p. 199). The Rev. R. I. Tacon, the present Rector of Rollesby, in reply to some inquiries which I made, says that "there are no remains of the disease, as Rollesby is especially noted for its good land and fine crops." Then there is the famous case, so frequently quoted, of the barberry

Now in the fen country, which may be termed the natural home of mildew, the barberry is a scarce tree, and it is probably only to be found in a few ornamental gardens. If a single tree infects a whole field, and if with the removal of that tree the disease disappears, might we not expect to find that districts which had no such tree would at least enjoy a partial immunity? Instead of this, they are peculiarly susceptible to the disease. Is there not some reason to suppose that some plant other than the barberry is capable of fulfilling the office of a foster-parent, or that the fungus can maintain life for more than one season without passing through that stage of existence which is passed on the barberry? There seems a reasonable probability that both these questions may be answered in the affirmative. A few months ago, when I asked whether any other plant could supply the place of the barberry, I was told that it was exceedingly improbable; that all the different species of *Œcidium* frequenting English plants had been identified, and that it was very unlikely that one which could be connected with mildew had been overlooked. In the paper to which I have so often referred, Mr. Plowright gave a list of the varieties of barberry on which the *Œcidium* of *Puccinia graminis* is found.[*] Having observed in 1882 that the berries of *Berberis aquifolium* (syn. *Mahonia aquifolium*—a variety of the barberry not included in the list referred to) on some shrubs in my garden were covered with a suspicious-looking rust, I mentioned this to Mr. Plowright, and on the 31st of May 1883, I supplied him with some berries which appeared to me to be infected with *Œcidium.* Upon examination they were found to be covered with this rust. A wheat-plant grown in water, under glass, in Mr. Plowright's study, was infected from one of these berries, and on the 19th of June he sent me a portion of the plant with well-developed *Uredo linearis* upon it. Later on I found specimens of the same rust on the leaf and leaf-stalk of the Mahonia. Now

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hedge by the side of the Paris and Lyons Railway, which was said to have produced mildew, and the removal of a portion of it (1 kilometre in length) was so beneficial that "the whole hedge was then removed *and the disease disappeared*" (Rev. J. Du Port, 'On the Fungoid Diseases of Cereals,' Transactions of the Norfolk and Norwich Naturalists' Society, 1880).

[*] The following is the list:—

Berberis vulgaris.
,, ilicifolia.
,, canadensis.
,, nepalensis.
B. Aristala.
,, amarensis.
,, atropurpurea.
Mahonia[1] glauca.

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[1] (In London's Encyclopedia of trees and shrubs, 1842, this variety is classed in the Berberis subdivision (as distinguished from the Mahonia) under the name of *Berberis dealbata.*—W. C. L.)

here was a plant which is tolerably common in gardens, and it had never been suspected of having taken any part in rearing this parasite, much less detected in the very act. Indeed, I have been told of a Norfolk gentleman, who after listening to one of Mr. Plowright's lectures on mildew, went home in great distress, for he had been planting barberries largely, without any notion that he might have been contributing to agricultural distress by propagating mildew. With very great regret he sacrificed his shrubs, and was afterwards told on the best authority that, as they were *Berberis aquifolium*, they were perfectly harmless. If one œcidium-bearing shrub has escaped the notice of the botanists, why not others? Again, barberries are said to be unknown in Australia, but mildew is found there. Quite recently Mr. Plowright has examined specimens of straw sent over for his inspection from Queensland, and he pronounces the disease to be *Puccinia graminis*, and he writes to me thus: "One feels inclined to think that there must be some *Œcidium* host other than the barberry." Taking all things into consideration, it does seem not improbable that some other plant may take the place of the barberry. It is perhaps worth while to mention that there are some who affirm that the elder-tree will produce mildew, and who assert, as confidently as ever the advocates of the barberry theory have done, that they have traced the disease to some bush of this description, and that they have seen lines of mildew starting from one, just as they are said to have done from barberry-trees. At present, the most careful search amongst the leaves of the elder has not been rewarded with any success.

But on the second point, as to the fungus maintaining life for more than one season without resorting to the barberry, a new light has been thrown by Mr. Plowright. It has been said above that the mycelium in wheat, &c., produces *Uredo-spores* until the host-plant approaches maturity. Now if these *Uredo-spores* can find a succession of suitable plants in a growing state, successive generations of *Uredo-spores* will be produced throughout the winter. In December 1881 Mr. Plowright found a fresh pustule of Uredo upon Twitch grass, and in January 1883, he sent me similar specimens which he had recently gathered. He also informs me that he has proved that the *Uredo* of *Puccinia rubigo vera*, a species nearly allied to *P. graminis*, will stand a temperature of 23° Fahr. without injury to its vitality.

But Mr. Plowright goes one step farther, and ventures to assert the probability that the *Promycelium-spores* of mildew have the power of entering the wheat-plant, and there producing mycelium, with its successive stages of *Uredo* and *Teleuto-spores*, thus dispensing, for a season at least, with the assistance of the barberry and dropping out of the series the *Œcidium* and *Spermogonia* stages of the life cycle. It is true that De Bary did not succeed in his endeavours to produce *Uredo* in wheat directly from mildew; but this is merely negative evidence.

The following Table exhibits side by side (1) the normal and complete cycle of growth of *Puccinia graminis*, (2) an abnormal or incomplete cycle, and (3) a possible abnormal cycle:—

Puccinia Graminis in its successive Stages of Growth.

Seasons.	Normal or Complete Cycle.	Abnormal or Incomplete Cycle.	Hypothetical Abnormal Cycle.
Autumn	Mildewed straw, black lines, spots, and patches, which are		
Winter Spring	(1) Teleuto-Spores. Of Puccinia Graminis; these remain dormant until the spring, when	(5) Uredo-Spores continue growth and the process of reproduction, if growing plants of the species capable of acting as host-plants are within their reach and developing	(1) Teleuto-Spores.
	(2) Promycelium-Spores are produced, and growing on the barberry produce		Promycelium-Spores which it is thought may be capable of entering the Wheat Plant, and there, producing mycelium and its
	(3) Œcidium Spores and (4) Spermogonia. The former (fertilised by the latter?) germinate on the wheat plant and other grasses, and develop mycelium in the cellular tissue of the host-plant, from which spring		
Summer	(5) Uredo-Spores. These reproduce the parent mycelium, bearing Uredo-spores generation after generation, until the host-plant approaches maturity, when	Uredo On wheat without passing through the intermediate stage of Œcidium on the Barberry, and as the crop ripens	(5) Uredo. without passing through the Œcidium stage, and finally
Autumn	(1) Teleuto-Spores are formed, and the cycle of growth is completed.	(1) Teleuto-Spores	(1) Teleuto-Spores

It would seem then that in one way at least, and possibly in two, the mildew-plant can propagate its species without the aid of the barberry-tree. If it can do this for one season, why not for two or three? Occasional resort to the barberry may be necessary (unless some other plant will do as well), and renewed life and vigour may result from this resort, particularly if œcidium-spores are a sexual product.

I have dwelt at some length on this part of the subject, because hitherto the only practical remedy for the disease which has been suggested has been the extermination of the barberry tree. If other plants can perform the same office, it seems hardly worth while to wage war against this shrub. I cannot consider Mr. Carruthers's only suggestion by way of remedy, viz., that all mildewed straw should be burned, a practical one, as it would involve the entire destruction of the straw throughout the great wheat-growing district of the fens year after year.

I proceed now to notice the replies which I have received to my circular of inquiries, and at the same time I shall avail myself of information which I have received orally from witnesses not less competent to form opinions than those who have done me the honour to put pen to paper. I shall also interpolate the opinions which I myself have formed from observation, and I shall notice some of the replies which Arthur Young received from his correspondents some eighty years ago.

On reference to my circular * it will be seen that my questions were arranged under the following heads :—

I. Districts in which Mildew is prevalent.
II. Mildew years.
III. Conditions under which the Disease is developed to a great degree.
IV. Situation of Farm or Field attacked.
V. Climate (6).†
VI. Soil (1).
VII. Previous Cultivation (7, 8).
VIII. Description of Wheat (10).
IX. Time of Sowing (2).
X. Seed used.
XI. Character of Crop.
XII. Flowering Period.
XIII. First Observation of the Disease.
XIV. Time of Harvest.
XV. General Observations.

I propose to observe generally the order of these questions, but I have found it convenient in some cases to bracket two or three headings. On some points I have little to communicate,

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* App. I., p. 664.

† The Arabic numerals in brackets refer to Arthur Young's questions and the replies thereto.

and I must leave them for observation and investigation in the future.

I. *Districts and* IV. *Situations.*—In my returns 24 counties are represented, 8 lying in the Eastern Division, 9 in the South-eastern and East Midland, 6 in the Western and South-western, and 1 in the Northern and North-western districts. But some counties, as may be expected, are represented by a much larger number of returns than others. It is impossible from these replies to form any idea as to the extent to which different districts suffer from mildew. In almost every case the disease is recognised as an occasional visitant, but several correspondents (Nos. 4, 27, 42, 44, 46, 48, 52, 56, 57, 63, 74, 75) seem never to have had any serious experience of it. These fortunate farmers hail from Berks, Devon, Hereford, Herts, Hants, Kent, Leicester, Lincoln, Norfolk, and Sussex. On the other hand, representatives of Beds, Berks, Bucks, Cambs, Cornwall, Devon, Dorset, Hants, Huntingdon, Kent, Lincoln, Norfolk, Somerset, Sussex, Wilts, seem to have suffered seriously. Arthur Young's returns, which I have noticed, came chiefly from the same counties as mine, but six counties are represented among them which have supplied me with no information. Incidentally, I gather from these that in 1804, parts of Suffolk, Surrey, Gloucester, Worcester, Stafford, Monmouth, and the West Riding of York, were sufferers from mildew. In my returns the worst accounts from districts outside of the Fen country come from the neighbourhood of Hythe in Kent, Hampshire, the Downs of Wilts and Berks, the lowlands of Somerset, from North Devon, North Cornwall, and the Wolds of Lincolnshire. It would seem that, next to low-lying lands, those of great elevation and exposed situation suffer most; while the slightly elevated lands are the happy medium. Now, undoubtedly mists and a saturated atmosphere, the conditions under which the mildew spores germinate freely, are more common in the vales and on the heights than in the middle zone between the two; and the fact of mildew being more felt in these situations may seem to support Mr. Carruthers's conclusion that it depends entirely upon the atmospheric condition at the time when the spores are in the air, to determine whether a crop shall be destroyed or escape; but this would be a hasty generalisation, and it will, I think, appear clear hereafter that there are other predisposing causes than this liability to moist and misty atmosphere.

II. *Years of Mildew.*—I have stated at page 636, that certain years within my recollection were years of mildew in the Fen country. My correspondents specify as a rule only very recent years; but Mr. Attwater (No. 78) speaks of 1839, 1864, 1865, 1866, as bad years in Wilts. Mr. T. Duckham, M.P. (No. 42), mentions 1867 and 1877–1881 as years of serious injury in Herefordshire. A. Young instances 1780, 1781, 1782, as years of fatal mildew in Suffolk. And in 1804 the visitation was so remarkable as to induce him to issue the circular to which I have referred. Sir Joseph Banks * mentions 1797 and 1800 as years of blight. During the last 45 years the following seem to have been those of mildew more or less :—

									1839
1840	1841	....	....	....	1845	....	....	1848	1849
1850	....	1852	1853	....	1855	....	....	....	1859
1860	....	....	....	....	1865	....	....	....	....
....	1871	....	....	....	1875	....	1877	....	1879
1880	1881								

It would almost seem from these notices that there is a tendency towards a repetition of the mildew year after year until the disease has spent its force—this tendency being arrested by exceptionally fine and favourable seasons; and this would well agree with Mr. Plowright's theory of reproduction of Uredo without the aid of the barberry-tree. But probably a closer examination of the meteorological phenomena of the years in question than I am able to give, might afford some clue to the solution of the problem. I shall have some further remarks to make on this point under heading V.

III. *Conditions under which Mildew is developed to a great or injurious degree.*—This heading really includes all those which follow, and must be considered hereafter.

V. *Climate.*—Upon this point the only replies which I have received refer to spring frosts, heavy rain-fall, and violent changes of temperature, as encouraging mildew. Young's correspondents appear to have attached great importance to spring frosts; and certainly in the Fen country popular opinion supports the view that crops which are cut by late frosts are much more susceptible of mildew than those which have, from some cause or other, withstood these frosts. I remember that in 1865 some fields in my own neighbourhood which were cut down to the ground by a frost which occurred about the 1st of May, were those which suffered most from mildew. Although the quantity of rainfall must be considered an important feature in the problem, it does not seem that the prevalence of mildew is consequent on excessive rainfall so much as on rain after hot weather. In 1850 I remember my father's foreman attributing the mildew to hot rains, which he said "scalded the wheat." In 1852 we had very hot weather, and frequent thunder-storms with heavy showers. 1860 and 1879 were wet and cold years, and mildew

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* 'Annals of Agriculture,' vol. xliii.

was much less conspicuous than in 1852 or 1881. In the last-named year we had, from the 3rd of July to the 5th, warm days, the last of these days being remarkably hot; on the night of the 5th we had a thunder-storm with heavy rain, and the temperature dropped at Cambridge from 89° in the shade in the day on the 5th, to 46° at night on the 6th.* On the 16th, mildew was observed on some cottage allotments in this parish; and on the 18th, as I have stated previously, I found it everywhere on my farm. Now I believe that 11 days are supposed to be about the time that it takes for the development of the disease after it has entered the wheat-plant; and there can be little doubt that the mischief was done in the course of a few hours on the 5th, 6th, or 7th of the month.

6. *Soil:* 7. *Previous Cultivation.*—It will, I think, be convenient to consider the influence of soil, cultivation, and manuring under one heading, as it is not necessary for the purposes of our inquiry to distinguish between the natural and acquired fertility of the land; between the "inherent capabilities" of the soil and that "condition" which may be the result of good management. Probably there is no point in connection with mildew on which farmers would be found so unanimous in opinion as that (1) certain descriptions of soil are, in the districts which have come under their observation, more liable to attacks of this disease than others; or (2) that a particular course of husbandry, or a particular application of manures, does promote the disease. It will be worth while, then, to inquire whether there is any general agreement as to the description of soil, the previous crop, and the system of manuring which is believed to develop bad attacks of mildew, and if so, to proceed to inquire whether the opinion has any scientific basis.

Soils.—And first as to soil. In the fen country, which I have so often named as very subject to mildew, there are four different classes of soil, known locally as (1) strong, (2) silt, (3) skirt, (4) black fen. Of course, this classification is only a rough one. Some fields contain a mixture of two or three classes, and there are many gradations of texture and tenacity. The "strong land" is an alluvial clay, which does not compare in its stiffness with the soil of some of the Midland counties, but it is adhesive enough, and difficult to work in wet seasons. The "silt" has a considerable proportion of soft and fine sand; it is easily worked, and retains moisture. The "skirt" land is a mixture of the peat fen soil, with alluvial clay and silt deposited by the tide. The fen land is, in its original state, almost entirely vegetable mould or peat, but the character of it has been almost univer-

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* 'Meteorologica' Office Daily Weather Reports.'

sally modified by the application of large dressings of the underlying clay. As a rule it will be found that of these four descriptions of soil the strong land suffers least, the "silt" and "skirt" land about equally, and the pure peat lands most of all; but that where these peat lands have been recently clayed, they are much more healthy and less subject to mildew than they were, and even less so than the "silt" and "skirt" lands are. In 1881 the comparative immunity from this disease of the strong lands in Marsh-land (Norfolk) was very marked in degree, and that these soils are far less frequently subject to very serious injury than the lighter loams and silt is notorious. Now no theory of altitude, or climate, or humidity of atmosphere can account for the difference which undoubtedly exists. Is it not probable that the cause is to be sought for either in the chemical constitution of the soil or its mechanical condition. Referring to the answers which I have received, I find that a very considerable proportion of those correspondents who specify the soil on which their crops have been mildewed, describe them as clay, loam, alluvial, or strong lands; while peat, vegetable mould, and fen soils come next in order; gravelly and light soils being represented by few examples.* Now it would not be fair to take these replies as representative of the whole country, or to press them as conclusive evidence; but taking them for what they are worth, they do show a remarkable preponderance of opinion in one direction. It may seem at first sight that they tell against the former statement as to the strong lands in the fen country; but it must be remembered that the fen and peat soils form a very small proportion of the country, and that they may suffer more than the strong lands, though represented by fewer correspondents; and further, that though they are light lands they differ greatly from most of those soils which are usually described by that epithet. If we turn now to A. Young's collection of opinions, we shall find a considerable number of them in accord with those which I have collected. It may, I think, then be stated that mildew appears to be much more prevalent on peat and clay soils than on gravel and light lands.

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* Classified Summary of replies as to Soils:—

	Soils on which frequent attacks are reported.		Soils on which occasional attacks are reported.
Loam, clay, alluvial, or strong soils	17 replies	....	8 replies.
Peat, vegetable mould, fen soils ..	5 ,,	....	1 ,,
Gravel	1 ,,	....	1 ,,
Light soils	1 ,,	....	2 ,,
	24 ,,	....	12 ,,

Drainage.—It is curious to find that only three of my correspondents attribute mildew to want of drainage, but it is certain that the strong lands of Marsh-land, which I have spoken of as fortunate in 1881 and other years, lie in a district which is not well drained—and indeed instances have come under my own notice, within a few miles of my own farm, where wet and cold lands have escaped when better drained lands suffered.

Condition.—On this point there is not much direct testimony; but, as will be seen when we come to consider the question of manures, there is much indirect evidence to the effect that good farming and high condition tend to increase the disease. Mr. Smith Woolley, whose experience in the survey of farms is very large, says expressly, "On lands liable to mildew I think high farming rather promotes the evil than otherwise;"[*] and others[†] express a similar opinion. Only one correspondent is of opinion that foul and infertile land is most affected.[‡]

The mechanical condition of the soil has not been the subject of remark except by one gentleman, who attributes mildew entirely to the effect of frost loosening the soil and exposing the root.[§] There is no doubt that wheat on a soil not properly consolidated has a tendency to become lodged, and such crops are for obvious reasons much more likely to be attacked than those which stand up.

Previous Crops.—On this point there is a remarkable consensus of opinion as to the prevalence of mildew in wheat sown after clover, no fewer than twenty-one of my correspondents having specified this crop as one which appears to favour the disease, or as having preceded a particular crop which was much injured. Six more name seeds or grass ley as associated with mildew, and three speak of fresh broken up pasture as peculiarly dangerous. One of the latter writes from Marsh-land in Norfolk, and the other from the borders of the Romney Marsh, a somewhat similar district. In both districts a considerable quantity of old pasture was broken up in bygone years. Mr. Rigden, of Lyminge, says, "Mildew has been developed to such an extent on fresh broken-up bottom pastures that corn is only very

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[*] No. 68, p. 680.

[†] See Nos. 15, 35; pp. 667 and 671.

[‡] See No. 49, p. 674. In 1881 a well-known agricultural correspondent of the newspapers came down to Wisbech to inquire as to the alleged injury done by mildew. He told me that he had quite made up his mind that the disease was caused by bad farming, and that it was only found in foul crops. I had the pleasure of introducing this gentleman to some of the best farmers in the neighbourhood, and he had an opportunity of testing his theory by actual inspection of the wheat crops of one of our best farmers. Whether he changed his opinion or not I do not know, but I do know that it would be difficult to find better farming or cleaner crops than he saw; and they were as bad instances of mildew as were ever seen.

[§] No. 40, pp. 672-3.

sparingly attempted for the first six or seven years. . . . Stale ploughed land is less liable than fresh broken-up land."*

There is a curious difference of opinion as to whether mown or fed clovers are most connected with mildew. Mr. Beadel, of Essex,† is confident that where sheep have been folded heavily upon clover there has been a comparative absence of mildew. On the other hand, Mr. Cranfield, of Hunts,‡ says, "Generally the wheat that mildews worst is after clover fed off bare in the summer." Again, though two bad cases are reported as having occurred after a crop of oats, there are several instances where this crop is spoken of as diminishing the liability, one gentleman going so far as to say, "I never saw it in wheat after oats;"§ and another, "We never see a trace of the disease after oats." In my own neighbourhood we have been accustomed to consider wheat after oats or mangolds pretty safe; but I am bound to say that in 1881, on my farm and the adjoining one, the worst mildewed crops were grown after oats; and the next worst on my farm was after mangolds. The mangolds were, however, grown after a crop of rape, and the wheat after oats in a field which I have always found peculiarly subject to mildew.

It may be noted that in one case,‖ where mangolds and cabbages preceded wheat, there had been an application of decorticated cotton-cake as manure. It is not necessary to notice further the crops which are associated with mildew. Probably if we could know all the circumstances of each case we should understand better how it happens that occasionally a crop which is thought a safe one is attacked by mildew.

Before proceeding to the next branch of my subject I must

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* No. 54, p. 676.

ANALYSIS OF REPLIES.

Name of Preceding Crop mentioned in connection with attacks of Mildew.	Reference to Replies.
	See Nos.
Clover	2, 5, 6, 7, 9, 10, 13, 14, 19, 20, 26, 38, 42, 45, 51, 55, 58, 60, 66, 69, 84.
Seeds, Ley, &c.	8, 23, 31, 39, 59, 72.
Fresh-broken Pasture ..	43, 54, 64.
Tares	60.
Beans or Peas	14, 37, 60.
Oats	16, 17.
Brank	11.
Potatoes	17, 60.
Mangolds	21, 28, 37.
Cabbages	27.
Rape or Turnips	60, 71, 73, 83.
Fallows	60, 64.

† No. 37, pp. 671–2.

‡ No. 45, p. 674.

‖ No. 28, pp. 669–70.

§ No. 64, pp. 678–9.

point out that the views of Arthur Young's correspondents given in answer to his question, "Have crops on fallows or layers escaped best?" may seem at first sight at variance with those which I have collected, since a majority reply that "layers escape best;" but it must be remembered that this is only as compared with wheat after fallows; that the layers spoken of were generally mixed seeds laid down for two or three years, and that at the present time only a very small proportion of the wheat crop is sown after fallows, so that the experience of the present generation as to wheats grown under such conditions is small.

Manures.—I pass on to notice the opinions which have been expressed as to effect of the application of different kinds of manures.[*] Seven correspondents connect mildew with the application of nitrate of soda, two with nitrogenous manures, one with ammoniacal manures, one suffered after woollen rags, another after soot, another after rape-cake. In six replies farmyard manure is said to have been used. The effect of the whole of the replies is that where a crop has been stimulated and forced into luxuriant growth it is more liable to fatal injury by mildew. There are one or two bits of evidence in favour of the application of marl, clay, and sea-sand, which are well worth notice.[†]

I have now placed before the readers of this 'Journal' the opinions of practical men as to the influence of soil, cultivation, and manures in promoting mildew; and I have shown that, though there is considerable difference on minor points, there is a substantial agreement that rich land and land in a high state of cultivation are peculiarly susceptible of disease. It is true that some descriptions of light land contest with clay and loam the pre-eminence, and this circumstance may very well lead us to doubt whether mechanical condition, solidity, texture, or even the

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Manures applied to Mildewed Crops, or believed to promote the Disease.	Reference to Replies.
	See Nos.
Nitrate of Soda	8, 26, 72, 77, 78, 79, 80.
Nitrogenous Manures	1, 61.
Ammoniacal Manures	69.
Woollen rags	5.
Soot..	2.
Rape-cake	51.
Decorticated Cotton-cake ..	28.
Heavy folding	54.
Excessive manuring	34, 81.
Farmyard manure..	6, 7, 13, 23, 30, 39.
Artificial manure	18, 52, 54, 62.
Liquid manure	20.

[†] See Nos. 23, 62, 65; pp. 669, 678, 679.

consistency of the soil, are as important as the chemical constitution of it, whether natural or artificial. At this point it will be desirable to inquire whether the popular opinion which I have recorded has any scientific basis. I am fortunate enough to have communications from two recognised authorities to lay before my readers, which, if they are not absolutely in accord in detail, are thoroughly in support of the idea that the chemical constituents of the soil have an important effect in promoting and encouraging attacks of mildew. The first of these is from Sir J. B. Lawes, Bart., who writes to me as follows:—

"Rothamsted, St. Albans, Nov. 22, 1882.

"DEAR MR. LITTLE,

"Upon reading over your questions respecting mildew, I felt really so ashamed of myself for having so little to say upon the subject, that I kept your circular before me, hoping that I might have something to say on the subject. Your letter, however, puts a question to me upon which I have a very decided opinion, although I am bound to say that it has reference to diseases of all sorts which attack our crops, and not in reference to mildew alone. I consider that plants are liable to be attacked by fungi, parasites, insects, &c., in proportion as the soil is deficient in available mineral food. I happened to pass through the fen district in the summer of 1881, and I particularly noticed the dreadful state of the wheat in that district; and as my own wheat, although not a good crop, had not suffered from mildew, I was anxious to know whether the season in that district possessed any special character differing from my own. According to my view, fen-land wheat should be specially liable to mildew, as the balance of the soil constituents is organic and not mineral. Ordinary arable land, such as mine, contains about 97 per cent. of mineral matter and 3 per cent. of vegetable substance · some of the fen land must have these proportions almost reversed. It is quite possible that when the climate favours mildew it will prevail more or less, but that the extent to which it will prevail will greatly depend upon the relation between the mineral and organic matter in the soil; and I should be disposed to say that the greater the amount of available mineral matter (potash, lime, silica, phosphate) at the disposal of the plant, the greater would be its power of resistance. I have taken out from our wheat experiments two experiments, on one of which only mineral manures were used, and on the other only ammonia. You will observe that the crop receiving ammonia is generally the larger, which means that the crop is more capable of finding minerals in the soil than ammonia. You will see, however, that the weight of the bushel is generally lower where ammonia is used, and that the proportion of offal corn to dressed corn, which is a measure of disease of all sorts, is very high in the ammonia plots.

"Yours truly,
"J. B. LAWES."

The table showing the results of the experiments to which Sir J. B. Lawes refers in the preceding letter is given in an Appendix to this Report.* It will be sufficient if I give in this place the average results of the thirty-one years, and some of the extraordinary variations from this average.

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* App. V., p. 690.

	Dressed Corn in Bushels.		Weight per Bushel Dressed Corn.		Percentage of Offal Corn to 100 Dressed Corn.	
	Plot 5.*	Plot 10 A.*	Plot 5.*	Plot 10 A.*	Plot 5.	Plot 10 A.
Average of 31 years, 1852–1882 .. .	15·0	20·5	58·6	56·8	6·9	11·7
Bad years—						
1853	10·0	10·0	49·0	49·0	21·0	33·0
1859	20·5	18·75	56·0	51·5	10·5	23·5
1860	15·5	15·0	54·0	49·5	6·5	20·5
1861	15·25	12·75	59·0	55·0	14·75	20·5
1871	12·0	10·00	56·5	53·75	15·0	24·0
1879	5·5	3·75	54·0	49·0	27·0	41·0
Good years—						
1854	24·1	34·1	61·0	60·75	5·0	6·5
1857	23·0	29·0	59·0	58·0	4·0	7·5
1863	19·5	39·0	63·0	62·5	3·33	5·5
1864	16·0	32·0	62·0	61·75	4·0	5·5
1868	17·0	25·0	63·0	62·0	0·5	6·75
1874	12·5	25·0	59·0	56·5	3·0	3·5

* Permanent wheat. These plots have been sown with wheat every year.

Plot 5 receives every year potash, soda, magnesia, and superphosphate, but no ammonia.

Plot 10 A receives salts of ammonia alone.

In a second letter Sir J. B. Lawes enforces what he has said before, and gives some particulars of other plots which had been "well and judiciously manured," and states distinctly that the remarkable variations in the proportion of offal corn which his figures show "cannot be accidental," and he adds, "we know that in bad seasons the best crops are attacked with mildew if that be the prevailing disease."

"Rothamsted, St. Albans, Nov. 24, 1882.

"DEAR MR. LITTLE,

"I sent to you on Wednesday the results of growing wheat on land which had received nothing but salts of ammonia for thirty years, and I pointed out that the amount of offal corn was to a certain degree the result of mildew, or disease of some sort. Plot A, the experiment referred to, received in 1844 a liberal dressing of potash, soda, magnesia, and superphosphate of lime, since which time it has received salts of ammonia alone. 10 B, next to it, received the same mineral manure in 1844, and then mineral dressings were repeated in 1845 and 1850; both experiments have received exactly the same amount of salts of ammonia every year; one received minerals in 1844, the other minerals in 1844, 1848, and 1850. If you will refer to my records of crops you will find that 1853 and 1860 were notoriously bad, and the wheat very much blighted with mildew. On referring to my table for these two years I find that the proportion of offal to 100 dressed corn was, in 1853, 10 A, 33; 10 B, 16½; in 1860, 10 A, 20½; 10 B, 11½. Such results cannot be accidental. We learn that in bad seasons the best crops are attacked with mildew if that is the prevailing disease, but the power of resistance to disease is greatly affected by the condition of the soil. In both the years referred to the proportion of offal corn to 100 dressed in the same field, did not exceed four and seven, but in these cases the land was well and judiciously manured. Plants are very much like ourselves, their power to escape disease, and to struggle against it when attacked, depend very much upon their state of health.

"Yours truly,
"J. B. Lawes."

I have now to present some very important communications which I have received from Dr. Voelcker. The first is as follows:—

"Royal Agricultural Society of England,
"Laboratory, 12, Hanover Square, London, W.
"Nov. 22, 1882.

"Dear Mr. Little,

"I believe the soil has a great deal to do with mildew. Only about a fortnight ago I sent a report to Mr. John Oxley, Stowe, Buckingham, who sent me a soil upon which his wheat (and also beans) became more or less blighted during the last six or seven years.

"He grew plenty, but not good healthy straw, but at a certain stage it got blighted, and the corn was miserable.

"The composition of the soil is so instructive that I give it to you. If you should make public use of it I should require to ask Mr. Oxley's permission.

"The soil in a perfectly dry state contains in 100 parts:—

*Organic matter and combined water	12·97
Oxide of iron	6·50
Alumina	9·03
Carbonate of lime	1·07
Sulphate of lime	·51
Magnesia	·56
Potash	1·07
Soda	·18
Phosphoric acid	·10
Insoluble silicates	68·01
	100·00
* Containing nitrogen	·45
Equal to ammonia	·55

"The soil was a very stiff clay soil, resting on a nasty yellow-coloured still stiffer clay subsoil, which unfortunately came to within four inches to the surface.

"I give you an abstract of my Report:—

"'Your soil is unusually rich in nitrogenous organic matters, and it also contains more potash than most clay soils, which accounts fully for the fact that your wheat and beans got blighted, and made lots of straw and haulm in wet and cold seasons like those we have had for the last six or seven years. On the other hand, your soil is very deficient in *phosphoric acid*, and not over rich in lime.'

"This is a very instructive case, for it confirms the frequent observations which I have made in various parts of England, namely, that an excess of available nitrogenous food (be it nitrate of soda, ammonia salts, or organic matters which are readily decomposed in the soil) appears to me to have a decided tendency to cause mildew in wheat. On the other hand, phosphate of lime, of which there always is a considerable residue in the land when a crop of mangolds is heavily manured with bone-manures or guano, as is now almost invariably the case, has a tendency to produce early maturity.

"I do not know any crop which exhausts the land as much of available nitrogen as a crop of mangolds, or, speaking generally, a root-crop. On the other hand, a good crop of clover leaves on the land an enormous quantity of nitrogenous food, as you will see if you turn to my paper in the 'Journal' on "Clover as a preparatory crop for Wheat." I have a very strong conviction that an excess of nitrogenous food in the soil as manure renders wheat liable to the attack of mildew; for I know as a fact that an excess of nitrogenous food retards in a marvellous manner the ripening of corn crops, and is in all very warm seasons, or in hot climates, but most objectionable in cold soils, and cold and wet seasons, and because the nitrogenous food, as we all know, at first causes great luxuriance of growth, especially if the early part of summer is warm and promising, and the weather then suddenly changes and turns cold and wet.

"Of course the mischief done by an excess of nitrogenous food in the soil is greater on a cold clay soil than on a lighter and naturally warmer and naturally well-drained soil. However, even on our light Woburn land I have noticed for several years that the plots which were manured with a heavy dose of nitrate of soda, or with ammonia salts, were more blighted than others manured with less nitrate or ammonia salts.

"My impression is that a sudden check, by cold or continued wet weather, has a decided tendency to favour the attack of mildew in wheat, and that this tendency is greater in highly manured land than in poorer soils, or at all events on land which is manured with too much nitrogenous food, or on land naturally rich in such food.

"Believe me, dear Mr. Little,
"Yours faithfully,
"AUGUSTUS VOELCKER."

This direct confirmation of the suspicion that certain soils were peculiarly liable to mildew, and that under a particular treatment that liability was greatly increased, seems to me to be very notable. In order to ascertain whether the soils with which I have to do were similar to the Bucks soil, of which Dr. Voelcker has written in the preceding letter, I sent him four samples of soil from my own farm, representing four different classes of soil which are found in this neighbourhood. With the permission of the Chemical Committee of the Society, these were analysed, and the result communicated to me for the purpose of this paper. A few words as to the agricultural characteristics of these soils may be necessary before Dr. Voelcker's analysis is examined.

No. 1 represents the *medium strong soil* of this district. Like nearly all the soil on my farm, it has been deposited by the tide. It is not nearly so tough and heavy as much of the Marshland district, and it can generally be ploughed with two horses.

No. 2 represents another and lighter alluvial deposit, in which a soft sand is present in sufficient quantity to make the land work freely in almost all seasons. This description of land is known locally as "silt."

Table showing the Previous Cropping of the Land from which Samples of Soil were taken for Analysis.

	1879.	1880.	1881.	1882.	1883.
No. **1** from 34 acres. A field which has very often had mildew.	Beans. Farmyard-manure applied in previous winter. Land constantly horse-hoed during the wet summer, and land much poached.	Oats Black Tartary. Wheat had been sown, but it never came up. After oats farmyard manure applied.	Wheat. Scholey's Square Head, sown November 10–12. Put in badly. Mildewed, but less injured than most of my wheat; yield 27 bush. of 55 lbs.	Fallow. Steam cultivated and worked; sown with white mustard, which was fed off in the autumn.	Wheat.
No. **2** from 11 acres. A field which often suffers, and in 1881 was the worst of anything on the farm. In 1863 this field produced the best crop of wheat I ever grew.	Mangold. Farmyard - manure, and about 3 cwt. superphosphate.	Oats.	Wheat. Velvet chaffed white seed from East Kent, sown November 8, well put in, very promising crop until July 18; yield 20 bush. of 53½ lbs.	Clover. Manured in autumn for wheat.	Wheat.
No. **3** from 18 acres. Skirt land	Rape. 2 cwt. of superphosphate at time of sowing; fed off by sheep eating cake. Farmyard manure applied in the winter.	Oats. A heavy crop ..	Wheat. Nursery, seed from Norfolk, sown well Oct. 15. Mildewed, but not very seriously; yield 36 bush. of 58 lbs.	Clover.	Wheat.
No. **4** from 9 acres. Dilands very subject to mildew.	Wheat.	Rape. Fed off	Oats. Farmyard - manure for wheat.	Wheat	Beans. 2 cwt. of Kainit applied at time of sowing.

No. 3 is a mixed soil on the lower part of the farm, where the tidal deposit on the top of the peat is thinner. As you pass from the sea inland you traverse first the marsh-land, which may be of the character of No. 1 or No. 2, and next the fen land. On the border-line of these two distinct soils you find a mixed soil which is known locally as "skirty" or "skirt" land, and the sample No. 3 represents this description of soil.

No. 4 is a more exceptional soil. It is taken from the bed of one of the old water-courses which traverse my farm and the district. These runs are called "dilands." The corn growing on them presents a very marked and distinct appearance in the spring, when ribands of dark green hue contrast themselves with the lighter green of a healthy crop. In cold and dry seasons the corn on these "dilands" will often stand six inches higher than that on the remainder of the field. Later on in the summer the crop on them is almost sure to lodge, and if there is any mildew about, these are the spots where it will certainly appear.

It will be seen, then, that Nos. 1, 2, 3, represent considerable tracts, while No. 4 is a peculiar soil limited in its area. The cropping and manuring of the fields from whence these samples were taken are shown on page 657.

"Royal Agricultural Society of England,
"Laboratory, 12, Hanover Square, London, W.,
"July 26th, 1883.

"My dear Sir,

"I have now the pleasure of reporting to you the results which I obtained by careful and complete analysis of the four Cambridgeshire soils which you sent me some time ago, and upon which I understand you to say mildew more or less prevails.

"The soils were labelled as follows:—

"No. 1. Medium strong soil of the district.

"No. 2. Lighter soil (called locally, silt).

"No. 3. Mixed soil skirting the fen (called locally, skirty).

"No. 4. Soil from the channel of an old water-course. These runs ('dilands' locally) you inform me are very common in your district, which consist of alluvial tidal deposits on the top of peat.

"Fair average samples of the soils were prepared from slices taken down to a depth of twelve inches from the surface, and, after complete drying at 212° F., fully analysed in a perfectly dry state, when the results shown in the Table (p. 659) were obtained.

"No. 1 is a dark-brown coloured alluvial clay-soil, rather stiff, showing streaks or veins of oxide of iron, and thin layers of fine sand or silt.

"No. 2 is a lighter soil, containing more fine sand than No. 1; colour dark brown. On the whole it resembles much No. 1 in general appearance, and also in composition.

"No. 3. The mixed soil skirting the fen (skirty) is a dark-coloured (almost black) alluvial clay deposit, rather stiff, showing patches of blue clay here and there, especially in the subsoil, and streaks of oxide of iron.

"No. 4. Is a dark chocolate-brown coloured soil, rather lighter than No. 3, and containing more organic matter (peaty matter) than No. 3.

RESULTS of the ANALYSES of the SOILS DRIED at 212° FAHR.

	No. 1.	No. 2.	No. 3.	No. 4.
	Medium Strong Land.	Light Soil (Silt).	Soil Skirting the Fen (Skirty).	Dilands.
*Organic matter and water of combination	5·65	6·38	13·50	15·23
Oxide of iron	4·53	2·91	5·31	4·03
Alumina	8·13	5·12	8·52	5·50
Sulphate of lime	·25	·22	·69	·59
Carbonate of lime	4·67	2·01	1·80	3·99
Magnesia	·50	·23	·50	·26
Potash	·68	·50	·81	·52
Soda	·11	·05	·04	·07
Phosphoric acid	·18	·15	·23	·25
Insoluble silicates and sand ..	75·30	82·43	68·60	69·56
	100·00	100·00	100·00	100·00
* Containing nitrogen ..	·19	·26	·58	·69
Equal to ammonia	·23	·32	·70	·84

"All four soils are richer in nitrogen than most arable soils, and No. 3 and No. 4 are immensely rich in nitrogenous organic matter.

"No. 3 you will notice contains over ½ of a per cent. of nitrogen, and No. 4 in round numbers $\frac{7}{10}$ of a per cent.

"The proportions of nitrogen are fully as great, if not greater, than in the richest arable land, as in the celebrated Russian black wheat soils.

"In a good and warm season, the large proportions of nitrogenous organic matter in soils like No. 3 or No. 4, contribute largely to the heavy crops of wheat, which in favourable seasons can be grown on such soils; but in cold wet seasons the excess of nitrogenous matters is a great hindrance to the wheat-crop's ripening properly, as it is well known that over-luxuriance in the flag and straw of the wheat-crop renders it more liable to become attacked by mildew, on a sudden change of temperature or long-continued wet weather.

"Allow me to direct your attention further to the fact that all four soils are rich in potash, which is another constituent which has a tendency to retard the maturity of the grain, and I certainly cannot advise you to use any potash manures on any of these four soils.

"No. 1 and No. 4 you will notice contain from 4 to 4½ per cent. of carbonate of lime, and Nos. 2 and 3 about 2 per cent., and, roughly speaking, none of the soils want any lime, and Nos. 3 and 4 are richer in phosphoric acid than most soils noted for their fertility.

"My impression is that the richness of the soils in nitrogenous matters renders them all more or less liable in cold wet seasons to become attacked by mildew, and all the more so the higher it has been farmed, or the more dung has been applied to the land. It appears to me probable that in bad seasons the wheat on the best land, especially if highly manured, is more liable to suffer from mildew than on soils which are less rich in nitrogenous organic matters; but so much depends on previous cropping and manuring that the experience of one year on the four different soils which I analyzed for you, may be entirely reversed by that of another season. As I have not an intimate knowledge of the previous agricultural history and physical properties of these soils, I dare not venture to express an opinion as to which of the four is most liable to be attacked by mildew.

"If I may be allowed to hazard any opinion, I should say on No. 2 wheat is more likely to suffer from mildew than on No. 1; and on No. 3 soil more than on No. 4.

"Of one thing I feel pretty confident, and that is that dung, nitrate of soda, soot, and sulphate of ammonia, in cold and wet seasons, are likely to do more harm than good to the wheat-crop on your fen-land, especially on land so rich in nitrogen as the soils marked No. 3 and No. 4.

"Soils like No. 3 and No. 4 are so rich in organic fertilizing constituents, that they do not want any manure. The only manure which may safely, and I believe with advantage, be used in cold and wet seasons on these soils, is mineral superphosphate, applied at the rate of about three cwt. per acre, before or at the time of drilling in the wheat. Superphosphate promotes early maturity, and may be useful in checking the attacks of mildew.

"Yours faithfully,
"AUG. VOELCKER."

"W. Little, Esq., Stags Holt, March."

These analyses are so fully explained by Dr. Voelcker that they require very little comment from me. The richness of these soils has for some years past shown itself only by the production of straw. The explanation which Dr. Voelcker gives of the action of nitrogenous organic matter and of potash in retarding the ripening of corn throws an entirely new light on the subject; and the adoption of the farmers' opinion, that whatever tends to produce over-luxuriance of flag and straw renders the crop more liable to mildew, gives that opinion a scientific basis and support. It is true that Sir J. B. Lawes and Dr. Voelcker do not quite agree about the effect of potash, but in the main their views are the same; a deficiency of mineral matter means the same thing I suppose as an excess of organic matter, and both of these authorities attribute the liability of certain districts to mildew to this cause.

Description of Wheat grown.—In the inquiries which I made I was rather anxious to ascertain whether any sort of wheat was believed to be disease-proof, or more capable of resisting mildew than others. It is well known that one of the old-established wheats in the Fen country, a red wheat with white chaff, is called (or was more frequently called a few years ago) the "anti-mildew" wheat. That it does mildew there is no doubt, but it is popularly supposed to have a greater power in resisting disease than any other sort. Rivett's, or cone wheat, a stiff-strawed, bearded variety, seems to be very rarely attacked; on the other hand, Talavera wheat is generally supposed to be peculiarly susceptible, and the Velvet Chaffed, or Rough Chaffed, or Hoary White, is in this district thought a dangerous wheat, particularly if sown after clover. I remember that in 1859 I had a portion of a field (that from which No. 1 soil was taken) sown after clover with this wheat, and the remainder of the field was sown with Browick red. The white wheat was very much mildewed, while the red was not much injured. On my remarking that this was the case, an experienced farmer said to me, "It serves you right, you ought to have known better than to sow that sort of wheat after clover." He himself was a large grower of this wheat, but he never sowed it after clover, and I never did again. The following notes from my replies will give the opinions which were expressed:—

Descriptions of Wheat attacked by Mildew or reported as most susceptible.		Descriptions of Wheat reported as least liable to Mildew.	
	See Nos.		See Nos.
Scholey's Square Head	10, 20, 21, 49, 60, 66, 82.		
Golden Drop	41, 49.	Rivett's	21.
Nursery	11, 73.		
The finer sorts	8.	Lenny's White ..	38.
White[*]	20, 31.		
White (excepting Stand-up and Red Chaff White)	60.	Browick	43.
Stand-up White	17.	Stand-up	60.
Talavera	5.	Red Chaff White ..	60.
Rough Chaff, Essex Rough Chaff, Hoary White, or Velvet ear ..	41, 49, 54, 58.		
Fenton's White	39.		
Essex White	71, 72.		

From these replies it would seem that Scholey's Square-head, a rather favourite wheat on rich loams, has an unenviable reputation; with me, however, it has certainly suffered less than white wheats.

Referring to A. Young's collection of opinions, it will be seen that it was believed very generally that white wheat suffered more than red, and that bearded wheat and Rivett's escaped the best. Does it not seem probable that the constitution of some sorts may be more vigorous and the power of resisting disease greater than in other sorts?

Time of Sowing and date of Harvest.—There is much evidence in favour of early-sown and early-matured crops. Over and over again one reads the same words, "late crops are most liable;" and one correspondent reports of a farm,[†] that it had the reputation of growing mildewed corn, and nothing else, but the present occupier having adopted early sowing has suf-

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[*] I don't know whether Shakespeare will be admitted as a credible witness to the peculiar liability of *white* wheat to mildew; but he certainly makes one of his characters assert that "the foul fiend 'Flibbertigibbet' mildows tho *white* wheat."—*King Lear*, iv. 3.

[†] See No. 57, p. 676.

fered no serious loss. Of course, early sowing does not necessarily lead to an early harvest, the date of that being determined by the character of the season; but as a rule the last sown wheats ripen latest, and as a rule they mildew most; but here, again, there are exceptions, and it sometimes happens that late wheats escape when others suffer. In 1881 a good deal of spring wheat (the bearded variety), sown in April, entirely escaped mildew.

Probably most farmers, if asked whether mildew years were generally late harvest years, would answer yes. And such is the case, but it is not always so. I have been favoured by Mr. Exley, of Wisbech, with a record which he and his father have kept of the date of the first appearance of wheat-ears in the neighbourhood of Wisbech, and the date of the general commencement of harvest, and it is contained in Appendix VI. From this it will appear that the average date for the commencement of harvest is August 10–11, and the average number of days intervening between the first peeping of ears and the beginning of harvest is sixty. Now, if we characterise those harvests which began 7 days before the average period *early*, and those which began 14 days before the average period *very early*, and distinguish *late* and *very late* harvests in a similar way, we shall find that out of 20 years when mildew prevailed more or less in the district within which this record was made, four (1848, 1859, 1865, 1872) will fall in the "*early*" class and four (1855, 1860, 1879, 1880) in the "*late*" class, while the remaining years are in no way exceptional. Or, to apply a simpler test, it will be seen that in 10 years of mildew, harvest began before the average date, 4 at about that time, and 6 only after that time. If, again, we examine the period which elapsed between "earing and shearing," we shall not find any such decided difference as we should perhaps expect between mildew and other years. Of the 20 mildew years 8 matured in less than the average time (60 days), 11 required more than that time.

Quantity of Seed Sown and Character of Crop Produced: Flowering Period.—Thin-sown crops, and those which from any cause have become thin, are said to be more liable to mildew than those which are fairly and regularly planted. It is well known that on good land, or even ordinary land in good condition, a thin plant, and one which gathers or stools out is characterised by gross and luxuriant growth, and these are the crops which by general consent are most mildewed.*

Upon the other branches of the subject, such as the date of

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* See replies, Nos. 1, 2, 3, 6, 7, 8, 9, 10, 15, 16, 17, 18, 20, 31, 33, 35, 42, 43, 44, 55, 58, 59, 60, 64, 65, 67, 68, 69, 71, 73, 77, 79, 80, 81, 82, 83, 84, in Appendix II., pp. 665–684.

first observation of the disease, I have no further information, and I must conclude this paper, which has already exceeded its fair limits, by a few general observations on the results of the inquiry.

1. It would appear that seasons are the chief cause of mildew, and that sudden changes of temperature and rain, accompanied with close still weather, are favourable to the spread of the disease.

2. That low-lying rich soils are most subject to attack.

3. That high farming and too generous manuring, particularly with nitrogenous manures, promote mildew.

4. That early sowing is desirable on all lands subject to mildew.

5. That a thin and gathering crop runs more risk of the disease than an evenly planted crop.

6. That while no description of wheat is proof against disease, red wheats are generally less injured by it than white wheats.

There are some points on which further inquiry seems desirable, and amongst these I would particularly urge that observations should be made as to the relative amount of evaporation from soils of different descriptions. While I have been most anxious to prove that atmospheric conditions are not the sole governing cause of mildew, I must not be supposed to deny for one moment that a condition of humidity and saturation of the air is required to develop the disease. It may be that upon this depends some of the difference between soils which are similarly situated and farmed in the same manner; and that a gross and luxuriant growth may occur here without inducing mildew, while there a similar crop, growing on land which rapidly cools the lower stratum of air and thus produces mist, is fatally injured.

Again, I think that the exact influence of particular chemical constituents on the tissues of the plant is deserving further inquiry.

I have already intimated in the early part of this paper that perhaps we have yet more to learn as to the life-history of the mildew fungus, and I trust that our mycologists will pursue their inquiries with unabated ardour.

Although I have not been successful in elucidating all the facts connected with this mysterious and baneful disease, I trust that I may have been able to collect some information which may be useful to other inquirers.

I have, in conclusion, to offer my very sincere thanks to all those who have assisted me, including the correspondents who favoured me with replies to my inquiries. My thanks are specially due to Mr. H. M. Jenkins, the Secretary of the Society; to Mr. Plowright, to whom I owe most of what I know of the mildew fungus; and also to Dr. Voelcker and Sir John Lawes for their contributions.

APPENDIX I.

MILDEW ON WHEAT.

CIRCULAR OF INQUIRIES.

I. Has your farm, or the locality in which you reside, or any district with which you are well acquainted, been subject to frequent or malignant attacks of Mildew?

II. If so, can you give definite information as to the particular years in which great injury was occasioned by this disease?

III. Under what conditions have you observed that mildew has been developed to a great and injurious degree?

IV. Situation of the Farm.
- (*a*) Elevation.
- (*b*) Open and exposed, or sheltered.
- (*c*) Level or inclined, or undulating.
- (*d*) Aspect.

V. Climate of the District.
- (*a*) Average temperature.
- (*b*) Range of temperature (ordinary).
- (*c*) Remarkable variations of temperature in the particular season of attack.
- (*d*) Rainfall (ordinary and extraordinary).

VI. Soil of the Field.
- (*a*) Description.
- (*b*) Drainage:—natural or artificial, effectual or imperfect.
- (*c*) Condition:—as regards cleanliness, fertility, texture, and solidity.

VII. Previous Cultivation of the Field.
- (*a*) Crops of the two preceding years in order.
- (*b*) Manures:—natural or artificial, and the time of application.

VIII. Description of Wheat Sown.

IX. Time of Sowing.
- (*a*) Date.
- (*b*) Early or late for the district.

X. Seed used.
- (*a*) Quantity sown per acre.
- (*b*) Have you observed any connection between thick or thin sowing and attacks of Mildew?
- (*c*) Whether home-grown or changed.
- (*d*) Whether dressed or not.

XI. Character of Crop produced.
- (*a*) Full or deficient plant.
- (*b*) Development:—Gradual and continuous, or sudden and intermittent.

XII. Flowering Period.
- (*a*) Date:—Early or late for the district.

XIII. Observation of Disease.
- (*a*) Date of first notice.
- (*b*) Whether preceded by rust or not.

XIV. Harvest.
- (*a*) Date:—Early or late for the district.

XV. General Observations.

APPENDIX II.

ABSTRACT of REPLIES received in ANSWER to INQUIRIES as to PREVALENCE of MILDEW, and the CONDITIONS under which it is DEVELOPED.

I. COUNTY.	II. Name and Address of Correspondent.	III. Reply to Queries as to Prevalence of Mildew.	IV. Extracts from Replies to other Questions.
1. **BEDS.** ..	Eve, J. R., *Silsoe,* *Ampthill.*	Yes	Nitrogenous manures assist the disease, which is most prevalent in late summers. Thin and late crops most liable.
2. Do. ..	Street, George, *Maulden,* *Ampthill.*	But seldom ..	Most where wheat has lost plant after clover on light land, and the evil has been increased by the application of soot, which produced a rapid and luxuriant growth.
3. **BERKS.**	Davies, J., *Englefeeld,* *Reading.*	Some farms in the locality are subject to the disease.	Developed under great extremes of temperature and heavy rains. Thin-sown wheat on land in good heart most liable—to be avoided by manuring in the previous winter, and never just before planting, and by early sowing.
4. Do. ..	Druce, A. F. M., *Fyfield,* *Abingdon.*	Never.	
5. Do. ..	Floyd, T., *Frilford,* *Abingdon.*	Not much until 1882.	A piece of Talavera on light sandy soil, lying about 6 feet above the river Ock. The preceding crop was clover, mown once, the aftermath being fed by sheep penned; afterwards 7 cwt. per acre of woollen rags per acre were applied. The wheat was sown Nov. 4th and 5th, and some Red Lammas wheat was sown in the same field a little later. This wheat was not hurt by mildew; and some red corns, which got mixed with the Talavera and grew with it, escaped, while the Talavera was much blighted. Two of my neighbours who grew Talavera, say that it was much more affected last harvest (1882) than other sorts of wheat.
6. Do. ..	Hutchinson, N. G., *Thatcham,* *Newbury.*	Yes, on the lower land in 1875, 1879, 1881.	Soil, loam on peat. In 1879 the crop attacked followed clover, and in 1881 turnips. The clover ley was manured with farm-

ABSTRACT of REPLIES received in ANSWER to INQUIRIES as to PREVALENCE of MILDEW, and the CONDITIONS under which it is DEVELOPED—*continued.*

I. County.	II. Name and Address of Correspondent.	III. Reply to Queries as to Prevalence of Mildew.	IV. Extracts from Replies to other Questions.
6. BERKS.	Hutchinson, N. G., *contd.*		yard-manure immediately before ploughing. The turnips were fed by sheep penned at night after spending the day in the water-meadows — thin tillering crops suffer most.
7. Do. ..	King, J. G., *Beedon, Newbury.*	Farm subject to mildew, great injury in 1879, 1880, 1881.	Strong red flinty soil. Nursery wheat sown after broad clover on which sheep had been folded-and farmyard-manure applied—thin crops most liable.
8. Do. ..	Lanfear, C., *Avington, Hungerford.*	In 1879 great injury, and more or less since 1874.	The high-lying lands most injured (200–300 feet above sea). Soi a thin gravel, with a slight mixture of clay. Wheat usually sown after grass (one year's ley) Natural and artificial manures are applied. *Nitrate of soda makes the plant more liable to mildew than any other manure* Sorts of wheat—Trump, Rough-Chaff, Golden Drop. The finer sorts most subject—thin sowing or defective plant renders the crop more susceptible. Wheat after mangolds, rape, or turnips is seldom blighted. Rain afte dry weather and hot sunshine just at the edge of harvest, invariably produce mildew.
9. BUCKS ..	Fowler, J. K., *Aylesbury.*	My farm occasionally suffers—parts of the vale are subject—particularly during the last 5 years and especially in 1881.	Wheat after clover is more likely to mildew than after other crops *as the plant is often thin.*
10. Do. ..	Treadwell, John, *Upper Winchendon.*	In 1880 I suffered considerably, and in 1881 slightly.	The worst was a piece of Scholey' Square Head after clover—rather a thin plant.
11. CAMBS.	Cook, M., *Little Downham, Ely.*	Not to a great extent, with the excep-	The field in question is partly fe and partly strong "skirt" land The latter is underdrained, an

bstract of Replies received in Answer to Inquiries as to Prevalence of Mildew, and the Conditions under which it is Developed—*continued.*

	I. County.	II. Name and Address of Correspondent.	III. Reply to Queries as to Prevalence of Mildew.	IV. Extracts from Replies to other Questions.
1.	Cambs.	Cook, M., *contd.*	tion of one field in 1881.	there the wheat was good. On the fen land, which is deficient in clay, the corn was "chicken food." The preceding crop was Buckwheat—the wheat Nursery. Farmyard and artificial manure applied.
2.	Do. ..	Egarr, S., *Wryde, Thorney.*	Part of my farm frequently attacked.	Disease developed in a crop growing luxuriantly, and then checked by sudden change of temperature at the flowering period, as in 1881, about the middle of July. Crops on the black soil on gravel most affected—those on strong clay scarcely hurt.
3.	Do. ..	Holben, R., *Barton, Cambridge.*	My farm suffered in 1880 and 1881.	Elevated position, open country, mixed soil, gravel and white clay, part heavy soil on gault. In 1880 the crop was after one year's clover; in 1881, after clover, two years' ley. In both cases yard-manure was applied in 1878; there was a full plant. Late-sown wheats are more prone to mildew, as they are generally more luxuriant.
.	Do. ..	Ivatt, C., *Rampton, Cambridge.*	My farm and the district suffer frequently; 1879, 1880, 1881, bad attacks.	Low-lying level land, heavy with clay subsoil. Wheat sown after beans or clover. Farmyard-manure applied in the preceding winter.
.	Do. ..	Long, H., *Shippey, Ely.*	In 1879, 1881, and in some other years, as 1865, I have suffered.	Low fen land, with a good bed of blue clay 4 or 5 feet below the surface. Thin and late wheat most mildewed; the better the land is farmed the more it is subject to this disease.
.	Do. ..	Martin, Joseph, *Littleport, Ely.*	Occasionally, but never so seriously as in 1881.	Fen and high land both suffered in 1881. The worst piece on fen followed oats; on the high land the worst was after turnips —both were white wheat. The fen crop had gathered, that on the high land was a full plant—as a rule late wheats are most liable.

ABSTRACT of REPLIES received in ANSWER to INQUIRIES as to PREVALENCE o MILDEW, and the CONDITIONS under which it is DEVELOPED—*continued.*

I. COUNTY.	II. Name and Address of Correspondent.	III. Reply to Queries as to Prevalence of Mildew.	IV. Extracts from Replies to other Questions.
17. CAMBS.	Oldham, E., *Wisbech, S. Mary's.*	Frequently, 1881 the worst year.	Rich loam, with silt subsoil slightly elevated above the surrounding land, but low and flat One field, partly after oats an partly after potatoes in 1881 yielded only 4 sacks of 14 stone each. The seed, Stand-up White was sown 2–6 Nov.; it germinated slowly and came up thin tillered well in spring and looke rank before coming into ear. attribute the attack to th heavy rainfall on the 6th July after unusual heat.
18. Do. ..	Robins, G. F., *Isleham.*	All fen lands more or less subject to frequent and malignant attacks. In 1872 partial attacks. 1879, 1880, very general.	Severe attacks invariably in luxuriant crops; thin plant mor liable than thick. Soils restin upon chalk have a greater immunity than those on clay artificial manure more injuriou than farmyard-dung. Squar Head is peculiarly liable t mildew, especially if sown late.
19. Do. ..	Silcock, E. C., *Chettisham, Ely.*	In 1879, 1880, 1881.	Fen land. Badly drained lan most injured; worst crops afte clover; loss from mildew i 1881, 2½ qrs. per acre on th fen lands in this neighbou hood.
20. Do. ..	Toller, I., *Winfold, Waterbeach, Cambridge.*	The fens suffer much, especially in 1880, 1881.	Fine loam. Wheat after rye-gras and clover affected. Whit wheats more liable than red Golden Drop and Spring Re resist disease best; late-sow and thin-gathering crops mo liable. Wheat after clover suffe more than after beans or ry grass. I have noticed milde very prevalent after applicatio of liquid manure.
21. Do. ..	Topham, J., *Thorney.*	In 1879 and 1881.	This district is much more subje to mildew than the uplands Huntingdon and Beds. In 187 wheat after mangolds suffere more than that after oats an seeds. In 1881 Square Head w the worst. Rivett's only slightl

BSTRACT of REPLIES received in ANSWER to INQUIRIES as to PREVALENCE of MILDEW, and the CONDITIONS under which it is DEVELOPED—*continued.*

I. COUNTY.	II. Name and Address of Correspondent.	III. Reply to Queries as to Prevalence of Mildew.	IV. Extracts from Replies to other Questions.
CAMBS.	Topham, J., *contd.*		attacked; straw enough for 40 bushels an acre yielded only 21 bushels.
Do. ..	West, Samuel, *Upwell.*	In 1879 fen farms. In 1881, both fen and high lands equally.	More damage done in these two years than in any other during the last thirty.
CORNWALL	May, John, *Suffenton, St. Teath, Camelford.*	This neighbourhood is subject to frequent attacks.	Situation open and exposed, 300 feet above the sea. Wheat generally grown after grass ley fallowed — sowing time Oct.— thick sown crops most free. A liberal dressing of sea-sand a great preventive. I have observed a field on part of which farmyard-manure with 15 tons of sea-sand was applied; on the other part farmyard-manure only; where the sand was used, the straw was brighter and stiffer, and the grain more perfect; where no sand was used, the straw became dark with mildew.
CUMBERLAND.	Gibbons, T., *Arthuret, Carlisle.*	Occasionally	Ten feet above sea, at head of Solway Frith, alluvial soil. Light land frequently under the plough, and badly drained land most liable.
DEVON	Balsdon, R., *Westleigh, Bideford.*	Occasionally; great injury in 1879, and slight in 1881.	I consider very late and very early sown crops most susceptible. The situation is rather exposed and about 100 feet above the sea-level; the soil clay, with loose "shale." Wheat on clover leas dressed with 1½ cwt. nitrate of soda; a thin, forced plant decidedly most liable.
7. Do. ..	Carter, T. S., *Otterton, Budleigh Salterton.*	Mildew is quite unknown in this part of our county.	
Do.	Scratton, D. L., *Ogwell, Newton Abbot.*	Mildew, here called rust, is rather prevalent.	I have only suffered seriously once during the twelve years I have occupied land here. In 1881, two fields after cabbages folded

ABSTRACT of REPLIES received in ANSWER to INQUIRIES as to PREVALENCE of MILDEW, and the CONDITIONS under which it is DEVELOPED—*continued.*

I. COUNTY.	II. Name and Address of Correspondent.	III. Reply to Queries as to Prevalence of Mildew.	IV. Extracts from Replies to other Questions.
28. DEVON	Scratton, D. L., *contd.*		with sheep, and one after mangolds carted off, were affected to a considerable extent. In both cases I had manured with ground decorticated cotton-cake, and I think the nitrogen in that might be the cause.
29. Do. ..	Spearing, T. B., *Maristow Cottage, Roborough.*	.. ..	If in the latter part of May and beginning of June we get very warm and forcing days, and at night a very low temperature, with some degrees of frost, the sudden change causes the life or sap of many plants to exude through the surface, and coming in contact with some particular property in the air, produces *life* to parasites, on some plants, and insects on others.
30. DORSET	Buckman, J., *Bradford-Abbas, Sherborne.*	My farm is usually free; the worst attack I have known was in 1879.	The disease is developed under the conditions of wet sunless skies—a continual state of damp. We seldom use farmyard-manure direct for wheat or any corn, as it tends to the production of mildew and red rust. The two counties in which I have seen the least mildew are Cheshire and Dorset, and both from the same cause. Cheshire uses much salt in agriculture, and Dorset is midway between the Bristol and the S. Channels, and at this moment our dining-room window is covered with salt. We think little of barberry as the cause of mildew. It is usually quite a rare plant.
31. Do.	Ellswood, W., *Down House, Bridport.*	Some mildew this year, and in 1877, 1878, 1879.	Farm on the coast, 300 feet above the sea. In one field this year (1882) white wheat is badly mildewed, while red wheat in the same field is not affected at all. Both wheats were sown on the same day, the previous crop was one year's lea penned all over with sheep. Thin plant is most liable, but this year I had

Bstract of Replies received in Answer to Inquiries as to Prevalence of Mildew, and the Conditions under which it is Developed—*continued.*

I. County.	II. Name and Address of Correspondent.	III. Reply to Queries as to Prevalence of Mildew.	IV. Extracts from Replies to other Questions.
1. Dorset	Ellswood, W., *contd.*		the disease in a very thick plant. Early-sown wheat less liable than late-sown.
2. Do. ..	Galpin, G., *Tarrant, Keynston, Blandford.*	When I entered this farm in 1868, it had an unenviable notoriety as a blighting farm. It had been badly farmed. In 1869, 1871, 1878, I suffered.	The farm is 300 feet above sea, and much exposed. There were numbers of barberry-bushes, which I grubbed up. I think the farm is less subject to mildew now than formerly; but whether this is due to the absence of the barberry or to better cultivation I cannot say. I am inclined to think to the latter. A crop which is thin during winter, and then becomes gross and luxuriant in the spring, is very apt to mildew.
3. Do. ..	Hoddinott, J., *Sherborne.*	Occasionally, as in 1879, 1880, 1881.	Stone brash soil, fairly drained. Wheat follows two years' ley; thin plant always more liable to attacks.
4. Do. ..	Mitchell, J. H., *Deanslease, Wimborne.*	My farm suffers little. In the immediate locality, *near the sea*, they suffer sometimes.	Land which has been over-dosed with manure and sown late is most liable.
5. Do. ..	Parham, G., *Gillingham.*	My farm is not much subject.	A farm near Hindon, Wilts, very subject to it. When a thin crop grows fast in summer from being highly manured, the disease is most developed. Cleanliness favours mildew, as foul land is seldom rich in condition. Thick sowing is the best preventive of the disease.
6. Do. ..	Saunders, J. C., *Watercombe, Dorchester.*	Not much known in the locality.	We get "rust" a few days before the wheat is fit to cut, following fogs from the sea, which is about two miles distant.
7. Essex	Beadel, W. J., *Springfield, Chelmsford.*	Frequent, but not malignant; prevalent during last 5 years.	Open level country, mixed soil. Wheat generally grown after clover, beans, peas, or potatoes; no exception as to mildew after either of the above crops. *Where clover or grass seeds have been*

ABSTRACT of REPLIES received in ANSWER to INQUIRIES as to PREVALENCE of MILDEW, and the CONDITIONS under which it is DEVELOPED—*continued.*

I. COUNTY.	II. Name and Address of Correspondent.	III. Reply to Queries as to Prevalence of Mildew.	IV. Extracts from Replies to other Questions.
37. ESSEX	Beadel, W. J., *contd.*		*heavily fed during the summer, mildew is less apparent.* In reply to further queries, "My bailiff's opinion coincides entirely with mine, viz., that where we have folded sheep during the summer heavily upon feeding clover, there has been an absence of mildew compared to wheat grown either after mown clover, beans, peas, or mangold."
38. Do. ..	Delf, W., *Great Bentley, Tendring Hundred.*	Wheat in this district more or less attacked by mildew in 1881, 1882. In many cases the value of the crop was reduced ⅓rd.	This farm is open, undulating; about 4 miles from the sea—soil both heavy and light. The wheat on both was affected, but that on the heavy land suffered in a greater degree. Wheat is sown after red clover layer, some of which is mown twice. On the lighter land a mixture of Pacey's rye-grass, white and red clover, and trefoil is sown; this is mown once and then fed. Dung is applied sometimes just before ploughing, sometimes on the young layers in the previous winter or spring. The sorts grown are Lenny's White, Golden Drop, and Burwell Red. Invariably find that Lenny's White is more free from mildew than the others.
39. HANTS	Manning, E., *Titchfield.*	More frequently during the past seven years, and especially in 1879 and 1881.	Land 10 or 15 feet above sea. Sheltered loam, or loam on gravel. Wheat sown on one year's ley after barley; dung applied immediately before ploughing. Where wheat is thickest, most mildew found. Fenton's White attacked, while red wheat and some New Zealand wheat that had been grown in England one year were not mildewed.
40. Do. ..	Kent, G. E., *Stubbington, Portsea.*	.. ..	What some call blight or mildew is not in my opinion an actual disease. I attribute it entirely to the state of the land at the

ABSTRACT of REPLIES received in ANSWER to INQUIRIES as to PREVALENCE of MILDEW, and the CONDITIONS under which it is DEVELOPED—*continued.*

I. COUNTY.	II. Name and Address of Correspondent.	III. Reply to Queries as to Prevalence of Mildew.	IV. Extracts from Replies to other Questions.
40. HANTS	Kent, G. E., *contd.*		time of sowing, or the effect of frost heaving the land and exposing the root; and just before harvest the straw becomes darkened, and, if examined, the straw quite decayed just above the root.
41. Do. ..	Stratton, J., *Chilcombe, Winchester.*	This county is perhaps more liable to mildew than any other part of England.	The light districts suffer especially when the season is wet and the crop of straw heavy. A weedy crop or a thin are most subject; frost is, in my opinion, often the cause of the disease. I have seen a field in which was a barberry-bush, and mildew extended its ravages from this spot. This happened whenever the field was planted with wheat (triennially), until the tree was eradicated, since which the corn has not been blighted. Sow early and thickly where mildew is feared; cut the corn immediately after it is seized by the disease.
42. HEREFORD.	Duckham, T., M.P., *Baysham Court, Sellack.*	This district is not subject to serious attacks.	In 1867, after a frost on the 24th June, up to which time there had been a grand prospect, the wheat changed immediately, and the straw was covered with red rust; the yield was very bad, not one half the previous promise. In 1877, 1878, 1879, 1880, 1881, cold wet seasons, much of the wheat in this district was mildewed—the low-lying lands are more subject—soil, sandy loam. Wheat is sown after clover ley; the young clover is folded over in the autumn, and no other manure is applied. Essex Rough Chaff in 1867, and Golden Drop in 1877, *in the same field*, badly mildewed—a thin plant is most liable.
43. HERTS ..	Fordham, E. K., *Ashwell, Baldock*	Not very subject.	Farm about 145 feet above sea-level; soil, gravel on chalk marl.

Abstract of Replies received in Answer to Inquiries as to Prevalence of Mildew, and the Conditions under which it is Developed—*continued.*

I. County.	II. Name and Address of Correspondent.	III. Reply to Queries as to Prevalence of Mildew.	IV. Extracts from Replies to other Questions.
43. Herts.	Fordham, E. K., *contd.*		Wheat grown after clover, beans, or sainfoin; a thin plant is more liable; unhealthy plants more susceptible of disease. I have observed mildew most in low-lying land, on land lately broken up from pasture, and on late sown and thin crops. I am certain that some sorts of wheat are more subject than others. Browick is the least liable of any variety with which I am acquainted; over-manuring with nitrate of soda or raw farmyard-dung is a cause.
44. Hunts	Battcock, F., *Hemingford Abbots, St. Ives.*	Very little known in this district.	Occasionally found on late-sown or thin wheats, or on land which requires draining.
45. Do.	Cranfield, W., *Buckden, Huntingdon.*	For 30 years past I have always seen mildew in this part, except in very dry and hot summers.	Clay and loam. If our wheat grows fast in spring and gets a heavy flag, mildew is nearly sure to follow. Generally the wheat that mildews worst is after clover, fed off bare in the summer. I find it no matter whether we sow early or late.
46. Do. ..	Spencer, S., *Holywell, St. Ives.*	I have seen so little of mildew that I have no practical information to give.	
47. Kent ..	Coleman, T., *Ash by Sandwich.*	Not very frequently.	A very good soil on subsoil of sand.
48. Do. ..	Collard, C., *Little Barton, Canterbury.*	Never having suffered any loss from mildew, I must plead ignorance about the disease. I do not think this neighbourhood is subject to it. Rust we sometimes have.	
49. Do. ..	Goodwin, W. J., *Wrotham.*	My own farm and others in this neighbourhood have suffered	High situation, open and exposed. Light loam and heavy land on Kentish rag; some chalk, sand, and clay, all more or less affected in bad years—foul and infertile fields most affected. Velvet-ear,

ABSTRACT of REPLIES received in ANSWER to INQUIRIES as to PREVALENCE of MILDEW, and the CONDITIONS under which it is DEVELOPED—*continued.*

I. COUNTY.	II. Name and Address of Correspondent.	III. Reply to Queries as to Prevalence of Mildew.	IV. Extracts from Replies to other Questions.
49. KENT	Goodwin, W. J., *contd.*	severely in late wet seasons.	Golden Drop, and Square Head seem to blight worst. Disease encouraged by a check to vegetation (as by frost), succeeded by wet of long duration. Rust (the first sign) may be destroyed, or nearly so, by top-dressing with suitable manure, particularly if salt is also used to harden the straw.
50. KENT ..	Knights, R., *Bobbing Court, Sittingbourne.*	In this locality some crops have suffered.	Soil variable. Generally loam on chalk or gravel.
51. Do. ..	Monckton, F., *Tonbridge.*	This district is not generally liable.	In 1881 a field on the farm was struck. It was half wheat and half barley—both crops were mildewed. The corn was not much injured, but the straw was utterly useless for thatching or sale. The wheat was sown on loam or clay soil—land steam-ploughed after two years' clover ley. The barley was after wheat following beans. For wheat, 3 cwt. of rape-cake were applied at the time of sowing. For barley, 3 cwt. superphosphate and guano.
52. Do. ..	Neve, George, *Sissinghurst, Staplehurst.*	Fortunately I have never suffered much from mildew.	When the disease has appeared here, it has been when the crop is thin, and it has been forced by heavy dressings of artificial manure into a luxurious growth. Late-sown wheat is more liable than early sown.
53. Do. ..	Pye, James, *Knights-place, Rochester.*	I have never had any damage from mildew, except in 1880.	I grow about 300 acres of wheat on various soils lying between the Thames and the Medway. In 1880, my wheats in the latter part of July looked like growing 6 qrs. an acre; but the last six days of the month were wet, with thunder. After this, nearly every acre went black, the corn became lean, the straw rotten. The crop, about 4 qrs., weighed about 55 lbs. the bushel.

ABSTRACT of REPLIES received in ANSWER to INQUIRIES as to PREVALENCE of MILDEW, and the CONDITIONS under which it is DEVELOPED—*continued.*

I. COUNTY.	II. Name and Address of Correspondent.	III. Reply to Queries as to Prevalence of Mildew.	IV. Extracts from Replies to other Questions.
54. KENT	Rigden, H., *Lyminge, Hythe.*	The land of blight.	Mildew has been developed to such an extent on *fresh broken up bottom pastures*, that corn is only very sparingly attempted for the first six or seven years. I have some high land 600 feet above the sea, some sloping down to the valley, and some flat lands in the valley. On the top of the hills strong clay lies on chalk; the slopes are light chalk; the valley rich loam. I have observed that the hills and the slopes are much less subject than the valley; that the stale ploughed land is less liable than fresh broken up land; very thick and thin plants suffer most. Heavy folding with sheep and large quantities of artificial manure are provocative of the disease. The Hoary wheat with us blights most, and the old White Straw always goes best through a blight.
55. DO. ..	Stonham, H., *Thornham, Maidstone.*	Have suffered more or less since 1875, and particularly in 1881.	My farm lies between the chalk range and the gault. Thin-sown wheat and crops after clover ley which have been thinned by wire-worm are worst. Some varieties are more disease-resisting than others. The Bearded April and Nursery are particularly so.
56. LEICESTER	Smythies, Rev. E., *Hathern, Loughboro'.*	No mildew on my farm, except one year.	
57. LINCOLN	Bramley, C., *Fiskerton, Lincoln.*	My farm (clay land) is not subject to mildew.	My brother took a farm ten years ago, which had the reputation of growing nothing else but mildewed wheat; he adopted early sowing, and has had nothing of the kind—at least nothing serious—since.
58. DO. ..	Hobson, J. G., *Long Sutton.*	Have suffered frequently in forty	District a dead level, little above the sea, exposed. Soil good, deep, alluvial. Wheat is grown

Abstract of Replies received in Answer to Inquiries as to Prevalence of Mildew, and the Conditions under which it is Developed—*continued.*

I. County.	II. Name and Address of Correspondent.	III. Reply to Queries as to Prevalence of Mildew.	IV. Extracts from Replies to other Questions.
58. Lincoln	Hobson, J. G., *contd.*	years' experience.	after oats, seeds, or potatoes. Thin late crops after clover most disposed to disease. Rough chaffed white wheat is the most sensitive variety.
59. Do. ..	Hopkins, T., *Limber Magna.*	Few years in which wheat on our Wolds is not attacked (more or less) with mildew, but the attacks are not so malignant as to cause serious injury.	My farm is 420 feet above sea, open and exposed. The soil is a sandy loam on chalk. Wheat is mostly grown after seed-pastures (rag grass, white clover, trefoil, alsyke, and rib grass, a little of the other clovers grown for mowing). On my light land I have invariably the worst crop after mowing. Thin wheats, whether from thin sowing or from grubbing, or working out in winter, are always most liable to attack. Crops forced with artificial manures are especially susceptible to the disease. I attribute the little damage generally occasioned in this part of our Wolds by mildew to the fact of the soil being thinner and drier, and more easily affected beneficially by a few days of bright hot weather. On the Wolds between Louth and Horncastle they often suffer almost as much as you in the Fens, their soil being deeper, stronger, and their crops generally ripening slowly, and a full week later than ours.
60. Lincoln	Martin, G., *Huberts Bridge, Kirton.*	My farm has frequent attacks of mildew.	The situation is exposed; the land level 10 or 12 feet above the sea. The soil is silt, loam, and clay. Wheat after beans, clover, tares, potatoes, cole, and fallows, is more subject to the disease than after oats or mangold. Scholey's Square Head is more attacked than other sorts; but white wheats are generally more susceptible than red, excepting the Stand-up White, and the Red Chaff White; but these

ABSTRACT of REPLIES received in ANSWER to INQUIRIES as to PREVALENCE of MILDEW, and the CONDITIONS under which it is DEVELOPED—*continued.*

I. COUNTY.	II. Name and Address of Correspondent.	III. Reply to Queries as to Prevalence of Mildew.	IV. Extracts from Replies to other Questions.
60. LINCOLN	Martin, G., *contd.*		wheats are not generally grown, as they are not good millers' wheats. Late harvests are frequently accompanied with mildew, and thin crops invariably take the disease.
61. NORFOLK	Cubitt, W., *Bacton Grange, N. Walsham.*	Not often ..	Situation exposed, 20 to 30 feet above sea; soil good loam; productive wheat is generally sown after artificial grasses in the four-year course. Farmyard-dung is applied before ploughing; white wheat is seldom grown, as it is far more subject to mildew than red. October-sown wheats produce stiffer and brighter straw than later sown; thinly planted crops invariably more subject to this disease. No forcing manures, especially those containing an excess of nitrogen, should be used on good soils for wheat.
62. Do. ..	Day, G. J., *Horsford, Norwich.*	.. ..	My experience is that late-sown and thin-planted wheat is very subject to mildew. Wheat forced by artificial manure is the most of all likely to be affected. A sudden check of N.E. wind after some hot summer days produces the disease. Well marled or clayed farms are least subject. The constitution of the plant is strengthened, and the straw stiffened by such manures.
63. Do. ..	Gayford, T. J., *E. Wretham.*	This district is generally very free from mildew.	The disease arises from (1) no or imperfect dressing of seed-corn. (2) Cold, wet, windy weather during flowering, or from loss of plant from frost and too rapid growth in spring and summer; almost invariably top-dressing on thin wheat produces more or less mildew.
64. Do. ..	Johnson, W., *Lynn.*	.. ..	A late harvest, with an absence of sun in July, produces mildew. Fen and skirty land, and fresh broken grass land, are very sus-

ABSTRACT of REPLIES received in ANSWER to INQUIRIES as to PREVALENCE of MILDEW, and the CONDITIONS under which it is DEVELOPED—*continued.*

I. County.	II. Name and Address of Correspondent.	III. Reply to Queries as to Prevalence of Mildew.	IV. Extracts from Replies to other Questions.
64. NORFOLK	Johnson, W., *contd.*		ceptible, especially if the wheat is sown late and is a thin plant. Wheat after wheat is almost sure to have it; the same after a naked fallow. I never saw it in wheat after oats; nor on thin-skinned poor clay, however much out of condition it might be. There is no sort of wheat proof against the disease, unless it be the Old Rivett's.
65. Do. ..	Morton, J., *Stow Bardolph, Downham Market.*	Very subject, and especially 1881–1882.	Mildew is always found after severe spring frosts. Have never tried thin sowing; but if by any accident the plant is thin, the chances of mildew are much increased. The land heavily clayed suffered in 1881, but not nearly so much as those lands where claying had been neglected.
66. Do. ..	Parsons, W. B., *Tilney St. Lawrence, Lynn.*	On my farm and in this district the disease seldom occurs to any serious extent.	In 1881 a field of 50 acres was injured in my estimation to the extent of 2 coombs an acre. The farm is open and exposed; it lies below high-water mark. The soil is deep-stapled loam. The crop in question followed clover, partly mown, partly grazed. No manure was applied, but the sheep were fed with cake. Square Head wheat was sown Nov. 5, 6, 9, the usual season. The crop came up thin, but filled up into a very fine crop. Land in a high state of fertility is most liable. We never see a trace of the disease after oats.
67. NORTHAMPTON.	Rocke, John, *Weldon.*	Not subject to malignant attacks.	Where soils contain a superabundance of organic matter in a raw or crude state, and the crop is exposed to continuous rains, with damp atmosphere, conditions most favourable to the development of mildew seem to be present. Thin-sown crops are more predisposed to attack than those which are thicker.

ABSTRACT of REPLIES received in ANSWER to INQUIRIES as to PREVALENCE of MILDEW, and the CONDITIONS under which it is DEVELOPED—*continued.*

I. COUNTY.	II. Name and Address of Correspondent.	III. Reply to Queries as to Prevalence of Mildew.	IV. Extracts from Replies to other Questions.
67. NORTHAMPTON.	Rooke, John, *contd.*		I attribute the immunity enjoyed by this district to its elevated position, and to the abundance of calcareous matter in the soil.
68. NOTTS ..	Smith, Woolley T., *Stokingham, Newark*	No part of my farm is subject in any marked degree to attacks of mildew.	General results of my experience: 1. Land on which wheat is most liable to mildew, light peaty soils, or black vegetable mould overlying silt sand or gravel. 2. In the case of arable land traversed by brooks, it is very common to find in the lower parts of the fields adjoining the brook course, portions of land which have been embanked, broken up, and brought into cultivation; the wheat on such parts is very commonly attacked when the adjoining lands wholly escape; such land is very apt "to run to straw," and to lodge, even after it has been many years in cultivation. 3. In the case of all lodged straw, the straw is commonly more or less mildewed. 4. Wet or damp sunless weather is very conducive to mildew. I think also the shade of hedgerow timber, woods, and plantations encourages it. 5. On lands liable to mildew, I think high farming rather promotes the evil than otherwise. 6. A crop which, having been thinly sown, or having lost root from wireworm or frost, has recovered itself by "tillering" or "stooling," is more liable to mildew than a crop which was full and regular from the first.
69. OXON ..	Dashwood, F. L., *Kirtlington.*	I have not suffered from mildew in many seasons.	Years ago we heard more of diseases affecting the wheat crop than we have of late years, excepting the seasons of 1879, 1880, 1881. I attribute many of the diseases of wheat to late

ABSTRACT of REPLIES received in ANSWER to INQUIRIES as to PREVALENCE of MILDEW, and the CONDITIONS under which it is DEVELOPED—*continued.*

I. COUNTY.	II. Name and Address of Correspondent.	III. Reply to Queries as to Prevalence of Mildew.	IV. Extracts from Replies to other Questions.
69. OXON ..	Dashwood, F. L., *contd.*		sowing, to the want of change of seed, to inclement seasons and sudden changes of temperature; also to the top-dressing of thin crops with ammoniacal manures. I also question whether the application of farmyard-manure to clover as a preparation for wheat is not injurious in some seasons.
70. SOMERSET	Corner, R., *Inglescombe, Bath.*	.. ..	We only suffer from "rust."
71. Do. ..	Feaver, John, *West Camel, Ilchester.*	My farm and this locality very subject to mildew.	In 1879, 1880, the attacks were very malignant. Where wheat and weather are both sour the disease is most prevalent. The following observations apply to a crop of wheat grown in a field peculiarly subject to mildew. The situation is rather low, fairly sheltered, and sufficiently inclined to drain well. Soil, rather heavy loam, with cold tenacious subsoil. Wheat followed rape and turnips fed off; the green crop having been preceded by barley. 2½ cwt. of superphosphate was applied to the green crop, and no manure to the wheat; 2 bushels of Essex White wheat sown in the first week of Nov. When the plant is thin and gross, it is more liable to attack.
72. Do. ..	Hood, Sir A. H., *W. Quantockshead, Bridgwater.*	The district is not much subject to mildew.	In 1819 mildew appeared on one farm at Stringston. The farm is about 150 feet above the sea; sheltered, moderately level, sufficiently drained, clean, and fairly fertile. The field where the wheat was injured is partly heavy stonebrash, partly clay and peat, and the disease was much more serious on the latter soil. Short-eared Essex White wheat was sown (9 pecks to the acre) early in Nov. (this being

ABSTRACT of REPLIES received in ANSWER to INQUIRIES as to PREVALENCE of MILDEW, and the CONDITIONS under which it is DEVELOPED—*continued.*

I.	II.	III.	IV.
COUNTY.	Name and Address of Correspondent.	Reply to Queries as to Prevalence of Mildew.	Extracts from Replies to other Questions.
72. SOMERSET	Hood, Sir A. H., *contd.*		early for the district). The previous crop was seeds after barley. The sheep had cake and corn; nitrate of soda and salt were applied in April. This is the only case which has come within the correspondent's knowledge.
73. SUSSEX	Colgate, T., *Glynde, Lewes.*	Frequent attacks, seldom of a malignant character.	Most malignant in 1881. A field which was rye-grass depastured in 1879, and rape in 1880, was sown with Nursery Wheat (3½ bushels to the acre), late in January (the usual time for this description of wheat). Good manure and superphosphate were applied for rape, which was folded over. There was a full plant of free growth until attacked by the disease. My experience is, however, that thin-sown wheat is most subject to mildew.
74. Do. ..	Drewitt, C. J., *Drayton, Chichester.*	.. ..	The only thing we get approaching mildew is a blight, which begins with a kind of red fungus on the straw, then turns black, and the ear produces nothing but very light thin grains.
75. Do. ..	King, M., *Salvington.*	The disease is little known here.	On one farm near the sea, where a great quantity of straw is often grown, mildew is occasionally found if the growth has been very rapid, and there has been an absence of sunshine.
76. Do. ..	Tallant, F., *Easeboune Priory, Midhurst.*	.. ..	These light soils are remarkably free from mildew.
77. Do. ..	Wood, W., *Ifield.*	Very seldom	Wheat is generally grown after a summer fallow and sown early. The disease is found mostly where a crop has been taken in the previous year, or where artificial manure, particularly nitrate of soda, has been applied in the spring. A thin and deficient plant is most liable.

ABSTRACT of REPLIES received in ANSWER to INQUIRIES as to PREVALENCE of MILDEW, and the CONDITIONS under which it is DEVELOPED—*continued.*

I. COUNTY.	II. Name and Address of Correspondent.	III. Reply to Queries as to Prevalence of Mildew.	IV. Extracts from Replies to other Questions.
78. WILTS	Attwater, J. G., *Britford, Salisbury.*	This locality has, but not this farm.	In 1839 I was on a farm when the wheat and *meadow grass* were much injured by mildew. The wheat was grown after two green crops in succession. I grew 16 crops of wheat on the Cotswolds, and never had mildew. When I entered the farm I was told I should never have it if I kept the hedges clear of barberry-bushes, which of course I did; there I used nitrate of soda and salt freely, and with success. From there I moved to a farm 14 miles north of this, and followed the same course; got mildew a bit the first season on oats and wheat; not much the second; tried again, wheat and oats suffered severely; barley, the straw was worthless and grain inferior. This was 1864, '65, '66, and I have not dressed an acre of corn with nitrate of soda for fear since. A large, good, and successful farmer told me that on a strong wheat and bean soil he tried Talavera with great success the first year; sowed all his wheat field with it the next year, when it was so mildewed that he never would sow that sort again, and he added, that if he had, the last bushel of it he would send to the miller.
79. WILTS	Carpenter, J., *Burcombe, Salisbury.*	I do not suffer so much as some.	The following circumstances are favourable to the production of mildew: A wet and sunless summer, a southern aspect, late sowing, a thin plant, and a top-dressing of nitrate of soda. I do not fancy that one sort of wheat is more liable than another, but many of my neighbours declare that Square Head is.

ABSTRACT of REPLIES received in ANSWER to INQUIRIES as to PREVALENCE of MILDEW, and the CONDITIONS under which it is DEVELOPED—*continued.*

I. COUNTY.	II. Name and Address of Correspondent.	III. Reply to Queries as to Prevalence of Mildew.	IV. Extracts from Replies to other Questions.
80. WILTS	Lywood, E., *Maddington, Devizes.*	.. ..	The barberry tree, without a doubt, will mildew the wheat in a direct sweep from the shrub across a whole field; this I have seen repeatedly. I have found white wheat blight here when other kinds do not. Thin wheat, and wheat to which nitrate of soda has been applied, and backward wheat, are very apt to have mildew.
81. Do. ..	Parham, J. N., *Sutton Veney, Warminster.*	Formerly very common, but less so since feeding cake and corn, and sowing Nursery Wheat.	Developed by thin or late sowing, or deficient plant, or by excessive manuring.
82. Do. ..	Stratton, W., *Kingston Deverel, Warminster.*	My farm and certain fields in this and the next parish have suffered much in past years.	From 1866 to 1871 the disease was very malignant; bottoms of valleys most liable; thin plant suffers most. When I suffered most, I was sowing about 6 pecks an acre. I now sow 10 pecks.
83. YORKS ..	Beckett, R., *Driffield.*	In 1882 I had one field much injured.	Situation a few yards above sea-level, open exposed country. Soil, clay loam, imperfectly drained. The previous crop, rape and turnips after oats. Square Head wheat sown early in Dec. (rather late), 10 pecks to the acre; thin crop most liable.
84. Do. ..	Illingworth, P., *Newsham, Thirsk.*	The locality is not subject to frequent attacks of mildew.	When wheat is sown on clover leys in a damp situation, mildew is more prevalent. If the plant is thin on the ground, it is more likely to grow gross. The disease is seldom seen where wheat is sown on bean or oat-stubble.

APPENDIX III.

From a Circular issued by A. Young, as Secretary to the Board of Agriculture in 1804.*

Queries.

1. What soils have yielded the crops most affected by mildew?
2. Have early or late sown crops suffered most?
3. What situations have been most exposed to it? high and ventilated ones, or low and sheltered dales?
4. Have thin or thickly sown crops escaped the best? and thin or thick from other circumstances, drilling, the red worm, etc.?
5. Has the use of old or new seed been attended with any effect?
6. If, from your observations, you conceive the cause to be atmospheric—of what sort? late frosts, fogs, severe or open winters, etc.?
7. Have crops on fallows or layers escaped the best?
8. Has manuring, whether by lime, dung, fold, etc., had any effect?
9. Have you made any observations on the barberry, as locally affecting wheat?
10. Has there been any difference from the sort of wheat sown—bearded red, white, spring, etc.?
11. Has early cutting been found useful? and how early, in point of the milk of the grain being coagulated?
12. What proportion, in your opinion, does the late crop bear to a common average produce?

With any other circumstances which you may think applicable to the inquiry.

APPENDIX IV.

I. Extracts from 'Annals of Agriculture.' Edited by Arthur Young, Secretary to the Board of Agriculture.

1. Suffolk	Nesfield, Rev. W., *Wickambrook* (in 1784).	1780, 1781, 1782, years of fatal mildew in Suffolk.	Spring frosts from 20 May to 10 June cause mildew; distinction between real and apparent vigour; luxuriance of growth not a sign of vigour. Very late sown crops are most liable; a thin crop on loose soil will almost certainly be mildewed, wheat on fallow more subject than on clover-ley, except on very stiff soils.—i. 327.†
2. Essex ..	Onley, C., *Glistead, Braintree* (in 1784).	Very lately it has affected the old chalked lands verging towards the hundreds of Essex.	Lands chiefly subject, such as have clay bottom, moist and heavy surface lands long in tillage most liable. Wheat on fallow more liable than on clover ley; and land dunged more than not dunged. Red wheat or rivets least subject. Early sowing and much seed some security.—i. 331.

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* Young's 'Annals of Agriculture,' xliii. 322.

† These figures refer to the vol. and page, 'Annals of Agriculture.'

APPENDIX IV.—*continued.*

II. REPLIES to QUERIES on the subject of MILDEW circulated by ARTHUR YOUNG in 1804.

3. BEDS. ..	Maxey, W., *Knotting.*	(1) Woodlands, new lands broke up from ancient pasture, such soils produce luxuriant growth and later maturity. (2) In general late sown. (3) Low and sheltered. (4) Thick or thin no difference. (7) Fallows generally escape best. (8) Manures which cause early maturity have a good effect.—xliii. 504.
4. BUCKS. ..	King, Isaac, *Wycombe.*	In this district this year (1804) the worst I ever knew; no soil or management has escaped entirely, but the valleys worse than the hills; severe frost in July.—xliii. 458.
5. CAMBS. ..	Custance, W., *Cambridge.*	(2) Late sown most. (4) Thin crops best. (8) Land most manured and best done by has been the most affected. (10) Bearded wheat least affected.—xlv. 112.
6. Do. ..	Shepard, James, *Chippenham, Newmarket.*	(1) Loose chalky soils; broken up pasture and sainfoin layers not limed or marled. (2) Late sown most. (3) Low and sheltered. (4) Thin plants escaped best. (7) Wheat on layers best. (10) Bearded and white escaped the best.—xliii. 509.
7. Do. ..	Wedd, Nath., *Trumpington.*	(1) Gravelly soils. (2) Late sown crops. (3) The vales. (4) Doubtful; thick sown. (7–8) Layers suffered least, folded lands [most. (10) Bearded less injured than white or red; but spring wheat least of all.—xliii. 328.
8. CORNWALL	Lord De Dunslanville, *Trehidy.*	(1) Morestone. (2) Late in general. (3) Low and sheltered vales. (7) Fallows escaped best.—xliii. 472.
9. ESSEX ..	Ambrose, J., *Copford, Colchester.*	(1) Hollow bottom and unsound land. (2) Late sown. (3) Low and sheltered vales. (4) Thick sown have escaped best. (7) Layers best.—xliv. 158.
10. Do. ..	North, John, *Ashden, Saffron Walden.*	(1) Thin staple over chalk, low bottoms covered with black land. (2) Low lands most subject (4) Thick crops escape best.

II. REPLIES to QUERIES on the subject of MILDEW circulated by ARTHUR YOUNG in 1804—*continued.*

10. ESSEX ..	North, J., *contd.*	(7) Layers best. (10) White wheat most affected, rivets least.—xliv. 149.
11. GLOUCESTER	Estcourt, T., M.P.	(1) Stiff moist soils that lie damp. (3) Lowest and most sheltered; though in some cases very exposed situations. (4) Thinnest escaped equally well with the thickest. Wheat after potatoes less affected. The part most affected was ploughed two furrows deep, a full crop of vetches turned down; top-dressed in spring with coal ashes; bearded wheat suffered less than red lammas.—xliii. 323.
12. Do. ..	Lumbers, R., *Wick Risington.*	(2) Late sown. (3) Low and sheltered. Wheat growing more luxuriantly there. (8) Over-luxuriance produced by manuring, or by green vetches ploughed in.—xliv. 89.
13. KENT ..	Grebell, Allen, *Barton, Canterbury.*	(1) Light and low soils most affected. (3) Low and sheltered vales. (4) Thick crops escaped best. (7) Layers gave crops most free. (10) White wheats suffer most.—xliii. 497.
14. LINCOLN ..	Amos, W., *Brothertoft.*	(1) Light loamy rich soils. (2) Late sown. (7) Fallow crops on strong land least affected.—xliv. 76.
15. LINCOLN ..	Linton, J., *Freiston, Boston.*	(1) Rich argillaceous and loamy soils. (4) The strongest crops. (7) Fallows and layers equally. (8) Not usual to manure wheat land. (10) *Red* wheat suffered most this year, the contrary more usually the case.—xliii. 463.
16. MONMOUTH	Berry, Edward, *Court St. Lawrence.*	(1) Rich vale lands well mucked without being limed. (2) Early sown suffered most. (3) Low and sheltered vale. (4) Thin sown escaped best. (7) Fallows best.—xliii. 507.
17. NORFOLK	Cubitt, John, *Southrepps.*	(1) Light soils most affected. (2) Divided opinion, but generally thought early sown. (3) Low situations most. (4) Thin crops escaped best. (7) Layers escaped best.—xliii. 461.
18. Do. ..	Johnson, S., *Thurning.*	(4) Thick wheat on foul grassy lands escaped best.

II. Replies to Queries on the subject of Mildew circulated by Arthur Young in 1804—*continued.*

18. Norfolk	Johnson, S., *contd.*	(8) In 1803 lands in a high state suffered most.—xliii. 470.
19. Do. ..	Muskett, J., *Easton.*	(1) Deep loamy soils, and such as grow luxuriant crops as new broke lands, &c. (2) Late sown. (3) Low lands. Small inclosures. (4) Thick wheat has always escaped best. (10) White wheat and spring wheat suffer most.—xlv. 117.
20. Oxford ..	Benwell, H., *Caversham.*	(1) Wheat generally mildewed this year, fine loamy soils most. (4) Thinnest plant most favoured, worst farmers have the best crops. (6) Great rain just as bloom going off succeeded by hoar frost. (7) Layers and fallows suffered equally. (8) Where no manure applied wheat escaped most. (10) Red chaffed wheat and the American egg shell have fared best. —xliii. 459.
21. Stafford	Miller, Thomas, *Dunstall Hall, Wolverhampton.*	(1) The strongest. (2) Late. (3) Low lands and those hanging north and north-east. (4) Thick sown best. (8) Lime has produced the best crops. (10) Red wheat and bearded the best.—xliv. 425.
22. Suffolk ..	Cotton, B., *Weybread.*	(1) Inferior loose soils exposed to a north-east wind. (2) Late sown. (4) Thick and thin equally. (7) Layers escaped best.—xliv. 131.
23. Do. ..	Gwilt, E., *Icklingham.*	(1) Strong soils. (2) Late sown. (3) Sheltered vale. (4) Thick sown.—xliv. 139.
24. Do. ..	Hill, H., *Buxhall.*	(1) The real wheat lands. (10) White has suffered most.—xliv. 154.
25. Do. ..	Simpson, Thomas, *Witnesham.*	(1) Soft spongy lands. (2) Late. (3) Vales if sound escape best. (4) Thick plants escape best. (7) Layers best. (8) Extremely highly manured lands worst. (10) Red escapes best.—xliv. 141.
26. Surrey ..	Birkbeck, Rev. Morris, *Wanborough.*	(1) All soils, but perhaps light soils most. (2) Early crops this year, contrary to all expectation.

II. Replies to Queries on the subject of Mildew circulated by Arthur Young in 1804—*continued.*

26. Surrey ..	Birkbeck, Rev. M., *contd.*	(7) Difference in favour of fallows.—xliii. 460.
27. Do. ..	Page, T., *Cobham.*	(1) Sand and chalk. (2) Late sown crops. (3) High situations most. (4) Thick sown crops escape best. (6) Frost in end of June the cause. (7) Crops on layers best. (10) Brown American suffered least.—xliii. 460.
28. Sussex ..	Turner, R., *Lurgershall, Petworth.*	(1) No kind of soil escaped. 1804 worse than any other year since 1725.—xliv. 135.
29. Wilts ..	Davies, Thomas, *Longleat.*	Mischief generally done when in a dry time in the *Wheat Kerning* a misling rain happens. We have known something of this disease for 25 years. Much damage in 1803, and still more in 1804. Whenever a plant of wheat grows on a dunghill the ears are almost always blighted. Tare crops, thin crops, and crops on light land where the plants have not good firm foothold, seldom miss the blight. Land worn out with cropping or made too light with manure will produce the same effect.—xliii. 456.
30. Worcestershire	Darke, John, *Bredon.*	(2) Late crops most affected. (3) Low lands. (4) Thick crops more than thin.—xliii. 326.
31. Yorks. ..	Lee, John, *Leconfield, Beverley.*	(1) Moor or sand land fresh ploughed. (2) Late crops. (3) Low sheltered vales. (4) Thin. (7) Fallows escaped best. (10) White most affected.—xliv. 140.
32. Yorks., E. R.	Payne, W., *Frickley, Doncaster.*	(1) Gravelly and sandy soils. (7) Crops on layers best. (10) Difference, if any, in favour of bearded wheat.—xliv. 155.
33. Do. ..	Topham, Edward, *The Wolds.*	(1) Strongest soils suffered most; best wheat produced on worst land. (2) Early and late suffered equally. (3) Low and sheltered vales most. (7) Crops on fallows escaped best.—xliii. 501.
34. Yorks., W. R.	Bramley, Richard Ramsden, *Leeds.*	(1) Disorder prevalent in soils which abound in extra proportions of clay; soils in a highly improved state. (2) Early sown crops. (3) Low ones. [335. (4) Thick sown most probably.—xliii.

II. REPLIES to QUERIES on the subject of MILDEW circulated by ARTHUR YOUNG in 1804—*continued.*

35. YORKS., W. R.	Medley, J., *Potter Newton,* *Leeds.*	(2) Late sown crops. (3) Low and sheltered vales. (4) Thin crops escaped most. (10) Red wheat has suffered least.—xliv. 423.

APPENDIX V.

Communicated by SIR J. B. LAWES, Bart.

TABLE showing
(1) The Produce of Wheat in bushels.
(2) The Average Weight per bushel.
(3) The proportion of Offal Corn to 100 of Dressed Corn.
in TWO PLOTS of PERMANENT WHEAT 1852–1882.

(NOTE.—*Plot* 5 *receives every year* POTASH, SODA, MAGNESIA, SUPERPHOSPHATE, *but no* AMMONIA. *Plot* 10 A *receives* SALTS OF AMMONIA alone.)

Years.	Dressed Corn in Bushels per Acre.		Weight per Bushel of Dressed Corn.		Proportion of Offal Corn to 100 Dressed.	
	Plot 5.	Plot 10 A.	Plot 5.	Plot 10 A.	Plot 5.	Plot 10 A.
1852	17	22	57½	55¾	7½	8
1853	10	10	49	49	21	33
1854	24·1	34·1	61	60½	5	6½
1855	18	20	60	57	4½	13
1856	19	24	56½	55½	9½	12
1857	23	29	59	58	4	7½
1858	18½	23	61½	59½	3	5½
1859	20½	18¾	56	51½	10½	23½
1860	15½	15	54	49½	6½	20½
1861	15¼	12¾	59	55	14¾	20½
1862	18	23	59	56½	5½	12
1863	19½	39	63	62½	3⅓	5½
1864	16	32	62	61¾	4	5½
1865	14	25	61	59½	5	9½
1866	13	26	60¾	61¼	4½	5½
1867	9	18	59½	57¾	5¾	7⅓
1868	17	25	63	62	2½	6¾
1869	15½	20	56¾	54¾	5	9
1870	18	21½	62½	60¾	3½	7½
1871	12	10	56½	53¾	15	24
1872	12½	18	60	56¾	7	15
1873	12½	19½	57	56	5½	6¾
1874	12½	25	59	56½	3	3½
1875	9	12¾	59	54½	7½	13
1876	10	12	59	57	3	3
1877	11½	17	57	57	4	4½
1878	14½	27¼	58½	59½	4½	4¾
1879	5½	3¾	54	49	27	41
1880	17	10½	59	55	3	10½
1881	12½	18	58	58	9	10
1882	12½	23½	58½	60¾	5	8

APPENDIX VI.

Table showing the Date of the first Peeping of Wheat Ears, and of the commencement of Harvest in the neighbourhood of Wisbech. Compiled by Mr. William Exley, Merchant, Wisbech.

Years.	Peeping of Wheat Ears.	Beginning of Harvest.	Number of Days intervening.		
1834	May 24	July 18	55		Very early.
1835	June 10	Aug. 4	55		
1836	„ 15	„ 8	54		
1837	„ 17	„ 16	60		
1838	„ 17	„ 14	58		
1839	„ 12	„ 9	58	Mildew.	
1840	May 31	„ 10	71	Mildew.	
1841	„ 31	„ 8	69	Mildew.	
1842	June 7	„ 9	63		
1843	„ 6	„ 11	66		
1844	May 30	„ 1	63		Early.
1845	June 16	„ 16	61	Mildew.	
1846	„ 2	July 30	58		Early.
1847	„ 15	Aug. 4	50		
1848	May 29	July 27	59	Mildew.	Early.
1849	June 8	Aug. 11	64		
1850	„ 12	„ 12	61	Mildew.	
1851	„ 6	„ 6	61		
1852	„ 8	„ 4	57	Mildew.	
1853	„ 10	„ 10	61	Mildew.	
1854	„ 6	„ 8	63		
1855	„ 16	„ 18	63	Mildew.	Late.
1856	„ 10	„ 13	64		
1857	„ 3	July 31	58		Early.
1858	„ 2	„ 26	54		Very early.
1859	„ 2	„ 28	56	Mildew.	Early.
1860	„ 13	Aug. 21	69	Mildew.	Late.
1861	„ 8	„ 2	55		Early.
1862	May 31	„ 6	67		
1863	„ 29	July 29	61		Early.
1864	June 1	Aug. 4	64		
1865	May 31	July 29	59	Mildew.	Early.
1866	June 4	Aug. 6	63		
1867	„ 5	Aug. 12	68		
1868	May 25	July 17	53		Very early.
1869	June 8	Aug. 6	59		
1870	„ 4	July 28	54		Early.
1871	„ 7	Aug. 10	64	Mildew.	
1872	„ 10	„ 2	53	Mildew.	Early.
1873	„ 14	„ 4	51		
1874	„ 3	July 28	55		Early.
1875	„ 3	Aug. 6	64	Mildew.	
1876	17	„ 7	51		
1877	„ 18	„ 10	53	Mildew.	
1878	„ 7	„ 8	62	Mildew.	
1879	July 1	Sept. 1	62	Mildew.	Very late.
1880	June 19	Aug. 18	60	Mildew.	Late.
1881	„ 16	„ 8	53	Mildew.	
1882	„ 3	„ 6	64		

APPENDIX VII.

Communicated to C. B. Plowright, Esq., by Professor Farlow, of Harvard University, U.S.

Province Laws of Massachusetts, 1736–1761, p. 153.

Anno Regni Regis Georgii II., Vicesimo Octavo, chap. x. (published January 13, 1755).

An Act to prevent damage to English grain arising from barberry bushes.

Whereas it has been found by experience, that the blasting of wheat and other English grain is often occasioned by barberry bushes, to the great loss and damage of the inhabitants of this province:—

Be it therefore enacted by the Governour, Council, and House of Representatives, that whoever, whether community or private person, hath any barberry bushes standing or growing in his or their land, within any of the towns in this province, he or they shall cause the same to be extirpated or destroyed on or before the thirteenth day of June Anno Domini One Thousand Seven Hundred and Sixty.

Be it further enacted that if there shall be any barberry bushes standing or growing in any land within this province after the said 10th day of June, it shall be lawful, by virtue of this Act, for any person whosoever to enter the lands wherein such barberry bushes are, first giving one month's notice of his intention to do so to the owner or occupant thereof, and to cut them down, or pull them up by the root, and then to present a fair account of his labour and charge therein to the owner or occupant of the said land; and if such owner or occupant shall neglect or refuse by the space of two months next after the presenting said account, to make to such person reasonable payment as aforesaid, then the person who cut down or pulled up such bushes, may bring the action against such owner or occupant, owners or occupants, before any Justice of the Peace, if under forty shillings, or otherwise before the Inferior Court of Common Pleas in the county where such bushes grew, who upon proof of the cutting down or pulling up of such bushes by the person who brings the action, or such as were employed by him, shall and is hereby respectively empowered to enter up judgment for him to recover double the value of the reasonable expense and labour in such service and award execution accordingly.

Be it further enacted, that if the lands on which such barberry bushes grew are common and undivided lands, that then an action may be brought as aforesaid, against any one of the proprietors in such manner as the laws of this province provide, in such cases where proprietors may be sued.

Be it further enacted, that the surveyors of the highways, whether publick or private, be and hereby are empowered and required ex-officio to destroy and extirpate all such barberry bushes as are or shall be in the highways in their respective wards or districts, and if any such shall remain after the aforesaid tenth day of June, Anno Domini One Thousand Seven Hundred and Sixty, that then the town or district in which such bushes are shall pay a fine of two shillings for every bush standing or growing in such highway, to be recovered by bill, plaint, information, or on the presentment of a grand jury, and to be paid one half to the informer and the other half to the treasury of the county in which such bushes grew, for the use of the county.

Be it further enacted, that if any barberry bush stand or grow in any stone wall or other fence, either pointing on highway, or dividing between one property and another, that an action may be brought as aforesaid against the owner of ths said fence or the person occupying the land to which such fence belongs: and if the fence in which such bushes grew is a divisional fence between the lands of one person or community and another, and such fence hath not been divided, by which means the particular share of each person or community is not known, then an action may be brought as aforesaid against either of the owners or occupants of the said land.

Be it further enacted, that where the occupant of any land shall eradicate and destroy any barberry bush growing thereon, or in any of the fences belonging to the same (which such occupant is hereby authorised to do, and every action to be brought against him for so doing shall be utterly barred) or shall be obliged, pursuant to this act, to pay for pulling them up or cutting them down, that then the owner or proprietor of such land shall pay the said occupant the full value of his labour and cost in destroying them himself, or what he is obliged to pay to others as aforesaid; and if such owner or owners shall refuse so to do, then it shall be lawful for the said occupant or occupants to withhold so much of the rents or income of the said land as shall be sufficient to pay or reimburse his cost and charge arising as aforesaid.

This Act to continue in force until the tenth day of June, One Thousand Seven Hundred and Sixty-four.—*Reprinted from the 'Lynn News,' December 23rd*, 1882.

XXVIII.—*Report of the Judges of Book-Keeping.*

In compliance with the wish of the Council, that the Judges who examined the large number of systems of farm accounts sent in competition for the prizes offered by the Society, should "draw up such a plan of keeping those accounts as they would recommend to English farmers," we, the said Judges, have endeavoured to comply with that desire, and now lay before the Council the result of our consideration of the question. We recommend:—

1. A Diary combining the cash account with a daily record of all farm transactions.

2. A Farm-account book, showing in columnar form all payments and receipts; and at the end of the book a form of balance-sheet for each year (see pp. 694–701).

These two books, correctly kept, would enable the occupier of any farm to see the annual result of his farming.

Our object has been to lead those farmers who keep no accounts, or none which deserve the name, to do so in future by placing before them a simple form which they can keep, with the least possible trouble, and which will show what farming does for them in every year. We believe the Council will best promote that object by sanctioning these two books only. It is not that we doubt the value of other books, especially Labour-book, Cash-book, Stock-book, and Ledger, or see reason to recommend any material change in the forms already given, but we fear that to ask the class of farmers whose interests we are considering to go beyond the two first books might deter them from beginning to keep any, and it is not necessary to help those who already keep their farm accounts—they will generally prefer to do so in the form to which they are accustomed.

Believing that the two simple forms which we recommend will,

BLANK EXAMPLE PAGE OF DIARY. (Book No. 1.)

		Received.			Paid.		
		£	s.	d.	£	s.	d.
	SATURDAY. Brought forward						
	SUNDAY.						
	MONDAY.						
	TUESDAY.						
	WEDNESDAY.						
	To carry forward £						

		Received.			Paid.		
		£	s.	d.	£	s.	d.
	THURSDAY. Brought forward						
	FRIDAY.						
	For Memoranda; or Weekly Labour Account where no Labour Book is kept.						
	To carry forward £						

Names.	S.	M.	T.	W.	T.	F.	Total.	Rate.

May 1883.		Received.			Paid.		
		£	s.	d.	£	s.	d.
	SATURDAY.						
12th	Stow Fair—Fine Brought forward	14	17	6			
	Began Shearing Tegs.						
	Paid Clements for New Sacks ..		..		1	10	0
	Received of Geo. Smith for Beans ..	52	0	0			
	and Paid to Bank		..		52	0	0
	Carting Manure to Brook Furlong for Swedes.						
	SUNDAY.						
13th	"Blossom" calved (white Cow Calf).						
	MONDAY.						
14th	Fine. Carting Manure.						
	Sent Mr. Smith, of Norton, 20 lbs. Swede Seed, 8*d*.						
	Paid H. Weaver—Poor Rate		..		7	15	0
	Shearing Tegs.						
	TUESDAY.						
15th	Fine. Carting Manure.						
	Finished Shearing Tegs.						
	Received from Leventon and Co., 3 Tons of Fish Guano.						
	Paid Carriage of same		..		2	5	0
	WEDNESDAY.						
16th	Showery. Finished Carting Manure to Brook Furlong.						
	Sold I. Morris 2 Calves, £9.						
	To carry forward £	66	17	6	63	10	0

May 1883.		Received.			Paid.		
		£	s.	d.	£	s.	d.
	THURSDAY.						
17th	Fine .. .. .. Brought forward	66	17	6	63	10	0
	Ploughing in Brook Furlong.						
	Paid Leventon for Fish Guano (by cheque).						
	Received of Geo. Camden for 2 Pigs	2	0	0			
	FRIDAY.						
18th	Fine. Ploughing Brook Furlong.						
	Finished Hoeing Wheat.						
	Received of Morris for 2 calves ..	9	0	0			
	Bought of Attwood 5 store pigs @ 50s. each.						
	Sold Geo. Laight a Yearling Bull ..	15	0	0			
	and Paid to Bank		..		15	0	0
	For Memoranda; or WEEKLY LABOUR ACCOUNT where no Labour Book is kept.	92	17	6	78	10	0
		78	10	0			
		14	7	6			

Names.	S.	M.	T.	W.	T.	F.	Total.	Rate.	Received.	Paid.
J. Bullingham	1	1	1	1	1	1	6	2/6	..	0 15 0
Jos. Keeley ..	1	1	1	1	1	1	6	2/6	..	0 15 0
Richd. Bowles	1	½	½	a	½	1	3½	2/–	..	0 7 0
Wm. Staite ..	1	1	1	1	1	½	5½	2/–	..	0 11 0
Wm. Beard ..	1	½	½	1	1	a	4	2/3	..	0 9 0
Tom Heckes ..	1	1	1	1	1	1	6	1/.	..	0 6 0
Ann Beavington	1	1	1	1	a	a	4	–/10	..	0 3 4
Sarah Burford	1	1	1	1	a	a	4	–/10	..	0 3 4

	Received.			Paid.		
	14	7	6	3	9	8
	3	9	8			
To carry forward £	10	17	10			

BLANK FORM OF RECEIPTS FROM SALES. (Book No. 2.)

Date.	Of whom Received, or to whom Charged in Ledger, and Particulars.	For Live Stock.	Corn and Seeds.	Dairy Produce and Poultry.	Other Produce.	Ledger Folio.	Total Receipts.
		£ s. d.	£ s. d.	£ s. d.	£ s. d.		£ s. d.
	Brought forward						
	To carry forward .. £						

EXAMPLE SHEET OF RECEIPTS FROM SALES. (Book No. 2.)

Date.	Of whom Received, or to whom Charged in Ledger, and Particulars.	For Live Stock.	Corn and Seeds.	Dairy Produce and Poultry.	Other Produce.	Ledger Folio.	Total Receipts.
		£ s. d.	£ s. d.	£ s. d.	£ s. d.		£ s. d.
1883.	Brought forward	56 16 0	78 4 0	28 0 8	11 3 0	..	174 3 8
May 12	Geo. Smith—52 Sacks of Beans, at 20*s.*	..	52 0 0	..	..	17	52 0 0
„ 17	Geo. Camden—For 2 Pigs	2 0 0	..	..	..	..	2 0 0
„ 18	Isaac Morris—2 Fat Calves	9 0 0	..	..	..	..	9 0 0
	Geo. Laight—1 Yearling Bull	15 0 0	..	..	..	..	15 0 0
„ 21	Robt. Arkell—10 Ewes and Lambs	45 0 0	..	..	..	..	45 0 0
	C. H. Smith—20 lbs. of Swede Seed, at 8*d.*	..	0 13 4	..	..	..	0 13 4
„ 23	John Rimell—5 Bags of Beans, at 15*s.*	..	3 15 0	..	..	70	3 15 0
	Geo. Attwood—3 Fat Lambs, at 50*s.*	7 10 0	..	..	..	..	7 10 0
„ 26	Robt. Horne—Butter and Eggs	..	..	3 0 0	..	..	3 0 0
	Fred. Canning—1 Nag Horse	25 0 0	..	..	..	..	25 0 0
„ 29	F. H. Cubberley—3 In-calf Heifers	48 0 0	..	..	..	..	48 0 0
June 1	Robt. Lunn—4 Sacks of Barley, at 19*s.*	..	3 16 0	..	..	58	3 16 0
	Geo. Cole—Cabbages, 1½ Acres	..	..	..	30 0 0	101	36 0 0
	Do. 1 Ton of Straw	..	..	..	3 5 0		
	Do. ½ Ton of Hay	..	..	..	2 15 0		
	R. H. Haydon—1 Calf	3 3 0	..	..	..	28	3 3 0
	Do. 4 Sacks of Potatoes	..	..	..	1 12 0	..	1 12 0
	To carry forward .. £	211 9 0	138 8 4	31 0 8	48 15 0	..	£429 13 0

BLANK FORM OF PAYMENTS.

Date.	To Whom Paid and Particulars.	Live Stock.	Corn and Seeds.	Oilcake and Manure.	Rent, Rates, and Taxes.	Labour.	Sundries.	House-keeping.	Ledger Folio.	Total Payments.
		£ s. d.	£ s. d	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d		£ s. d.
	Brought forward ..									
	To carry forward .. £									

Date.	To Whom Paid and Particulars.	Live Stock.	Corn and Seeds.	Oilcake and Manure.	Rent, Rates, and Taxes.	Labour.	Sundries.	House-keeping.	Ledger Folio.	Total Payments.
		£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.		£ s. d
1883.	Brought forward ..	15 0 0	5 6 6	12 6 8	11 19 1	40 4 8	13 6 4	20 16 5	..	118 19 8
May 12	Thos. Clements—For New Sacks	..	..	..	..	..	1 10 0	..	..	1 10 0
„ 14	H. Weaver—Poors Rate ..	..	..	..	7 15 0	..	..	..	..	7 15 0
„ 15	Great Western Railway—Carriage of Fish Guano	..	..	2 5 0	..	..	..	..	..	2 5 0
„ 17	Leventon & Co.—For Fish Guano	..	..	31 10 0	..	..	..	..	..	31 10 0
„ 18	Geo. Attwood—Five Store Pigs at 50s.	12 10 0	..	..	..	..	..	..	..	12 10 0
	Labour Account—1 Week	..	..	..	..	3 9 8	..	..	..	3 9 8
„ 24	Fred. Dunn—Long Plough	..	..	..	..	..	3 10 0	..	..	3 10 0
	Thos. Jarvis—Blacksmith	..	..	..	..	..	1 12 6	..	..	1 12 6
	F. V. Saunders—Fish ..	..	..	..	..	..	..	1 7 11	..	1 7 11
„ 25	Labour Account—1 Week	..	..	..	..	2 14 0	..	..	..	2 14 0
„ 29	Expenses to Beckford Sale	..	..	..	..	..	0 2 2	..	..	0 2 2
	C. H. Smith—6 Yearlings	60 0 0	..	..	..	..	..	..	..	60 0 0
	Do. 12 Bush. of Vetches at 8s.	..	4 16 0	..	..	..	..	..	..	4 16 0
	Do. 1 Young Boar	5 5 0	..	..	..	..	..	..	..	5 5 0
	Idiens & Sons—Coal for House	..	..	..	..	..	..	3 4 0	..	3 4 0
„ 30	Ralph Smith—Steam Cultivating and Threshing	..	..	..	..	..	12 8 9	..	..	12 8 9
	Webb & Son—For Clover Seed	..	2 5 6	..	..	..	..	..	..	2 5 6
„ 31	Foster Bros.—For Oilcake	..	..	17 12 8	..	..	..	..	..	20 16 8
	Do. „ Linseed	..	..	3 4 0						
June 1	Labour Account—1 Week	..	..	..	..	2 14 7	..	..	..	2 14 7
	Expenses to Stratford-on-Avon	..	..	..	..	..	0 2 6	..	..	0 2 6
	To carry forward .. £	92 15 0	12 8 0	66 18 4	19 14 1	49 2 11	32 12 3	25 8 4	..	298 18 11

Dr. **BLANK BALANCE SHEET** for the Year ending 18 . (End of Book No. 2.) Cr.

	£ *s.* *d.*	£ *s.* *d.*		£ *s.* *d.*	£ *s.* *d.*
To Valuation of Live and Dead Stock, Acts of Husbandry, on the first day of the Farming Year, ...			By Receipts from page , for:		
To Payments from page , for:			Live Stock Sold		
Live Stock bought			Corn and Seeds Sold		
Corn and Seeds bought			Dairy Produce and Poultry ..		
Oilcake and Manure			Other Produce		
Rent, Rates, and Taxes					
Labour			By Valuation of Live and Dead Stock, Acts of Husbandry, &c., on the last day of the farming year		
Sundries					
Housekeeping					
	£				
To Balance, being Gross Profit for the year					
	£			£	

DR. EXAMPLE BALANCE SHEET FOR THE YEAR ENDING 31ST DECEMBER, 1883. (End of Book No. 2.) CR.

	£ s. d.	£ s. d.		£ s. d.	£ s. d.
To Valuation of Live and Dead Stock, Acts of Husbandry, on the first day of the Farming Year, January 1st, 1883	..	3491 17 6	By Receipts from page 15 for:		
To Payments from page 15, for:			Live Stock Sold	1448 17 6	
Live Stock bought	619 18 4		Corn and Seeds Sold	622 3 8	
Corn and Seeds bought	214 15 0		Dairy Produce and Poultry ..	143 5 4	
Oilcake and Manure	301 5 8		Other Produce	110 8 10	2324 15 4
Rent, Rates, and Taxes	656 0 10				
Labour	218 19 11		By Valuation of Live and Dead Stock, Acts of Husbandry, &c., on the last day of the farming year	..	3744 15 0
Sundries	183 1 6				
Housekeeping	215 6 9	2409 8 0			
		£ 5901 5 6			
To Balance, being Gross Profit for the year		168 4 10			
		£ 6069 10 4			£ 6069 10 4

will, if known, induce many farmers to keep accounts who hitherto have not done so, and enable those who have kept accounts to do so more easily, we ask the Council to authorise the Secretary to supply all booksellers who desire to publish them with the several forms. They would be more generally adopted by farmers if published in their own localities, than if only obtainable in London.

C. Randell.
Wm. Frankish.
Reginald A. Warren.

XXIX.—*On Sweet Vernal Grass and Golden Oat Grass, and their Adulteration.* By William Carruthers, F.R.S.

Sweet Vernal Grass (*Anthoxanthum odoratum*, Linn.) Fig 1 *a*, is one of the most widely distributed of our indigenous grasses. It is found flourishing in all kinds of soils—in rich meadows and dry pastures, in bogs and woods, and on barren hill-sides. It is one of the earliest grasses, showing its flowering heads even at the end of April, and it sends up flowering stems all through the season. Whatever benefit may be derived from its presence in pastures is due to its early foliage, which at the best is but scanty, and is never a favourite food of any kind of stock, though in this early state it is eaten with the other palatable grasses of the pasture. Whether it is better liked by cattle as a food when dry is doubtful, but it is certain that its extremely fragrant odour enhances the money-value of hay in the eyes of both seller and buyer. It is a perennial grass, and deserves a place, though not an important one, in permanent pastures.

But the benefits sweet vernal grass may give to a pasture are entirely wanting from the allied species, the seeds of which are very largely sold in its stead. This plant, called *Anthoxanthum Puelii*, Lec. and Lam., Fig. 1 *b*, is an annual grass, found throughout Central and Southern Europe, and extending as far north as Holland and Belgium; but whether in these two countries it is an introduced or an indigenous plant I have not the means of determining. It is a smaller and more delicate grass, branching very freely from the root, and producing a large number of flowering stems. The plant has scarcely any odour, either when green or dried. The foliage is small, and not abundant. The substitution, therefore, of its seeds for the perennial sweet vernal grass is a serious injury, and the increasing proportion of samples that have during the year come under my notice prove that this adulteration is on the increase.

The introduction of *Anthoxanthum Puelii* by seedsmen, and

Fig. 1.—*a*, Sweet-scented Vernal Grass, *Anthoxanthum odoratum*, Linn. *b*, Annual Vernal Grass, *Anthoxanthum Puelii*, Lec. and Lam. Both one-third natural size.

its extensive presence in mixtures for laying down new pastures and improving old ones, has led to its appearance over the country in such a way as to puzzle botanists, and to lead to the notion that it is an indigenous grass, which had been overlooked until a few years ago. It was first noticed by Mr. Britten in 1872, at Mobberly in Cheshire, in a field which had been broken up and re-sown with grass some years before. It was next observed by Mr. Townsend, in 1874, in a gravelly field near Netley, in Hampshire; and since then it has been recorded from Staffordshire, Worcestershire, Devonshire, and other places. But in none of the localities is its appearance free from the strong suspicion that it has been introduced with agricultural seeds. Mr. Townsend gave a figure and description of the plant in the 'Journal of Botany' for 1875, page 1, plate 157.

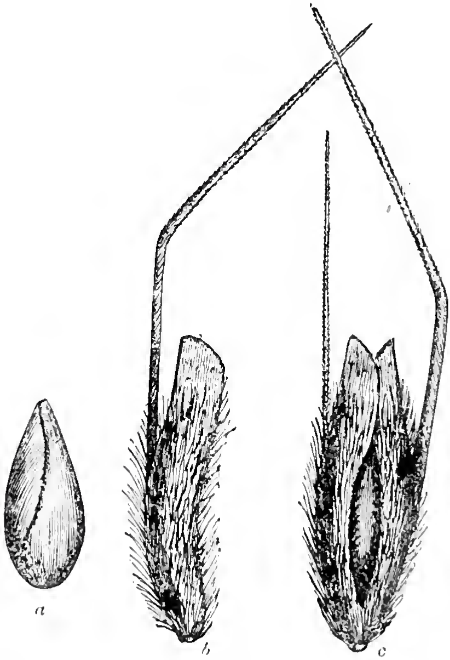

Fig. 2.—Sweet Scented Vernal Grass, *Anthoxanthum odoratum*, Linn. Ten times the natural size. *a*, The seed with its shining striated scales; *b*, one of the hairy pales, with the jointed hygrometric awn, covered with hairs, and with curved edges, and an even apex; *c*, the "seed" as offered for sale, consisting of the two pales surrounding the small shining seed, which is seen between the open edges of the pales.

The seeds of the two grasses very closely resemble each other, yet they possess differences which may be detected when they are carefully examined.

As offered for sale, the seeds are not naked like those of wheat, but are still covered by two sets of leafy envelopes. They are oblong and more or less hairy bodies, with two hygrometric awns, one being kneed, and the other shorter and straight. The small seed is easily freed from the outer coverings, and it is found to be an oval brownish body, with a shining coat. The coat consists of two thin striated scales, which are so closely wrapped round the seed that it is very difficult to remove them. When the grass is in flower, the scales are more open, and the stamens spring from within them. The hairy awned pales are believed to be aborted florets, one on either side of the central fertile floret, which produces the seed; and the three florets are enclosed in two unequal-sized white chaffy glumes, which remain attached to the flowering stalk when the seeds are ripe. This description applies equally to the seeds of all species of *Anthoxanthum.*

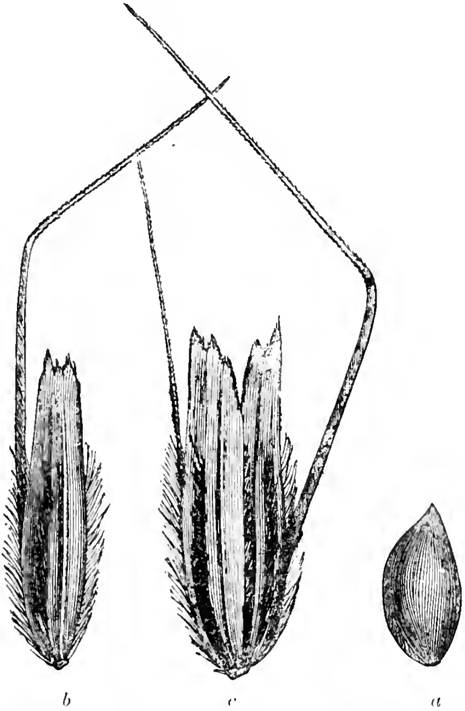

Fig. 3.—Annual Vernal Grass, *Anthoxanthum Puelii*, Lec. and Lam. Ten times the natural size. *a*, The seed with its shining striated scales; *b*, one of the pales, with the jointed hygrometric awn, the hairs along the nerves and margins. and with straight edges and toothed apex; c, the "seed" as offered for sale, consisting of the two pales, completely enclosing the seed.

The differences between the seeds of the sweet vernal grass and the annual species employed to adulterate it are not very obvious, yet, when accurately apprehended, they can easily be detected. In the bulk, the seeds of the true vernal grass are darker in colour than those of the other species. The most important characters for distinguishing them are to be seen in the hairy pales or barren florets. In the sweet vernal grass the pales are narrowed or hollowed out in the middle, so that while they overlap at top and bottom, they leave a narrow oval space in the middle, through which the glistening surface of the seed may be seen. In *Anthoxanthum Puelii* the pales are quite straight-sided, and entirely cover the seed. This difference may be seen in the aspect of the complete seed as offered for sale—Figs. 2 *c* and 3 *c*, but perhaps better in the drawings of the separate glumes of each species, Figs. 2 *b* and 3 *b*. In the sweet vernal grass the enlarged apex of the pale is evenly rounded, and the edge is uniformly and finely serrate; while in the allied species the apex has two or three irregular teeth. And further, the hairs on the pales of the sweet vernal grass are scattered irregularly over the surface, while in the other species they are in lines along the midrib and veins, and along the edges. Finally, the seeds free from the hairy pales of the sweet vernal grass are longer and narrower, and darker in colour than those of *Anthoxanthum Puelii*. In both the outer scale is very large, completely covering the seed and the smaller inner scale. The white seed is of the same form, when denuded of the scales.

The Yellow Oat-grass (*Avena flavescens*, Linn.) Fig. 4 *a*, occurs frequently in dry meadows and pastures, and may be grown in almost any kind of soil or situation. It produces a considerable quantity of foliage, and is a favourite food of sheep. It is important as a late grass in pastures, and is therefore a desirable ingredient in mixtures of seeds used for laying down fields. It has fibrous roots, and sends out creeping underground stems by which it increases. The stems of the oat-grass rise to a height of 1 to 3 feet; the leaves are flat and somewhat hairy, especially on the upper surface. The flowers, which are very small for an oat-grass, are borne on a branched lax panicle. The seeds are enclosed in two pales; the outer one has the apex bifid and drawn out into two short roughish awns, and it gives off from its outer surface towards the apex a long rough-jointed awn. The inner pale is white and membranous, with a bifid apex; it is very obvious in the seed being free in its upper portion from the outer pale. There is a small crown of short white hairs at the base of the pales, and the longish stalk or pedicel of the next flower has a continuous series of silvery hairs along its sides.

Fig. 4.—*a*, Yellow Oat Grass, *Avena flavescens*, Linn.; *b*, Wavy Mountain Hair Grass, *Aira flexuosa*, Linn. Both one-third the natural size.

The seed which is extensively supplied instead of the yellow oat-grass is the Wavy Mountain Hair-grass (*Aira flexuosa*, Linn.), Fig. 4, *b*, a grass very common on sandy heaths, moors, and hilly pastures, where it often forms a considerable portion of the herbage, and is no doubt of value as an ingredient in such exposed native pastures. It belongs to the same genus as the Hassock grass (*Aira cæspitosa*, Linn.), so common in moist rich soils, especially where there is some shade. As the wiry foliage of the Hassock grass is rejected by cattle, it grows in tussocks, which are as objectionable to the sight as they are worthless in the pasture. The seeds of this common grass could not be employed to adulterate the yellow oat-grass without easy detection, for they are much smaller than those of the latter grass. It is obvious that intelligence is somewhere exercised in selecting

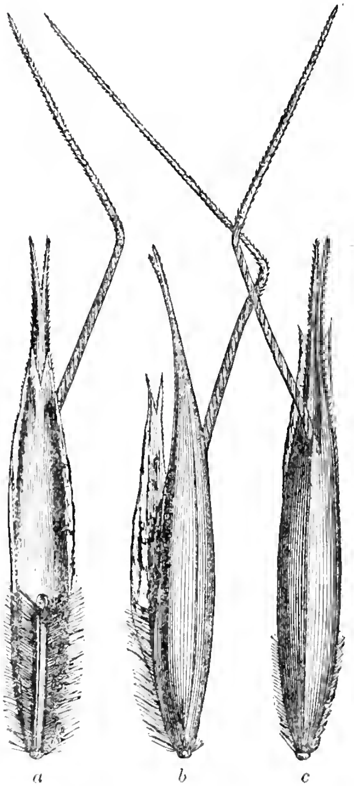

Fig. 5.—Yellow Oat Grass, *Avena flavescens*, Linn. Ten times the natural size. *a*, Inner surface of the seed, showing the pedicel of the next seed, with a continuous line of hairs on each side; *b*, side view, showing the inner chaffy scale; *c*, back view, showing the place of attachment of the hygrometric awn, and the smaller awns terminating the outer pale.

suitable seeds for the purposes of adulteration. It would seem difficult to understand why in this case seed-collectors should gather the seeds of a totally different-looking and worthless grass, when the same labour would secure the seeds of the valuable yellow oat-grass. The two grasses do not naturally grow together. The seeds are collected separately, and are sold, each pure of its kind, and both as the seeds of *Avena flavescens.*

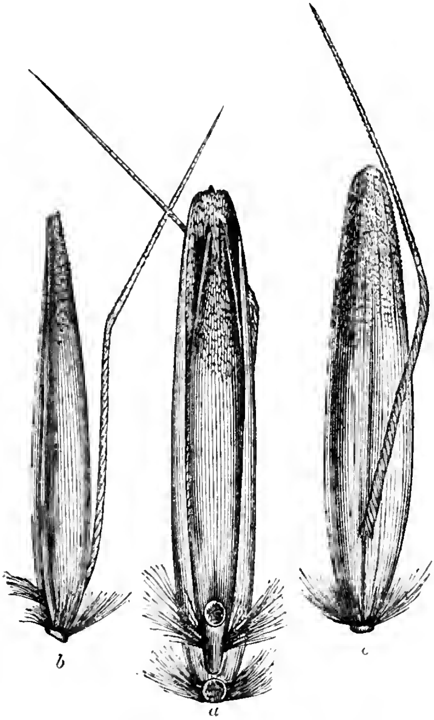

Fig. 6.—Wavy Mountain Hair Grass, ***Aira flexuosa***, Linn. Ten times the natural size. *a*, Inner surface of the seed, showing the pedicel of the next seed, with a pencil of hairs on either side; ***b***, side view, in which the inner pale cannot be seen; *c*, back view, showing the place of attachment of the hygrometric awn, and the entire apex of the outer pale.

When one examines a little more closely into the relations of the two seeds, it is however easy to discover the reasons that induce unprincipled merchants to substitute the one for the other. *Aira flexuosa* seeds abundantly, and its seeds are three times heavier than the seeds of *Avena flavescens*, so that, other things being equal, the labour of collecting 3 cwt. of the one grass would secure only 1 cwt. of the other. But other things are not equal, for the *Aira*, where its seeds are gathered, grows in large breadths unmixed with other grasses; while the seeds of the *Avena* are collected from individual plants growing amongst other grasses, so that their collection necessarily involves greater labour. Then the price of the seed of *Aira flexuosa* is from 20*s.* to 30*s.* per cwt., while the same quantity of *Avena flavescens* costs from 150*s.* to 220*s.* I have reason to believe that less than a *hundredth part* of the seed sold last year in this country as *Avena flavescens* belonged to this species, and that ninety-nine parts out of a hundred were the seeds of this worthless *Aira!* One firm, having a deservedly large seed-trade, had the misfortune this year to acquire *Aira flexuosa* as *Avena flavescens*, without a single seed of the *Avena* being mixed with it. It is not easy to realise the injury to pastures and the loss to farmers which the distribution of this worthless grass must have unwittingly caused. But the distribution of wavy hair-grass, under the name of yellow oat-grass, has not been confined to one house. The main purpose I have in drawing special attention to these adulterations and substitutions, and giving the accompanying figures by which they may be detected, is to draw the attention of the trade to their parcels, in the hope that they may avoid being imposed upon, and so be prevented from unwittingly purchasing and distributing a worthless weed instead of a valuable grass.

The wavy hair-grass has long fibrous roots, a stem from 1 to 2 feet high, and a large number of very narrow bristle-shaped, roughish leaves, the lower and outer ones being longer and more numerous than the upper. The flowers are in a spreading panicle, the branches being hair-like and wavy.

The seeds of this grass can be readily distinguished from those of the yellow oat-grass by the twisted awn which springs from near the base of the outer pale. The inner pale is smaller and firmer in texture, and its edges are covered by those of the outer pale. The base of the outer pale is surrounded by a crown of spreading silvery hairs, and two pencils of similar hairs spring from either side of the otherwise smooth persistent stalk, lying on the face of the grain.

The figures of the whole grasses described in this paper should enable the farmer to recognise any of them present in his fields. If he accepts the seed on the testimony of the merchant from whom he buys it, without careful examination to discover whether it be the seed he has ordered or not, he ought at least to be able to discover what are the plants that appear in his pasture, from the admirable drawings by Mr. R. Morgan which accompany this paper, even though they are reduced one-third, to suit the pages of the 'Journal.'

Royal Agricultural Society of England.

1883–84.

President.

SIR BRANDRETH GIBBS.

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1861	**DENT**, J. D., *Ribston Hall, Wetherby, Yorkshire.*
1863	**KINGSCOTE**, Colonel, M.P., *Kingscote, Wotton-under-Edge, Gloucestershire.*
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1856	**POWIS**, Earl of, *Powis Castle, Welshpool, Montgomeryshire.*
1858	**RUTLAND**, Duke of, K.G., *Belvoir Castle, Grantham, Leicestershire.*
1861	**WELLS**, WILLIAM, *Holmewood, Peterborough, Northamptonshire.*

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1847	**EVERSLEY**, Viscount, *Heckfield Place, Winchfield, Hants.*
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1855	**WYNN**, Sir WATKIN WILLIAMS, Bart., M.P.,*Wynnstay, Ruabon, Denbighshire.*

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1880	**ASHWORTH**, ALFRED, *Tabley Grange, Knutsford, Cheshire.*
1875	**AYLMER**, HUGH, *West Dereham, Stoke Ferry, Norfolk.*
1871	**BOWEN-JONES**, J., *Ensdon House, Montford Bridge, R.S.O., Salop.*
1874	**CHANDOS-POLE-GELL**, H., *Hopton Hall, Wirksworth, Derbyshire.*
1883	**CLAY**, CHARLES, *Walton Grange, Wakefield, Yorkshire.*
1883	**COKE**, Hon. EDWARD K. W., *Longford Hall, Derby.*
1882	**COXON**, JOHN, *Freeford Farm, Lichfield, Staffordshire.*
1860	**DRUCE**, JOSEPH, *Eynsham, Oxford.*
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1882	**EMLYN**, Viscount, M.P., *Golden Grove, Carmarthen, S. Wales.*
1873	**EVANS**, JOHN, *Uffington, Shrewsbury, Salop.*
1876	**FEVERSHAM**, Earl of, *Duncombe Park, Helmsley, Yorkshire.*
1879	**FOSTER**, SAMUEL P., *Killhow, Carlisle, Cumberland.*

Year when Elected.	
1875	Frankish, William, *Limber Magna, Ulceby, Lincolnshire.*
1881	Gilbey, Walter, *Elsenham Hall, Essex.*
1879	Gorringe, Hugh, *Kingston-by-Sea, Brighton, Sussex.*
1874	Hemsley, John, *Shelton, Newark, Notts.*
1876	Howard, Charles, *Biddenham, Bedford.*
1878	Howard, James, M.P., *Clapham Park, Bedfordshire.*
1869	Leeds, Robert, *Keswick Old Hall, Norwich.*
1874	Lindsay, Colonel Sir R. Loyd, M.P., *Lockinge Park, Wantage, Berkshire.*
1881	Little, Herbert J., *Coldham Hall, Wisbech, Cambridgeshire.*
1865	Lopes, Sir Massey, Bart., M.P., *Maristow, Roborough, Devon.*
1874	Martin, Joseph, *Highfield House, Littleport, Isle of Ely, Cambridgeshire.*
1880	Moreton, Lord, M.P., *Tortworth Court, Falfield, R.S.O., Gloucestershire.*
1879	Neville, Robert, *Butleigh Court, Glastonbury, Somersetshire.*
1857	Pain, Thomas, *Audley's Wood, Basingstoke, Hants.*
1881	Parker, Hon. Cecil T., *Eccleston, Chester.*
1861	Randell, Charles, *Chadbury, Evesham, Worcestershire.*
1875	Ransome, Robert Charles, *Ipswich, Suffolk.*
1867	Ravensworth, Earl of, *Ravensworth Castle, Gateshead, Durham.*
1871	Rawlence, James, *Bulbridge, Wilton, Salisbury, Wilts.*
1869	Ridley, Sir M. White, Bart., M.P., *Blagdon, Cramlington, Northumberland.*
1875	Russell, Robert, *Horton Court Lodge, Dartford, Kent.*
1874	Sanday, George Henry, *Wensley House, Bedale, Yorkshire.*
1878	Sheraton, William, *Broom House, Ellesmere, Salop.*
1882	Stafford, Marquis of, M.P., *Trentham Hall, Stoke-upon-Trent, Staffs.*
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1883	Sutton, Martin J., *Westwood House, Tilehurst, near Reading.*
1881	Thorold, Sir John H., Bart., *Syston Park, Grantham, Lincolnshire.*
1874	Turbervill, Lieut.-Col. Picton, *Ewenny Priory, Bridgend, South Wales.*
1845	Turner, George, *Great Bowley, Tiverton, Exeter, Devonshire.*
1871	Turner, Jabez, *Norman Cross, Yaxley, Huntingdonshire.*
1871	Wakefield, William H., *Sedgwick, Kendal, Westmoreland.*
1882	Warren, Reginald Augustus, *Preston Place, Arundel, Sussex.*
1870	Whitehead, Charles, *Barming House, Maidstone, Kent.*
1865	Wilson, Jacob, *Chillingham Barns, Alnwick, Northumberland.*
1878	Wise, George, *Charlwood Place Farm, Charlwood, Crawley, Surrey.*

Secretary and Editor.

H. M. JENKINS, 12, *Hanover Square, London,* W.

Consulting Chemist—Dr. Augustus Voelcker, F.R.S., 12, *Hanover Square,* W.

Consulting Botanist—W. Carruthers, F.R.S., F.L.S., *Central House, Central Hill, Norwood,* S.E.

Consulting Veterinary Surgeon—Professor James Beart Simonds, *St. John's Villa, Ryde, Isle of Wight.*

Honorary Consulting Entomologist—Miss E. A. Ormerod, F.M.S., *Dunster Lodge, Spring Grove, Isleworth.*

Veterinary Inspectors—The Officers of the Royal Veterinary College.

Consulting Engineer—W. Anderson, 3, *Whitehall Place,* S.W.

Surveyor and Superintendent of Works—Wilson Bennison, 62, *Ashley Road, Crouch Hill,* N.

Consulting Surveyor—George Hunt, *Evesham, Worcestershire.*

Seedsmen—Thomas Gibbs and Co., *Down 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 1883.

Finance Committee.

Kingscote, Colonel (Chairman).
Bridport, General Viscount.
Ridley, Sir M. White, Bt.
Frankish, W.
Randell, Charles.

House Committee.

Chairman of Finance Committee (Chairman)
The President.
Bridport, General Viscount.
Randell, C.
Wilson, Jacob.

Journal Committee.

Cathcart, Earl (Chairman).
Ridley, Sir M. White, Bt.
Thorold, Sir John H., Bt.
Bowen-Jones, J.
Chandos-Pole-Gell, H.
Dent, J. D.
Frankish, W.
Hemsley, J.
Howard, J.
Little, H. J.
Ransome, R. C.
Turbervill, Lieut.-Col.
Wells, W.
Whitehead, Charles.

Chemical Committee.

Wells, William (Chairman).
Bedford, Duke of.
Emlyn, Viscount.
Lawes, Sir J. B., Bt.
Macdonald, Sir A. K., Bt.
Arkwright, J. H.
Bowen-Jones, J.
Dent, J. D.
Howard, C.
Little, H. J.
Neville, R.
Turbervill, Lieut.-Col.
Voelcker, Dr. A.
Wakefield, W. H.
Warren, R. A.
Whitehead, Charles.

Seeds and Plant-Diseases Committee.

Whitehead, Charles (Chairman).
Thorold, Sir J. H., Bt.
Gibbs, Sir Brandreth.
Arkwright, J. H.
Bowen-Jones, J.
Carruthers, W.
Frankish, W.
Little, H. J.
Parker, Hon. C. T.
Sutton, Martin, J.
Turbervill, Lieut.-Col.
Voelcker, Dr.

Veterinary Committee.

Egerton, Lord (Chairman).
Bridport, General Viscount.
Moreton, Lord.
Stafford, Marquis of.
Gibbs, Sir Brandreth.
Ridley, Sir M. White, Bt.
Thorold, Sir J. H., Bt.
Allender, G. M.
Ashworth, A.
Brown, Professor.
Fleming, George.
Foster, S. P.
Harpley, M. J.
Kingscote, Colonel.
Parker, Hon. C. T.
Robertson, Professor.
Sanday, G. H.
Sanderson, Dr. J. Burdon.
Simonds, Professor.
Stratton, R.
Wakefield, W. H.
Wilson, Jacob.

Stock-Prizes Committee.

Wilson, Jacob (Chairman).
Bridport, Gen. Viscount.
Emlyn, Viscount.
Moreton, Lord.
Gibbs, Sir Brandreth.
Arkwright, J. H.
Ashworth, A.
Aylmer, H.
Chandos-Pole-Gell, H.
Coxon, John.
Frankish, W.
Gilbey, Walter.
Gorringe, H.
Hemsley, J.
Howard, C.
Martin, J
Pain, T.
Parker, Hon. C. T.
Randell, C.
Sanday, G. H.
Sheraton, W.
Simonds, Prof.
Stratton, R.
Turner, George.
Wakefield, W. H.
Wise, G.
The Stewards of Live Stock.

Implement Committee.

Hemsley, J. (Chairman).
Bridport, Gen. Viscount.
Moreton, Lord.
Thorold, Sir John H., Bart.
Gibbs, Sir Brandreth.
Allender, G. M.
Anderson, W.
Ashworth, A.
Bowen-Jones, J.
Frankish, W.
Gorringe, H.
Howard, C.
Howard, J.
Martin, J.
Neville, R.
Parker, Hon. C. T.
Ransome, R. C.
Sanday, G. H.
Sheraton, W.
Stratton, R.
Turbervill, Lieut.-Col.
Turner, Jabez.
Wilson, Jacob.
The Stewards of Implements.

General Shrewsbury Committee.

Richmond and Gordon, Duke of (Chairman).
Bridport, Gen. Viscount.
Powis, Earl of.
Moreton, Lord.
Stafford, Marquis of.
Gibbs, Sir Brandreth.
Arkwright, J. H.
Ashworth, A.
Aylmer, H.
Bowen-Jones, J.
Chandos-Pole-Gell, H.
Coxon, John.
Dent, J. D.
Evans, J.
Everall, P.
Foster, S. P.
Frankish, W.
Gorringe, H.
Hemsley, J.
Howard, C.
Kingscote, Colonel.
Neville, R.
Parker, Hon. Cecil T.
Randell, Charles.
Sanday, G. H.
Sheraton, W.
Turbervill, Lieut.-Col.
Wakefield, W. H.
Wells, W.
Whitehead, Charles.
Wilson, Jacob.
Wingfield, C. G.
Shrewsbury, Mayor of.
Shrewsbury, Town Clerk of.

Show-Yard Contracts Committee.

Randell, Charles (Chairman).
Gibbs, Sir Brandreth.
Allender, G. M.
Frankish, W.
Hemsley, J.
Howard, C.
Ransome, R. C.
Sanday, G. H.
Stratton, R.
Wilson, Jacob.

Committee of Selection.

Cathcart, Earl (Chairman).
Ridley, Sir M. W., Bt.
Bowen-Jones, J.
Chandos-Pole-Gell, H.
Foster, S. P.
Wakefield, W. H.

And the Chairmen of the Standing Committees.

Education Committee.

Moreton, Lord (Chairman).
Thorold, Sir J. H., Bt.
Bowen-Jones, J.
Carruthers, W.
Dent, J. D.
Kingscote, Colonel.
Little, H. J.
Parker, Hon. Cecil T.
Turbervill, Lieut.-Col.
Voelcker, Dr.

Dairy Committee.

Parker, Hon. C. T. (Chairman).
Bridport, Gen. Viscount.
Moreton, Lord.
Macdonald, Sir A. K., Bt.
Thorold, Sir John H., Bt.
Allender, G. M.
Bowen-Jones, J.
Chandos-Pole-Gell, H.
Kingscote, Colonel.
Neville, R.
Stratton, R.
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, Tuesday, May 22nd, 1883.

REPORT OF THE COUNCIL.

The Council are glad to be able to congratulate the Society upon a substantial addition to the list of Members since the last General Meeting in December, by the election of 389 Members against the resignation of 151 Members, the death of 2 Governors and 70 Members, and the removal of 25 Members by order of the Council.

The Society now consists of

78 Life Governors.
71 Annual Governors.
2979 Life Members.
4952 Annual Members.
19 Honorary Members.

making a total of 8099, and showing an increase of 141 Members.

Since the last General Meeting the death of Mr. Shuttleworth has deprived the Council of the most valuable aid of a thoroughly practical Member of their body, who for some years had acted as Chairman of the Showyard Contracts Committee.

By the recent sudden death of Lord Vernon, the Society and British Agriculture have alike sustained a most severe and unexpected loss. In his several capacities as a former President, as a Vice-President, as a Steward at the Country Meetings, and as Chairman of important Committees, Lord Vernon has long taken a leading part in the administration of the Society's affairs. His great and practical philanthropy were signally illustrated by his untiring exertions as Chairman of the French Peasant-Farmers' Seed Fund after the Franco-German War.

The vacancies in the Council caused by the death of Mr. Shuttleworth and Mr. Amos, the latter of which was reported at the last General Meeting, have been filled up by the election of Mr. Martin J. Sutton, of Reading, and Mr. C. Clay, of Wakefield.

The accounts for the year 1882 have been examined and certified by the auditors and accountants of the Society, and have been published in the current number of the 'Journal,' together with the statement of Receipts and Expenditure relating to the Reading Meeting. The funded property of the Society has been increased by the investment of 1500*l.*, and now stands at 19,910*l.* 1*s.* 3*d.* New Three per Cents. The balance of the current account in the hands of the Society's bankers on the 1st instant was 5960*l.* 17*s.* 6*d.*, and 2000*l.* remained on deposit.

The York Meeting will commence on Monday, July 16th, and will close on Friday, July 20th; but the Implement Yard will be open to the public on Saturday, the 14th.

The Council have accepted the invitation which they received from the Mayor and Corporation of Shrewsbury to hold the Country Meeting of 1884 on the Race-course close to that town.

The Country Meeting for the year 1885 will be held in the district which includes North Wales, Cheshire, and Lancashire.

The Council regret that the competition for the Prize of 20*l.* offered for the best system of keeping Farm Accounts failed to bring forth any plan which, in the opinion of the Judges, was good enough to be efficient, and, at the same time, simple enough to be adopted by ordinary farmers. The Judges have therefore undertaken, at the request of the Council, to draw up such a system as they would recommend.

The investigation into the life-history of the Liver-fluke, made at the request of the Council, has been completed by Professor A. P. Thomas, and a plain statement of the results which he has obtained has been published in the recently-issued number of the 'Journal.' The summary of the preventive measures which he recommended was also published several weeks ago in the Agricultural newspapers.

The Council have viewed with much concern the renewed spread of Foot-and-mouth disease throughout the country; and feeling strongly the importance of the question to all stock-owners, and more especially to breeders, a deputation from them recently waited upon the Lord President of the Council to urge upon the Government the necessity of taking such further steps as will prevent this disease being imported from foreign countries.

The Medals and Prizes offered by the Society to graduates of the Royal College of Veterinary Surgeons for proficiency in "Cattle Pathology" have been awarded as follows:—

Gold Medal and 20*l*., Mr. W. H. Edgar, Dartford.
Silver Medal and 10*l*., Mr. A. H. Archer, Dunstable.
Bronze Medal and 5*l*., Mr. J. B. Cresswell, Louth.

In consequence of the paucity of candidates and the small interest apparently felt by the veterinary profession in these examinations, the Council have, though with much regret, decided to discontinue the offer of these medals and prizes; but being still anxious to encourage proficiency in the pathology of cattle, sheep, and pigs, they have decided to offer the Silver and Bronze Medals of the Society to the two students who may pass best in that subject at the Diploma examinations of the Royal College of Veterinary Surgeons.

The Council are glad to state that the large increase in the number of samples of manures and feeding stuffs, which were sent for analysis to the Society's Laboratory last year, has up to the present time been exceeded, as compared with the equivalent period of 1882. This evidence that the Members of the Society are taking more advantage of the facilities offered them to test their purchases of manures and feeding stuffs by analysis is the more satisfactory, because recent Quarterly Reports of the Chemical Committee have shown the continued need of such a precaution being taken in many cases.

The Council have determined that in addition to the "Privileges of the Chemical Analysis" as now sanctioned by them, Governors of the Society may be allowed to send to the Society's Laboratory, for analysis at the scale of fees that may be in force, any manures and feeding stuffs which are to be used by their outgoing tenants.

The Annual Excursion of Members of the Society to the Experimental Farm at Crawley, near Woburn, has taken place in the last two years in connection with the Annual Meeting; but experience having shown that this is too early in the season to allow of a reliable judgment of the crops on the differently manured plots being formed, the Council have thought it best to postpone it this year until June 7th.

The Council have much satisfaction in observing that the Members of the Society have more largely availed themselves of the services of the Consulting Botanist during the current year, especially in connection with seeds for permanent pasture. The details given in the Annual Report as to the impurities and defects in grass seeds are confirmed by the examinations of the past quarter.

Miss Ormerod, the Consulting Entomologist, has prepared reports on the insects sent to her by Members of the Society; and her elaborate memoir on the Wireworm, giving the life-history of this destructive insect, and suggesting remedial measures against it, is published in the current number of the Society's 'Journal.'

Twenty-six candidates entered their names for examination for the Society's Senior Prizes and Certificates, and of these nineteen presented themselves on the 8th instant and four succeeding days. The result of the examination was that the following gentlemen placed in the order of merit obtained First Class Certificates and the Life Membership of the Society, the first four also qualifying for the Prizes as stated below :—

Girischandra Bose, Royal Agricultural College, Cirencester, 25*l.*

Henry Blair Mayne, College of Agriculture, Downton, Salisbury, 15*l.*

Arthur Herbert Kerr, College of Agriculture, Downton, Salisbury, 10*l.*

Edward Charles Ozanne, Royal Agricultural College, Cirencester, 5*l.*

John Henry Tiffen, Royal Agricultural College, Cirencester.

James Henry Dugdale, Royal Agricultural College, Cirencester.

By order of the Council,

H. M. JENKINS,

Secretary.

ROYAL AGRICULTURAL

DR.

HALF-YEARLY CASH ACCOUNT

	£	s.	d.	£	s.	d.	£	s.	d.
To Balance in hand, 1st January, 1883:—									
Bankers				818	9	8			
Secretary				31	14	8			
							850	4	4
To Income:—									
Dividends on Stock				290	11	3			
Subscriptions:—									
Governors' Annual	290	0	0						
Members' Life-Compositions	1,396	0	0						
Members' Annual	3,943	4	3						
				5,629	4	3			
Establishment:—									
Rent				100	0	0			
Journal:—									
Sales	69	2	5						
Advertisements	148	11	5						
Sale of Pamphlets	13	15	3						
				231	9	1			
Chemical:—									
Laboratory Fees				180	3	6			
Veterinary:—									
Professional Fees				6	1	6			
Education:—									
Sale of Insect Diagrams				14	15	9			
Reading Meeting				64	3	6			
Total Income				.. .. ..			6,516	8	10
To York Meeting				.. .. ..			7,693	5	5
							£15,059	18	7

BALANCE-SHEET,

LIABILITIES.	£	s.	d.	£	s.	d.	£	s.	d.
To Capital:—									
Surplus, 31st December, 1882				24,718	1	0			
Surplus of Income over Expenditure during the Half-year, viz.:—									
Income	6,516	8	10						
Expenditure	3,618	12	3						
				2,897	16	7			
							27,615	17	7
Deduct half-year's interest and depreciation on Country Meeting Plant				.. .. ..			189	7	0
							£27,426	10	7

QUILTER, BALL, CROSBIE, GLEGG & WELTON, *Accountants.*

SOCIETY OF ENGLAND.

FROM 1ST JANUARY TO 30TH JUNE, 1883. Cr.

	£	s.	d.	£	s.	d.	£	s.	d.
By Expenditure:—									
Establishment:—									
Salaries, Wages, &c.	805	0	0						
House:—Rent, Taxes, Repairs, &c.	422	10	7						
Office:—Printing, Postage, Stationery, &c.	394	3	5						
				1,621	14	0			
Journal:—									
Printing and Stitching	584	7	10						
Printing Advertisements	62	18	6						
Postage and Delivery	200	0	0						
Advertising	10	7	10						
Literary Contributions	71	10	0						
Engravings	27	14	6						
Pamphlets	10	7	0						
				967	5	8			
Chemical:—									
Salaries	431	13	4						
Petty Payments	26	15	0						
				458	8	4			
Veterinary:—									
Prizes and Medals	47	12	0						
Fees to Examiners	22	12	3						
On Account of Investigation	50	0	0						
				120	4	3			
Botanical:—									
Consulting Botanist's Salary				50	0	0			
Education:—									
Fees to Examiners	52	10	0						
Printing and Advertising	38	10	0						
Prizes	55	0	0						
Scholarships	40	0	0						
Insect Diagrams	15	0	0						
				201	0	0			
Farm Inspection:—									
Advertising	63	9	9						
Entry Fee returned	2	0	0						
				65	9	9			
Subscriptions (paid in error) returned				16	4	0			
Reading Meeting				118	6	3			
Total Expenditure							3,618	12	3
By York Meeting							6,333	15	2
By Balance in hand, 30th June:—									
Bankers	3,092	12	8						
Secretary	14	18	6						
				3,107	11	2			
At Deposit				2,000	0	0			
							5,107	11	2
							£15,059	18	7

30TH JUNE, 1883.

ASSETS.	£	s.	d.	£	s.	d.
By Cash in hand	3,107	11	2			
By New 3 per Cent. Stock 19,910*l*. 1*s*. 3*d*. cost *	19,177	17	1			
By Books and Furniture in Society's House	1,451	17	6			
By Country Meeting Plant	2,339	7	9			
By Deposit Account	2,000	0	0			
				28,076	13	6
Less at credit of York Meeting				650	2	11
				£27,426	10	7

* *Value at* 100¼ = 19,959*l*. 16*s*. 9*d*.

Mem.—The above Assets are exclusive of the amount recoverable in respect of arrears of Subscription to 30th June, 1883, which at that date amounted to 2285*l*.

Examined, audited, and found correct, this 27th day of August, 1883.

FRANCIS SHERBORN,
A. H. JOHNSON,
C. GAY ROBERTS,
} *Auditors on behalf of the Society.*

YORK MEETING,

1883.

STEWARDS OF DEPARTMENTS.

Implements.

J. Bowen Jones.
Lord Moreton, M.P.
Hon. Cecil T. Parker.

Stock.

S. P. Foster.
Jabez Turner.
Hugh Gorringe.
Alfred Ashworth.

Engineering.

Robert Neville.

Butter and Cheese.

G. H. Sanday.

Forage.

Marshall Stephenson.

Finance.

Charles Randell.
William Frankish.

General Arrangements.

Jacob Wilson.

JUDGES OF IMPLEMENTS.

John Coleman.
George Gibbons.
T. P. Outhwaite.

JUDGES OF STOCK, &c.

HORSES.

Shire and Agricultural.

William Little.
James Martin.
Alexander Turnbull.

Clydesdales.

Peter Anderson.
David Buchanan.

Suffolks.

Manfred Biddell.
William Thompson.

Hunters.

H. R. Corbett.
James Hope.
Col. Luttrell.

Coaching and Cleveland.

William Robinson.
John S. Stowell.

Hackneys and Ponies.

William Flanders.
George Higgins.
William B. Turner.

CATTLE.

Shorthorns.

H. W. Beauford.
E. W. Meade-Waldo.
William Parker.

Herefords and Welsh.

William Groves.
John Williams.
John H. Yeomans.

Devons, Sussex, and Norfolk and Suffolk Polled.

H. W. Keary.
Richard Hamshar.
John Risdon.

Polled Angus or Aberdeen.

George J. Walker.
William Whyte.

Galloways and Ayrshires.

M. Clark.
Thomas Gibbons.
James Hamilton.

Jerseys.

G. W. Baker.
Col. Le Cornu.
C. Stephenson.

Dairy Cattle.

Thomas Bowstead.
William Stratton.

SHEEP.

Leicesters, Lincolns and Cotswolds.

Charles Clarke.
Skelton Jefferson.
Thomas Porter.

Border Leicesters and other Long-wools.

William Ford.
George Rea.

Wensleydales.

Robert Hutchinson.
John Ingilby.

Oxfordshire Downs.

A. F. Milton Druce.
W. D. Little.

Shropshires.

John Coxon.
Thomas Instone.

Southdowns and Hampshires.

H. Harwood.
John G. King.

Cheviots, Black-faced and other Short-wools.

John Clay.
R. Paterson.

PIGS.

White Breeds.

John Angus.
Peter Eden.
Joseph Smith.

Black Breeds.

James Edwards.
Richard Fowler.

JUDGES OF CHEESE AND BUTTER.

G. W. Burrows. | A. Graham. | John Robinson.

JUDGES OF BEE-KEEPING APPLIANCES, &c.

Rev. E. Bartrum. | William N. Griffin. | J. M. Hooker.

INSPECTORS OF SHEARING.

William Jobson. | J. B. Workman.

JUDGES OF FARMS.

Thomas Bell. | J. Williams Bell. | John Treadwell.

AWARD OF PRIZES.

NOTE.—The Judges were instructed, in addition to awarding the Prizes, to designate as the *Reserve Number* one animal in each Class, next in order of merit, if it possessed sufficient for a Prize; in case an animal to which a Prize was awarded should subsequently become disqualified.

Prizes given by the Yorkshire Agricultural Society are marked thus (*), *and those by the Yorkshire Local Committee thus* (†).

HORSES.

Shire Stallions foaled in either 1876, 1877, 1878, *or* 1879.

THE EARL OF ELLESMERE, Worsley Hall, Manchester: FIRST PRIZE, 25*l.*, for "Exchange" (2421), bay; was foaled in 1878; bred by Mr. Stanley, Kirby Bogs, Mansfield, Notts; sire, "Cambridge" (352); dam, by "Warrior" (2245).

THOMAS SHAW, The Island, Winmarleigh, Garstang, Lancashire: SECOND PRIZE, 15*l.*, for "Cromwell" (2415), brown; was foaled in 1877; bred by Mr. C. Loweth, Holbeach Hurn, Lincolnshire; sire, "Thumper" (2136).

HENRY CHANDOS-POLE-GELL, Hopton Hall, Wirksworth, Derbyshire: the *Reserve Number* to "Hyperion," chestnut; was foaled in 1879; bred by Mr. Kent, Eastville, Boston, Lincolnshire; sire, "Hydraulic" (1130); dam by "England's Glory."

Shire Stallions foaled in the Year 1880.

THE HON. E. K. W. COKE, Longford Hall, Derby: FIRST PRIZE, 20*l.*, and the CHAMPION PRIZE of 25*l.*,‡ for "Certainty," chestnut; bred by Mr. C. Tinsley, Holbeach, Lincolnshire; sire, "Lincolnshire Tom" (1367); dam, "Mettle," by "Admiral" (69).

THE EARL OF ELLESMERE, Worsley Hall, Manchester: SECOND PRIZE, 10*l.*, for "Esquire" (2744), bay; bred by Mr. W. Blunt, Ashby, Leicestershire; sire, "William the Conqueror" (2343); dam by "Champion" (419).

JAMES FORSHAW, Shire Horse Stud Farm, Blyth, Worksop, Notts: THIRD PRIZE, 5*l.*, for "Red Cross," chestnut; bred by Mrs. Sargant, Saxilby, Lincoln; sire, "Neville's Emperor"; dam, "Nancy," by "Masterman" (1495).

LORD EGERTON, Tatton Park, Knutsford, Cheshire: the *Reserve Number* and *Highly Commended* for "Waring's Wonder" (2688), bay; bred by Messrs. Waring, Semer House Farm, Catforth, Lancashire; sire, "What's Wanted" (2332); dam, "Smiler," by "Honest Tom" (1105).

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‡ Given by the English Cart-horse Society for the best Shire Stallion in the Showyard.

Shire Stallions foaled in the Year 1881.

WILLIAM EDWARD ELSEY, Baumber, Horncastle, Lincolnshire: FIRST PRIZE, 15*l.*, for "Baumber Tom" (2712), bay; bred by Mr. King, Whaplode, Spalding, Lincolnshire; sire, "Lincolnshire Tom" (1367).

WILLIAM WELCHER, Griston Hall, Watton, Norfolk: SECOND PRIZE, 10*l.*, for "Griston Tom" (2797), bay; bred by Mr. J. Brett, Holbeach Marsh, Lincolnshire; sire, "Lincolnshire Tom" (1367); dam, "Gipsy," by "Sweep 4th" (2083).

SIR HICKMAN B. BACON, Bart., Thonock, Gainsborough, Lincolnshire: THIRD PRIZE, 5*l.*, for "Bismarck" (2719), grey; bred by himself; sire, "The Lame Horse" (2928); dam, "Bounty."

THE HON. E. K. W. COKE, Longford Hall, Derby: the *Reserve Number* and *Highly Commended* for "Charter" (2740), black; bred by himself; sire, "Candidate" (2405); dam, "Charcoal," by "King of the Vale" (1241).

Clydesdale Stallions foaled in either 1876, 1877, 1878, *or* 1879.

DAVID RIDDELL, Blackhall, Paisley, Renfrewshire: FIRST PRIZE, 20*l.*, for "St. Lawrence," brown; was foaled in 1878; bred by Mr. Lawrence Drew, Merryton, Hamilton, N.B.; sire, "Prince of Wales;" dam, "Jemima," by "Young Lord Lyon."

ANDREW MONTGOMERY, Nether Hall, Castle-Douglas, Kircudbright: SECOND PRIZE, 15*l.*, for "Manfred" (1758), bay; was foaled in 1879; bred by Sir Michael R. Stewart, Bart., Ardgowan, Greenock; sire, "Keir" (1167); dam, "Lily" (650) by "Prince of Wales" (673).

WILLIAM MOFFAT, Blackford, Westlinton, Carlisle: THIRD PRIZE, 5*l.*, for "Prince Henry" (1257), bay; was foaled in 1876; bred by Mr. Robert Willie, Machireoch, Campbeltown, Argyleshire; sire, "Prince David" (643); dam, "Maggie."

ROBERT COLLING, Hurworth-on-Tees, Darlington: the *Reserve Number* and *Highly Commended* for "David" (1634), black; was foaled in 1879; bred by himself; sire, "Tam o' Shanter" (851); dam, "Welsh Princess" (495), by "Prince of Wales" (673).

Clydesdale Stallions foaled in the Year 1880.

ANDREW MONTGOMERY, Nether Hall, Castle-Douglas, Kircudbright: FIRST PRIZE, 20*l.*, and the CHAMPION PRIZE, 25*l.*,‡ for "Auld Reekie" (1920), bay; bred by Mr. John Rennie, Craigburn, Falkirk; sire, "Royal Prince" (1521); dam, "Cameloun Maggie" (1668), by "Young Scotsman" (1028).

The MARQUESS OF LONDONDERRY, Seaham Hall, Seaham Harbour, Durham: SECOND PRIZE, 10*l.*, for "The Viscount" (2477), bay; bred by himself; sire, "What Care I" (912); dam, "Countess" (1450) by "Lockfergus Champion" (449).

WILLIAM MOFFAT, Blackford, Westlinton, Carlisle: THIRD PRIZE, 5*l.*, for "Baron of Drumlanrigg," bay; bred by the Duke of Buccleuch, Drumlanrigg, Thornhill, Dumfries-shire; sire, "Chancellor of Blackhall" (1049); dam, "Nanny of Drumlanrigg" (1060), by "Dumbarton Tom" (254).

JAMES WHYTE, Aldbro' Hall, Darlington: the *Reserve Number* and *Commended* for "Prizeman," brown; bred by Mr. Miller, Over Kinfauns, Perth, N.B.; sire, "Dainty Davy" (214); dam by "Prince Royal" (2357).

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‡ Given by the Clydesdale Society for the best Stallion in the Clydesdale Classes.

Clydesdale Stallions foaled in the Year 1881.

ALEXANDER McCOWAN, Newton Airds, Dumfries, N.B.: FIRST PRIZE, 15*l.*, for "The Douglas" (2060), bay; bred by Mr. John Houston, Castle-Douglas, Kirkcudbright; sire, "The MacGregor" (1487); dam, "Bet" (1338), by "Hero" (380).

The HON. G. WALDEGRAVE LESLIE, Leslie House, Leslie, Fifeshire, N.B.: SECOND PRIZE, 10*l.*, for "Leslie Chief," bay; bred by Mr. A. Baird, Urie, Stonehaven, Kincardine; sire, "Boydston Boy" (111); dam, "Kate" (5), by "McRobbie's General Moltke."

GEORGE RODGER, Newton Bank, Preston Brook, Cheshire: THIRD PRIZE, 5*l.*, for "Mystic" (2298), bay; bred by himself; sire, "Drumpellier" (1428); dam, "Mystery" (881) by "Craigie Lea" (204).

JAMES WHYTE, Aldbro' Hall, Darlington: the *Reserve Number* and *Highly Commended* for "Prince of Perth," bay; bred by Mr. James Gordon, Mains of Airlie, Alyth, Forfarshire; sire, "Blantyre" (1068); dam, "Miss," by "Young Baronet" (919).

Suffolk Stallions foaled in either 1876, 1877, 1878, *or* 1879.

THE DUKE OF HAMILTON AND BRANDON, K.T., Easton Park, Wickham Market, Suffolk: FIRST PRIZE, 20*l.*, for "Eastern Emperor," chestnut; was foaled in 1879; bred by Mr. M. Mumford, Creeting St. Peter, Needham Market; sire, "Bismarck" (1301); dam by "Harwich Emperor" (1025).

SAMUEL WOLTON, Butley Abbey, Wickham Market, Suffolk: SECOND PRIZE, 10*l.*, for "Chieftain" (1354), chestnut; was foaled in 1877; bred by himself; sire, "Cupbearer 2nd" (542); dam, "Newbourn Princess" (1095), by "Warrior" (1353).

HORACE WOLTON, Newbourn Hall, Woodbridge, Suffolk: the *Reserve Number* to "Vivacity," chestnut; was foaled in 1879; bred by himself; sire, "Proctor" (285); dam, "Victoria" (1055), by "Royal Duke 2nd" (1366).

Suffolk Stallions foaled in the Year 1880.

SAMUEL WOLTON, Butley Abbey, Wickham Market, Suffolk: FIRST PRIZE, 20*l.*, for "Big Ben," chestnut; bred by himself; sire, "Duc de Paris" (1357); dam, "Ashfield Moggy" (1059), by "Cupbearer" (416).

Suffolk Stallions foaled in the Year 1881.

SIR RICHARD WALLACE, Bart., K.C.B., M.P., Sudbourn Hall, Wickham Market, Suffolk: FIRST PRIZE, 15*l.*, for "Banner Bearer," chestnut; bred by Mr. John Sewell, Butley Mills, Wickham Market; sire, "Chieftain" (1354); dam, "Machet 2nd," by "Standard Bearer" (397).

JAMES TOLLER, Blaxhall, Wickham Market, Suffolk: SECOND PRIZE, 10*l.*, for "Verger," chestnut; bred by himself; sire, "Cupbearer 3rd" (566); dam, "Venture" (922), by "Monarch" (1348).

SAMUEL WOLTON, Butley Abbey, Wickham Market, Suffolk: the *Reserve Number* and *Highly Commended* for "Gambler," chestnut; bred by himself; sire, "Tiptop" (1367); dam, "Foxhall Chance 2nd" (1077), by "Monarch" (1348).

Agricultural Stallions, not qualified to compete in the preceding Classes, foaled in either 1876, 1877, 1878, *or* 1879.

David Riddell, Blackhall, Paisley, Renfrewshire, N.B.: First Prize, 25*l.*, for "St. Vincent," bay; was foaled in 1878; bred by Mr. Lawrence Drew, Merryton, Hamilton, N.B.; sire, "Drew's Prince of Wales;" dam, "Sheba."

Col. Sir R. Loyd Lindsay, V.C., K.C.B., M.P., of Lockinge Park, Wantage, Berks: Second Prize, 15*l.*, for "Netley," chestnut; was foaled in 1877; bred by himself; sire, "Prince Albert" (613); dam, "Florence Nightingale."

Agricultural Stallions, not qualified to compete in the preceding Classes, foaled in the Year 1881.

Edward and Alfred Stanford, Eatons, Ashurst, Steyning, Sussex: First Prize, 20*l.*, for "The Monarch," black; bred by themselves; sire, "Young Topsman;" dam, "Mabel," by "The Duke:" and Second Prize, 10*l.*, for "Beaconsfield," brown; bred by Mr. William Stanford, Steyning; sire, "The Baronet;" dam, "Mrs. Brown."

Agricultural Stallions, not qualified to compete in the preceding Classes, foaled in the Year 1881.

John Cheers, The Hough Barrow, Chester: First Prize, 15*l.*, for "Britain's Wonder," black; bred by Mr. Cogswell, Kelsterton, Flints; sire, "British Wonder" (278).

Abram Briggs Foster, Canwell Hall, Tamworth, Staffs: Second Prize, 10*l.*, for "Canwell," brown; bred by Mr. T. Lowndes, Castern Hall, Ashbourne, Derbyshire; sire, "Wellington;" dam by "Sweet William" (2093).

John Milnes and Sons, Brighouse, Yorkshire: Third Prize, 5*l.*, for "Roan Active 2nd," roan; bred by Mr. G. Greaves, Arksey, Doncaster; sire, "Roan Active."

Thoroughbred Stallions suitable for getting Hunters.

The Earl of Scarborough, Sandbeck Park, Tickhill, Rotherham, Yorkshire: First Prize, 100*l.*, for "Discord," bay; was foaled in 1876; bred by Mr. Thomas Brown, Graham Place, Newmarket, Cambs; sire, "See-Saw;" dam, "Anthem" (19), by "Cathedral."

Colonel Barlow, Hasketon, Woodbridge, Suffolk: Second Prize, 25*l.*, for "Troll," chestnut; was foaled in 1879; bred by the Duke of Westminster, Eaton Hall, Cheshire; sire, "Doncaster;" dam, "Freia," by "Hermit."

Thomas Carr, May House, Ombersley, Droitwich, Worcestershire: Third Prize, 10*l.*, for "Rattle," chestnut; was foaled in 1869; bred by Sir Tatton Sykes, Sledmere, Malton, Yorkshire; sire, "Rataplan;" dam, "Marigold," by "Teddington."

*Coaching Stallions.**

JOHN KIRBY, Burton Fields, Stamford Bridge, Yorkshire: FIRST PRIZE, 20*l.*, for "Nobleman," bay; was foaled in 1881; bred by Mr. E. Appleyard, Barlby, Yorks; sire, "Baronet;" dam by "Ebor."

JOSEPH READER, Beacon Farm, Holme-on-Spalding Moor, Yorkshire: SECOND PRIZE, 10*l.*, for "Lord Beacon," bay; was foaled in 1881; bred by himself; sire, "Yorkshireman;" dam, "Princess," by "Speculation."

FRANCIS HENRY STERICKER, Danby House, Pickering: the *Reserve Number* to "Duke of Edstone," bay; was foaled in 1881; bred by Mr. J. Cousins, Edstone, Yorks; sire, "Duke of Ryedale;" dam by "Captain Cook."

Stallions suitable for getting Hackneys, foaled in either 1876, 1877, 1878, *or* 1879.

JOHN GROUT, Woodbridge, Suffolk: FIRST PRIZE, 20*l.*, for "Fashion," brown; was foaled in 1878; bred by Mr. Wortley, Hall Farm, Suffield, Norfolk.

ROBERT MARTIN, Scoreby Grange, Gate Helmsley, Yorkshire: SECOND PRIZE, 10*l.*, for "Lord Derwent," brown; was foaled in 1879; bred by himself; sire, "Denmark;" dam, "Lady Mary," by "Sir Edwin Landseer."

GEORGE BOURDASS, Hunmanby, Yorkshire: THIRD PRIZE, 5*l.*, for "Danegett," chestnut; was foaled in 1879; bred by Mr. Francis Rickell, Warter, Pocklington, Yorks; sire, "Denmark;" dam, "Nelly," by "St. Giles."

WILLIAM ASKWITH, Callis Wold, Bishop Wilton, Wilberfoss, Yorkshire: the *Reserve Number* and *Highly Commended* for "Merryman," chestnut; was foaled in 1879; bred by himself; sire, "Star of the Garter;" dam by "Denmark."

Pony Stallions foaled in either 1876, 1877, 1878, *or* 1879.

T. WALKER ANDERSON, Hodsock Lodge, Carlton, Worksop: FIRST PRIZE, 15*l.*, for "Nobby," chestnut; was foaled in 1878; bred by Mr. R. Cowton, Pottle Brampton, Ganton, Yorks; sire, "Calcutta;" dam by "Old Fire-away."

JOHN M. MARTIN, Auchendennan, Balloch, Dumbartonshire: SECOND PRIZE, 10*l.*, for "Mars," brown; was foaled in 1878; bred by himself; sire, "Derby."

HENRY ROUNDELL, Black Horse Hotel, Otley, Yorkshire: THIRD PRIZE, 5*l.*, for "Sir Harry," black; was foaled in 1878; bred by himself; sire, "Sir George Wombwell;" dam by "Despatch."

JONATHAN EDMUND BACKHOUSE, The Rookery, Middleton Tyas, Richmond, Yorkshire: the *Reserve Number* and *Highly Commended* for "Sir William," brown; was foaled in 1879; bred by Mr. Christopher Wilson, Rigmaden, Kendal; sire, "Sir George."

Shire Mares and Foals.

THE EARL OF ELLESMERE, Worsley Hall, Manchester: FIRST PRIZE, 20*l.*, for "Darling," brown; was foaled in 1876 (foal by "Active" (60)); bred by Mr. W. Kelsall, Bilsborough, Preston; sire, "England's Glory;" dam by "Farmer's Friend."

WALTER GILBEY, Elsenham Hall, Essex: SECOND PRIZE, 10*l.*, for "Gipsy Queen," black; was foaled in 1874 (foal by "Cromwell" (2415)); bred by Mr. Thomas Stokes, Caldecote, Rutland; sire, "Champion" (441); dam, "Gipsy," by "Prince of Denmark" (1804).

THOMAS HORROCKS MILLER, Singleton Park, Poulton-le-Fylde, Lancashire: THIRD PRIZE, 5*l.*, for "Trimmer," bay; was foaled in 1871 (foal by "Honest Tom" (1105)); bred by Mr. A. Richardson, Fortrey House, Mepal, Cambridgeshire; sire, "Emperor" (692); dam by "England's Glory" (733).

THE EARL OF ELLESMERE, Worsley Hall: the *Reserve Number* and *Highly Commended* for "Pink," chestnut; was foaled in 1868 (foal by "Stonton" (2065)); bred by Mr. D. Martin, Wainfleet, Lincolnshire; sire, "Jolly Samson."

Clydesdale Mares and Foals.

ALEXANDER McCOWAN, Newton Airds, Dumfries: FIRST PRIZE, 20*l.*, for "Bessie" (1498), brown; was foaled in 1877 (foal by "Jacob Wilson" (2178)); bred by Sir W. Stirling Maxwell, Bart., Keir, Dunblane, Perth; sire, "Newstead" (559); dam, "Keir Bessie" (194), by "Lochfergus Champion" (449).

EDWARD CHARLTON, Shaw House, Stocksfield-on-Tyne: SECOND PRIZE, 10*l.*, for "Nannie," bay; was foaled in 1877 (foal by "Merry Monarch" (538); bred by Mr. T. H. Jobling, Stamford, Alnwick, Northumberland; sire, "Hamilton Jock" (1151); dam, "Black Bess" (183), by "Young Merry Tom" (1001).

GEORGE RODGER, Newton Bank, Preston Brook, Cheshire: THIRD PRIZE, 5*l.*, for "Dawn of Mystery," brown; was foaled in 1879 (foal by "Macgregor" (1487)); bred by himself; sire, "Prince Charlie" (629); dam, "Mystery" (881), by "Craigie Lea" (204).

THE MARQUESS OF LONDONDERRY, Seaham Hall, Seaham Harbour, Durham: the *Reserve Number* and *Highly Commended* for "Melona," bay; was foaled in 1880 (foal by "King of the Clans" (2201)); bred by Mr. Lawrence Drew, Merryton, Hamilton, N.B.; sire, "Prince of Wales" (673); dam, "Old Mailie," by "Lochend Champion" (448).

Suffolk Mares and Foals.

HORACE WOLTON, Newbourn Hall, Woodbridge, Suffolk: FIRST PRIZE, 20*l.*, for "Queen of Newbourn" (1049), chestnut; was foaled in 1875 (foal by "Tiptop" (1367); bred by himself; sire, "Captain Snap" (142); dam, "Duchess of Newbourn" (1030), by "Warrior" (1353).

SIR RICHARD WALLACE, Bart., K.C.B., M.P., Sudbourn Hall, Wickham Market, Suffolk: SECOND PRIZE, 10*l.*, for "Jessie," chestnut; was foaled in 1879 (foal by "Standard Bearer" (397)); bred by himself; sire, "Prince Imperial" (1239); dam, "Brag."

THE DUKE OF HAMILTON AND BRANDON, K.T., Easton Park, Wickham Market, Suffolk: the *Reserve Number* and *Highly Commended* for "Smart" (430), chestnut; was foaled in 1872 (foal by "Statesman" (657)); bred by Mr. Williams, Trimley, Ipswich; sire, "Emperor" (279); dam, "Williams."

Agricultural Mares and Foals not qualified to compete in the preceding Classes.

ROBERT H. LOWE, Bassingfield, Nottingham, FIRST PRIZE, 20*l.*, for "Flower," roan; was foaled in 1877 (foal by "Young Champion"); bred by himself; sire, "Samson."

EDWARD CHARLTON, Shaw House, Stocksfield-on-Tyne, SECOND PRIZE, 10*l*., for "Maggie Moir," brown; was foaled in 1877 (foal by "Thumper" (2140)); breeder unknown.

JOHN MILNES and SONS, Brighouse, Yorkshire, the *Reserve Number* and *Highly Commended* for "Baroness," bay; was foaled in 1876 (foal by "Northern King" (2635)); bred by Mr. Lawrence Drew; sire, "Lofty;" dam by "Perfection."

Hunter Mares and Foals.

WILLIAM WRIGHT, Wollaton, Nottingham, FIRST PRIZE, 20*l*., for "Rosamond," chestnut; was foaled in 1871 (foal by "Silvester"); bred by Mr. Spencer, Pickley Lodge, Northamptonshire; sire, "Dalesman;" dam by "Catesby."

ROBERT DIXON, Manor House, Dunnington, Seaton, Hull, SECOND PRIZE, 10*l*., for his chestnut; was foaled in 1862 (foal by "Mapleton"); bred by himself; sire, "Wild Hero;" dam, "Gay Lass."

JOHN NALTON, Copmanthorpe, York, THIRD PRIZE, 5*l*., for "Jezebel," chestnut, aged (foal by "Ambergris"); bred by the late Mr. Duffitt, Whitwell, York; sire, "King Caradoc;" dam by "Canute."

ERNEST G. C. BOMFORD, Spring Hill, Pershore, Worcestershire: the *Reserve Number* to "Marguerite," chestnut; was foaled in 1871 (foal by "Cedric"); bred by the Rev. W. Parker, Comberton, Pershore; sire, "Wantage."

*Coaching Mares and Foals.**

THOMAS KELSEY, Hooke House, Howden, Yorkshire: FIRST PRIZE, 20*l*., for his bay; was foaled in 1877 (foal by "Wilmelow"); bred by himself; dam by "Cyrus."

JOHN KIRBY, Burton Fields, Stamford Bridge, Yorkshire: SECOND PRIZE, 10*l*., for "Flora," bay; was foaled in 1871 (foal by "Young Paulinus"); bred by Mr. James Bilton, Mowthorp, Castle Howard, Yorks; sire, "The Earl;" dam by "Aristocrat."

JOSEPH READER, Beacon Farm, Holme-on-Spalding Moor: the *Reserve Number* and *Highly Commended* for "Bonny," bay; was foaled in 1863 (foal by "Landmark"); bred by the late Mr. J. Reader; sire, "Cawston;" dam by "Lord John."

Cleveland Bay Mares and Foals.†

WILLIAM DIXON PETCH, East Pastures, Skelton, R.S.O., Yorkshire: FIRST PRIZE, 20*l*., for "Fanny," bay; was foaled in 1874 (foal by "Thornbrough"); bred by Mr. W. Jackson, Ugthorpe, Yorkshire; dam, "Bay Splendour."

Hackney Mares and Foals.

ROBERT MARTIN, Scoreby Grange, Gate Helmsley, Yorkshire: FIRST PRIZE, 15*l*., for "Lady Mary," brown; was foaled in 1870 (foal by "Denmark"); bred by himself; sire, "Sir Edwin Landseer;" dam, "Lady Superior," by "Sir Charles."

EDWARD B. HAMOND, Waterden, Fakenham, Norfolk: SECOND PRIZE, 10*l*., for "Lady Jane," grey; was foaled in 1877 (foal by "D'Oyly Confidence"); bred by Mr. W. Hamond, Pensthorpe, Fakenham; sire, "Hurdle;" dam, "Grey Beauty."

HENRY MOORE, Burn Butts, Cranswick, Hull, Yorkshire: THIRD PRIZE, 5*l.*, for "Princess," chestnut; was foaled in 1879 (foal by "Lord Derby 2nd"); bred by himself; sire, "Denmark;" dam by Triffitt's "Fireaway."

THOMAS COOK, Hull, Yorkshire, the *Reserve Number* and *Highly Commended* for "Portia," bay; was foaled in 1872 (foal by "Lord Derwent"); bred by Mr. F. Cook, Fridaythorpe, Yorks; sire, "Bay President;" dam, "Evening Star," by Cook's "Wildfire."

Pony Mares and Foals.

WILLIAM GLOSSOP, Endsleigh, Newland, Hull: FIRST PRIZE, 15*l.*, for "Polly," brown; was foaled about 1875 (foal by "Lord Derby 2nd"); bred by the late Mr. W. Winter, Thane, Doncaster, Yorks; sire, "Blazeaway;" dam by "Squirrel."

RICHARD GLEDHILL, Park Road, Bradford, Yorkshire: SECOND PRIZE, 10*l.*, for "Lady Downes," bay; was foaled in 1870 (foal by "Star of the East"); breeder unknown; sire, "Alchymist."

WILLIAM HENRY COOK, Blakelow, Nantwich, Cheshire: THIRD PRIZE, 5*l.*, for "Kate," black; was foaled about 1870 (foal by "Boy of the Period"); breeder unknown.

WILLIAM R. TROTTER, South Acomb, Stocksfield-on-Tyne, the *Reserve Number* to "Lucy;" bay, aged (foal by "Fireaway Charley"); breeder unknown.

Shire Fillies foaled in the Year 1880.

THE HON. E. K. W. COKE, Longford Hall, Derby: FIRST PRIZE, 15*l.*, for "Chance," black; bred by Mr. Lawrenson, Ash Farm, Preesall, Lancashire; sire, "Lincoln" (1350); dam, "Brock," by "Ploughboy" (1745).

THE EARL OF ELLESMERE, Worsley Hall, Manchester: SECOND PRIZE, 10*l.*, for "Acorn," bay; bred by Mr. G. Mornington, Craven Arms; sire, "Heart of Oak" (1009); dam, Mornington's "Diamond."

GARRET TAYLOR, Trowse House, Norwich, the *Reserve Number* and *Highly Commended* for "Teuta," grey; bred by Mr. S. Underwood, Adstone, Towcester; sire, "Farmer's Glory."

Shire Fillies foaled in the Year 1881.

SAMUEL SHAW, Brooklands, Halifax, Yorkshire: FIRST PRIZE, 15*l.*, for "Sunflower," bay; bred by Mr. John Fisher, Layton Hall, Blackpool, Lancashire; sire, "What's Wanted" (2332); dam, "Star," by "Drayman" (640).

THE HON. E. K. W. COKE, Longford Hall, Derby: SECOND PRIZE, 10*l.*, for "Czarina," chestnut; bred by Mr. Williams, Blackesley, Towcester, Northamptonshire; sire, "Helmdon Emperor" (2799); dam by "England's Glory" (745).

THE EARL OF ELLESMERE, Worsley Hall, Manchester: THIRD PRIZE, 5*l.*, for "Watercress," chestnut; bred by Mr. Solomon Brown, Leverton, Boston, Lincolnshire; sire, "Hydraulic" (1130); dam by "Lincolnshire Hero."

WALTER GILBEY, Elsenham Hall, Essex, the *Reserve Number* and *Highly Commended* for "Topsy's Gipsy," black; bred by Mr. Peter Blundell, Ream Hills, Weeton, Lancashire; sire, "Honest Tom" (1105); dam, "Eva's Topsy," by "Drayman" (670).

Clydesdale Fillies foaled in the Year 1880.

JOHN M. MARTIN, Auchendennan, Balloch, Dumbartonshire: FIRST PRIZE, 15*l*., and the CHAMPION PRIZE, 25*l*.,‡ for "Alice Lee," bay; bred by Mr. James Melroy, Galdenoch, Stranraer, Wigtownshire; sire, "Lord Lyon" (489); dam, "Maggie Lauder" (253), by "General Williams" (326).

CHARLES JAMES LUCAS, Warnham Court, Horsham, Sussex: SECOND PRIZE, 10*l*., for "Dandelion," bay; bred by the Earl of Strathmore, Glamis, Forfar, N.B.; sire, "Lord Lyon" (489); dam, "Duchess of Glamis."

JOHN M. MARTIN: THIRD PRIZE, 5*l*., for "Diana Vernon," bay; bred by himself; sire, "Crown Prince" (207); dam, "Darling" (241), by "Tintock."

LORDS ARTHUR AND LIONEL CECIL, Orchardmains, Innerleithen, Peeblesshire, the *Reserve Number* and *Highly Commended* for "Contest," bay; bred by themselves; sire, "Farmer" (288); dam, "Lily" (485), by "Crown Prince" (207).

Clydesdale Fillies foaled in the Year 1881.

ALEXANDER MCCOWAN, Newton Airds, Dumfries, N.B.: FIRST PRIZE, 15*l*., for "Moss Rose," bay; bred by Mr. George Ure, Wheatlands, Bonnybridge, Stirling; sire, "Prince Charlie" (634); dam, "Rosebud" (1814), by "Time O'Day" (875).

ANDREW BAIRD MATTHEWS, British Linen Co. Bank, Newtonstewart, Wigtownshire: SECOND PRIZE, 10*l*., for "Eugenie," bay; bred by himself; sire, "Lord Lyon" (489); dam, "Crinoline" (586), by "Newstead" (559).

DAVID RIDDELL, Blackhall, Paisley, Renfrewshire, THIRD PRIZE, 5*l*., for "The Queen," bay; bred by Mr. A. Taylor, Belzill, Galston, Ayrshire; sire, "Darnley."

ROBERT LODER, M.P., Whittlebury, Towcester, Northamptonshire, the *Reserve Number* and *Highly Commended* for "Lioness," bay; bred by himself; sire, "Druid" (1120); dam, "Lovely 2nd" (1446), by "Lord Lyon" (489).

Suffolk Fillies foaled in the Year 1881.

THE DUKE OF HAMILTON AND BRANDON, K.T., Easton Park, Wickham Market, Suffolk: FIRST PRIZE, 15*l*., for "Gaudy Poll," chestnut; bred by himself; sire, "Statesman" (657); dam, "Smart" (430), by "Emperor" (279).

WILLIAM BYFORD, The Court, Glemsford, Suffolk, SECOND PRIZE, 10*l*., for his chestnut; bred by himself; sire, "Reliance" (239); dam, "Barmaid" (143), by "Active" (230).

HORACE WOLTON, Newbourn Hall, Woodbridge, Suffolk, the *Reserve Number* to "Dove," chestnut; bred by himself; sire, "Raglan" (651); dam, "Duchess of Newbourn" (1030), by "Warrior" (1353).

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‡ Given by the Clydesdale Society for the best Mare in the Clydesdale Classes.

Agricultural Fillies foaled in the Year 1880, *not qualified to compete in the preceding Classes.*

PETER BLUNDELL, Ream Hills, Weeton, Kirkham, Lancashire: FIRST PRIZE, 15*l.*, for "Miss Stonton," bay; bred by Mr. Chapman, Exton, Oakham, Rutland; sire, "Stonton" (2065).

DAVID RIDDELL, Blackhall, Paisley, Renfrewshire: SECOND PRIZE, 10*l.*, for "Bessie," brown; bred by Mr. J. McTier, Ladyfield, Dumfries, N.B.; sire, "Chancellor."

EDWARD and ALFRED STANFORD, Eatons, Ashurst, Steyning, Sussex: THIRD PRIZE, 5*l.*, for "Barbara," bay; bred by themselves; sire, "Young Topsman;" dam, "Bella," by "The Duke."

Agricultural Fillies, foaled in the Year 1881, *not qualified to compete in the preceding Classes.*

RICHARD MACHIN, Cattal Grange, Green Hammerton, Yorkshire: FIRST PRIZE, 15*l.*, for "Violet," bay; bred by himself; sire, "Honest Tom" (1105); dam, "Jet," by "Young Conqueror."

WILLIAM STEPHENSON, Bushy Hill, Newbald, Brough, Yorkshire: SECOND PRIZE, 10*l.*, for "Topsy," roan; bred by himself; sire, "Young Napoleon;" dam by "Wellington."

Coaching Fillies foaled in the Year 1880.†

WALTER HERBERT SEPTIMUS PYMAN, Moss Brow, Whitby, Yorkshire: FIRST PRIZE, 15*l.*, for "Darling," bay; bred by Mr. Beadman, Newbiggin, Whitby, Yorkshire; sire, "Lord of the Manor;" dam by "Barnaby."

RICHARD MACHIN, Cattal Grange, Green Hammerton, Yorkshire: SECOND PRIZE, 10*l.*, for his bay; bred by Mr. B. Greaves, Spofforth Haggs, Wetherby, Yorks; sire, "Dart," dam by "Lord Zetland."

CHARLES WAINER, Abbey Green, Harome, Newton, Yorkshire: the *Reserve Number* and *Highly Commended* for "Luckshall," bay; bred by himself; sire, "Young Candidate;" dam, "Old Monarch."

Coaching Fillies foaled in the Year 1881.*

WILLIAM BECKETT, Deighton, Escrick, Yorkshire: FIRST PRIZE, 10*l.*, for his bay; bred by himself; sire, "Liberal."

WILLIAM DICKSON, Heslington, York: SECOND PRIZE, 5*l.*, for "Lucy," bay; bred by himself; sire, "Liberal;" dam, "Blossom," by "Inkerman Hero."

The EXECUTORS of the late Mr. W. W. KIRBY, North Grimston, York: the *Reserve Number* to "Rosemary," bay; bred by themselves; sire, "Volunteer;" dam, "Rosebud," by "Lucks All."

Coaching Geldings or Fillies foaled in the Year 1882.*

JOHN HUGHES, Skirpenbeck, Stamford Bridge, Yorkshire: FIRST PRIZE, 10*l.*, for "Gamester," bay; bred by himself; sire, "Young Candidate;" dam by "Palestine."

JOHN GILLIARD, Crayke, Easingwold, Yorkshire: SECOND PRIZE, 5*l.*, for his bay; bred by himself; sire, "Wonderful Lad;" dam, "Trimmer," by "Cromwell."

JOSEPH READER, Beacon Farm, Holme-on-Spalding Moor, Yorkshire: the *Reserve Number* and *Highly Commended* for "Lady Beacon," bay; bred by himself; sire, "Yorkshireman;" dam, "Bonny," by "Cawston."

Coaching Geldings foaled in the Year 1880.*

John Kirby, Burton Fields, Stamford Bridge, Yorkshire: First Prize, 20*l.*, for "Grand Duke," bay; bred by Mr. Leaper, Beverley, Yorkshire; sire, "Cyrus;" dam by "Venture."

Timothy Cattle, West Field Farm, Norton, Doncaster: Second Prize, 10*l.*, for his bay; bred by Mr. Ness, Sproxton Park, Helmsley, Yorks; sire, "Candidate."

George Burton, Thorpe Willoughby, Selby, Yorkshire: the *Reserve Number* and *Highly Commended* for his brown; bred by Mr. Sykes, Pollington, Selby; sire, "Domino;" dam by "Gaiety."

Coaching Geldings foaled in the Year 1881.†

George Burton, Thorpe Willoughby, Selby: First Prize, 15*l.*, for his bay; bred by Mr. J. Kirke, Gilberdyke, Brough, Yorks; sire, "Prince of Wales;" dam by "Grand Inquisitor."

Francis Beal, Scrayingham, Kirkham Abbey, Yorkshire: Second Prize, 5*l.*, for "Major," brown; bred by Mr. R. Hopper, Scrayingham; sire, "Domino;" dam by "Grey President."

John Kirby, Burton Fields, Stamford Bridge: the *Reserve Number* and *Highly Commended* for "King Harold," bay; bred by Mr. John Johnson, Brook Farm, North Cave, Brough, Yorkshire; sire, "The Count;" dam by "Artemis."

Agricultural Geldings foaled in the Year 1880.†

William Hurst, Sandal, Wakefield, Yorkshire: First Prize, 20*l.*, for "Prince," brown; breeder unknown.

Sir Joseph Whitwell Pease, Bart., M.P., Hutton Hall, Guisboro', Yorkshire: Second Prize, 10*l.*, for "Clyde," bay; bred by Mr. James Little, Fauld, Longtown, Cumberland; sire, "Clydesdale Hero:" and the *Reserve Number* and *Highly Commended* for "Major," bay; bred by Mr. J. Taylor, Friarland, Ayr, N.B.; sire, "Black Watch" (64).

Hunter Mares or Geldings, up to 15 *stone, foaled in either* 1876, 1877, *or* 1878.†

Andrew John Brown, North Elmsall Hall, Pontefract, Yorkshire: First Prize, 40*l.*, for "Waterford," brown gelding; was foaled in 1878; bred by The Marquis of Waterford, Curraghmore, Waterford; sire "Jerreypoint;" dam by "Jemma de Verger": and the Second Prize, 20*l.*, for "Harvester," brown gelding; was foaled in 1878; bred by Dr. Nickle, Athboy, Meath, Ireland; sire, "Haymaker;" dam by "Olimpic."

John Robinson, Cleavland House, Coltman Street, Hull: Third Prize, 10*l.*, for "Elegant," chestnut gelding; was foaled in 1878; bred by Mr. Trew, Kildare, Ireland; sire, "Master George;" dam by "Will Scarlet."

T. Harvey D. Bayly, Edwinstowe House, Newark, Notts: the *Reserve Number* and *Highly Commended* for "The Robber," black gelding; was foaled in 1876; breeder unknown; sire, "Barabbas."

Hunter Mares or Geldings, up to 12 *stone, foaled in either* 1876, 1877, *or* 1878.†

Major Thwaites, Chevin Grange, Menston, Leeds: First Prize, 30*l.*, for "Royal Monarch," chestnut gelding; was foaled in 1876; breeder unknown; sire, "Monarch of the Glen;" dam by "Macaroni."

John Lett, Scampston, Rillington, Yorkshire: Second Prize, 10*l.*, for "Coquette," bay mare; was foaled in 1877; bred by Mr. Coulson, Castle Howard, York; sire, "The Mallard;" dam by "Strathern."

Jacob Smith, Humburton, Helperby, Yorkshire: Third Prize, 5*l.*, for "Sweetbriar," brown mare; was foaled in 1877; breeder unknown; sire, "Highthorn."

John Robinson, Cleavland House, Coltman Street, Hull: the *Reserve Number* and *Highly Commended* for "Lord of the Glen," bay gelding; was foaled in 1878; breeder unknown; sire, "Glenfillen;" dam by "Cain."

Hunter Geldings foaled in the Year 1879.

John B. Booth, Killerby, Catterick, Yorkshire: First Prize, 40*l.*,* for "Brian Boroimhe," bay; breeder unknown; sire, "Herbertstown;" dam by "Redmond o' Hanlon."

Teasdale H. Hutchinson, Manor House, Catterick: Second Prize, 20*l.*,† for "Merrymaker," chestnut; bred by Mr. Fisher, Blackpool, Lancashire; sire, "Laughing Stock;" dam by "Carbineer."

Andrew John Brown, North Elmshall Hall, Pontefract: Third Prize, 5*l.*,* for "Grenadier," grey; bred by Mr. W. Little, Bliborough, Kirton Lindsey, Lincolnshire; sire, "Snowstorm;" dam by "Croton Oil."

Thomas Darrell, of Spikers Hill, West Ayton, York: the *Reserve Number* and *Highly Commended* for "Manchester," bay; breeder unknown; sire, "Syrian;" dam, "Fingal."

Hunter Mares foaled in the Year 1879.†

William Osborne Garbutt, Morton Grange, Nunthorpe, R. S. O., Yorkshire: First Prize, 30*l.*, for "Gladys," brown; bred by Mr. Mark Hall, Brotton, Yorks; sire, "Carbineer."

Henry George Curry, White House, Stockton-on-Tees: Second Prize, 15*l.*, for "May Queen," black; bred by the late Mr. Weighell, Carlton-in-Cleveland, Yorks; sire, "Bondsman;" dam by "Young Voltigeur."

William Wood, Habrough, Ulceby, Lincolnshire; Third Prize, 5*l.*, for "My Lady," bay; bred by himself; sire, "Jarnac;" dam, "Castor Oil," by "Croton Oil."

Christopher Stephenson, Naworth, Brampton, Cumberland: the *Reserve Number* and *Highly Commended* for "Siren," brown; bred by the late Lord Lamerton, Castle Howard, York; sire, "Paragon;" dam by "Caradoc."

Hunter Geldings foaled in the Year 1880.*

J. Mitchelson Mitchelson, The Hall, Pickering, Yorkshire: First Prize, 25*l.*, for "Eliezer," brown; bred by Mr. Gromet, Pellcter Abbey Town, Cumberland; sire, "Gladstone."

Matthew Dobson Peacock, Woodlands, Harmby, Bedale, Yorkshire: Second Prize, 10*l.*, for "Chance," brown; bred by Mr. J. Milner, Middledale, Kilham, Hull, Yorks; sire, "Haphazard;" dam, "Pi," by "Defender."

James S. Darrell, West Ayton, Scarborough, Yorkshire: Third Prize, 5*l.*, for "Mallard," bay; bred by himself; sire, "Mallard;" dam by "Cape Flyaway."

ANDREW JOHN BROWN, North Elmsall Hall, Pontefract: the *Reserve Number* and *Highly Commended* for "General," bay; bred by Capt. Armstrong, R.N., Chaffpool, Ballymote, Sligo; sire, "Sir George;" dam by "Artillery."

Hunter Fillies foaled in the Year 1880.†

GEORGE WHITEHEAD, Dighton Grove, York: FIRST PRIZE, 20*l.*, for "Wild Briar," chestnut; bred by himself; sire, "Highthorne;" dam by "Wild Hero."

J. MITCHELSON MITCHELSON, The Hall, Pickering: SECOND PRIZE, 10*l.*, for "Dagmar," chestnut; bred by Mr. Hick, Cawton, Gilling, Yorks; sire, "Conductor;" dam by "George Osbaldeston."

ERNEST BULMER, Newsham, Pickering: the *Reserve Number* and *Highly Commended* for "Gipsy Countess," brown; bred by Mr. W. Coulson, South Holme, Slingsby, Yorks; sire, "Prince Caradoc."

Hunter Geldings foaled in the Year 1881.*

JOHN B. BOOTH, Killerby, Catterick, Yorkshire: FIRST PRIZE, 20*l.*, for "Blondin," chestnut; bred by himself; sire, "Castlereagh;" dam, "Blonde," by "The Miner."

WILLIAM WRIGHT, Wollaton, Nottingham: SECOND PRIZE, 10*l.*, for "Silver King," chestnut; bred by himself; sire, "Silvester;" dam, "Rosamond," by "Dalesman."

WILLIAM C. P. SNOWDEN, Hutton Moor House, Ripon, Yorkshire: the *Reserve Number* and *Highly Commended* for "Squashed Strawberry," chestnut; bred by Mr. N. Snowden, Hutton Moor House; sire, "Duc de Beaufort;" dam by "Forester."

Hunter Fillies foaled in the Year 1881.†

GEORGE WILLIAM GOODISON, Coniston Bank, Ambleside, Westmoreland: FIRST PRIZE, 15*l.*, for "Daffodil," bay; bred by himself; sire, "Westerhall;" dam, "Fanny."

JOHN THOMAS ROBINSON, Leckby Palace, Asenby, Thirsk, Yorkshire: SECOND PRIZE, 5*l.*, for "Pay-away," bay; bred by himself; sire, "Bondsman."

JAMES NAYLOR, Beck Farm, Cundall, Boroughbridge, Yorkshire: the *Reserve Number* and *Highly Commended* for "Lady Cavendish," dark brown; bred by Mr. W. Naylor, Throstle Nest, Cundall; sire, "Baron Cavendish;" dam, "Bonny," by "Bewceiphas."

Hunter Geldings or Fillies foaled in the Year 1882.*

GEORGE THOMPSON CARR, The Farm, Silloth, Cumberland: FIRST PRIZE, 15*l.*, for his chestnut; bred by himself; sire, "Gladstone."

LORD MIDDLETON, Birdsall House, York: SECOND PRIZE, 5*l.*, for his bay; bred by himself; sire, "Happy Land;" dam, "Sunrise," by "Morocco."

JOHN PRESSICK ADAMSON, Wheatlands, Marske-by-the-Sea, Yorkshire: the *Reserve Number* and *Highly Commended* for "Southern Cross," bay, bred by himself; sire, "Morocco;" dam, "Grace Darling," by "Young Hippolytus."

Hackney Mares or Geldings up to 15 *stone, foaled in either* 1876, 1877, 1878, *or* 1879.†

JOHN ROBINSON, Cleavland House, Coltman Street, Hull: FIRST PRIZE, 30*l.*, for "Lincoln," black gelding; was foaled in 1878; bred by Mr. Crow, Lincoln.

JAMES HORNSBY, Honington Hall, Grantham, Lincolnshire: SECOND PRIZE, 10*l.*, for "Hampstead," brown gelding; was foaled in 1876; breeder unknown.

FREDERICK WILLIAM BURDOCK, The White House, Downham Market, Norfolk: THIRD PRIZE, 5*l.*, for "Nancy Lee," chestnut mare; was foaled in 1876; bred by Mr. Charles Beart, West Head Farm, Downham Market; sire, "The Great Gunn."

WILLIAM ABEL WOOD, Sutton-on-the-Forest, Easingwold, Yorkshire: the *Reserve Number* to "Bobby Burns," chestnut gelding; was foaled in 1879; bred by Mr. John Suggitt, Law Roans Farm, Sutton-on-the Forest.

Hackney Mares or Geldings up to 12 *stone, foaled either in* 1876, 1877, 1878, *or* 1879.†

JOHN BENTLEY, Great Driffield, Yorkshire: FIRST PRIZE, 20*l.*, for "Fashion," bay gelding; was foaled in 1877; bred by Mr. H. Fewson, Struncheon Hill, North Frodingham, Hull; sire, "Denmark;" dam, "Richmond."

THE STAND STUD COMPANY, Stand, Whitefield, Manchester: SECOND PRIZE, 10*l.*, for "British Queen," strawberry roan mare; was foaled in 1877; bred by Mr. Sindall, Prickwillow, Ely, Cambs.

MAJOR THWAITES, Chevin Grange, Menston, Leeds: THIRD PRIZE, 5*l.*, for "Scottish Queen," grey mare; was foaled in 1876; bred by Mr. W. Collinson, Otteringham, Hull; sire, "Lord Derby 2nd."

JOHN ROBINSON, Cleavland House, Coltman Street, Hull: the *Reserve Number* and *Highly Commended* for "Prince Charlie," chestnut gelding; was foaled in 1878; bred by Mr. Rickell, Waterwold, Pocklington, Yorks; sire, "Denmark;" dam by "General Giles."

Hackney Gelding foaled in the Year 1880.†

AMBROSE VERITY, 12, Coltman Street, Hull: FIRST PRIZE, 20*l.*, for "Gang Forward," bay; bred by Mr. Robinson, Sledmere, Yorks; sire, "Pluto;" dam by "Sir Charles."

ISAAC DENTON DUNN, Marsh House, Keyingham, Yorkshire: SECOND PRIZE, 10*l.*, for "Peacock," bay; bred by Mr. Arthur Fewson, Hedon, Yorks; sire, "Lord Derby 2nd;" dam by "Young Charley."

JOHN MAJOR, Sledmere, Yorkshire: the *Reserve Number* and *Highly Commended* for "Romeo," bay; bred by himself.

Hackney Fillies foaled in the Year 1880.†

ARTHUR FEWSON, Hedon, Yorkshire: FIRST PRIZE, 15*l.*, for "Lady Alice," chestnut; bred by himself; sire, "Lord Derby;" dam by "Tom Thumb."

MANSFIELD HARRISON, West End House, Ganton, York: SECOND PRIZE, 5*l.*, for "Sovereign," brown; bred by himself; sire, "Denmark;" dam, "Lady Jane," by Triflit's "Fireaway."

John Paul Crompton, Thornholm, Burton Agnes, Hull: the *Reserve Number* and *Highly Commended* for "Lily of the Valley," brown; bred by himself; sire, "Denmark;" dam by "St. Giles."

Hackney Geldings foaled in the Year 1881.*

Joseph John Dunnington-Jefferson, Thicket Priory, York: First Prize, 15*l.*, for his brown; bred by himself; sire, "Prince Alfred;" dam, "Firefly," by "Fireaway."

Thomas Nicholson, the Grange, Watton, Hull: Second Prize, 5*l.*, for his bay; bred by himself; sire, "Denmark."

Marmaduke Wray, Register Square, Beverley, Yorkshire: the *Reserve Number* and *Highly Commended* for "Crown Prince," bay; bred by Mr. Stephenson, Barmston, Bridlington, Yorks; sire, "Denmark;" dam by Triffit's "Fireaway."

Hackney Fillies foaled in the Year 1881.†

Thomas Horrocks Miller, Singleton Park, Poulton-le-Fylde, Lancashire: First Prize, 10*l.*, for "May," chestnut; bred by himself; sire, "Star of the East;" dam, "Kitty."

George Burton, Thorpe Willoughby, Selby, Yorkshire: Second Prize, 5*l.*, for his brown; bred by Mr. Richardson, Everingham, York; sire, "Denmark;" dam by "Bounding Willow."

Thomas Nicholson, The Grange, Watton, Hull: the *Reserve Number* and *Highly Commended* for his chestnut; bred by himself; sire, "Denmark;" dam by "Fireaway."

Hackney Geldings or Fillies foaled in the year 1882.*

Thomas Nicholson, The Grange, Watton, Hull: First Prize, 10*l.*, for his chestnut gelding; bred by himself; sire, "Denmark;" dam by "Fugleman."

Thomas Cook, Hull: Second Prize, 5*l.*, for his brown filly; bred by himself; sire, "Black Fireaway;" dam, "Rosalind," by "Eclipse."

Thomas Horrocks Miller, Singleton Park, Poulton-le-Fylde, Lancashire: the *Reserve Number* to "Mabel," bay filly; bred by himself; sire, "Fireaway;" dam, "Belle."

Pony Mares or Geldings, above 13 *hands, and not exceeding* 14 *hands* 2 *inches.*†

John Robinson, Cleavland House, Coltman Street, Hull: First Prize, 15*l.*, for "Lady Silver," roan mare; was foaled in 1877; breeder unknown: and Second Prize, 5*l.*, for "Lady Rose," grey mare; was foaled in 1877; breeder unknown; sire, "Lord Derby."

James Hornsby, Honington Hall, Grantham, Lincolnshire: the *Reserve Number* and *Highly Commended* for "Here I am," brown gelding; was foaled in 1879; breeder unknown.

Pony Mares or Geldings, not exceeding 13 *hands.*†

Major Thwaites, Chevin Grange, Menston, Leeds: First Prize, 10*l.*, for "Fashion," black gelding; was foaled in 1875; breeder unknown.

James Hornsby, Honington Hall, Grantham: Second Prize, 5*l*., for his brown gelding, aged; breeder unknown.

Robert Metcalfe, Castlegate, Malton, Yorkshire: the *Reserve Number* and *Highly Commended* for "High and Mighty," brown gelding; was foaled in 1876; breeder unknown.

Harness Mares or Geldings exceeding 14 *hands* 2 *inches.*†

John Fisher, Manor House, Willerby, Hull: First Prize, 20*l*., for "Pet," brown mare; was foaled in 1877; breeder unknown; sire, "Lord Derby 2nd."

John Fielden, Grimston Park, Tadcaster, Yorkshire: Second Prize, 10*l*., for "Brown Bess," brown mare; was foaled in 1872; breeder unknown; sire, "Denmark."

John Burton Barrow, Ringwood Hall, Chesterfield, Derbyshire: Third Prize, 5*l*., for "Ginger," chestnut mare; was foaled in 1878; bred by Mr. J. Grout, Woodbridge, Suffolk.

Mark Pearson, High Street, Knaresborough: the *Reserve Number* to "Speciality," chestnut mare; was foaled in 1879; bred by Mr. J. Stephenson, of Belford; sire, "Sir Garnet;" sire of dam, "Bay President."

Harness Mares or Geldings exceeding 14 *hands* 2 *inches.*†

Frederick William Burdock, The White House, Downham Market, Norfolk: First Prize, 15*l*., for "Maritana," brown mare; age unknown; bred by Mr. F. Lowe, Norwich; sire, "Don Carlos."

William Foster, Grove House, Pontefract, Yorkshire: Second Prize, 5*l*., for "Pomfret Fancy," brown mare; was foaled in 1877; bred by Mr. Blenkhorn, Otteringham, Lincolnshire; sire, "Lord Derby 2nd."

John Burton Barrow, Ringwood Hall, Chesterfield: the *Reserve Number* and *Highly Commended* for "A 1," brown gelding; was foaled in 1879; bred by Mr. J. Grout, of Woodbridge, Suffolk.

CATTLE.

Shorthorn Bulls calved in either 1877, 1878, *or* 1879.

John Outhwaite, Bainesse, Catterick, Yorkshire: First Prize, 25*l*., for "Lord Zetland" (43,596), roan; was calved April 12th, 1879; bred by the Earl of Zetland, Aske Hall, Richmond, Yorkshire; sire, "Royal Windsor" (29,890); dam, "Florella," by "George Peabody" (28,710); g. d., "Floss," by "Windsor Augustus" (19,157); gr. g. d., "Flirt," by "Cobham" (14,287); gr. g. g. d., "Wood Nymph," by "Ravensworth" (10,681).

Sir William Cayley Worsley, Bart., Hovingham, York: Second Prize, 15*l*., for "Hovingham" (43,363), white; was calved October 7th, 1879; bred by himself; sire, "Sir Arthur Ingram" (32,490); dam, "Irwin's Star," by "Lord Irwin" (29,123): g. d. "Louise," by "White Windsor" (27,803); gr. g. d. "Mushroom," by "Earl of Windsor" (17,788); gr. g. g. d. "Beauty 2nd," by "Magnus Troil" (14,880).

ROBERT THOMPSON, Inglewood Bank, Penrith, Cumberland: THIRD PRIZE, 10*l.*, for "Beau Benedict" (42,769), roan; was calved February 2nd, 1879; bred by Mr. W. Linton, Sheriff Hutton, York; sire, "Paul Potter" (38,854); dam, "Home Beauty," by "Mountain Chief" (20,383); g. d., "Hand-Maid," by "May-Day" (20,323); gr. g. d., "White Rose," by "Magnus Troil" (14,880); gr. g. g. d., "Miss Henderson," by "Magnus Troil" (14,880).

WILLIAM HANDLEY, Green Head, Milnthorpe, Westmoreland: the *Reserve Number* to "Hesperus" (39,994), roan; was calved June 21st, 1877; bred by Mr. Hugh Aylmer, West Dereham Abbey, Stoke Ferry, Norfolk; sire, "Hyperion" (34,196); dam, "Maid of Lorne," by "Royal Broughton" (27,352); g. d., "Maid of the Abbey," by "Prince Christian" (22,581); gr. g. d., "Maid of the Morn," by "Hildebrand" (18,068); gr. g. g. d., "Maid of Orleans," by "Knight of Windsor" (16,349).

Shorthorn Bulls calved in the Year 1880.

FRANCIS JOHN SAVILE FOLJAMBE, M.P., Osberton Hall, Worksop, Notts: FIRST PRIZE, 25*l.*, for "Bright Helm" (44,455), white; was calved February 3rd; bred by himself; sire, "Titan" (35,085); dam, "Bright Duchess," by "Grand Duke 15th" (21,852); g. d., "Bright Halo," by "Breast Plate" (19,337); gr. g. d., "Bright Dew," by "British Prince" (14,197); gr. g. g. d., "Bright Morn," by "Vanguard" (10,994).

WILLIAM HENRY WAKEFIELD, Sedgwick, Kendal, Westmoreland: SECOND PRIZE, 15*l.*, for "Baron Sedgwick" (44,373), roan; was calved January 30th; bred by himself; sire, "Baron Barrington 4th" (33,006); dam, "Well Heads Rose 2nd," by "Sir Arthur Windsor" (35,541); g. d., "Well Heads Rose," by "Dunrobin" (28,486); gr. g. d., "Rosebud 2nd," by "Albert Victor" (23,293); gr. g. g. d., "Rosebud 1st," by "Squire Stuart" (20,891).

WILLIAM FORSTER, Bulls Hill, Allendale, Northumberland: THIRD PRIZE, 10*l.*, for "Captain Boycott" (46,040), red; was calved October 28th; bred by Mr. G. J. Bell, The Nook, Irthington, Brampton, Cumberland; sire, "Baron Turncroft Bates 3rd" (39,443); dam, "Early Rose," by "Magician" (34,570); g. d., "Ella," by "Keir Butterfly 8th" (28,951); gr. g. d., "Miss Eliza," by "Rifleman" (32,304); gr. g. g. d., "Eliza 2nd," by "Mac Turk" (14,872).

CHARLES WILLIAM BRIERLEY, Rosedale, Tenbury, Worcestershire: the *Reserve Number* and *Commended* for "Rosedale Oxford," red and white; was calved September 5th; bred by himself; sire, "Oxford Duke 10th" (38,830); dam, "Bridal Veil," by "Lord George" (29,107); g. d., "Orange Blossom," by "Albion" (25,500); gr. g. d., "Bride Elect," by "Second Duke of Cumberland" (23,735); gr. g. g. d., "Bridesmaid," by "Fourth Duke of Thorndale" (17,750).

Shorthorn Bulls calved in the Year 1881.

JOHN ROWLEY, Went Bank House, Stubbs Walden, Pontefract, Yorkshire: FIRST PRIZE, 25*l.*, and the CHAMPION PRIZE, 25*l.*,† for "Self Esteem 2nd," roan; was calved September 9th; bred by Sir William C. Worsley, Bart., Hovingham, York; sire, "Hovingham" (43,363); dam, "Trusty

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† Given by the York Local Committee for the best Shorthorn Male in the Showyard.

Lass," by "Sir Robin" (40,720); g. d., "Conceit," by "Earl of Derby" (21,638); gr. g. d., "Confidence," by "Wizard of Windsor" (21,124); gr. g. g. d., "Trust," by "Sir Charles" (16,949).

THE DUKE OF PORTLAND, Clipstone Park Farm, Mansfield, Notts: SECOND PRIZE, 15*l.*, for "Grand Ruth" (46,459), white; was calved April 10th; bred by Mr. J. R. Singleton, Great Givendale, Pocklington, Yorkshire; sire, "Lord Surrey" (43,579); dam, "Mabel," by "Chatsworth" (25,346); g. d., "Maud," by "Patriot" (20,475); gr. g. d., "Graceful," by "Ferdinand" (12,871); gr. g. g. d., "Grace," by "Surplice" (10,901).

WILLIAM LANGHORN, East Mill Hills, Haydon Bridge, Northumberland: THIRD PRIZE, 10*l.*, for "Tambour Major," roan; was calved November 8th; bred by himself; sire, "St. Swithin" (43,986); dam, "Cowslip," by "Prince Regent" (29,676); g. d., "Trip the Daisy," by "Wild Boy" (25,447); gr. g. d., "Rosebud," by "Pizarro" (20,497); gr. g. g. d., "Rose Maid," by "Master Annandale" (14,916).

COLONEL ROBERT GUNTER, The Grange, Wetherby, Yorkshire: the *Reserve Number* and *Highly Commended* for "Duke of Tregunter 9th" (46,272), red and white; was calved January 16th; bred by himself; sire, "Duke of Gunterstone" (43,101); dam, "Duchess 118th," by "Eighteenth Duke of Oxford" (25,995); g. d., "Duchess 112th," by "Baron Oxford 6th" (33,075); gr. g. d., "Duchess 110th," by "Third Duke of Wharfdale" (21,619); gr. g. g. d., "Duchess 94th," by "Second Duke of Wharfdale" (19,649).

Shorthorn Bulls calved in the Year 1882.

RICHARD STRATTON, The Duffryn, Newport, Monmouthshire: FIRST PRIZE, 25*l.*, for "Acropolis," roan; was calved June 6th; bred by himself; sire, "Rover" (43,924); dam, "Maid of Athens," by "Charles 1st" (33,322); g. d., "Gloucester Maid," by "Coronet" (23,623); gr. g. d., "Duchess of Glo'ster 6th," by "King John" (14,763); gr. g. g. d., "Duchess of Glo'ster," by "The Red Duke" (8694).

MRS. ATKINSON, Raines Hall, Sedgwick, Milnthorpe, Westmoreland: SECOND PRIZE, 15*l.*, for "Holker 2nd," red; was calved February 16th; bred by Mr. George Drewry, Holker House, Carke-in-Cartmel, Lancashire; sire, "Baron Oxford 8th" (41,057); dam, "Glo'ster Wild Rose," by "Duke of Glo'ster 7th" (39,735); g. d., "Wetherby Wild Rose," by "Fifth Duke of Wetherby" (31,033); gr. g. d., "Wild Rose," by "Knight of the Harem" (24,278); gr. g. g. d., "Imperial Wild Eyes," by "Imperial Windsor" (18,086).

DAVID PUGH, Manoravon, Llandilo, Carmarthenshire: THIRD PRIZE, 10*l.*, for "Baron Manoravon 2nd," roan; was calved January 6th; bred by himself; sire, "Sir Charles" (44,020); dam, "Marchioness Manoravon 4th," by "Falmouth" (38,268); g. d., "Marchioness Manoravon 1st," by "Lord Abbot" (29,052); gr. g. d., "Marchioness," by "Lord Lyons" (26,677); gr. g. g. d., "Mistress Mary," by "Baron Warlaby" (7813).

JOHN FOSTER, Park House, Selby, Yorkshire: the *Reserve Number* to "Middy," red and white; was calved October 13th; bred by himself; sire, "Sailor;" dam, "Ruby," by "Kalamazoo" (40,039); g. d., "Brenda 4th," by "Lee Boo;" gr. g. d., "Brenda 3rd," by "Shuttlecock" (25,126); gr. g. g. d., "Brenda," by "Twentieth Duke of Oxford" (23,778).

Shorthorn Cows, in-milk or in-calf, calved previously to or in the Year 1879.

CHARLES WILLIAM BRIERLEY, Rosedale, Tenbury, Worcestershire: FIRST PRIZE, 20*l.*, for "Snowflake," white; was calved September 11th, 1878; in-milk; calved January 6th, 1883; bred by himself; sire, "Bolivar's Farewell" (33,173); dam, "Bolivar's White Tulip," by "Bolivar" (25,649); g. d., "Tulip Flower," by "Lord Albert" (20,143); gr. g. d., "Rachel," by "Monarch" (18,412); gr. g. g. d., "Young Matchless," by "Duke of Tyne" (12,773).

DANIEL ABBOTT GREEN, East Donyland Place, Colchester, Essex: SECOND PRIZE, 10*l.*, for "Gaiety," roan; was calved October 26th, 1879; in-milk; calved September 16th, 1882; bred by himself; sire, "Prince of the Roses" (42,216); dam, "Gertrude," by "Lord Oxford 7th" (38,645); g. d., "Cambridge Geraldine 3rd," by "Lord Cambridge" (38,588); gr. g. d., "Cambridge Geraldine," by "Cambridge Duke 3rd" (23,503); gr. g. g. d., "Geraldine," by "Duke" (25,924).

JOHN JERVIS SHARP, Broughton, Kettering, Northamptonshire: THIRD PRIZE, 5*l.*, for "May Duchess 15th," red; was calved June 21st, 1879; calved April 26th, 1882; and in-calf; bred by himself; sire, "Duke of Darlington 4th" (38,138); dam, "May Duchess 14th," by "Imperial Oxford" (36,785); g. d., "May Duchess 11th," by "Earl of Oxford" (21,651); gr. g. d., "May Duchess 4th," by "Earl of Oxford" (21,651); gr. g. g. d., "May Duchess," by "Grand Duke of York" (12,966).

TEASDALE HILTON HUTCHINSON, Manor House, Catterick: the *Reserve Number* and *Highly Commended* for "Gratia," roan; was calved October 7th, 1878; in-milk; calved January 1st, 1883, and in-calf; bred by himself; sire, "Pluto" (35,050); dam, "Gratification," by "M. C." (31,898); g. d., "Gerty 3rd," by "Knight of the Shire" (26,552); gr. g. d., "Gerty," by "Vain Hope" (23,102); gr. g. g. d., "Garland," by "Grand Master" (24,078).

Shorthorn Cows or Heifers, in-milk or in-calf, calved in the Year 1880.

BENJAMIN ST. JOHN ACKERS, Prinknash Park, Painswick, Gloucestershire: FIRST PRIZE, 20*l.*, for "Lady Carew 9th," red and white; was calved November 11th; in-calf; bred by himself; sire, "Lord Prinknash 2nd" (38,653); dam, "Lady Carew 3rd," by "County Member" (28,268); g. d., "Lady Jane," by "Baron Killerby" (23,364); gr. g. d., "Miracle," by "Prince James" (20,554); gr. g. g. d., "Heather Bell," by "Hero" (18,055).

TEASDALE H. HUTCHINSON, Manor House, Catterick: SECOND PRIZE, 10*l.*, for "Glad Tidings," roan; was calved December 24th; in-calf; bred by himself; sire, "Master of Arts" (34,816); dam, "Gratification," by "M. C." (31,898); g. d., "Gerty 3rd," by "Knight of the Shire" (26,552); gr. g. d., "Gerty," by "Vain Hope" (23,102); gr. g. g. d., "Garland," by "Grand Master" (24,078).

ARTHUR S. GIBSON, Bulwell, Notts: the *Reserve Number* and *Commended* for "Queen of Stroxton," red; was calved July 2nd; in-milk; calved November 14th, 1882, and in-calf; bred by the late Mr. John Lynn, Church Farm, Stroxton, Grantham, Lincolnshire; sire, "Cambridge Duke 10th" (42,867); dam, "Queen of Havering," by "Third Duke of Geneva" (23,753); g. d., "Queen of Oxford," by "Fifth Duke of Oxford" (31,738); gr. g. d., "Queen of the Roses," by "Cambridge Duke 4th" (25,706); gr. g. g. d., "Queen of the Ocean," by "Second Duke of Thorndale" (17,748).

Shorthorn Heifers calved in the Year 1881.

TEASDALE HILTON HUTCHINSON: FIRST PRIZE, 20*l.*, and the CHAMPION PRIZE, 25*l.*,† for "Lady Pamela," roan; was calved March 17th; bred by himself; sire, "British Knight" (33,220); dam, "Lady Pateley," by "Vehement" (35,853); g. d., "Lady Nidderdale," by "Merry Monarch" (22,349); gr. g. d., "Lady Fly," by "Champion" (23,520); gr. g. g. d., "Purity," by "Perfection" (27,059).

THE DUKE OF PORTLAND, Clipstone Park Farm, Mansfield, Notts: SECOND PRIZE, 10*l.*, for "Elvina," red and white; was calved August 9th; bred by himself; sire, "Paragon" (40,440); dam, "Elvira 2nd," by "Major Thorndale" (31,807); g. d., "Elvira," by "Mac Turk" (14,872); gr. g. d., "Juno," by "Sheldon" (8557); gr. g. g. d., "Flirt," by "Young Newton" (11,853).

SIR JOHN HENRY GREVILLE SMYTH, Bart., Ashton Court, Bristol: THIRD PRIZE, 5*l.*, for "Ashton Winsome 3rd," roan; was calved July 21st; bred by himself; sire, "Wild Oxonian" (40,927); dam, "Ashton Winsome," by "Duke of Glo'ster 7th" (39,735); g. d., "Winsome 20th," by "Fifth Duke of Wetherby" (31,033); gr. g. d., "Lady Wild Eyes 3rd," by "Seventh Duke of York" (17,754); gr. g. g. d., "Bright Eyes 2nd," by "Royal Butterfly 3rd" (18,754).

SIR HENRY HUSSEY VIVIAN, Bart., M.P., Park Le Breos, Swansea, Glamorganshire: the *Reserve Number* and *Highly Commended* for "Maid of Glamorgan," roan; was calved March 14th; in-calf; bred by himself; sire, "Rover" (43,924): dam, "Maiden," by "Eighth Duke of York" (23,808); g. d., "Mabel," by "James 1st" (24,202); gr. g. d., "Miranda," by "Knight of the Lagan" (20,083); gr. g. g. d., "Moss Rose 4th," by "Hickory" (14,706).

Shorthorn Heifers calved in the Year 1882.

WILLIAM HENRY WAKEFIELD, Sedgwick, Kendal, Westmoreland: FIRST PRIZE, 20*l.*, for "Gusta 4th;" red and white, was calved January 28th; bred by himself; sire, "Duke of Holker" (38,153); dam, "Gusta 3rd," by "Baron Barrington 4th" (33,006); g. d., "Gusta 1st," by "Dunrobin" (28,486); gr. g. d., "Lady White," by "Hamlet" (18,017); gr. g. g. d. by "Eclipse" (17,791).

DAVID PUGH, Manoravon, Llandilo, Carmarthenshire: SECOND PRIZE, 10*l.*, for "Zoe 2nd," roan; was calved January 8th: bred by himself; sire, "Sir Charles" (44,020); dam, "White Zoe," by "Falmouth" (38,268); g. d., "Zoe," by "Marquis 1st" (34,774); gr. g. d., "Czarina 10th," by "Duke of Albemarle" (28,355); gr. g. g. d., "Czarina 9th," by "Falconer" (23,907).

BENJAMIN ST. JOHN ACKERS, Prinknash Park, Painswick, Gloucestershire: THIRD PRIZE, 5*l.*, for "Western Georgie," roan; was calved May 3rd; bred by himself; sire, "Royal Gloucester" (45,525); dam, "Vain Countess," by "Knight of St. Patrick" (38,520); g. d., "Vain Peeress," "Sir Windsor Broughton" (27,507); gr. g. d., "Vain Fancy," by "King Richard 2nd" (28,984); gr. g. g. d., "Vain Woman," by "Merry Monarch" (22,349).

ROBERT THOMPSON, Inglewood Bank, Penrith, Cumberland: the *Reserve Number* and *Highly Commended* for "Inglewood Belle," roan; was

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† Given by the York Local Committee for the best Shorthorn Female in the Showyard.

calved January 3rd; bred by himself; sire, "Beau Benedict" (42,769); dam, "Inglewood Pet," by "Brilliant Butterfly" (36,270); g. d., "Love Token," by "Grand Duke of Fawsley 3rd" (31,286); gr. g. d., "Farewell," by "Royal Westmoreland" (35,416); gr. g. g. d., "General's Daughter," by "General Haynau" (11,520).

Shorthorn Families of Cow, and not less than Two nor more than Four of her Descendants in the Female line.†

H.R.H. THE PRINCE OF WALES, K.G., of Sandringham, Norfolk: FIRST PRIZE, 50*l.*, for "Diadem," red and white; was calved May 1st, 1872; bred by Mr. D. Fisher, Pitlochrie, Perthshire; sire, "Fawsley Prince" (31,150); dam, "Diamond," by "The Chieftain" (20,942); g. d., "Damsel," by "Lord Hopewell" (18,239); gr. g. d., "Datura," by "Fitz-Clarence" (14,552); gr. g. g. d., "Duchess," by "Duke of Cambridge" (12,742). "Diadem 3rd," red and white; was calved December 1st, 1876; bred by the Rev. J. N. Micklethwait, Taverham Hall, Norwich; sire, "Royal Dublin" (35,354). "Diadem 5th," roan; was calved November 8th, 1877; sire, "Balmoral" (36,151). "Diadem 9th," roan; was calved December 4th, 1879; sire, "Admiral" (39,353). "Diadem 14th," white; was calved April 30th, 1882; s. "Admiral" (39,353). Last three heifers bred by His Royal Highness.

GEORGE SCOBY, Beadlam Grange, Nawton, Yorkshire: SECOND PRIZE, 20*l.*, for "Duchess of Yetholm," red and white; was calved January 13th, 1871; bred by the late Sir W. C. Trevelyan, Bart., Wallington, Newcastle-upon-Tyne; sire, "Third Duke of Wharfdale" (21,619); dam, "Queen of Yetholm," by "Second Earl of Oxford" (23,843); g. d., "Princess of Yetholm," by "Gipsy Prince" (17,965); gr. g. d., "Young Honeysuckle 2nd," by "Daisy Bull 2nd" (14,364); gr. g. g. d., "Honeysuckle 2nd," by "Ravensworth" (10,681). "Empress of Yetholm," roan; was calved April 10th, 1879; sire, "Duke of Oxford 27th" (33,709). "Empress of Yetholm 2nd," roan; was calved February 18th, 1880; sire, "Duke of Tregunter 5th" (33,743). "Empress of Yetholm 4th," roan; was calved August 13th, 1881; sire, "Duke of Tregunter 5th (33,743). "Empress of Yetholm 7th," roan; was calved December 14th, 1882; s. "Baron of Oxford 9th" (42,738). Produce all bred by himself.

FRANCIS JOHN SAVILE FOLJAMBE, M.P., Osberton Hall, Worksop, Notts: THIRD PRIZE, 10*l.*, for "Cressida 4th" (A 3), roan; was calved June 10th, 1875; bred by the Rev. T. Staniforth, Storrs, Windermere; sire, "Judge of Assize" (34,280); dam, "Cressida 4th" (A), by "Grenadier" (21,876); g. d., "Cressida," by "Cedric" (19,415); gr. g. d., "Hecuba," by "Florian" (12,887); gr. g. g. d., "Young Cressida," by "Duke of Athol" (10,150). "Creusa," white; was calved March 10th, 1881; sire, "Sir Andrew" (42,387). "Clytemnestra," red and white; was calved February 12th, 1882; sire, "Sir Andrew" (42,387). "Chryseis," roan; was calved April 17th, 1882; sire, "Sir Andrew" (42,387); g. d., "Cressida 4th" (A 3). Produce all bred by himself.

GEORGE ASHBURNER, Low Hall, Kirkby Ireleth, Carnforth, Lancashire: the *Reserve Number* and *Highly Commended* for "Bride of Lorn," white; was calved May 29th, 1872; sire, "Sockburn Lad" (30,024); dam, "Lady Oxford," by "Tenth Duke of Oxford" (17,739); g. d., "Lily," by "Hope" (13,042); gr. g. d., "Daisy," by "Duke of Richmond" (8000); gr. g. g. d., "Gilliver," by "Bachelor" (5770). "Lady Lorn," roan; was calved September 29th, 1875; sire, "Duke of Oxford"

(31,004). "Duchess of Lorn," roan; was calved October 23rd, 1878; sire, "Duke of Oxford" (31,004). "Countess of Lorn," roan; was calved October 1st, 1880; sire, "Duke of Oxford 41st" (38,174). All bred by himself.

Hereford Bulls calved in either 1877, 1878, 1879, *or* 1880.

THE EARL OF COVENTRY, Croome Court, Severn Stoke, Worcestershire: FIRST PRIZE, 20*l.*, for "Fisherman" (5913); was calved May 25th, 1878; bred by Mr. T. Rogers, Coxhall, Leintwardine; sire, "Conservator" (5265); dam, "Beauty," by "Langdale" (3203); g. d., "Cockey," by "Energy" (1982); gr. g. d., by "Kinlet" (1293).

Hereford Bulls calved in the Year 1881.

JOHN HUNGERFORD ARKWRIGHT, Hampton Court, Leominster, Herefordshire: FIRST PRIZE, 20*l.*, for "Rose Cross" (7237); was calved August 5th; bred by himself; sire, "Conjuror" (5264); dam, "Rosebud," by "Sir Thomas" (2228); g. d., "Rose," by "North Star" (2138); gr. g. d., "Rose," by "The Grove" (1764).

HENRY WILLIAM TAYLOR, Showle Court, Ledbury, Herefordshire: SECOND PRIZE, 10*l.*, for "Franklin" (6961); was calved April 14th; bred by Mr. Carwardine, Stockton Bury, Leominster; sire, "Lord Wilton" (4740); dam, "Coral," by "Rodney" (4907); g. d., "Blossom," by "De Cote" (3060); gr. g. d., "Vera," by "Heart of Oak" (2035).

Hereford Bulls calved in the Year 1882.

THOMAS JAMES CARWARDINE, Stockton Bury, Leominster, Herefordshire: FIRST PRIZE, 20*l.*, for "Monarch;" was calved August 12th; bred by himself; sire, "Lord Wilton" (4740); dam, "Bella," by "De Cote" (3060); g. d., "Charity," by "Heart of Oak" (2035); gr. g. d., "Luna," by "Counsellor" (1939).

ALLEN EDWARD HUGHES, Wintercott, Leominster: SECOND PRIZE, 10*l.*, for "Washington;" was calved May 15th; bred by himself; sire, "Rudolph" (6660); dam, "Plum 3rd," by "Commander" (4452); g. d., "Plum," by "Comet" (2469); gr. g. d., "Gem," by "Adforton" (1839).

ARTHUR P. TURNER, The Leen, Pembridge, Herefordshire: THIRD PRIZE, 5*l.*, for "Hogarth;" was calved February 20th; bred by himself; sire, "The Grove 3rd" (5051); dam, "Helena," by "Corsair" (5271); g. d. "Elfrida," by "Prince Arthur" (3345); gr. g. d., "Ella," by "Bachelor" (2941).

HERBERT RICHARD HALL, Holme Lacey, Hereford: the *Reserve Number* to "Egerton;" was calved January 23rd; bred by Mr. T. D. Burlton, Eaton Hill, Leominster; sire, "Lord Wilton" (4740); dam, "Alice of Hesse 2nd," by "Protector 2nd" (4878); g. d., "Alice of Hesse," by "Minister" (4789); gr. g. d., "Princess Alice 4th," by "Sir Thomas" (2228).

Hereford Cows, in-milk or in-calf, calved previously to or in the Year 1879.

HENRY WILLIAM TAYLOR, Showle Court, Ledbury, Herefordshire: FIRST PRIZE, 15*l.*, for "Modesty;" was calved August 14th, 1875, calved May 31st, 1882, and in-calf; bred by the late Mr. W. Taylor, Showle Court; sire, "Tredegar" (5077); dam, "Lovely," by "Tenant Farmer" (2806); g. d., "Browny," by "Twin" (2284). SECOND PRIZE, 10*l.*, for

"Adelaide;" was calved June 21st, 1877; calved May 22nd, 1882, and in-calf; bred by the late Mr. W. Taylor, Showle Court; sire, "Tredegar" (5077); dam, "Lovely," by "Tenant Farmer" (2806); g. d., "Browny," by "Twin" (2284): and THIRD PRIZE, 5*l*., for "Rosamond;" was calved August 23rd, 1877; calved June 17th, 1882, and in-calf; bred by the late Mr. W. Taylor, Showle Court; sire, "Taunton" (5035); dam, "Monkton Beauty 3rd," by "Mercury" (3967); g. d., "Young Beauty" by "Sir Francis" (3438); gr. g. d., "Beauty," by "Holmer" (2043).

WILLIAM TUDGE, Leinthall, Ludlow: the *Reserve Number* and *Highly Commended* for "Mermaid;" was calved March 19th, 1877; calved Sept. 26th, 1882, and in-calf; bred by Mr. S. Robinson, Lynbales, Kington, Herefordshire; sire, "Regulus" (4076); dam, "Mermaid," by "Luxury" (3233); g. d., "Fairmaid 3rd," by "Douglas" (2505); gr. g. d., "Fairmaid 2nd," by "Master Butterfly" (1313).

Hereford Cows or Heifers, in-milk or in-calf, calved in the Year 1880.

ALLEN EDWARDS HUGHES, Wintercott, Leominster, Herefordshire: FIRST PRIZE, 15*l*., for "Modesty," was calved June 6th; in-milk; calved February 4th, 1883; bred by Mrs. Sarah Edwards, Wintercott; sire, "Commander" (4452); dam, "Maude," by "Royalist" (4921); g. d., "Young Meremaid 3rd," by "Leominster 3rd" (3211); gr. g. d., "Young Meremaid," by "Adforton" (1839).

WILLIAM TUDGE, Leinthall, Ludlow: SECOND PRIZE, 10*l*., for "Elsie;" was calved June 9th; in-calf; bred by himself; sire, "Downton Grand Duke" (5878); dam, "Mermaid," by "Regulus" (4076); g. d., "Mermaid," by "Luxury" (3233); gr. g. d., "Fairmaid 3rd," by "Douglas" (2505).

THOMAS MYDDLETON, Beckjay, Aston-on-Clun, Salop: the *Reserve Number* and *Highly Commended* for "Lady Mary 4th;" was calved June 3rd; in-calf; bred by himself; sire, "Hartington" (5358); dam, "Lady Mary 2nd," by "Sultan" (4163); g. d., "Lady Mary," by "Hermit" (3160); gr. g. d., "Vale Royal," by "Sir George" (2765).

Hereford Heifers calved in the Year 1881.

ROBERT WILLIAM HALL, Ashton, Leominster: FIRST PRIZE, 15*l*., for "Dorothea;" was calved September 28th; bred by himself; sire, "Lord Wilton" (4740); dam, "Lovely," by "Preceptor," (4030); g. d., "Vanity," by "Artist" (2934); gr. g. d., "Dainty," by "Ashton" (1500).

FREDERICK PLATT, Barnby Manor, Newark-on-Trent, Notts: SECOND PRIZE, 10*l*., for "Prettymaid 4th;" was calved March 17th; bred by himself; sire, "Hartington" (5358); dam, "Prettymaid," by "Horace" (3877); g. d., "Alice Grey 3rd," by "Sir Richard" (3460); gr. g. d., "Alice Grey 2nd," by "Marmaduke 2nd" (2632).

THOMAS MYDDLETON, Beckjay, Aston-on-Clun, Salop: THIRD PRIZE, 5*l*., for "Lady Mary 5th;" was calved June 14th; bred by himself; sire, "Captain" (5238); dam, "Lady Mary 2nd," by "Sultan" (4163); g. d., "Lady Mary," by "Hermit" (3160); gr. g. d., "Vale Royal," by "Sir George" (2765).

THOMAS FENN, Stonebrook House, Downton Castle, Ludlow: the *Reserve Number* and *Highly Commended* for "Downton Beauty;" was calved April 11th; in-calf; bred by himself; sire, "Commander" (4453); dam, "Queen of the Teme," by "Severus 2nd" (2747); g. d., "Victoria," by "Wilson" (4250); gr. g. d., by "Havelock" (1609).

Hereford Heifers calved in the Year 1882.

Frederick Platt, Barnby Manor, Newark-on-Trent: First Prize, 15*l.*, for "Primrose 7th;" was calved January 22nd; bred by himself; sire, "Hartington" (5358); dam, "Primrose 2nd," by "Wolverhampton Boy" (4198); g. d., "Primrose," by "Triumph" (2836); gr. g. d., "Stately," by "Tell Tale" (1757).

Arthur P. Turner, The Leen, Pembridge, Herefordshire: Second Prize, 10*l.*, for "Portia;" was calved April 13th; bred by himself; sire, "The Grove 3rd" (5051); dam, "Purity 2nd," by "Bachelor" (2941); g. d., "Purity" by "Bolingbroke" (1883); gr. g. d., "Amethyst," by "Felix" (953).

Thomas Fenn, Stonebrook House, Downton Castle, Ludlow: Third Prize, 5*l.*, for "Downton Beauty 2nd;" was calved March 10th; bred by himself; sire, "Downton Boy" (5877); dam, "Queen of the Teme," by "Severus 2nd" (2747); g. d., "Victoria," by "Wilson" (4250); gr. g. d., "Havelock" (1609): and the *Reserve Number* and *Highly Commended* for "Downton Olive;" was calved April 6th; bred by himself; sire, "Downton Boy" (5877); dam, "Lady Olive," by "My Lord" (2647); g. d., "Olive," by "Sir David" (349); gr. g. d., "Olive," by "Gay Lad" (400).

Hereford Families, consisting of Cow and Two of her Offspring.‡

The Earl of Coventry, Croome Court, Severn Stoke, Worcestershire: First Prize, 20*l.*, for "Giantess;" was calved July 4th, 1872; bred by Mr. Tudge, Adforton; sire, "Sir Roger" (4133); dam, "Haidee," by "Battenhall" (2406); g. d., "Diana," by "Carbonel" (1525); gr. g. d., "Young Dainty," by "The Doctor" (1083). "Golden Treasure" was calved May 25th, 1878; sire, "Maréchal Niel" (4760); and "Good Boy;" was calved November 28th, 1881; sire, "Fisherman" (5913); both bred by himself.

Robert William Hall, Ashton, Leominster: Second Prize, 10*l.*, for "Lovely;" was calved March 31st, 1876; sire, "Preceptor" (4030); dam, "Vanity," by "Artist" (2934); g. d., "Dainty," by "Ashton" (1500); gr. g. d., "Nutty," by "Uncle Tom" (1107). "Theodora" was calved September 28th, 1881; sire, "Lord Wilton" (4740), and "Lord Ashton;" was calved January 28th, 1883: sire, "Chancellor" (5246); all bred by himself.

William Tudge, Leinthall, Ludlow: the *Reserve Number* and *Highly Commended* for "Roseleaf;" was calved November 20th, 1874; sire, "Lord Hythe" (3937); dam, "Rosebud," by "Sir Thomas" (2228); g. d., "Rose," by "North Star" (2138); gr. g. d., "Rose," by the "Grove" (1764). "Prince Rose" (7191), was calved October 20th, 1881; sire, "Westonbury" (6254), and bull calf; was calved March 3rd, 1883; sire, "Auctioneer" (5194) or "Downton Grand Duke" (5873); all bred by himself.

Devon Bulls calved in either 1877, 1878, 1879, *or* 1880.

William Perry, Alder, Lewdown, Devon: First Prize, 20*l.*, for "Druid" (1317); was calved October 5th, 1877; bred by himself; sire, "Dalesman" (1310); dam, "Dewdrop" (3392), by "Champson" (1035); g. d., "Dairymaid" (3343), by "Baronet" (781); gr. g. d., "Dairymaid" (1900), by "Duke of Chester" (404).

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‡ Given by the Hereford Herd-Book Society.

VISCOUNT FALMOUTH, Tregothnan, Probus, Cornwall: SECOND PRIZE, 10*l.*, for "Sir Michael" (1646); was calved August 17th, 1877; bred by himself; sire, "Sirloin" (1443); dam, "Water Lily" (5050), by "Jonquil" (1131); g. d., "Watercress" (4006), by "Sunflower" (937); gr. g. d., "Cheesewring" (2572A), by "Protector" (711): and THIRD PRIZE, 5*l.*, for "Plum Pudding;" was calved August 30th, 1879; bred by himself; sire, "Sirloin" (1443); dam, "Christmas Rose" (3280), by "Sunflower" (937); g. d., "Rosa Bonheur" (3009), by "Corrector" (809); gr. g. d., "Picture 4th" (2224), by "Davy's Napoleon 3rd" (464).

Devon Bulls calved in the Year 1881.

WILLIAM PERRY, Alder, Lewdown, Devon: FIRST PRIZE, 20*l.*, for "Bravo;" was calved August 30th, bred by himself; sire, "Druid" (1317); dam, "Bracelet" (3229), by "Duke of Devon" (1056); g. d., "Bracelet" (2533), by "Duke of Flitton 2nd" (825); gr. g. d., "Beauty 4th" (1782), by "Duke of Flitton" (613).

JOHN HOWSE, Leighland, Washford, Taunton, Somerset: SECOND PRIZE, 10*l.*, for "Master Harry;" was calved September 30th; bred by Mr. H. P. Coles, Glasses Farm, Taunton; sire, "King of the Gipsies" (1580); dam, "Beauty 3rd," by "Young Profit's Duke;" g. d., "Beauty" (4680); gr. g. d., "Beauty."

RICHARD BICKLE, Bradstone, Barton, Tavistock, Devon: the *Reserve Number* to "Captain" (1518); was calved January 3rd; bred by Messrs. Jackman and Bickle, Bradstone Barton; sire, "Dolly's Duke" (1315); dam, "Beatrice 2nd" (3187), by "Earl of Hexworthy" (1091); g. d., "Beatrice" (2501), by "Garibaldi 1st" (842).

Devon Bulls calved in the Year 1882.

HERBERT FARTHING, Nether Stowey, Bridgwater, Somerset: FIRST PRIZE, 20*l.*, for "Peer;" was calved May 4th; bred by himself; sire, "Forester" (1560); dam, "Peeress" (3746), by "Marquis" (1158); g. d., "Peeress" (2910), by "Eclipse" (835); gr. g. d., "Pearl" (2908), by "Wellington" (752).

ALFRED C. SKINNER, Pound Farm, Bishops Lydeard, Taunton: SECOND PRIZE, 10*l.*, for "Lord Somerset;" was calved October 18th; bred by himself; sire, "Lord Stowey" (1601); dam, "Fancy 3rd" (4478), by "Red Prince" (1432); g. d., "Fancy 1st" (4476); gr. g. d., "Fancy."

Devon Cows, in-milk or in-calf, calved previously to or in the Year 1879.

ALFRED C. SKINNER: FIRST PRIZE, 15*l.*, for "Myrtle 7th" (5544); was calved March 4th, 1879; in-milk; calved March 12th, 1882, and due to calve in June; bred by himself; sire, "Duke of Farrington" (1323); dam, "Myrtle 1st" (4765), by "Squire Winter" (1453); g. d., "Old Myrtle."

JOHN HOWSE, Leighland, Washford, Taunton: SECOND PRIZE, 10*l.*, for "Lily 5th" (5478); was calved March 7th, 1878; in-milk; calved Dec. 29th, 1882; bred by himself; dam, "Lily 3rd" (4683), by "Robin Hood" (914); g. d. "Lily 2nd" (4682); gr. g. d., "Lily 1st" (4681).

JOHN BRADBEER, Pyrland Hall Farm, Taunton: the *Reserve Number* and *Highly Commended* for "Graceful;" was calved April 30th, 1879; calved March 23rd, 1882, and due to calve May 30th; bred by himself; sire, "Nelson" (1413); dam "Cherry;" g. d., "Promise;" gr. g. d., "Old Beauty."

Devon Cows or Heifers in-milk or in-calf, calved in the Year 1880.

Sir William Williams, Bart., Heanton, Barnstaple, Devon: First Prize, 15*l.*, for "Rosebud;" was calved May 25th; in-milk; calved Feb. 28th, 1883; bred by Mrs. Langdon, Flitton Barton, North Molton; sire, "Sir Bevys" (1644); dam, "Temptress 4th" (3962), by "Duke of Flitton 4th."

John Howse, Leighland, Washford, Taunton: Second Prize 10*l.*, for "Daisy 4th" (5224); was calved April 30th; in-milk; calved Jan. 2nd, 1883; bred by himself; sire, "Nelson" (1413); dam, "Daisy 1st" (4360); g. d., "Daisy."

Alfred C. Skinner, Pound Farm, Bishops Lydeard, Taunton: Third Prize, 5*l.*, for "Sally" (5654); was calved August 4th; in-milk; calved March 3rd, 1883; bred by Mr. W. Farthing, Stowey Court, Bridgwater; sire, "Lord Stowey" (1601); dam, "Sarah" (4944), by "Profit's Duke" (1194); g. d., "Sally" (3931), by "Lord Dodington" (665).

Devon Heifers calved in the Year 1881.

Alfred C. Skinner, First Prize, 15*l.*, for "Moss Rose 8th;" was calved February 5th; bred by Mr. W. Farthing, Stowey Court, Bridgwater; sire, "Lord Stowey" (1601); dam, "Moss Rose 5th" (4758), by a "Son of Forester" (1108); g. d., "Moss Rose" (3716), by "Island Prince" (862); gr. g. d., "Modesty."

William Rolles Fryer, Lytchett Minster, Poole, Dorset: Second Prize, 10*l.*, for "Mignonette;" was calved May 28th; bred by himself; sire, "Viceroy" (1661); dam, "Musk" (4762), by "Emperor" (1096); g. d., "Goldcup" (4536): and Third Prize, 5*l.*, for "Coleus" (5182); was calved January 2nd; bred by himself; sire, "Viceroy" (1661); dam, "Cherry" (4208), by "Emperor" (1096); g. d., "Cherry."

Sir William Williams, Bart., Heanton, Barnstaple: the *Reserve Number* and *Highly Commended* for "Fanciful;" was calved November 4th; bred by himself; sire, "Young Actor;" dam, "Actress 15th," by "Jonquil;" g. d., "Actress 7th," by "Duke of Flitton 6th;" gr. g. d., "Actress 3rd," by "Duke of Flitton 2nd."

Devon Heifers calved in the Year 1882.

Sir William Williams, Bart.: First Prize, 15*l.*, for "Fashion;" was calved April 26th; bred by himself; sire, "Duke of Flitton 17th;" dam, "Temptress 8th," by "Duke of Flitton 10th."

John Bradbeer, Pyrland Hall Farm, Taunton: Second Prize, 10*l.*. for "Young Nellie;" was calved April 2nd; bred by himself; sire, "Fancy's Duke 2nd" (1555); dam, "Nellie," by "Nelson" (1413).

William Rolles Fryer, Lytchett Minster, Poole: the *Reserve Number* and *Highly Commended* for "Dahlia;" was calved March 10th; bred by himself; sire, "Poppy" (1626); dam, "Dowager" (4406), by "Duke of Plymouth" (1080); g. d., "Doubleteats" (4405).

Sussex Bulls calved in either 1877, 1878, *or* 1879.

Edward and Alfred Stanford, Eatons, Ashurst, Steyning, Sussex: First Prize, 20*l.*, for "Goldsmith" (391); was calved in August 1877; bred by the late Mr. George Smith, Paddockhurst, Crawley, Sussex; sire, "Young Hartley" (444); dam, "Young Golding."

LOUIS HUTH, Possingworth Manor, Hawkhurst, Kent: the *Reserve Number* and *Commended* for "Lord Beckley" (460); was calved in December 1879; bred by Mr. T. Wilsher, Hays; sire, "Willards Hill;" dam, "Young Damsel."

Sussex Bulls calved in the Year 1880.

EDWARD and ALFRED STANFORD: FIRST PRIZE, 20*l.*, for "Standen 2nd" (473); was calved November 23rd; bred by themselves; sire, "Goldsmith" (391); dam, "Strawberry" (1565).

JAMES STEWART HODGSON, Lythe Hill, Haslemere, Surrey: SECOND PRIZE, 10*l.*, for "Lord Oxford" (461); was calved December 18th; bred by himself; sire, "Oxford" (304); dam, "Pitcher 3rd" (2105), by "Berry" (259); g. d., "Pitcher 2nd" (1545), by "Grand Duke" (183); gr. g. d., "Pitcher" (1434).

THOMAS ALBERT VICKRESS, Hill House, Slinfold, Horsham, Sussex: the *Reserve Number* and *Highly Commended*, for "Shirley" (436); was calved July 25th; bred by himself; sire, "Berry" (259); dam, "Shamrock," by "The Bainden Bull;" g. d., "Shelly 2nd," by "Berry."

Sussex Bulls calved in the Year 1881.

EDWARD and ALFRED STANFORD: FIRST PRIZE, 20*l.*, for "Reading" (516); was calved March 31st; bred by themselves; sire, "Goldsmith" (391); dam, "Rosedew 5th" (2289) by "Clayton" (319); g. d., "Rosedew 1st" (2129), by "Dorchester" (325); gr. g. d., "Rosedew" (2128), by "Young Westminster" (159): and SECOND PRIZE, 10*l.*, for "Duke of Ashurst" (457); was calved January 9th; bred by themselves; sire, "Heasman" (392); dam, "Mary Fern 4th" (2263), by "Clayton" (319); g. d., "Mary Fern 2nd" (2085), by a "Child Bull;" gr. g. d., "Mary Fern" (1189), by "Westminster" (138).

ALFRED AGATE, Broomhall, Horsham, Sussex: the *Reserve Number* and *Highly Commended* for "Frankenstein 3rd" (499); was calved August 18th; bred by himself; sire, "Frankenstein 2nd" (328); dam, "Lucy 2nd" (2065), by "Alfred 2nd" (177).

Sussex Cows, in-milk or in-calf, calved previously to or in the Year 1879.

JAMES STEWART HODGSON, Lythe Hill, Haslemere: FIRST PRIZE, 15*l.*, for "Laura 5th" (2412); was calved Oct. 18th, 1879; in-milk; calved January 19th, 1883; bred by himself; sire, "Oxford" (304); dam, "Laura 3rd" (2055), by "Little Tom;" g. d., "Laura 1st" (2053), by "Mottingham 1st" (190); gr. g. d., "Young Gentle."

CAPTAIN PHILIP GREEN, Bayham Abbey, Lamberhurst, Sussex: SECOND PRIZE, 10*l.*, for "Buttercup" (2197); was calved April 13th, 1877; calved July 22nd, 1882, and in-calf; bred by Mr. T. B. Landsell, Built Bridge, Lamberhurst; sire, "The Standen Bull;" dam, "Duchess."

ALFRED AGATE, Broomhall, Horsham: THIRD PRIZE, 5*l.*, for "Daisy 4th" (2819); was calved December 30th, 1878; in-milk; calved November 24th, 1882; bred by Mr. F. Allcorn, Huggett's Furnace, Hadlow Down, Uckfield, Sussex; sire, "Sir Harry;" dam, "Daisy 3rd," by "Young Chelsea."

WILLIAM STEWART FORSTER, Gore Court, Maidstone, Kent: the *Reserve Number* and *Highly Commended* for "Marygold 4th" (2082); was calved July 1st, 1877; in-milk; calved April 17th, 1883; bred by Mr. T. B. Laudsdell, Bayham Home Farm, Lamberhurst, Sussex; sire, "Tunbridge;" dam, "Marygold 3rd."

Sussex Cows or Heifers, in-milk or in-calf, calved in the Year 1880.

Edward and Alfred Stanford: First Prize, 15*l.*, for "Dorset 8th" (2365); was calved March 11th; in-milk; calved January 8th, 1883; bred by themselves; sire, "Goldsmith" (391); dam, "Dorset 2nd" (1993), by "Dorchester" (325); g. d., "Dorset" (1991), by "Young Westminster" (159).

Alfred Agate, Broomhall, Horsham: Second Prize, 10*l.*, for "Honesty 6th" (2867); was calved Oct. 2nd; in-milk; calved January 15th, 1883; bred by himself; sire, "Robinson Crusoe 2nd" (361); dam, "Honesty 1st" (1617), by "Alfred 2nd" (177).

Sussex Heifers calved in the Year 1881.

James Stewart Hodgson, Lythe Hill, Haslemere: First Prize, 15*l.*, for "Peace 2nd" (2916); was calved October 5th; bred by himself; sire, "Royal Kilburn" (401);" dam, "Peace" (2273), by "Croydon" (245); g. d., "Snowdrop" (1727), by "Egerton;" gr. g. d., "Leicester" (1120), by "Prince Arthur" (129).

Edward and Alfred Stanford, Eatons, Ashurst: Second Prize, 10*l.*, for "Magdala 22nd" (2652); was calved Jan. 17th; bred by themselves; sire, "Goldsmith" (391); dam, "Magdala 9th" (2255), by "Dorchester" (325); g. d., "Magdala 3rd" (1185); gr. g. d., "Magdala 1st" (1183).

Alfred Agate, Broomhall, Horsham: Third Prize, 5*l.*, for "Young Gentle 2nd" (2973); was calved Jan. 12th; in-milk; calved February 1st, 1883; bred by himself; sire, "Young Hartley" (444); dam, "Young Gentle" (1737), by "Frankenstein" (181).

Edward and Alfred Stanford: the *Reserve Number* and *Highly Commended* for "Magdala" (2653); was calved Jan. 20th; bred by themselves; sire, "Goldsmith" (391); dam, "Magdala 10th" (2256); g. d., "Magdala 5th" (1220).

Sussex Heifers calved in the Year 1882.

Thomas A. Vickress, Hill House, Slinfold, Horsham: First Prize, 15*l.*, for "Activity;" was calved February 5th; bred by himself; sire, "Berry 2nd" (415); dam, "Actress 4th" (1676), by "Grand Duke" (183); g. d. "Actress" (1146), by "Westminster," (138); gr. g. d. "Primrose:" and Second Prize, 10*l.*, for "Confidence;" was calved Feb. 21st; bred by himself; sire, "Berry" (259); dam, "Christmas Rose" (1766); g. d. "Christmas Dark 2nd" (1761).

James Stewart Hodgson, Lythe Hill, Haslemere: Third Prize, 5*l.*, for "Lady Bird 1st" (2875); was calved March 1st; bred by himself; sire, "Oxford" (304); dam, "Pitcher 3rd" (2105), by "Berry" (259); g. d., "Pitcher 2nd" (1545), by "Grand Duke" (183); gr. g. d., "Pitcher" (1434).

Edward and Alfred Stanford: the *Reserve Number* and *Highly Commended* for "Magdala 24th" (2890); was calved March 19th; bred by themselves; sire, "Goldsmith" (391); dam, "Magdala 7th" (2076), by "Sir William" (164).

Welsh Bulls calved in either 1877, 1878, 1879, 1880, *or* 1881.

Lord Harlech, Glyn, Talsarnau, Merionethshire: First Prize, 20*l.*, for "Cipher;" was calved July 31st, 1880; bred by himself; sire, "Black Prince;" dam, "Morfa."

The Earl of Cawdor, Stackpole Court, Pembroke: Second Prize, 10*l.*, for "Vivod;" was calved June 10th, 1880; bred by Captain Best, Plas-y-Vivod, Llangollen, North Wales; sire, "Black Prince;" dam, "Curley."

Lord Harlech: the *Reserve Number* and *Highly Commended* for "Black Prince;" was calved May 14th, 1877; bred by Mr. John Williams, Gwenhefin, Bala, Merionethshire.

Welsh Bulls calved in the Year 1882.

Lord Harlech: First Prize, 15*l.*, for "Zulu;" was calved July 26th; bred by himself; sire, "Black Prince;" dam, "Beauty."

Henry Jones, Cefnprys, Llanuwchllyn, Merionethshire: the *Reserve Number* and *Commended* for "Georgy;" was calved February 20th; bred by Mr. George Rowlands, Hendrefawr, Llanuwchllyn, Merionethshire.

Welsh Cows or Heifers, in-milk or in-calf, calved previously to or in the Year 1880.

The Earl of Cawdor: First Prize, 15*l.*, for "Leonora;" was calved July 5th, 1876; calved December 8th, 1882, and in-calf; bred by himself; sire, "Trabowen;" dam, "Sidas" (143).

Welsh Heifers, calved in the Year 1881.

The Earl of Cawdor: First Prize, 15*l.*, for "Rosal 2nd;" was calved March 29th; bred by Mrs. L. Williams, Love Lodge Farm, Llandilo, Carmarthenshire; sire, "Symen 2nd;" dam, "Gymras" (23), by "Gymro" (26).

Norfolk and Suffolk Bulls, calved either in 1877, 1878, 1879, 1880, *or* 1881.

Charles Austin, Brandeston Hall, Wickham Market, Suffolk: First Prize, 20*l.*, for "Shylock," red; was calved December 18th, 1879; bred by the Executors of the late Mr. Palmer, Wilby, Norfolk; sire, "Othello" (532); dam, "Flora," by "Davyson 3rd" (48); gr. d., "Sal 2nd," by "Wonder" (231); gr. g. d., "Sal."

John Hammond, Bale, East Dereham, Norfolk: Second Prize, 10*l.*, for "Davyson 7th," red; was calved Dec. 1st, 1878; bred by himself; sire, "Davyson 5th;" dam, "Davy 10th," by "Sir Nicholas 2nd;" g. d., "Davy 3rd," by "Sir Nicholas;" gr. g. d., "Rose of Hope," by "Hammond's Rufus."

Alfred Taylor, Starston Place, Harleston, Norfolk: Third Prize, 5*l.*, for "Passion" (714), red; was calved Jan. 2nd, 1881; bred by himself; sire, "King Charles" (329); dam, "Sly" (1192), by "Sir Edward 1st" (197); g. d., "Strawberry 2nd R 2," by "Richard 2nd" (173); gr. g. d., "Tiny R 2," by "Laxfield Sire" (101).

Robert Harvey Mason, Necton Hall, Swaffham, Norfolk: the *Reserve Number* and *Highly Commended* for "Starston Duke," red; was calved Nov. 8th, 1879; bred by Mr. A. Taylor, Starston, Harleston; sire, "King Charles" (329); dam, "Flirt," by "Easton Duke" (61); g. d., "Sly," by "Sir Edward 1st" (167); gr. g. d., "Strawberry 2nd," by "Richard 2nd" (173).

Norfolk and Suffolk Bulls calved in the Year 1882.

Jeremiah James Colman, M.P., Carrow House, Norwich : First Prize, 15*l.*, for "Francillo" (669), red ; was calved January 13th ; bred by himself ; sire, "Charles" (469) ; dam, "Fan" (1506), by "Roundhead" (180) ; g. d., "Fanny" (220), by "Hero 3rd" (87) ; gr. g. d., "Madame Freeman."

Bazett Michael Haggard, Kirby Cane Hall, Bungay, Norfolk : Second Prize, 10*l.*, for "Sand Boy," red ; was calved March 4th ; bred by Mr. H. Biddell, Hill House, Playford, Ipswich, Suffolk ; sire, "Monarch 4th ;" dam, "Currant Wine" (1424), by "Iron Duke" (125) ; g. d., "Cherry Pie" (787), by "Earl of Suffolk" (297) ; gr. g. d., "Cherry Lux."

Robert Emlyn Lofft, Troston Hall, Bury St. Edmunds : Third Prize, 5*l.*, for "Taurus," red ; was calved Sept. 28th ; bred by himself ; sire, "Stout" (581) ; dam, "Topknott 3rd," by "Bright" (269) : and *Reserve Number* to "Orion," red ; was calved Aug. 7th ; bred by himself ; sire, "Renaldo" (556) ; dam, "Bridesmaid 3rd," by "Cherry Duke" (32).

Norfolk and Suffolk Cows or Heifers, calved previously to or in the Year 1880.

Jeremiah James Colman, M.P., Carrow House, Norwich : First Prize, 15*l.*, for "Dolly" (1463) ; was calved November 3rd, 1879 ; in-milk ; calved November 10th, 1882, and in-calf ; bred by himself ; sire, "Rufus" (188) ; dam, "Polly" (1084), by "Rufus" (189) ; g. d., "Lily 2nd" (311), by "Hero 3rd" (87) ; gr. g. d., "Lily" (310), by "Hero of Newcastle" (85) : and Second Prize, 10*l.*, for "Silent Lady" (1855), red ; was calved December 18th, 1880 ; in-calf ; bred by himself ; sire, "Rufus" (188) ; dam, "Silent Lass" (1189), by "Powell" (143) ; g. d., "Silence" (548), by "Rifleman" (175) ; gr. g. d., "Silence."

Alfred Taylor, Starston Place, Harleston, Norfolk : Third Prize, 5*l.*, for "Buxom" (1355), red ; was calved July 29th, 1878 ; in-milk ; calved Feb. 18th, 1883 ; bred by the late Mr. J. F. Palmer, Wilby, Norfolk ; sire, "Davyson 3rd" (48) ; dam, "Cheerful" (762), by "Young Major" (235) ; g. d., "Spot" (558), by "Wonder" (231) ; gr. g. d., "Rose" (K 19), by "Elmham Sire."

William Amhurst Tyssen-Amherst, M.P., Didlington Hall, Brandon, the *Reserve Number* and *Highly Commended* for "Satin" (T 7. 1837), red ; was calved March, 1879 ; in-milk ; calved December 19th, 1882 ; bred by Mr. T. Fulcher, North Elmham, East Dereham, Norfolk ; sire, "Robin Hood" (394) ; dam, "Songster" (1859), by "Duke of Norfolk" (295) ; g. d., "Stranger" (566).

Norfolk and Suffolk Heifers calved in the Year 1881.

John Hammond, Bale, East Dereham : First Prize, 15*l.*, for "Davy 37th," red ; was calved in June ; bred by himself ; sire, "Davyson 7th ;" dam, "Davy 21st," by "Davyson 5th ;" g. d., "Davy 7th," by "Young Duke ;" gr. g. d., "Davy 2nd," by "Sir Nicholas :" and Second Prize, 10*l.*, for "Davy 38th," red ; was calved September 14th ; bred by himself ; sire, "Davyson 7th ;" dam, "Davy 27th," by "Davyson 5th ;" g. d., "Davy 5th," by "Tenant Farmer."

Alfred Taylor, Starston Place : Third Prize, 5*l.*, for "Cousin" (2108), red ; was calved April 8th ; in-calf ; bred by himself ; sire, "King Charles" (329) ; dam, "Cossette" (1405), by "Rifleman" (175) ; g. d., "Cowslip" (O 3), by "Bow-bearer" (22).

Jeremiah James Colman, M.P., Carrow House, Norwich: the *Reserve Number* and *Highly Commended* for "Silent Woman" (2537), red; was calved December 25th; bred by himself; sire, "Rufus" (188); dam, "Silent Lass" (1189), by "Powell" (143); g. d., "Silence" (548), by "Rifleman" (175); gr. g. d., "Silence."

Polled Angus or Aberdeen Bulls, calved in 1877, 1878, 1879, 1880, *or* 1881.

Andrew Rouse Boughton-Knight, Downton Castle, Ludlow: First Prize, 20*l.*, for "Souter Johnny" (1615), black; was calved June 24th, 1877; bred by Mr. W. M. Skinner, Drumin; sire, "Adrian 2nd" (622); dam, "Moonlight" (1479), by "Clansman" (398); g. d. "Georgina 3rd" (1231), by "Damascus" (495); gr. g. d., "Georgina of Rothiemay" (532), by "Fintray" (125).

Arthur Egginton, South Ella, Hull: Second Prize, 10*l.*, for "Premier of Montbletton" (2288), black; was calved January 21st, 1881; bred by the late Mr. R. Walker, Montbletton, Banff; sire, "Young Hero" (1837); dam, "Lady Palmerston 2nd" (3819), by "Derby of Montbletton" (914); g. d., "Lady Palmerston" (1398), by "Palmerston" (374); gr. g. d., "Lady Alexina" (1026), by "Victor of Ballindalloch" (403).

Owen C. Wallis, Bradley Hall, Ryton-on-Tyne, Durham: Third Prize, 5*l.*, for "Sea King," black; was calved January 15th, 1881; bred by Sir G. M. Grant, Bart., Ballindalloch, Elgin; sire, "Justice" (1462); dam, "Sprite" (3796), by "Judge" (1150); g. d., "Siren" (1915), by "Juryman" (404); gr. g. d., "Sybil" (974), by "Black Prince of Bogfern" (501).

Polled Angus or Aberdeen Bulls, calved in the Year 1882.

George Wilken, Waterside of Forbes, Alford, Aberdeenshire: First Prize, 15*l.*, for "Strathglass" (2357), black; was calved March 19th; bred by Lord Tweedmouth, Guisachan Home Farm, Beauly, Inverness-shire; sire, "Heir of Glory" (1746); dam, "Witch of Endor" (3528), by "Valiant" (663); "g. d., "Mayflower 2nd" (3521), by "Emperor of East Tulloch" (396); gr. g. d., "Mayflower of East Tulloch" (3519), by "King Henry" (390).

Owen C. Wallis: Second Prize, 10*l.*, for "Juggler" (2168), black; was calved April 24th; bred by himself; sire, "King of Diamonds" (1818); dam, "Jemima of Ballindalloch" (4172), by "Editor" (1460); g. d., "Judy" (2996), by "Ballimore" (741); gr. g. d., "Jilt" (973), by "Black Prince of Tillyfour 2nd" (1180).

Clement Stephenson, Sandford Villa, Newcastle-on-Tyne: Third Prize, 5*l.*, for "Expert" (2091), black; was calved March 3rd; bred by himself; sire, "Juval" (1883); dam, "Esther of Aberdour" (4843), by "Moraystown" (1439); g. d., "Etta" (2225), by "Ballimore" (741); gr. g. d., "Ella" (1205), by "Kildonan" (405): and the *Reserve Number* to "Referee," black; was calved June 10th; bred by himself; sire, "Ebony" (1261); dam, "Ethelinda" (3356), by "Donald Bain" (978); g. d., "Ruth 2nd" (1783), by "Prince of Wales 2nd" (394); gr. g. d., "Ruth of Tillyfour" (1169), by "Black Prince of Tillyfour" (366).

Polled Angus or Aberdeen Cow or Heifer in-milk or in-calf, calved previously to or in the Year 1880.

Arthur Eggerton, South Ella, Hull: First Prize, 15*l.*, for "Waterlily" (2432), black; was calved January 5th, 1875; in-milk; calved September 16th, 1882, and in-calf; bred by Mr. W. J. Taylor, Glengarry; sire, "Walrus" (592); dam, "Talmage" (2431), by "Statesman of Drumin" (636).

Clement Stephenson: Second Prize, 10*l.*, for "Abbess 3rd" (3616), black; was calved July 6th, 1875; calved September 3rd, 1882, and in-calf; bred by Mr. James Scott, Easter Tulloch, Stonehaven; sire, "Blue Beard" (648); dam, "Abbess 2nd" (1969), by "Cavalier" (411); g. d., "Amelia of Easter Tulloch" (1900), by "Mr. Brown, of Sootywells Bull;" gr. g. d., "Ashentilly" (1029), by "Colonel of East Tulloch" (391).

Owen C. Wallis, Bradley Hall: Third Prize, 5*l.*, for "Nosegay 8th" (3914), black; was calved January 28th, 1878; in-milk; calved December 20th, 1882; bred by Mr. W. J. Taylor, Rothiemay, Huntly, N.B.; sire, "Sir Maurice" (1319); dam, "Nosegay 4th," by "Juryman" (404); g. d., "Nosegay," by "King Charles" (236): and the *Reserve Number* to "Smyrna" (4571), black; was calved May 4th, 1879; calved September 22nd, 1881; and in-calf; bred by Mr. James Metcalfe, Mains of Auchmunreel, New Deer, N.B.; sire, "Provost 2nd" (1790); dam, "Miss McCombie 4th," by "Carvour" (566); g. d., "Miss McCombie of Fivie," by "Black Prince of Tillyfour;" gr. g. d., "Miss Watson," by "President 3rd."

Polled Angus or Aberdeen Heifers, calved in the Year 1881.

Arthur Egginton, South Ella, Hull: First Prize, 15*l.*, for "Waterlily 2nd" (5435), black; was calved February 3rd; in-milk; calved March 15th, 1883; bred by himself; sire, "Kinsman" (1444); dam, "Waterlily" (2432), by "Walrus" (592); g. d., "Talmage" (2431), by "Statesman of Drumin" (636).

Owen C. Wallis, Bradley Hall, Ryton-on-Tyne: Second Prize, 10*l.*, for "May Queen of Advie," black; was calved May 20th; in-calf; bred by Mr. John Grant, Advie, N.B.; sire, "Highland Chief" (1590); dam, "May Flower 4th" (4439), by "Elcho" (595); g. d., "May Flower" (3108), by "Conqueror" (1190); gr. g. d., "Dandy" (3106), by "Trojan" (402).

Clement Stephenson, Sandyford Villa, Newcastle-on-Tyne, Third Prize, 5*l.*, for Abbess 5th" (4956), black; was calved January 20th; in-calf; bred by Mr. G. Bean, Balquhain Mains, Pitcaple, Aberdeenshire; sire, "Serapis" (998); dam, "Abbess 3rd" (3616), by "Bluebeard" (648); g. d., "Abbess 2nd" (1969), by "Cavalier" (411); gr. g. d., "Amelia of Easter Tulloch" (1900), by "Mr. Brown," of Sootywells Bull.

W. B. Greenfield, Beechwood Park, Dunstable, Bedfordshire, the *Reserve Number* to "Susanne 3rd of Beechwood" (5654), black; was calved June 4th; in-calf; bred by Mr. J. H. Gavenwood, Corskie, Banff; sire, "Fitz Maur" (1764); dam, "Susanne 2nd" (2452), by "Juniper" (742); g. d., "Susanne" (942), by "March" (355); gr. g. d., "Rosedale" (934), by "Captain of Westerton" (468).

Polled Angus or Aberdeen Heifers, calved in the Year 1882.‡

OWEN C. WALLIS, Bradley Hall: FIRST PRIZE, 15*l.*, for "Pride Languish" (5681), black; was calved January 19th; bred by Mr. John Hanney, Gavenwood, Banff, N.B.; sire, "Young Hero" (1837); dam, "Lilias of Tillyfour" (1795), by "Black Prince of Westerfowlis" (619); g. d., "Pride of Aberdeen 3rd," by "Bright" (454); gr. g. d., "Pride of Aberdeen," by "Hanton" (228).

CLEMENT STEPHENSON: SECOND PRIZE, 10*l.*, for "Abbess of Benton," black; was calved September 3rd; bred by himself; sire, "Englishman" (2076); dam, "Abbess 3rd" (3616), by "Blue Beard" (648); g. d., "Abbess 2nd" (1969), by "Cavalier" (411); gr. g. d., "Amelia of Easter Tulloch" (1900), "by Mr. Brown of Sootywells Bull."

ARTHUR FITZPATRICK GODMAN, Smeaton Manor, Northallerton, Yorkshire: THIRD PRIZE, 5*l.*, for "Regina," black; was calved February 21st; bred by himself; sire, "Ludolph" (1711); dam, "Regia 2nd" (4283), by "Blackwatch" (1242); g. d., "Regia" (3394), by "Warlock" (1159); gr. g. d., "Queen of Corskie" (1018), by "Mountbairey" (496).

W. B. GREENFIELD, Beechwood Park, Dunstable: the *Reserve Number* to "Pride of Beds" (5653), black; was calved February 25th; bred by himself; sire, "Bombastis" (1548); dam, "Escape" (3879), by "Potentate" (1199); g. d., "Esther" (1962), by "Spankie 2nd" (565); gr. g. d., "Eva of Airlie" (1957), by "Frederick" (480).

Galloway Bulls, calved in either 1877, 1878, 1879, 1880, *or* 1881.

JAMES CUNNINGHAM, Tarbreoch, Dalbeattie, Kirkcudbright: FIRST PRIZE, 20*l.*, for "Harden" (1151), black; was calved February 8th, 1877; bred by Mr. James Graham, Lynefoot, Longtown, Cumberland; sire, "Sim of Whitram" (562); dam, "Mary of Parcelstown" (1420), by "Willie of Westburnflat" (523); g. d., "Queen of Culloch" (1315), by "Sir Walter" (536); gr. g. d., "Agnes of Mickle Culloch" (220), by "Wellington" (22).

FREDERICK ERNEST VILLIERS, Closeburn Hall, Thornhill, Dumfriesshire: SECOND PRIZE, 10*l.*, for "John Highlandman" (1531), black; was calved January 25th, 1879; bred by Messrs. W. and J. Shennan, Balig, Kirkcudbright, N.B.; sire, "Duke of Drumlanrig" (667); dam, "Black Beauty 5th" (3053), by "Uncle Tom of Balig" (1043); g. d., "Black Beauty 4th" (2651), by "Mick" (1042); gr. g. d., "Black Beauty 3rd" (1352), by "Geordie 2nd" (528).

ALEXANDER McCOWAN, Newtonairds, Dumfries: THIRD PRIZE, 5*l.*, for "Wellington 5th" (1555), black; was calved January 16th, 1880; bred by Mr. James Graham, Lynefoot, Longtown, Cumberland; sire, "Harden" (1151); dam, "Dinah 2nd" (2671), by "Braw Willie" (1051).

THE DUKE OF BUCCLEUCH AND QUEENSBERRY, K.G., Drumlanrig, Thornhill, Dumfriesshire: the *Reserve Number* and *Highly Commended* for "Eskdail" (1559), black; was calved January 19th, 1880; bred by himself; sire, "Black Prince of Drumlanrig" (546); dam, "Antigone of Drumlanrig" (1663), by "Lochinvar" (520); g. d., "Handsome of Drumlanrig" (1638), by "Kinsman" (538); gr. g. d., "Rose of Culmain" (2964), by "Mullock of Culmain" (1141).

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‡ Given by breeders of Polled Angus or Aberdeen Cattle.

Galloway Bulls calved in the Year 1882.

JAMES CUNNINGHAM, Tarbreoch, Dalbeattie: FIRST PRIZE, 15*l.*, for "Braw Lad of Barskeoch" (2041), black; was calved February 8th; bred by Mr. J. McTurk, Barskeoch Mains, Dalry, Kircudbright; sire, "Osman Pasha" (1282); dam, "Pride of Knocklae" (3513), by "Mullock" (1108); g. d., "Beauty of Knocklae" (2862).

THE DUKE OF BUCCLEUCH AND QUEENSBERRY, K.G., Drumlanrig: SECOND PRIZE, 10*l.*, for "Stanley 3rd of Drumlanrig" (1793), black; was calved January 1st; bred by himself; sire, "Eskdail" (1559); dam, "Lady Stanley of Drumlanrig" (2858), by "Pretender" (617); g. d., "Lady Stanley" (1670), by "Hossack" (1319); gr. g. d., "Jane of Breconhill" (3354), by "Emancipation" (1318).

ALEXANDER McCOWEN, Newtodairds, Dumfries: THIRD PRIZE, 5*l.*, for "Statesman 2nd of Drumlanrig" (1786), black; was calved February 22nd; bred by the Duke of Buccleuch and Queensberry, K.G., Drumlanrig, N.B.; sire, "Black Prince of Drumlanrig" (546); dam, "Bessie of Drumlanrig" (2183), by "Statesman" (630); g. d., "Countess of Blaiket" (1582), by "Clansman of Blaiket" (629); gr. g. d., "Maggie of Blaiket" (1579), by "Sir Walter" (536).

THE REV. JOHN GILLESPIE, Mouswall Manse, Dumfries: the *Reserve Number* and *Highly Commended* for "Grenadier Guardsman" (2420), black; was calved February 16th; bred by Mr. R. Jefferson, Rothersyke, Carnforth, Cumberland; sire, "Chancellor 2nd of Drumlanrig" (1163); dam, "Semiramis 10th" (2971), by "Sim of Whitram" (562); g. d., "Semiramis 2nd" (1321), by "Glenorcky" (521); gr. g. d., "Rose of Galloway" (134), by "Sir James of Balig" (537).

Galloway Cows or Heifers, in-milk or in-calf, calved previously to or in the Year 1880.

THE DUKE OF BUCCLEUCH AND QUEENSBERRY, K.G.: FIRST PRIZE, 15*l.*, for "Princess of Drumlanrig" (2995), black; was calved February 6th, 1876; in-milk; calved January 13th, 1883; bred by Mr. Maxwell Clark, Culmain, Crocketford, Dumfries, N.B.; sire, "Black Prince of Drumlanrig" (546); dam, "Blossom of Drumlanrig" (4228), by "Mangerton" (525).

JAMES CUNNINGHAM, Tarbreoch: SECOND PRIZE, 10*l.*, for "Flora of Kirkland," black; was calved May 26th, 1878; in-calf; bred by Mr. A. Hanning, Kirkland, Dalbeattie, N.B.; sire, "Chieftain of Drumlanrig" (752); dam, "Stately of Kirkland" (3351).

THE DUKE OF BUCCLEUCH AND QUEENSBERRY, K.G.: THIRD PRIZE, 5*l.*, for "Harriet 6th of Drumlanrig" (2646), black; was calved March, 1872; in-milk; calved March 10th, 1883; bred by Mr. W. Routledge, Elrig, Portwilliam, Wigtownshire, N.B.; sire, "Marquis of Elrig" (842); dam, "Harriet 2nd of Drumlanrig" (2178); by "Son of Sir John the Graham" (1115); g. d., "Harriet of Drumlanrig" (1633), by "Heir-at-Law" (815); gr. g. d., "Nancy of Elrig" (2699), by "Tawny."

JAMES CUNNINGHAM: the *Reserve Number* to "Lizzie of Breckonhill" (3366), black; was calved in 1877; in-milk; calved March, 1883; and in-calf; bred by Mr. C. Graham, Breckonhill, Longtown, Cumberland; sire, "Captain" (1320); dam, "Daisy of Breckonhill," by "Emancipation" (1318); g. d., "Rosy of Breckonhill" (3353), by "Black Jock of Pedderhill" (1316).

Galloway Heifers calved in the Year 1881.

Alexander McCowan, Newtonairds, Dumfries: First Prize, 15*l.*, for "Madonna," black; was calved in March; bred by Mr. W. Shennan, Barmoffity, Dalbeattie, N.B.; sire, "Blackamore" (1175); dam, "Sally 3rd of Barmoffity" (3117), by "Barmoffity Jock" (1237); g. d. "Sally 2nd of Barmoffity" (3113), by "Barmoffity" (1236); gr. g. d. "Sally of Barmoffity" (3111), by "Geordi 2nd" (528).

James Cunningham, Tarbreoch: Second Prize, 10*l.*, for "Rosie of Lairdlaugh," black; was calved in February; bred by Messrs. J. S. and A. Nivison, of Lairdlaugh, Dalbeattie, N.B.; sire, "Fancy Jock" (1177); dam, "Mary 2nd of Redcastle" (2933); g. d., "Mary of Redcastle" (2926).

Ayrshire Bulls, calved in either 1878, 1879, 1880, 1881, *or* 1882.

William Bartlemore, Netherhouses, Lochwinnoch-by-Glasgow, Paisley: First Prize, 15*l.*, "Baron o' Bucklyvie" (281), brown and white; was calved about July 20th, 1878; bred by Mr. Duncan Keir, Hardieston, Port of Monteith, Bucklyvie, Stirlingshire; sire, "Borland" (126); dam, "Beauty 2nd of Bucklyvie" (453), by "Prince Charlie;" g. d., "Beauty" (453), by "Miling;" gr. g. d., "McKeish."

The Duke of Buccleuch and Queensberry, K.G., Drumlanrig, Thornhill, Dumfries, N.B.: Second Prize, 10*l.*, for "The Star of Drumlanrig" (247), white and brown; was calved February 22nd, 1880; bred by himself; sire, "Morning Star" (43); dam, "Maud of Drumlanrig" (297), by "Statesman of Drumlanrig" (57); g. d., "Gracie of Drumlanrig" (57).

Alexander Sherratt, Oclepilchard, Hereford: Third Prize, 5*l.*, for "Prince Arthur," brown and white; was calved July 12th, 1880; bred by himself; sire, "Brown;" dam, "Flora."

Ayrshire Bulls calved in the Year 1882.

William Bartlemore, Netherhouses, Lochwinnoch-by-Glasgow: First Prize, 15*l.*, for "Baron Jack," flecked;" was calved about the middle of May; bred by Mr. Hugh Jack, of Auchengown, Carm, Lochwinnoch; sire, "Baron o' Bucklyvie" (281); dam, "Rosebud."

George Ferme, Leigham Lodge Farm, Roupell Park, Streatham Hill, Surrey: Second Prize, 10*l.*, for "Sir Garnet" (441), brown and white; was calved May 9th; bred by himself; sire, "Lord John" (186); dam, "Lady Bell" (972), by "Munroch of Drumlanrig" (44); g. d., "Bellfield" (969), by "Forchouse of Japstone" (114); gr. g. d. "Alrington."

Ayrshire Cows or Heifers, in-milk, in-calf, calved previously to or in the Year 1880.

The Duke of Buccleuch and Queensberry, K.G., Drumlanrig, Thornhill, Dumfries: First Prize, 15*l.*, for "Dainty 3rd of Drumlanrig" (886), red; was calved March 4th, 1880, in-calf; bred by himself; sire, "Knight of Drumlanrig" (35); dam, "Dainty of Drumlanrig" (137), by "White Prince" (63); g. d., "Old Dainty:" and Second Prize, 10*l.*, for "Maggie 7th of Drumlanrig" (704), red and white; was calved February 20th, 1878; calved July 15th, 1882, and due to calve before the Show; bred by himself; sire, "Ringhead of Drumlanrig" (51); dam, "Maggie of Drumlanrig" (275).

ROBERT WILSON, Manswraes, Kilbarchan, Renfrewshire: THIRD PRIZE, 15*l.*, for his brown and white; was calved May, 1878; calved in March, 1882; and due to calve before the Show; breeder unknown.

GEORGE FERME, Leigham Lodge Farm, Roupell Park, Streatham Hill, Surrey: the *Reserve Number* and *Highly Commended* for his brown and white; was calved about 1878; calved in 1882, and in-calf; breeder unknown.

Ayrshire Heifers calved in the Year 1881.

ROBERT WILSON: FIRST PRIZE, 15*l.*, for his brown and white; was calved May; bred by Mr. Hugh Wilson, Auchengilsie, Ochiltree, Ayrshire, N.B.

THE DUKE OF BUCCLEUCH AND QUEENSBERRY, K.G.: SECOND PRIZE, 10*l.*, for "Lady 7th of Drumlanrig" (1144), red and white; was calved January 2nd, 1881, in-calf; bred by himself; sire, "Scottish Chief" (200); dam, "Lady 4th of Drumlanrig" (234), by "The Earl of Drumlanrig" (21); g. d., "Lady 2nd of Drumlanrig" (254), by "Mar;" gr. g. d., "Lady of Drumlanrig" (253).

Jersey Bulls, calved in either 1877, 1878, 1879, 1880, *or* 1881.

JOHN WILSON WALTER, Radford, Dawlish, Devon: FIRST PRIZE, 20*l.*, for "Claude Duval," dark fawn; was calved October 10th, 1880; bred by Mr. P. Duval, St. Peter's, Jersey; sire, "Farmer's Glory" (274 J.H.B.); dam, "Cocotte 2nd" (359 J.H.B.) by "Jimmy" (150 J.H.B.); g. d., "Cocotte" (235 J.H.B.), by "Hero" (90 J.H.B); gr. g. d., "Belle" (302 J.H.B.).

THE REV. ROBERT SUTTON, Scawby Hall, Brigg, Lincolnshire: SECOND PRIZE, 10*l.*, for "Champion," whole colour; was calved May 26th, 1879; bred by Mr. E. Denize, St. Lawrence, Jersey; sire, "Carlo" (1030 J.H.B.); dam, "Butterfly" (162 J.H.B.), by "Leo" (448 J.H.B.); g. d., "Trinitaise" (1343 J.H.B.).

HUMPHREY BROOKE FIRMAN, Gateforth Hall, Selby, Yorkshire: THIRD PRIZE, 5*l.*, for "Tisquantum," grey; was calved February 28th, 1880; bred by Mr. J. C. Hamon, St. John's, Jersey; sire, "Farmer's Glory;" dam, "Chance."

HENRY JAMES CORNISH, Thornford, Sherborne, Dorset: the *Reserve Number* and *Highly Commended* for "Grey of the West 2nd" (352 J.H.B.), silver grey; was calved February 26th, 1881; bred by Mr. J. Arthur, St. Mary's, Jersey; sire, "Farmer's Glory" (274 J.H.B.); dam, "Lily Grey," (2000 J.H.B.).

Jersey Bulls calved in the Year 1882.

EUGÈNE JOHN ARNOLD, Summerland, St. Heliers, Jersey: FIRST PRIZE, 15*l.*, for "Summerland Duke," dark fawn; was calved April 27th; bred by Mr. W. Amy, St. Peters, Jersey; sire, "Nero" (248 J.H.B.); dam, "Duchesse."

GEORGE SIMPSON, Wray Park, Reigate, Surrey: SECOND PRIZE, 10*l.*, for "King's Messenger," grey; was calved April 10th; bred by himself; sire, "Orpheus" (1178); dam, "Queen Dora" (288), by "Prime Minister" (664); g. d., "Queen" (237), by "Marquis" (533); gr. g. d., "Beauty."

THE DUKE OF PORTLAND, Welbeck Abbey, Worksop, Notts: THIRD PRIZE, 5*l.*, for "The Young Duke," dark brown; was calved January 12th; bred by himself; sire, "Grand Duke" (40); dam, "Jessie."

HENRY JAMES CORNISH, Thornford, Sherborne, Dorset: the *Reserve Number* and *Highly Commended* for his "Cicero 2nd," blue grey; was calved March 10th; bred by Mr. P. Godeaux, Trinity, Jersey; sire, "Cicero" (266 J.H.B.); dam, "Zingara" (1863 J.H.B).

Jersey Cows, in-milk or in-calf, calved previously to or in the Year 1879.

William Arkwright, Sutton Scarsdale, Chesterfield: First Prize, 20*l.*, for "Lilian" (908 E.H.B.); was calved in March 1878, in-milk; calved June 11th, 1882; bred by Mr. J. Le Quesne, St. John's, Jersey; sire, "Vertumnus" (161 J.H.B.); dam, "Buttercup."

George Simpson, Wray Park: Second Prize, 10*l.*, for "Pandora 3rd" (283), grey fawn; was calved October 22nd, 1879; in-milk; calved February 26th, 1883; bred by himself; sire, "Farmer's Glory" (319); dam, "Pandora 2nd," by "Milord" (566); g. d., "Pandora" (1645 J.H.B.).

William Arkwright, Sutton Scarsdale: Third Prize, 5*l.*, for "Kilburn Maid," fawn; was calved in June 1879, in-milk; calved June 17th, 1882; bred by Mr. J. P. Marrett, St. Saviour's, Jersey; sire, "Willie" (245 J.H.B.); dam, "Zenobia" (86 J.H.B.).

George Simpson, Wray Park: the *Reserve Number* and *Highly Commended* for "Bessie," grey; was calved May 12th, 1879; calved June 9th, 1882, and due to calve before the Show; bred by Mr. P. Mourant, St. Saviour's, Jersey; sire, "Noble 2nd" (256 J.H.B.); dam, "Beauty" (637 J.H.B.).

Jersey Cows or Heifers, in-milk or in-calf, calved previously to or in the Year 1880.

James Richard Corbett, More Place, Betchworth, Surrey: First Prize, 15*l.*, for "Mabel," fawn; was calved January 18th; in-milk; and due to calve before the Show; bred by Mr. J. Collas, St. Mary's, Jersey; sire, "Rolls" (212 J.H.B.); dam, "Pansy Lass" (1603 J.H.B.).

James Ashcroft, Grange House, Oakhill Park, Old Swan, Liverpool: Second Prize, 10*l.*, for "Gulnare," silver grey; was calved July 3rd; due to calve in June; bred by Mr. G. Simpson, Wray Park, Reigate; sire, "Milkboy" (561); dam, "Gertrude," by "Noble" (591).

Henry James Cornish, Thornford: Third Prize, 5*l.*, for "Lady of the Isles 3rd," grey fawn; was calved July 4th; in-milk; calved March 6th, 1883; bred by himself; sire, "Grey of the West" (317 J.H.B. and 1098 E.H.B); dam, "Lady of the Isles 2nd" (2996 J.H.B.), by "Garibaldi" (121); g. d., "Lady of the Isles" (992 J.H.B.); gr. d. d., "Browny" (85 J.H.B.).

Richard James Streatfeild, Rossington Hall, Bawtry: the *Reserve Number* and *Highly Commended* for "Lobelia," whole colour; was calved September 12th; calved August 5th, 1882; and in-calf; bred by himself; sire, "Royalist" (770 E.H.B.); dam, "Languish," by "Island King 2nd" (431 E.H.B.); g. d., "Landscape."

Jersey Heifers calved in the Year 1881.

George Simpson, Wray Park, Reigate, Surrey: First Prize, 15*l.*, for "Patricia 2nd," grey; was calved May 17th; due to calve before the Show; bred by himself; sire, "Prince Imperial;" dam, "Patricia" (227), by "Romeo" (760); g. d., "Portia" (227), by "Welcome" (937); "Fleurie" (859 J.H.B.).

William Arkwright, Sutton Scarsdale, Chesterfield: Second Prize, 10*l.*, for "Gratitude," whole silver grey; was calved April 4th; due to calve in June; bred by himself; sire, "Grey of the East" (234 J.H.B.); dam, "Innocence;" g. d., "Lady Godiva."

GEORGE SIMPSON, Wray Park: THIRD PRIZE, 5*l.*, for "Jersey Maid," grey; was calved March 28th; in-milk; calved March 18th, 1883; bred by himself; sire, "Sir Thomas" (1246); dam, "Jersey Lily" (183), by "Lemon Peel" (480); g. d., "St. Martinaise" (J.H.B.).

HENRY JAMES CORNISH, Thornford: the *Reserve Number* and *Highly Commended* for "Daisy 2nd," silver grey fawn; was calved in March; in-calf; bred by Mr. J. Messcroy, St. John's, Jersey; sire, "Noble;" dam, "Daisy" (211 J.H.B.).

Jersey Heifers calved in the Year 1882.

JAMES ASHCROFT, Grange House, Oakhill Park, Old Swan, Liverpool: FIRST PRIZE, 15*l.*, for "Mascotte," fawn; was calved June 15th; bred by himself; sire, "Farmer's Joy" (1075); dam, "Gulnare," by "Milkboy" (561); g. d. "Gertrude," by "Noble" (591).

THE EARL OF FEVERSHAM, Duncombe Park, Helmsley, Yorkshire: SECOND PRIZE, 10*l.*, for "Blue Stone 8th," fawn; was calved June 3rd; bred by himself; sire, "Chesham;" dam, "Blue Stone 3rd," by "Valesman;" g. d., "Blue Stone."

LADY HAWKE, Womersley Park, Pontefract: THIRD PRIZE, 5*l.*, for "Lady Muriel," solid fawn; was calved January 12th; bred by herself; sire, "Sir Oliver;" dam, "Miss Bradford."

RICHARD JAMES STREATFEILD, Rossington Hall, Bawtry: the *Reserve Number* to "Smut," whole colour; was calved February 26th; in-calf; bred by himself; sire, "Royalist" (770 E.H.B.); dam, "Smirk," by "Banboy" (17 E.H.B.); g. d., "Smile."

Dairy Cows, in-milk or in-calf, calved previously to or in the Year 1879.†

JOSEPH PHILLIPS, Park Meadow Farm, Peterborough: FIRST PRIZE, 25*l.*, for "Red Cherry" (Shorthorn), red; was calved November 24th, 1875; calved April 26th, 1882, and due to calve in May; bred by himself.

JOHN JERVIS SHARP, Broughton, Kettering, Northamptonshire: SECOND PRIZE 15*l.*, for "Charming White" (Shorthorn), white; was calved March 28th, 1872; calved May 29th, 1882, and due to calve in May 1883; bred by Mr. Bliss, Weston Underwood, Newport Pagnel, Bucks; sire, "Warrior" (3281); dam, "Miss Charming," by "Bridegroom" (23,454); g. d., "Charming Maid," by "Cambridge Lad" (28,121); gr. g. d., "Rosemary," by "Romeo" (29,819).

PHILIP ASCROFT, Rufford, Ormskirk, Lancashire: THIRD PRIZE, 10*l.*, for his Shorthorn; calved September 1882, and in-calf; age and breeder unknown.

JAMES BEAN, Claxton, York: the *Reserve Number* and *Highly Commended* for "Butterfly" (Crossbred); red and white; age and breeder unknown; in-milk and in-calf.

Dairy Heifers, in-milk or in-calf, calved in the Year 1880.†

ROBERT HARRISON, Underpark, Lealholm, Grosmont, Yorkshire (Shorthorn): SECOND PRIZE, 10*l.*, for "White Rose," white; was calved October 4th; in-milk; calved March 1st, 1883; bred by himself; sire, "Duke of Rainton 5th" (39,778);" dam, "Hartforth Rose," by "Pilgrim" (35,036); g. d., "Hartforth Beauty," by "Dairy Prince" (17,655); gr. g. d., "Dairymaid," by "Prince George" (13,510).

SHEEP.

Leicester Two-Shear Rams.

GEORGE TURNER, Jun., Thorplands, Northampton: FIRST PRIZE, 15*l.*; was dropped in March 1881; bred by himself.

TEASDALE H. HUTCHINSON, Manor House, Catterick, Yorkshire: SECOND PRIZE, 10*l.*; was dropped in March 1881; bred by himself.

JOHN and DAVID LINTON, Bedale, Yorkshire: the *Reserve Number* and *Highly Commended;* was dropped April 18th, 1881; bred by themselves.

Leicester Shearling Rams.

TEASDALE H. HUTCHINSON: FIRST PRIZE, 15*l.*; was dropped in March 1882; bred by himself.

WILLIAM BROWN, High Gate House, Holme-on-Spalding Moor, Yorkshire: SECOND PRIZE, 10*l.*; was dropped in March 1882; bred by himself; sire, "Barnsley."

ERNEST FRANCIS JORDAN, Eastburn, Driffield, Yorkshire: THIRD PRIZE, 5*l.*, and the *Reserve Number* and *Highly Commended;* were dropped in April 1882; bred by himself.

Leicester Shearling Ewes—Pens of Five.

ERNEST FRANCIS JORDAN: FIRST PRIZE, 15*l.*; were dropped in April 1882; bred by himself.

JOHN and DAVID LINTON, Bedale: SECOND PRIZE, 10*l.*; were dropped in April 1882; bred by themselves.

MRS. PERRY-HERRICK, Beau Manor Park, Loughborough: the *Reserve Number* and *Highly Commended;* were dropped about March 16th, 1882; bred by herself.

Border Leicester Shearling Rams.

ANDREW WOOD, Brockbushes, Corbridge, Northumberland: FIRST PRIZE, 15*l.*; was dropped March 3rd, 1882; bred by himself.

JOHN TWENTYMAN, Blennerhasset Farm, Aspatria, Cumberland: SECOND PRIZE, 10*l.*; was dropped February 20th, 1882; bred by himself.

JAMES WHYTE, Aldborough Hall, Darlington: the *Reserve Number* and *Highly Commended;* was dropped in March 1882; bred by himself.

Border Leicester Shearling Ewes—Pens of Five.

JAMES WHYTE: FIRST PRIZE, 15*l.*; were dropped in April 1882: bred by himself.

JOHN TWENTYMAN: SECOND PRIZE, 10*l.*; were dropped in February 1882; bred by himself; and the *Reserve Number* and *Commended;* were dropped in March 1882; bred by himself.

Cotswold Two-Shear Rams.

RUSSELL SWANWICK, Royal Agricultural College Farm, Cirencester, Gloucestershire: FIRST PRIZE, 15*l.*; was dropped in February 1881; bred by himself.

Thomas and Stephen G. Gillett, Kilkenny Farm, Faringdon, Oxfordshire: Second Prize, 10*l.*, for "Lord Braintree;" was dropped in January 1881; bred by themselves.

Russell Swanwick: the *Reserve Number* and *Highly Commended;* was dropped in February 1881; bred by himself.

Cotswold Shearling Rams.

Thomas Brown, Marham Hall, Downham Market, Norfolk: First Prize, 15*l.*; Second Prize, 10*l.*; and the *Reserve Number* and *Highly Commended;* were dropped in February 1882; bred by himself.

Cotswold Shearling Ewes—Pens of Five.

Thomas and Stephen G. Gillett, Kilkenny Farm, Faringdon: First Prize, 15*l.*, and Second Prize, 10*l.*; were dropped in February 1882; bred by themselves.

Lincoln Two-Shear Rams.

Robert Wright, Nocton Heath, Lincoln: First Prize, 15*l.*; was dropped in March 1881; bred by himself.

Henry Smith, The Grove, Cropwell Butler, Nottingham: Second Prize, 10*l.*, and the *Reserve Number* and *Highly Commended;* were dropped in March 1881; bred by himself.

Lincoln Shearling Rams.

Henry Smith: First Prize, 15*l.*; was dropped in March 1882; bred by himself.

Robert Wright: Second Prize, 10*l.*; was dropped in March 1882; bred by himself.

Henry Smith: the *Reserve Number* and *Highly Commended;* was dropped in March 1882; bred by himself.

Lincoln Shearling Ewes—Pens of Five.

Robert Wright: First Prize, 15*l.*; were dropped in March 1882; bred by himself.

John Pears, Mere, Lincoln: Second Prize, 10*l.*; were dropped in March 1882; bred by himself.

Henry Dudding, Riby Grove, Great Grimsby, Lincolnshire: the *Reserve Number;* were dropped in March 1882; bred by himself.

Wensleydale Two-Shear Rams.†

John Lambert, Swinithwaite, Bedale, Yorkshire: First Prize, 15*l.*; was dropped March 20th, 1881; bred by Mr. Joseph Row, Carperby, Bedale.

John Willis, Jun., Carperby, Bedale: Second Prize, 10*l.*; was dropped in March 1881; bred by himself.

William and Reuben Raw, Ellington, Masham, Yorkshire: the *Reserve Number* and *Highly Commended;* was dropped in March 1881; bred by Mr. W. Raw, Ellington.

Wensleydale Shearling Rams.†

JOHN LAMBERT: FIRST PRIZE, 15*l.*; was dropped March 25th, 1882; bred by Mr. J. Pilkington, Swinithwaite Hall, Bedale.

WILLIAM RAW, Ellington, Masham; SECOND PRIZE, 10*l.*; was dropped in April 1882; bred by himself.

JOHN WILLIS, Jun.: the *Reserve Number* and *Highly Commended;* was dropped in March 1882; bred by himself.

Wensleydale Shearling Ewes—Pens of Five.†

JAMES PILKINGTON, Swinithwaite Hall, Bedale: FIRST PRIZE, 15*l.*, and SECOND PRIZE, 10*l.*; were dropped in March and April 1882; bred by himself.

JOHN DOUTHWAITE, Crakehale, Bedale: the *Reserve Number;* were dropped in March 1882; bred by himself.

Long-woolled Rams, not qualified to compete in the preceding Classes.

JOSEPH SEDGWICK, Lambrigg, Kendal, Westmoreland: FIRST PRIZE, 10*l.*, for his Westmoreland Long-wool; was dropped April 1st, 1882; bred by himself.

SIR J. H. HEATHCOTE-AMORY, Bart., M.P., Knightshayes Court, Tiverton, Devon: SECOND PRIZE, 5*l.*, for his Devon Long-wool "Mars;" was dropped February 14th, 1882: and the *Reserve Number* and *Highly Commended* for "Meteor;" was dropped March 1st, 1882; bred by himself.

Long-woolled Shearling Ewes, not qualified to compete in the preceding Classes—Pens of Five.

SIR J. H. HEATHCOTE-AMORY, Bart., M.P.: FIRST PRIZE, 10*l.*, for his Devon Long-wools; were dropped February 28th, 1882; bred by himself.

Oxfordshire Down Two-Shear Rams.

ALBERT BRASSEY, Heythrop Park, Chipping Norton, Oxfordshire: FIRST PRIZE, 15*l.*, for "The Rover;" was dropped about February 14th, 1881; sire, "Royal Kilburn:" and the *Reserve Number* for "The Don;" was dropped about February 14th, 1881; sire, "Kilburn Reserve;" bred by himself.

Oxfordshire Down Shearling Rams.

ALBERT BRASSEY: FIRST PRIZE, 15*l.*, for "The Nobleman;" was dropped about February 14th, 1882: bred by himself; sire, "Peterborough."

JOHN TREADWELL, Upper Winchendon, Aylesbury, Bucks: SECOND PRIZE, 10*l.*; was dropped about February 14th, 1882; bred by himself; sire, "Young Freeland."

WILLIAM ARKELL, Hathcrop, Fairford, Gloucestershire: the *Reserve Number;* was dropped February 14th, 1882; bred by himself; sire, "Roberts's No. 6."

Oxfordshire Down Shearling Ewes—Pens of Five.

ALBERT BRASSEY: FIRST PRIZE, 15*l.*; and SECOND PRIZE, 10*l.*; were dropped about February 11th, 1882; bred by himself.

FREDERICK STREET, Somersham Park, St. Ives, Hunts: the *Reserve Number;* were dropped in February 1882; bred by himself.

Shropshire Two-Shear Rams.

Thomas James Mansell, Dudmaston Lodge, Bridgnorth, Salop: First Prize, 15*l.*, for "Patriot Lord;" was dropped in March 1881; bred by Mr. C. Wadlow, Haughton, Bridgnorth; sire, "Bridgnorth;" dam by "Warwick:" and Second Prize, 10*l.*; was dropped in February 1881; bred by himself.

Mrs. Barrs, Oldstone Hall, Atherstone: Third Prize, 5*l.*; was dropped in March 1881; bred by himself.

Robert Loder, M.P., Whittlebury, Towcester: the *Reserve Number* and *Highly Commended*, for "Earl of Leicester;" was dropped in March 1881; bred by Mr. Beach, The Hattons, Brewood, Staffs; sire, "Royal Chief;" dam by "Sir Garnet."

Shropshire Shearling Rams.

Lord Chesham, Laiimer, Chesham, Bucks: First Prize, 15*l.*; was dropped March 24th, 1882; bred by himself; sire, "Dudmaston;" dam by "Lord Chesham's No. 4:" and Second Prize, 10*l.*; was dropped March 12th, 1882; bred by himself; sire, "Dudmaston;" dam by "Lord Chesham's No. 6."

Joseph Beach, The Hattons, Brewood, Staffs: Third Prize, 5*l.*; was dropped March 1st, 1882; bred by himself.

The Executors of the late William German, Measham Lodge, Atherstone: the *Reserve Number* and *Highly Commended*; was dropped about March 18th, 1882; bred by the late Mr. German.

Shropshire Shearling Ewes—Pens of Five.

Joseph Beach: First Prize, 15*l.*; were dropped in February and March 1882; bred by himself.

Mrs. Barrs, Odstone Hall: Second Prize, 10*l.*; were dropped in March 1882; bred by herself.

George Graham, The Oaklands, Birmingham: Third Prize, 5*l.*; were dropped in March 1882; bred by himself.

Lord Chesham, Latimer: the *Reserve Number* and *Highly Commended*; were dropped in March 1882; bred by himself; sires, "Dudmaston" and "No. 8;" dam by "British Tar."

Southdown Two-Shear Rams.

H.R.H. The Prince of Wales, K.G., Sandringham, Norfolk: First Prize, 15*l.*; was dropped in March 1881; bred by His Royal Highness.

Jeremiah J. Colman, M.P., Carrow House, Norwich; Second Prize, 10*l.*: was dropped March 5th, 1881; bred by himself.

The Duke of Richmond and Gordon, K.G., Goodwood, Chichester, Sussex: Third Prize, 5*l.*; was dropped in February 1881; bred by himself.

Henry Humphrey, Ashington, Pulborough, Sussex: the *Reserve Number* and *Highly Commended*; was dropped March 4th, 1881.

Southdown Shearling Rams.

Charles Chapman, Frocester Court, Stonehouse, Gloucestershire: First Prize, 15*l.*; was dropped March 14th, 1881; bred by himself.

George C. Carew-Gibson: Second Prize, 10*l.*, and Third Prize, 5*l.*; were dropped February 28th, 1882; bred by himself.

JEREMIAH J. COLMAN, M.P., Carrow House, Norwich: the *Reserve Number* and *Highly Commended;* was dropped February 28th, 1882; bred by himself.

Southdown Shearling Ewes—Pens of Five.

JEREMIAH J. COLMAN, M.P.: FIRST PRIZE, 15*l.*; were dropped March 1st, 1882; bred by himself.

CHARLES CHAPMAN, Frocester Court, Stonehouse: SECOND PRIZE, 10*l.*; were dropped March 14th, 1882; bred by himself.

SIR WILLIAM THROCKMORTON, Bart., Buckland, Faringdon, Berks: THIRD PRIZE, 5*l.*; were dropped in March 1882; bred by himself.

THE DUKE OF RICHMOND AND GORDON, K.G., Goodwood, Chichester: the *Reserve Number* and *Highly Commended;* were dropped in February 1882; bred by himself.

Hampshire Down Two-Shear Rams.

ALFRED MORRISON, Fonthill House, Tisbury, Wilts: FIRST PRIZE, 15*l.*; SECOND PRIZE, 10*l.*; and the *Reserve Number* and *Highly Commended;* were dropped February 14th, 1881; bred by himself.

Hampshire Down Shearling Rams.

ALFRED MORRISON: FIRST PRIZE, 15*l.*; was dropped February 12th, 1882; bred by himself.

JOHN BARTON, Hackwood Farm, Basingstoke, Hampshire: SECOND PRIZE, 10*l.*; was dropped in January, 1882; bred by himself.

ALFRED MORRISON: the *Reserve Number* and *Highly Commended;* was dropped February 13th, 1882; bred by himself.

Hampshire Down Shearling Ewes—Pens of Five.

WILLIAM PARSONS, West Stratton, Micheldever, Hampshire: FIRST PRIZE, 15*l.*; were dropped in January 1882.

HENRY LAMBERT, Babraham, Cambridge: were dropped about January 14th, 1882; bred by himself.

WILLIAM PARSONS: the *Reserve Number* and *Highly Commended;* were dropped about January 28th, 1882; bred by himself.

Cheviot Two-Shear Rams.

JACOB ROBSON, Byrness, Otterburn, Northumberland: FIRST PRIZE, 10*l.* for "Black Neck;" was dropped April 20th, 1881; bred by himself; sire, "Gentleman."

JOHN ROBSON, Newton, Bellingham, Northumberland: SECOND PRIZE, 5*l.*; was dropped in April 1881; sire, "Alvington:" and the *Reserve Number;* was dropped in April 1881; bred by himself.

Cheviot Shearling Rams.

JACOB ROBSON: FIRST PRIZE, 10*l.*, for "Sir William;" was dropped April 21st, 1882; bred by himself; sire, "Son of Masterpiece."

JOHN ROBSON, Newton: SECOND PRIZE, 5*l.*; was dropped in April 1882; bred by himself; sire, "General Roberts;" dam, by "Masterpiece."

JACOB ROBSON, Byrness: the *Reserve Number and Commended;* was dropped April 21st, 1882; bred by himself; sire, "Son of Masterpiece."

Cheviot Shearling Ewes—Pens of Five.

John Robson, Newton, Bellingham: First Prize, 10*l.*; were dropped in April 1882; bred by himself; sire, "General Roberts."

Black-faced Mountain Two-Shear Rams.

James McCracken, Black Hall, Kirkwhelpington, Northumberland: First Prize, 10*l.*, for "Garnet;" was dropped April 16th, 1881; bred by himself.

John Thomas Dodd, Catcleugh, Otterburn, Northumberland: Second Prize, 5*l.*, for "Young Benhar;" was dropped April 2nd, 1881; bred by himself; sire, "Benhar;" dam by "Blackhead."

John Robson, Newton, Bellingham; the *Reserve Number;* was dropped in April 1881; bred by Mr. Brydon, Burncastle, N.B.

Black-faced Mountain Shearling Rams.

Thomas Armstrong, Garrigill, Alston, Cumberland; First Prize, 10*l.*, for "Mountain Heather;" was dropped in April 1882; bred by himself.

John Irving, Forest Hall, Kendal, Westmoreland: Second Prize, 5*l.*; was dropped May 4th, 1882; bred by himself.

James McCracken, Black Hall: Third Prize, for "Alnwick;" was dropped April 5th, 1882; bred by himself; sire, "Ayr 3rd;" dam by "Ayr 2nd."

John Irving: the *Reserve Number* and *Commended;* was dropped May 4th, 1882; bred by himself.

Black-faced Mountain Shearling Ewes—Pens of Five.

Robert Rawlinson, Docker Hall, Kendal: First Prize, 10*l.*; were dropped in April 1882; bred by himself; sire, "Prince Charley."

Matthew Henderson, The Hope, Allendale Town, Northumberland: Second Prize, 5*l.*; were dropped in April 1882; bred by himself.

John Irving: the *Reserve Number* and *Commended;* were dropped in April and May 1882; bred by himself.

Short-woolled Rams not qualified to compete in the preceding Classes.

Joseph Smith, Thorpe Hall, Hasketon, Woodbridge, Suffolk: First Prize, 10*l.*, for his "Suffolk;" was dropped April 2nd, 1882; sire, "Jumbo;" and Second Prize, 5*l.*, for his Suffolk; was dropped February 18th, 1882; sire, "Jumbo;" bred by himself.

Herbert Farthing, Nether Stowey, Bridgwater, Somerset: the *Reserve Number*, for his Somerset and Dorset Horn; was dropped about January 1st, 1882; bred by himself.

Other Short-woolled Ewes not qualified to compete in the preceding classes—Pens of Five.

Joseph Smith: First Prize, 10*l.*, for his Suffolks; were dropped in February 1882; bred by himself; sire, "Jumbo."

Herbert Farthing: Second Prize, 5*l.*, for his Somerset and Dorset Horns; were dropped about January 1st, 1882; bred by himself.

William Walsh, Gilstead, Bingley, Yorkshire: the *Reserve Number* and *Highly Commended;* were dropped in March 1882; bred by Messrs. J. Green and Son, Silsden, Leeds.

PIGS.

Large White Breed—Boars farrowed in the Year 1880 *or* 1881.

The Earl of Ellesmere, Worsley Hall, Manchester: First Prize, 10*l.*, for "Brutus;" was farrowed April 1st, 1881; bred by himself; sire, "Joseph;" dam by "Yorkshireman;" and Second Prize, 5*l.*, for "Jumbo;" was farrowed Aug. 17th, 1880; bred by himself; sire, "Joseph;" dam by "Samson 2nd."

Joseph Ashforth, Longley Hall, Sheffield: the *Reserve Number* to "Yorkshireman;" was farrowed Sept. 20th, 1881; bred by himself; sire, "Yorkshire Lad;" dam, "Curley," by "Rodger."

Large White Breed—Boars farrowed in the Year 1882.

Charles Elmhirst Duckering, Whitehoe, Kirton-Lindsey, Lincolnshire: First Prize, 10*l.*; was farrowed July 7th; bred by himself.

The Earl of Ellesmere: Second Prize, 5*l.*, for "Sankey;" was farrowed May 28th; bred by himself; sire, "Joseph," dam by "Samson 2nd."

Thomas Frederick Hill, Victoria Terrace, Heslington Road, York: the *Reserve Number* to "Young Cultivator;" was farrowed Jan. 7th; bred by himself.

Large White Breed—Breeding Sows, farrowed previously to or in the Year 1882.

The Earl of Ellesmere: First Prize, 10*l.*, for "Queen;" was farrowed July 1st, 1880: bred by himself; sire, "Tiger 2nd;" dam by "King Duncan."

John and Joseph Nuttall, 22, Mary Street, Longfield, Heywood, Lancashire: Second Prize, 5*l.*, for "Nipbone;" was farrowed Aug. 1st, 1881; bred by themselves; sire, "Samson;" dam, "Lancashire Sall," by "Bill."

The Earl of Ellesmere: the *Reserve Number* and *Highly Commended* for "Countess;" was farrowed Nov. 5th, 1880; bred by himself; sire, "Peter;" dam by "King Duncan."

Large White Breed—Breeding Sow Pigs, farrowed in the Year 1883. *—Pens of Three.*

The Earl of Ellesmere: First Prize, 10*l.*; were farrowed Jan. 3rd; bred by himself; sire, "Tiger 3rd;" dam by "Samson 2nd;" and Second Prize, 5*l.*; were farrowed Jan. 9th; bred by himself; sire, "Madman;" dam by "Joseph."

Charles Elmhirst Duckering, Whitehoe, Kirton-Lindsey: the *Reserve Number;* were farrowed Jan. 2nd; bred by himself.

Middle White Breed—Boars farrowed in the Year 1880 *or* 1881.

The Earl of Ellesmere: First Prize, 10*l.*, for "Prince;" was farrowed August 7th, 1880; bred by himself; sire, "Peter;" dam, "Lady Howard."

Philip Ascroft, Rufford, Ormskirk, Lancashire: Second Prize, 5*l.*; was farrowed October 18th, 1881; bred by himself.

The Earl of Ellesmere: the *Reserve Number* and *Highly Commended* for "Duke;" was farrowed December 1st, 1880; bred by himself; sire, "Peter;" dam by "Sir Roger."

Middle White Breed—Boars farrowed in the Year 1882.

THE EARL OF ELLESMERE: FIRST PRIZE, 10*l.*; was farrowed April 18th; bred by himself; sire, "The Swell;" dam by "Gem:" and SECOND PRIZE, 5*l.*; was farrowed June 1st; sire, "Prince;" dam by "Peter."

FRANCIS A. WALKER-JONES, Little Mollington, Chester: the *Reserve Number;* was farrowed April 5th; bred by himself; sire, "Roger;" dam, "Snowdrop."

Middle White Breed—Breeding Sows farrowed previously to or in the Year 1882.

THE EARL OF ELLESMERE: FIRST PRIZE, 10*l.*, for "Princess;" was farrowed Aug. 7th, 1880; bred by himself; sire, "Peter;" dam, "Lady Howard."

JOHN FRANCIS DIXON, Lodge Farm, Crockey Hill, York: SECOND PRIZE, 5*l.*; was farrowed April 7th, 1880; bred by Mr. G. Dickson, Pool Bridge, Crockey Hill.

PHILIP ASCROFT, Rufford, Ormskirk: the *Reserve Number* and *Highly Commended;* was farrowed June 29th, 1881; in-pig; bred by himself.

Middle White Breed—Breeding Sow Pigs, farrowed in the Year 1883 *—Pens of Three.*

THE EARL OF ELLESMERE: FIRST PRIZE, 10*l.*; were farrowed January 15th; bred by himself; sire, "Peter;" dam by "Duke."

Small White Breed—Boars farrowed in the Year 1880 *or* 1881.

WILSON, CROSBY and Co., Apperley Bridge, Leeds: FIRST PRIZE, 10*l.*, for "Star;" was farrowed May 21st, 1881; bred by Mr. Saunders Spencer, Holywell Manor, St. Ives, Hunts; sire, "Omega;" dam, "Shortnose," by "Pat."

THE EARL OF ELLESMERE: SECOND PRIZE, 5*l.*, for "Right Sort;" was farrowed December 25th, 1881; bred by himself; sire, "The Swell;" dam by "King Koffee."

PHILIP ASCROFT, Rufford, Ormskirk: the *Reserve Number* and *Highly Commended;* was farrowed November 28th, 1881; bred by himself.

Small White Breed—Boars farrowed in the Year 1882.

THE EARL OF ELLESMERE: FIRST PRIZE, 10*l.*; was farrowed June 5th; bred by himself; sire, "The Swell;" dam, "Yorkshire Queen;" and SECOND PRIZE, 5*l.*; was farrowed June 5th; bred by himself; sire, "The Swell;" dam, "Yorkshire Queen."

WILSON, CROSBY and Co., Apperley Bridge, Leeds: the *Reserve Number* and *Highly Commended* for "Dreadnought;" was farrowed June 9th; bred by the Earl of Ellesmere, Worsley Hall, Manchester; sire, "The Swell;" dam, "Venus," by "King of the Peacocks."

Small White Breed—Breeding Sows farrowed previously to or in the Year 1882.

THE EARL OF ELLESMERE: FIRST PRIZE, 10*l.*, for "Columbine;" was farrowed October 6th, 1881; bred by himself; sire, "King Koffee;" dam by "The Swell:" and SECOND PRIZE, 5*l.*, for "Fairy;" was farrowed Sept. 5th, 1881; bred by himself; sire, "King Koffee;" dam, "Yorkshire Queen."

Wilson, Crosby and Co., Apperley Bridge: the *Reserve Number* and *Highly Commended*, for "Venus;" was farrowed January 16th, 1882; in-pig; bred by themselves; sire, "Star;" dam, "Purity," by "Prince."

Small White Breed—Breeding Sow Pigs, farrowed in the Year 1883. *—Pens of Three.*

John and Joseph Nuttall, 22, Mary Street, Longfield, Heywood, Lancashire: Second Prize, 5*l.*; were farrowed Jan. 7th; bred by themselves; sire, "King;" dam, "Nelly," by "Prince."

Small Black Breed—Boars farrowed in the Year 1880 *or* 1881.

Nathaniel Benjafield, Short's Green Farm, Motcombe, Shaftesbury, Dorsetshire: First Prize, 10*l.*, for "The Czar;" was farrowed March 6th, 1881; bred by himself; sire, "Sultan;" dam, "Aunt Sally," by "Topsawyer."

The Duke of Hamilton and Brandon, K.T., Easton Park, Wickham Market: Second Prize, 5*l.*, for "Young Sam;" was farrowed Oct. 3rd, 1881; bred by himself; sire, "Sam;" dam, "Diamond."

James Mollett, Seafield Cottage, Fishergate, York: the *Reserve Number* and *Highly Commended* for "Young Prince;" was farrowed February 2nd, 1881; bred by himself; dam, "Rose of York."

Small Black Breed—Boars farrowed in the Year 1882.

The Duke of Hamilton and Brandon, K.T.: First Prize, 10*l.*, for "Robert;" was farrowed July 7th; bred by himself; sire, "Robert the Devil;" dam, "Jet 3rd," by "Rattling Jack."

Major William Dods, Woodlands, Gorleston, Great Yarmouth: Second Prize, 5*l.*, for "Sir Arthur;" was farrowed March 1st; bred by himself; sire, "Camballo 2nd;" dam, "May," by "Topsawyer."

Joseph Alfred Smith, Rise Hall, Akenham, Ipswich, Suffolk: the *Reserve Number* and *Highly Commended* for "The Negro;" was farrowed May 12th; bred by himself; sire, "Parnell;" dam, "Shotover," by "Cetewayo."

Small Black Breed—Breeding Sows farrowed previously to or in the Year 1882.

Joseph Alfred Smith: First Prize, 10*l.*, for "Princess;" was farrowed July 22nd, 1881; in-pig; bred by himself; sire, "Parnell;" dam, "Hope."

The Duke of Hamilton and Brandon, K.T.: Second Prize, 5*l.*, for "Negro;" was farrowed September 10th, 1881; bred by himself; sire, "Sam;" dam, "Jet 2nd."

Henry Charles Bliss Gilbert, Braydestone Hall, Blofield, Norfolk: the *Reserve Number* and *Highly Commended* for "Alice;" was farrowed Jan. 10th, 1881; in-pig; bred by Rev. William Hooper, Chilfrome Rectory, Dorchester; sire, "Sultan."

Small Black Breed—Breeding Sow Pigs, farrowed in the Year 1883. *—Pens of Three.*

The Duke of Hamilton and Brandon, K.T.: First Prize 10*l.*; were farrowed January 4th; bred by himself; sire, "Robert the Devil;" dam, "Jet 3rd," by "Rattling Jack."

JOHN JOSEPH HUNT, 26, Aldwark, York: SECOND PRIZE, 5*l.*; were farrowed Jan. 20th; bred by the Hon. Payan Dawnay, Park Farm, York.

HENRY CHARLES BLISS GILBERT, Braydestone Hall, Blofield, Norfolk: the *Reserve Number* and *Highly Commended* for "Gracette," "Rosabelle," and "Rose;" were farrowed Feb. 10th; bred by himself; sire, "Sir Charles;" dam, "Nettie."

Berkshire Boars farrowed in the Year 1880 *or* 1881.

RUSSELL SWANWICK, Royal Agricultural College Farm, Cirencester, Gloucestershire: FIRST PRIZE, 10*l.*, for "Duke of Monmouth;" was farrowed September 25th, 1881; bred by himself; sire, "Gloucester 4th;" dam, "Sally 100th," by "Wizard 1st."

HEBER HUMFREY, Kingstone Farm, Shrivenham, Berkshire: SECOND PRIZE, 5*l.*, for "Leinster;" was farrowed June 7th, 1880; bred by himself; sire, "Connaught;" dam, "Donna Therese," by "Little Western."

HENRY BRIGGS, SON, and CO., Whitwood Collieries, Normanton, Yorkshire: the *Reserve Number* and *Highly Commended* for "Shilton;" was farrowed May 17th, 1880; bred by Mr. E. Tombs, Shilton, Bampton, Oxon; sire, "Tasker;" dam, "Edgley Lass," by "Hercules."

Berkshire Boars farrowed in the Year 1882.

THE EXECUTORS OF THE LATE ARTHUR STEWART, Saint Bridge Farm, Gloucester: FIRST PRIZE, 10*l.*; was farrowed January 2nd; bred by themselves; sire, "King Birt;" dam, "Chloe," by "Prodigal."

EDWARD TOMBS, Shilton, Bampton, Oxfordshire: SECOND PRIZE, 5*l.*, for "Surprise 2nd;" was farrowed August 26th; bred by himself; sire, "Sir Trevor;" dam, "Lily," by "Goldsmith."

RUSSELL SWANWICK, Royal Agricultural College Farm, Cirencester: the *Reserve Number* and *Highly Commended*; was farrowed November 9th, bred by himself; sire, "Duke of Newport;" dam, "Stumpy 10th," by "Emulation."

Berkshire Breeding Sows farrowed previously to or in the Year 1882.

JOHN PITTMAN KING, North Stoke, Wallingford, Berkshire: FIRST PRIZE, 10*l.*, for "Ruby 5th;" was farrowed January 20th, 1882; in-pig; bred by himself; sire, "Samphire;" dam, "Ruby 3rd," by "Western Walk."

EDWARD TOMBS, Shilton, Bampton, Oxfordshire: SECOND PRIZE, 5*l.*, for "Violet;" was farrowed July 20th, 1881; in-pig; bred by himself; sire, "Goldsmith;" dam, "Trot," by "Timothy."

MAJOR PEPLOE, Garnstone, Weobley, Herefordshire: the *Reserve Number* and *Highly Commended*; was farrowed January 29th, 1882; in-pig; bred by himself; sire, "Leinster Don;" dam, "Sister B." by "Soporific."

Berkshire Sow Pigs farrowed in the Year 1883.—*Pens of Three.*

THOMAS PRICE WILLIS, The Elms, Winslow, Buckinghamshire: FIRST PRIZE, 10*l.*; were farrowed January 8th; bred by himself; sire, "Champion;" dam, "Topsy."

RUSSELL SWANWICK, Royal Agricultural College Farm: SECOND PRIZE, 5*l.*; were farrowed January 7th; bred by himself; sire, "Artful Joe;" dam, "Sally 110th," by "Hopeful 1st."

The Executors of the late Arthur Stewart, Saint Bridge Farm, Gloucester: the *Reserve Number* and *Highly Commended;* were farrowed January 3rd; bred by themselves; sire, "Exor;" dam, "Chloe," by "Prodigal."

Boars of any other Breed, farrowed in the Year 1880 *or* 1881.

Wilson, Crosby, and Co., Apperley Bridge, Leeds: First Prize, 10*l.*, for their Large Middle Breed "Joseph;" was farrowed April 9th, 1881; bred by the Earl of Ellesmere, Worsley Hall, Manchester; sire, "Joseph;" dam, by "Madman."

Boars of any other Breed, farrowed in the Year 1882.

George Mander Allender, Solna, Roehampton, Surrey: First Prize, 10*l.*, for his Tamworth Breed "St. Lubbock;" was farrowed August 5th; bred by himself.

Breeding Sows of any other Breed, farrowed previously to or in the Year 1882.

Wilson, Crosby and Co., Apperley Bridge, Leeds: First Prize, 10*l.*, for their Middle Breed "Duchess;" was farrowed February 20th, 1882; in-pig; bred by themselves; sire, "Fugleman;" dam by "Prince Charley."

William Holmes, 24, Jackson Street, Groves, York: Second Prize, 5*l.*, for "Miss Brutus;" was farrowed August 15th, 1881; in-pig; bred by himself; sire, "Old Whiley."

Wilson, Crosby and Co.: the *Reserve Number* and *Highly Commended*, for their "Middle Breed "Pug;" was farrowed February 10th, 1882; in-pig; bred by themselves; sire, "Peter;" dam by "Prince Charley."

Breeding Sows of any other Breed farrowed in the Year 1883.—*Pens of Three.*

William Holmes, 24, Jackson St., Groves, York: First Prize, 10*l.*; were farrowed January 3rd; bred by himself; sire, "Brutus."

Joseph Alfred Smith, Rise Hall, Akenham, Ipswich, Suffolk: Second Prize, 5*l.*, for "Peace," "Plenty," "Prosperity;" were farrowed March 15th; bred by himself; sire, "Lord Essex;" dam, "Snowball."

CHEESE.†

Half-hundredweight of Yorkshire Cheese of any make.

Lord Overstone, Grange Farm, Withybrook, Coventry: First Prize, 8*l.*

Matthew Lodge, Colburn, Richmond, Yorkshire: Second Prize, 4*l.*

Mr. M. Smith, Prospect House, Little Langton, Northallerton: Third Prize, 2*l.*

Thomas F. King, Edgley, West Witton, Bedale: the *Reserve Number.*

BUTTER.†

Six pounds of Fresh Butter.

Mrs. Long, Gillemoor, Kirby Moorside: First Prize, 5*l.*

Fanny J. Milner, Rarey Farm, Weaverthorp, York: Second Prize, 3*l.*

John Fielden, Grimston Park, Tadcaster: Third Prize, 2*l.*

Mrs. Prescott, Birches Farm, Tenbury, Herefordshire: Fourth Prize, 1*l.*

Henry Bentley, Holtby, York: the *Reserve Number* and *Highly Commended.*

HIVES, HONEY, &c.‡

Hives for Observation Purposes.

S. J. Baldwin, The Apiary, Bromley, Kent: First Prize, 1*l.*

T. B. Blow, Welwyn, Herts: Second Prize, 15*s.*

G. Neighbour and Son, 149, Regent Street, London: Third Prize, 10*s.*

Frame Hives for general use in an Apiary. Price not to exceed 15*s.*

Denes and Son, Maldon, Essex: First Prize, 1*l.*

T. B. Blow: Second Prize, 15*s.*

S. J. Baldwin: Third Prize, 10*s.*

Frame Hives for Cottagers' use. Price not to exceed 10*s.* 6*d.*

S. J. Baldwin: First Prize, 1*l.*

Denes and Son: Second Prize, 15*s.*

T. B. Blow: Third Prize, 10*s.*

Collection of Hives and Bee Furniture.

Neighbour and Son: First Prize, 2*l.*

T. B. Blow: Second Prize, 1*l.* 10*s.*

S. J. Baldwin: Third Prize, 1*l.*

Supers of Honey (not being Sectional).

W. Sells, Uffington, Stamford: First Prize, 1*l.*

Twelve 2 lb. Sections of Comb Honey.

J. Garratt, Hockingden, St. Mary Cray, Kent: First Prize, 1*l.*

E. Gulston, King's Langley, Herts: Second Prize, 10*s.*

The Rev. T. B. Garland, Ranby, Retford: Third Prize, 5*s.*

Twelve 1 lb. Sections of Comb Honey.

J. Garratt: First Prize, 1*l.*

C. Gulston, King's Langley: Second Prize, 10*s.*

Rev. T. B. Garland: Third Prize, 5*s.*

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‡ Prizes given by the British Beekeepers' Association.

Run, or Extracted Honey, in twelve 2 lb. or twenty-four 1 lb. glass jars.

J. Garratt: First Prize, 1*l.*

R. R. Godfrey, Grantham: Second Prize, 10*s.*

W. Martin, Wainfleet, Lincolnshire: Third Prize, 5*s.*

Samples of Comb Foundation.

S. J. Baldwin: First Prize. 1*l.*

T. B. Blow: Second Prize, 10*s.*

IMPLEMENTS, &c.

Dairies.*

Eduard Ahlborn, Hildesheim, Hanover: the Prize 50*l.*, for the best equipped Dairy, suitable for not more than 20 Cows.

SILVER MEDALS.

Thomas Bradford and Co., Manchester; for Butter-worker and Table combined.

J. and F. Howard, Bedford; for Straw Trussing Machine.

R. Maynard, Whittlesford, Cambs; for Straw Yealming Machine.

Charles Catley, 20, New Walk Terrace, York; for Steam Plough.

George Cradock and Co., Wakefield, Yorkshire; for Wire Rope for Steam Cultivation.

Frederick Savage, King's Lynn, Norfolk; for Horse Hoe.

Shield and Crockett, Nottingham; for Corn Screen.

Edwin Foden, Elworth, Sandbach, Cheshire; for Threshing Machine.

Priestman Brothers, Holderness, Hull, Yorkshire; for Dredger.

PRIZE FARMS.†

For Yorkshire Farms.

The best managed Grazing or Dairy Farms, above 150 acres in extent, at least two-thirds in Permanent Grass.

Robert Edward Turnbull, Twyers Wood, Hedon, Hull: First Prize, 75*l.*

William Henry Davis, Holme House, Gargrave: Second Prize, 25*l.*

Henry Holden, Halton East, Skipton: Commended.

The best managed Arable Farm, above 150 acres in extent, less than two-thirds Permanent Grass.

T. H. Hutchinson, Manor House, Catterick: First Prize, 75*l.*

Joseph Watson, Wood House, Brough: Second Prize, 25*l.*

William Coverdale, Lund Cote, Kirby Moorside: Commended.

The best managed Farm under 150 acres in extent.

Benjamin Beevers, Clay Shed Farm, Escrick, York: First Prize, 75*l.*

Joseph Horner, Morton, Bingley: Second Prize, 25*l.*

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* Given by the Rev. T. Staniforth, M.A., of Storrs Hall, Windermere.

† Of these Prizes 200*l.* was given by the York Local Committee.

AGRICULTURAL EDUCATION.

Examination Papers, 1883.

EXAMINATION IN AGRICULTURE.

Maximum Number of Marks, 200. Pass Number, 100.

Tuesday, May 8th, from 10 *a.m. till* 1 *p.m.*

1. Describe shortly the general management of a herd of pedigree cattle—either Herefords or Shorthorns.

2. Describe a farm of 200 acres which you would consider suitable for keeping cows upon for milk selling in a district where there is a large regular demand for milk.

Give shortly the general management of the farm and the cattle.

3. Describe the management of 2½-year-old bullocks, feeding in covered yards from 1st November, until they are fit for the butcher.

Give the description and quantity of food, and the probable monthly increase of live-weight.

How would you estimate their value for sale? How would you estimate the unexhausted value of the cake and corn consumed by them if you were quitting the farm at the ensuing Lady-day?

4. Give a description of manure-drills — dry and with water— state their advantages or disadvantages—state for what crops they are most suitable, and what description and quantity of manure should be applied (without farmyard-manure) to such crops on land in fair condition.

5. What description and quantity of grass and clover seeds should be sown on a medium soil for one year's grazing? The same for one year's mowing.

6. What description and quantity of seeds should be sown on strong land for permanent pasture?

How should the land be prepared, and what should be the after-treatment to ensure a good turf?

7. What should be the germinating power of each description of seed named above (5 and 6), and how can an ordinary farmer test this?

8. What farm operations can be most advantageously done by piece-work, and what would be a fair average price for each in any district where the average wage per day is 2*s.* 6*d.*

9. State a suitable rotation of crops on a light-land farm in the Midland Counties; the same on a medium soil; the same on a strong soil.

10. Supposing upon the strong land you have some couch-grass and weeds, how would you prepare the land for each crop you have named, and to what crop would you apply lime, and to what crop farmyard-manure?

11. Give a description of land upon which sheep are most liable to fluke or liver-rot. State the best mode of prevention and of treatment.

12. Under what conditions and for what reasons is a Lady-day entry upon a farm to be preferred to a Michaelmas entry.

13. Having the live-weight given of fat cattle and sheep, how would you estimate the dead-weight, specifying: inferior quality, middling quality, prime quality.

14. Describe and name the most common sorts of couch, or squitch, or creeping grasses found on foul arable land. Which are the most difficult to eradicate, and why?

EXAMINATION IN CHEMISTRY.

MAXIMUM NUMBER OF MARKS, 200. PASS NUMBER, 100.

Wednesday, May 9th, from 10 *a.m. till* 1 *p.m.*

I. GENERAL CHEMISTRY.

1. Show how to determine accurately the proportion of oxygen to nitrogen in atmospheric air. Explain the causes which tend to keep that proportion nearly constant; and why it is that the proportion of aqueous vapour to the other ingredients is so much more variable.

2. How much nitric acid can be made from 7000 grains of sodium-nitrate, and how much from the like weight of calcium-nitrate? (O : N : Na : Ca = 16 : 14 : 23 : 40.)

3. How do you account for the high temperature of an oxy-hydrogen blow-pipe flame? What precautions have to be taken in burning the mixed gases, and on what grounds?

4. Give an account of the mode of preparing and collecting olefiant gas, and explain the chemistry of the process. Describe the general properties of that gas, and show how it differs from marsh gas in composition and in characters.

5. Explain how to prepare (1) sodium-sulphite, (2) sodium-sulphide. What is the effect of hydrochloric acid on each of those substances? How do you explain the antiseptic property of sulphites?

6. Explain the chemical effects of exposure to weather of iron, zinc, copper and lead respectively. Why is rain-water more liable than spring-water to be contaminated by lead after storage in a leaden tank? By what tests could you detect (1) lead, (2) iron, in a sample of water?

7. Given a sample of what is stated to be distilled water: how would you proceed to determine experimentally whether it tallied with that statement?

8. Explain the chemical changes which go on in the alcoholic fermentation, and the circumstances which are favourable and unfavourable to it. Show that the heat evolved in burning a given quantity of alcohol ought to be less than that evolved in burning the sugar from which it was made.

9. In what parts of animals and plants, respectively, is albumen chiefly found? Describe the chemical characters of egg albumen; and state how other kinds differ from it.

II. AGRICULTURAL CHEMISTRY.

Wednesday, May 9th, from 2 p.m. till 5 p.m.

1. Give an account of the different plans of separating cream from milk.

2. State approximately the composition of cream, skim-milk and butter-milk.

3. Describe the process of making Cheddar cheese, and refer specially to the conditions to which attention must be paid in the dairy and store-room in order to turn out first-class Cheddar cheese.

4. State the composition and some of the principal properties of carbolic acid, bleaching powder, quicklime and sulphurous acid. Refer to their chemical effect upon organic matters and to their application and respective merits as disinfectants.

5. Write a short paper on the use and abuse of lime in agriculture.

6. Contrast the chemical composition of fertile alluvial clay-soils with that of poor clay-land.

7. State in general terms the composition and character of pure linseed-cakes, and how the quantitative analysis of feeding-cakes is carried out.

8. State the composition and chief chemical properties and physiological functions of the following food-constituents:—starch, oil, albumen, casein, gluten, phosphate of lime.

9. A farmer wants to apply to a field 35 lbs. of nitrogen, 25 lbs. of soluble phosphoric acid and 25 lbs. of potash per acre. How much commercial nitrate of soda, containing 95 per cent. of pure nitrate, how much mineral superphosphate, containing 25 per cent. of tribasic phosphate of lime rendered soluble by acid, and how much kainite, containing 25 per cent. of potassium-sulphate, must he apply to the acre in order to supply 35 lbs. of nitrogen, 25 lbs. of phosphoric acid, soluble in water, and 25 lbs. of potash?

Equivalent of N = 14; oxygen = 16; sulphur = 32; phosphorus = 31; potassium = 39.

EXAMINATION IN MECHANICS AND NATURAL PHILOSOPHY.

MAXIMUM NUMBER OF MARKS, 200. PASS NUMBER, 100.

Thursday, May 10*th, from* 10 *a.m. till* 1 *p.m.*

1. What are the fundamental units of distance, time, and mass commonly used in England; and how are they respectively fixed?

2. State the condition of the equilibrium of three forces acting at a point called the "triangle of forces."

Show by a diagram drawn to scale how three forces of 15, 18 and 21 units respectively can be made to act at a point so as to balance one another. Describe an experiment by which the accuracy of your construction might be tested.

3. State the rule for finding the centre of gravity of two particles whose masses are given.

What is a particle?

Particles whose masses are 3 lbs., 4 lbs., 7 lbs., are placed one at each end of three corners of a square, laid flat on a table; show by a construction drawn to scale, where a particle whose mass is 14 lbs. must be placed that the centre of gravity of the four particles may be at the fourth corner of the square.

4. A rod (A B) 10 feet long can turn freely round a point C between A and B, and distant 2 feet from B; a weight of 20 lbs. is tied to the end A, and one of 60 lbs. to the end B; the rod is kept in a horizontal position by resting on a fixed point 4 feet from C; what is the pressure on that fixed point and on C? What would the rod in this question be called, if considered to be a simple machine? What would the fixed point C be called? No notice of the weight of the rod is taken in the question; under what circumstances are we justified in thus neglecting the weight of the rod?

5. What is the number of foot-pounds of work done when a weight of $3\frac{2}{3}$ tons are lifted vertically through $25\frac{1}{2}$ feet? If this were done in a quarter of a minute, what is the horse-power of the agent doing the work?

6. What is meant when the velocity of a body is said to undergo a constant or uniform acceleration? How is such an acceleration measured?

A body moving from a state of rest under the action of a constant force describes a distance of 300 feet in the first half minute of its motion; what is the accelerative effect of the force on the body? What ratio does the force producing the motion bear to the force of the gravity on the body ($g = 32$)?

7. Define the specific gravity (or specific density) of a solid or liquid, and describe the usual method of finding the specific gravity

of a solid which is not soluble, and does not float in water. Why is it necessary to take account of temperature in the accurate determination of specific gravity? For instance, would the specific gravity of a piece of platinum taken in water at 40° F. be the same as if it were taken in water at 70° F.?

8. Explain briefly the formation of dew on a clear night. What is the dew-point? When water is drawn from a deep well in summer time and put into a tumbler, why does dew commonly form on the outside of the tumbler?

9. Explain briefly the mechanism and use of a steam indicator, and how the indicator-diagram is drawn.

EXAMINATION IN MENSURATION AND SURVEYING.

Maximum Number of Marks, 100. Pass Number, 50.

Thursday, May 10th, from 2 p.m. till 5 p.m.

1. If a four-sided figure were drawn to scale on paper, how would you find its area? In what way would the process be simplified if two of the sides were parallel?

An embankment passes along the side of a hill; the slope of the hill is one vertical to two horizontal; the top of the embankment is horizontal and 20 feet wide; the slopes of the sides are two vertical to one horizontal; the length of the longer slope is 30 feet; draw to scale the cross-section of the embankment and find its area.

2. State the rule for finding the volume of a prismoid.

Give two instances of solids whose volume can be found by the prismoidal rule.

A heap of earth is made on level ground; its base is rectangular and is 40 feet long by 30 feet wide; its top is at a uniform height of 10 feet above the ground, and its sides have a slope of one vertical to one horizontal; draw to scale a horizontal plan of the solid, and calculate its volume.

3. If you find the weight of a body first in air and then in water, how will these data enable you to calculate its volume? A body weighs 2 lbs. $5\frac{1}{4}$ oz. in air, and 1 lb. $6\frac{3}{4}$ oz. in water; find its volume in cubic inches.

4. Two points are separated by an impassable swamp or pond, round which you can go freely, so that both points are accessible; explain how you could find the distance between the points if you were provided with a few pointed stakes (or piquets) and a measuring tape.

5. If A and P are two points of which P is visible but wholly

inaccessible from A, explain how the distance from P to A can be found by an observer who has a measuring tape, and an instrument for measuring angles, such as a sextant or a theodolite.

6. A B is 750 feet long; P is a point such that P A B equals 25° 18′ and P B A equals 108° 31′; find, both by a construction drawn to scale and by calculation, the distance A P and the parts into which the angle A B P is divided by a straight line joining B and the middle point of A P.

7. A map is drawn to the scale of 5 inches to the mile, what is its representative fraction? For such a map draw a scale by which to read all distances from 25 yards to 1000 yards.

If three points A, B, C are taken on such a map, and if A B, B C and C A are respectively 2·73, 3·27, and 4·00 inches long; how many acres are there in the triangle A B C?

8. A, B, C, D are stakes at the corner of a four-sided field; the diagonal A C is 1320 links long; draw a plan of the field and find its area from the accompanying notes.

	D A	
	844	
	000	
	Right off	D
	C D	
0	1250	
20	1000	
30	700	
58	500	
20	300	
	000	
	Right off	C
	B C	
0	1050	
40	850	
60	550	
32	470	
Cross	370	Fence
	300	40
	200	70
	100	50
	000	0
	Right off	B
	A B	
	753	

Begin at A and go North.

EXAMINATION IN BOOK-KEEPING.

MAXIMUM NUMBER OF MARKS, 200. PASS NUMBER, 100.

Friday, May 11*th, from* 10 *a.m. till* 1 *p.m.*

Journalise and post in proper technical language and form the following imaginary transactions, and draw out therefrom a "Trial Balance," a "Profit and Loss Account," and a "Balance-sheet."

On the 1st of January, 1883, the affairs of John Smith stood thus:—

ASSETS.

	£	s.	d.	£	s.	d.
Cash in hand	122	12	8			
Plant, Machinery and Tools	1209	4	4			
Estimated value of Live Stock	3980	0	0			
Do. Hay and Straw	1808	14	8			
Do. Corn (unthreshed)	900	0	0			
Do. Provender and Growing Crops	669	2	0			
Amount due from J. Robinson	138	14	0			
Do. J. Brown	314	8	0			
Do. J. Williams	50	0	0			
				9192	15	8

LIABILITIES.

	£	s.	d.	£	s.	d.
Due to J. Jones for Rent	414	6	8			
Promissory Note due 10th instant, of John Smith, held by J. Thorley	1000	0	0			
Overdrawn Account at Bankers	2348	6	0			
				3762	12	8
Surplus of Assets over Liabilities				£5430	3	0

1883.

Jan.	2.—Sold J. Robinson, Hay	142	10	0			
	Do. Straw	20	5	0			
					162	15	0
,,	4.—Received cheque from James Brown				310	0	0
	Discount allowed him				4	8	0
	Paid the above cheque to Bankers				310	0	0
,,	5.—Sold J. Robinson, hay				60	0	0
	Sold J. Brown 20 bullocks				490	0	0
	Received cash 250*l*, and acceptance at three months, 240*l*. for same				490	0	0
,,	6.—Sold Robert Chase, corn				206	6	8
	Paid to Bankers, cash	300	0	0			
	Do. J. Brown's acceptance	240	0	0			
					540	0	0
	Bankers charged for discounting J. Brown's acceptance				1	11	4
,,	10.—Paid (J. Thorley) promissory note, due this day:—						
	By cheque on Bankers	500	0	0			
	By promissory note, at six months from this date	500	0	0			
					1000	0	0
	Paid J. Thorley interest thereon to due date by cheque on Bankers				20	0	0

1883.		£	s.	d.
Jan. 14.—	Received from Bankers	175	0	0
	Sold J. Robinson, hay	180	0	0
„ 17.—	Paid J. Jones by cheque on Bankers	414	6	8
„ 21.—	Received of J. Williams, composition of 5*s.* in the £ on his debt of £50	12	10	0
„ 28.—	Sold J. Robinson, hay	90	0	0
	Sold J. Brown, 2 bullocks	50	0	0
„ 31.—	Paid wages for month	153	15	0
	Paid sundry small disbursements for month (petty cash)	49	15	8
	Amount owing to J. Jones, for Rent	25	0	0
	Depreciation of plant, machinery and tools at 5 per cent.	5	0	9
	Amount owing to Bankers for interest	12	10	0
	At this date J. Smith had as under:—			
	Hay and Straw, valued at	1460	0	0
	Threshed Corn, valued at	760	0	0
	Live Stock, valued at	3450	0	0
	Provender and growing crops, valued at	800	0	0

EXAMINATION IN GEOLOGY.

MAXIMUM NUMBER OF MARKS, 100. PASS NUMBER, 50.

Friday, May 11*th, from* 2 *p.m. till* 5 *p.m.*

1. Describe the approximate composition and physical characters of six of the chief rock-forming minerals, and mention the chief rocks of which they are constituents.

2. Define the terms, Sedimentary, Eruptive, and Metamorphic rocks. Give some examples.

3. How have the Igneous rocks been classified?

4. What are calcareous rocks? How would you distinguish them from other rocks? For what different purposes are they employed?

5. Compare the Wolds of Gloucestershire with the Wolds of Lincolnshire and Yorkshire, as to their geological, physical, and agricultural characters.

6. Classify the oolitic series of rocks. (1.) Give their lithological characters. (2.) Mention their most characteristic fossils.

7. Define cleavage, foliation, and lamination. Name the kinds of rock which exhibit these structures.

8. What are necessary conditions for a good water-supply, (1) natural and (2) artificial?

9. Describe the different kinds of fossil fuel found in the British Islands, and give their geological position.

10. Mention the chief Tertiary formations of England. Where do they occur? Give some account of their nature and fossils.

11. Name the strata in which each of the great classes of Vertebrates first appear, and mention the earliest representative genus or genera in each case.

12. Describe the rocks and fossils placed before you.

EXAMINATION IN BOTANY.

[It is expected that Eight Questions at least will be answered.]

Maximum Number of Marks, 100. Pass Number, 50.

Saturday, May 12th, from 10 *a.m. till* 1 *p.m.*

1. Describe the structure of the tips of roots.

2. Describe a vertical section through the blade of a leaf, and explain the structure and functions of the stomata.

3. Describe a bud, and explain what changes it undergoes in the course of a year's growth.

4. What tissues contain nitrogen compounds, and from what sources do plants obtain their nitrogen?

5. What are the principal constituents of the ash of a plant, and how does the plant obtain them?

6. What is a hybrid? State how you would experiment to produce hybrids, and within what limits you might expect to secure them.

7. Explain the life of a biennial plant during its first and second years; mention some biennial plants in cultivation, and give the reason why they are cultivated.

8. Describe three parasitic plants injurious to crops, and state how you would deal with them.

9. What are Gymnosperms? Explain why they are so called, specify the Natural Orders of Gymnosperms, and give an example of each Order.

10. Give the common and scientific names of eight indigenous grasses, and state the value of each for pasture.

11. Give the principal characters of the following Natural Orders: — *Cruciferæ*, *Leguminosæ*, *Umbelliferæ*, *Polygonaceæ*, and *Gramineæ*.

12. Specify the Natural Orders and describe the plants marked A, B, C, taking the organs if present in the following order:—root, stem, leaves, bracts, sepals, petals, stamens, pistil, fruit, seeds.

EXAMINATION IN ANATOMY AND ANIMAL PHYSIOLOGY.

MAXIMUM NUMBER OF MARKS, 100. PASS NUMBER, 50.

Saturday, May 12th, from 2 p.m. till 4 p.m.

1. Name the several structures which are blended together in the formation of a tooth. State their relative quantities and how each is recognised on examination with a lens. Describe also the number and position of the incisor teeth of the ox, and say how many permanent and temporary incisors are present in an animal two years of age.

2. Describe the means by which rumination is carried on, and explain the advantages which the animal organism derives directly from the process.

3. State the position which the liver of the sheep occupies in the abdominal cavity, and how it is maintained in its location. Describe also the function of the gland, and say in what parts of it the parasites commonly called flukes are met with, and how they gain access to such parts.

4. Name the period of utero-gestation in the mare, cow, sheep and pig, and say how a fœtus is nourished in the uterus, and what are the indications of approaching parturition. Add also a description of the position of the fœtus during parturition, and the average length of time that natural labour occupies in the several animals which are named above.

MEMORANDA.

Address of Letters.—The Society's office being situated in the postal district designated by the letter W, Members, in their correspondence with the Secretary, are requested to subjoin that letter to the usual address.

General Meeting in London, December, 1883.

General Meeting in London, May 22nd, 1884, at 12 o'clock.

Meeting at Shrewsbury, July, 1884.

Monthly Council (for transaction of business), at 12 o'clock on the first Wednesday in every month, excepting January, September, and October: open only to Members of Council and Governors of the Society.

Adjournments.—The Council adjourn over Passion and Easter weeks, when those weeks do not include the first Wednesday of the month; from the first Wednesday in August to the first Wednesday in November; and from the first Wednesday in December to the first Wednesday in February.

Office Hours.—10 to 4. On Saturdays, 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, Camden Town, N.W.—(A statement of these privileges will be found on page c in this Appendix.)

Chemical Analysis.—The privileges of Chemical Analysis enjoyed by Members of the Society will be found stated in this Appendix (page ci).

Botanical and Entomological Privileges.—The Botanical and Entomological Privileges enjoyed by Members of the Society will be found stated in this Appendix (page civ).

Subscriptions.—1. Annual.—The subscription of a Governor is £5, and that of a Member £1, due in advance on the 1st of January of each year, and becoming in arrear if unpaid by the 1st of June. 2. For Life.—Governors may compound for their subscription for future years by paying at once the sum of £50, and Members by paying £10. Governors and Members who have paid their annual subscription for 20 years or upwards, and whose subscriptions are not in arrear, may compound for future annual subscriptions, that of the current year inclusive, by a single payment of £25 for a Governor, and £5 for a Member.

Payments.—Subscriptions may be paid to the Secretary, in the most direct and satisfactory manner, either at the Office of the Society, No. 12, Hanover Square, London, W., or by means of post-office orders, to be obtained at any of the principal post-offices throughout the kingdom, and made payable to him at the Vere Street Office, London, W.; but any cheque on a banker's or any other house of business in London will be equally available, if made payable on demand. In obtaining post-office orders care should be taken to give the postmaster the correct initials and surname of the Secretary of the Society (H. M. Jenkins), otherwise the payment will be refused to him at the post-office on which such order has been obtained; and when remitting the money-orders it should be stated by whom, and on whose account, they are sent. Cheques should be made payable as drafts on demand (not as bills only payable after sight or a certain number of days after date), and should be drawn on a London (not on a local country) banker. When payment is made to the London and Westminster Bank, St. James's Square Branch, as the bankers of the Society, it will be desirable that the Secretary should be advised by letter of such payment, in order that the entry in the banker's book may be at once identified, and the amount posted to the credit of the proper party. No coin can be remitted by post, unless the letter be registered.

New Members.—Every candidate for admission into the Society must be proposed by a Member; the proposer to specify in writing the full name, usual place of residence, and post-town, of the candidate, either at a Council meeting, or by letter addressed to the Secretary. Forms of Proposal may be obtained on application to the Secretary.

⁂ Members may obtain on application to the Secretary copies of an Abstract of the Charter and Bye-laws, of a Statement of the General Objects, &c., of the Society, of Chemical, Botanical, Entomological, and Veterinary Privileges, and of other printed papers connected with special departments of the Society's business.

Members' Veterinary Privileges.

I.—VISITS OF A PROFESSOR OF THE ROYAL VETERINARY COLLEGE.

1. Any Member of the Society who may desire professional attendance and special advice in cases of disease among his cattle, sheep, or pigs, should apply to the Secretary of the Society, or to the Principal of the Royal Veterinary College, Camden Town, London, N.W.

2. The remuneration of the Veterinary Surgeon or a visiting Inspector will be 2*l.* 2*s.* each day as a professional fee, and the charge for personal expenses, *when such have been incurred*, which will in no case exceed one guinea per diem. He will also be allowed to charge the cost of travelling to and from the locality where his services may have been required. These charges may, however, in cases of serious or extensive outbreaks of contagious disease, be reduced or remitted altogether, so far as the Members of the Society are concerned, at the discretion of the Council, on such step being recommended to them by the Veterinary Committee.

3. The Consulting Veterinary Surgeon or visiting Inspector, on his return, will report to the Member, and, through the Principal of the Royal Veterinary College, to the Veterinary Committee, in writing, the results of his observations and proceedings with reference to the disease; which Report will be laid before the Council.

4. When contingencies arise to prevent a personal discharge of the duties, the Principal of the Royal Veterinary College may, subject to the approval of the Veterinary Committee, name some competent professional person to act in his stead, who shall be remunerated at the same rate.

II.—CONSULTATIONS WITHOUT VISIT.

Personal consultation with Veterinary Inspector	10*s.* 6*d.*
Consultation by letter	10*s.* 6*d.*
Post-mortem examination, and report thereon	21*s.*

A return of the number of applications from Members of the Society during each half-year is required from the Consulting Veterinary Surgeon.

III.—ADMISSION OF DISEASED ANIMALS TO THE ROYAL VETERINARY COLLEGE, CAMDEN TOWN, N.W.; INVESTIGATIONS AND REPORTS.

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 following terms, viz. by paying for the keep and treatment of cattle 10*s.* 6*d.* per week each animal, and for sheep and pigs, 3*s.* 6*d.* per week.

2. A detailed Report of the cases of cattle, sheep, and pigs treated in the Infirmary of the College, or on Farms in the occupation of Members of the Society, will be furnished to the Council quarterly; and also special reports from time to time on any matter of unusual interest which may come under the notice of the Officers of the College.

IV.—VISITS OF PROVINCIAL VETERINARY SURGEONS.

The following Veterinary Surgeons have been appointed, at different centres in England and Wales, for the purpose of enabling Members of the Society to consult them with regard to the diseases of cattle, sheep, and pigs.

Mr. C. STEPHENSON, Sandyford Villa, Newcastle-on-Tyne.
Mr. JOSEPH CARTER, 38, Great Horton Road, Bradford.
Mr. WALTER LEWIS, 1, South St., Nantwich Road, Crewe.
Captain B. H. RUSSELL, Veterinary Infirmary, Grantham.
Mr. W. F. GARSIDE, Royal Agricultural College, Cirencester.
Mr. T. J. MERRICK, Northampton.
Mr. G. A. BANHAM, Downing Street, Cambridge.
Mr. CHARLES MOIR, Cardiff.
Mr. WM. PENHALE, Barnstaple.
Mr. THOMAS D. BROAD, Broad Street, Bath.
Mr. WM. BROMLEY, Lancaster.
Mr. OSBORN HILLS, 1, 3, 5, and 7, South Parade, Leamington.

Members may obtain the attendance of a Provincial Veterinary Surgeon in any case of disease by paying his travelling expenses (which include railway fares, and 1*s.* per mile if by road, including the return journey), and the cost of his visit, which will be at the following rate, viz.:—

	£	*s.*	*d.*
When the whole day is occupied	1	10	0
When half a day or less is occupied	0	15	0
Personal consultation with Veterinary Surgeon	0	10	0
Consultation by letter	0	5	0
Post-mortem examination and report thereon	1	0	0

A return of the number of applications from Members of the Society during each half year, embodying a statement of those cases which may be of public interest, is required from each Provincial Veterinary Surgeon. These half-yearly reports should reach the Secretary by the end of May and November respectively.

By Order of the Council,

H. M. JENKINS, *Secretary.*

Governors' and Members' Privileges of Chemical Analysis.

Applicable only to the case of Persons who are not commercially engaged in the manufacture or sale of any substance sent for Analysis.)

THE Council have fixed the following rates of Charges for Analysis to be made by the Consulting Chemist for the *bonâ-fide* and sole 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. Governors of the Society are also allowed to send to the Society's Laboratory for analysis, at the following scale of fees, any manures and feeding stuffs which are to be used by their outgoing tenants. The charge for analysis, together with the cost of the carriage of the specimens (if any), must be paid to the Consulting Chemist at the time of application:

No.		
1.	An opinion of the genuineness of bone-dust or oil-cake (each sample)	2*s.* 6*d.*
2.	An estimate of the value (relatively to the average samples in the market) of sulphate and muriate of ammonia and of the nitrates of potash and soda	5*s.*
3.	An analysis of guano; showing the proportion of moisture, organic matter, sand, phosphate of lime, alkaline salts and ammonia, and an estimate of its value, provided the selling price of the article to be analysed be sent with it	10*s.*
4.	An analysis of mineral superphosphate of lime for soluble phosphates only, and an estimate of its value, provided the selling price of the article to be analysed be sent with it	5*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, and an estimate of its value, provided the selling price of the article to be analysed be sent with it	10*s.*
6.	An analysis, showing the value of bone-dust or any other ordinary artificial manure, provided the selling price of the manure to be analysed be sent with it	10*s.*
7.	An analysis of limestone, showing the proportion of lime	7*s.* 6*d.*
8.	An analysis of limestone, showing the proportion of lime and magnesia	10*s.*
9.	An analysis of limestone or marls, showing the proportion of carbonate, phosphate, and sulphate of lime and magnesia, with sand and clay	10*s.*
10.	Partial analysis of a soil, including determinations of clay, sand, organic matter, and carbonate of lime	10*s.*
11.	Complete analysis of a soil	£3
12.	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; and an opinion of its feeding and fattening or milk-producing properties	10*s.*
13.	Analysis of any vegetable product	10*s.*
14.	Analysis of animal products, refuse substances used for manures, &c.	from 10*s.* to £1
15.	Determination of the "hardness" of a sample of water before and after boiling	5*s.*
16.	Analysis of water of land-drainage, and of water used for irrigation	£1
17.	Analysis of water used for domestic purposes	£1 10*s.*
18.	Determination of nitric acid in a sample of water	10*s.*
19.	Examination of Viscera for Metallic poison	£2 2*s.*
20.	Examination of Viscera complete, for metals and alkaloids	£5 5*s.*
21.	Personal consultation with the Consulting Chemist. (The usual hours of attendance, Monday excepted, will be from 11 to 2, but to prevent disappointment, it is suggested that Members desiring to hold a consultation should write to make an appointment)	5*s.*
22.	Consultation by letter	5*s.*
23.	Consultation necessitating the writing of three or more letters	10*s.*

The Laboratory of the Society is at 12, Hanover Square, London, W., to which address the Consulting Chemist, Dr. AUGUSTUS VOELCKER, F.R.S., requests that all letters and parcels (postage and carriage paid) from Members of the Society, who are entitled to avail themselves of the foregoing Privileges, should be directed.

GUIDE TO THE PURCHASE OF ARTIFICIAL MANURES AND FEEDING STUFFS.

Feeding Cakes.

1. *Linseed-cake* should be purchased as "Pure," and the insertion of this word on the invoice should be insisted upon. The use of such words as "Best," "Genuine," &c., should be objected to by the purchaser.

2. *Rape-cake for feeding purposes* should be guaranteed "Pure" and purchased by sample.

3. *Decorticated Cotton-cake* should be guaranteed "Pure," and purchased by sample.

4. *Undecorticated Cotton-cake* should be guaranteed "Pure," and purchased by sample.

N.B.—All feeding cakes should be purchased in good condition, and the guarantee of the vendor should be immediately checked by a fair sample (taken out of the middle of the cake) being at once sent for examination to a competent analytical chemist. The remainder of the cake from which the sample sent for examination had been taken should be sealed up in the presence of a witness, and retained by the purchaser for reference in case of dispute.

Artificial Manures.

1. *Raw or Green Bones or Bone-dust* should be purchased as "Pure" Raw Bones guaranteed to contain not less than 45 per cent. of tribasic phosphate of lime, and to yield not less than 4 per cent. of ammonia.

2. *Boiled Bones* should be purchased as "Pure" Boiled Bones guaranteed to contain not less than 48 per cent. of tribasic phosphate of lime, and to yield not less than 1¾ per cent. of ammonia.

3. *Dissolved Bones* are made of various qualities, and are sold at various prices per ton; therefore the quality should be guaranteed, under the heads of *soluble* phosphate of lime, *insoluble* phosphate of lime, and nitrogen or its equivalent as ammonia. The purchaser should also stipulate for an allowance for each unit per cent. which the dissolved bones should be found on analysis to contain less than the guaranteed percentages of the three substances already mentioned.

4. *Mineral Superphosphates* should be guaranteed to be delivered in a sufficiently dry and powdery condition, and to contain a certain percentage of *soluble* phosphate of lime, at a certain price per unit per cent., no value to be attached to *insoluble* phosphates.

5. *Compound Artificial Manures* should be purchased in the same manner and with the same guarantees as Dissolved Bones.

6. *Nitrate of Soda* should be guaranteed by the vendor to contain from 94 to 95 per cent. of pure nitrate.

7. *Sulphate of Ammonia* should be guaranteed by the vendor to contain not less than 23 per cent. of ammonia.

8. *Peruvian Guano* should be sold under that name, and guaranteed to be in a dry and friable condition, and to contain a certain percentage of ammonia.

N.B.—Artificial manures should be guaranteed to be delivered in a sufficiently dry and powdery condition to admit of distribution by the drill. A sample for analysis should be taken, not later than three days after delivery, by emptying several bags, mixing the contents together, and filling two tins holding about half a pound each, in the presence of a witness. Both the tins should be sealed, one kept by the purchaser for reference in case of dispute, and the other forwarded to a competent analytical chemist for examination.

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 oz. of the well-mixed sample, and send it to 12, Hanover Square, London, W., by post: or place the mixed manure in a small wooden or tin box, which may be tied by string, but must not be sealed, and send it by post. If the manure be very wet and lumpy, a larger boxful, weighing from 10 to 12 oz., should be sent either by post or railway.

Samples not exceeding 4 oz. in weight may be sent by post, by attaching two penny postage stamps to the parcel.

Samples not exceeding 8 oz., for three postage stamps.

Samples not exceeding 12 oz., for four postage stamps.

The parcels should be addressed: Dr. Augustus Voelcker, 12, Hanover Square, London, W., and the address of the sender or the number or mark of the article be stated on parcels.

The samples may be sent in covers, or in boxes, bags of linen or other materials. No parcel sent by post must exceed 12 oz. in weight, 1 foot 6 inches in length, 9 inches in width, and 6 inches in depth.

SOILS.—Have a wooden box made 6 inches long and wide, and from 9 to 12 inches deep, according to the depth of soil and subsoil of the field. Mark out in the field a space of about 12 inches square; dig round in a slanting direction a trench, so as to leave undisturbed a block of soil with its subsoil from 9 to 12 inches deep; trim this block or plan of the field to make it fit into the wooden box, invert the open box over it, press down firmly, then pass a spade under the box and lift it up, gently turn over the box, nail on the lid and send it by goods or parcel to the laboratory. The soil will then be received in the exact position in which it is found in the field.

In the case of very light, sandy, and porous soils, the wooden box may be at once inverted over the soil and forced down by pressure, and then dug out.

WATERS.—The water, if possible, should be sent in a glass-stoppered Winchester half-gallon bottle, which is 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 oz., should be sent enclosed in small linen bags, or wrapped in paper. Postage 2*d.*, if under 4 oz.

OILCAKES.—Take a sample from the middle of the cake. To this end break a whole cake into two. Then break off a piece from the end where the two halves were joined together, and wrap it in paper, leaving the ends open, and send parcel by post. The piece should weigh from 10 to 12 oz. Postage, 4*d.* If sent by railway, one quarter or half a cake should be forwarded.

FEEDING MEALS.—About 3 oz. will be sufficient for analysis. Enclose the meal in a small linen bag. Send it by post.

On forwarding samples, separate letters should be sent to the laboratory, specifying the nature of the information required, and, if possible, the object in view.

POISONS.—Before a chemical examination is undertaken, a post-mortem should be made by a Veterinary Surgeon, or at the Royal Veterinary College, Camden Town, N.W., and only the necessary Viscera should be sent to the Laboratory for analysis, with a report on the post-mortem.

H. M. JENKINS, *Secretary.*

Members' Botanical and Entomological Privileges.

The Council have fixed the following Rates of Charge for the examination of Plants, Seeds, and Insects for the *bonâ fide* use of Members of the Society, who are particularly requested when applying to the Consulting Botanist, or to the Honorary Consulting Entomologist, to mention the kind of examination they require, and to quote its number in the subjoined Schedule. The charge for examination must be paid at the time of application, and the carriage of all parcels must be prepaid.

I. BOTANICAL.

No.		
1.	A report on the purity, amount and nature of foreign materials, perfectness, and germinating power of a sample of seeds	5*s.*
2.	Detailed report on the weight, purity, perfectness, and germinating power of a sample of seeds, with a special description of the weeds and other foreign materials contained in it	10*s.*
3.	Determination of the species of any weed or other plant, or of any epiphyte or vegetable parasite, with a report on its habits, and the means of its extermination or prevention	5*s.*
4.	Report on any disease affecting the farm crop	5*s.*
5.	Determination of the species of a collection of natural grasses found in any district of one kind of soil, with a report on their habits and pasture value	10*s.*

N.B.—*The above Scale of Charges is not applicable in the case of Seedsmen requiring the services of the Consulting Botanist.*

II. ENTOMOLOGICAL.

6.	Determination of the species of any insect, worm, or other animal which, in any stage of its life, injuriously affects the farm crops, with a report on its habits and suggestions as to its extermination	2*s.* 6*d.*

INSTRUCTIONS FOR SELECTING AND SENDING SAMPLES.

In sending seed or corn for examination the utmost care must be taken to secure a fair and honest sample. If anything supposed to be injurious or useless exists in the corn or seed, selected samples should also be sent.

In collecting specimens of plants, the whole plant should be taken up, and the earth shaken from the roots. If possible, the plants must be in flower or fruit. They should be packed in a light box, or in a firm paper parcel.

Specimens of diseased plants or of parasites should be forwarded as fresh as possible. Place them in a bottle, or pack them in tinfoil or oil-silk.

All specimens should be accompanied with a letter specifying the nature of the information required, and stating any local circumstances (soil, situation, &c.) which, in the opinion of the sender, would be likely to throw light on the inquiry.

Parcels or letters containing seeds or plants for examination (Carriage or Postage prepaid) must be addressed to Mr. W. Carruthers, F.R.S., Central House, Central Hill, Norwood, S.E.

Parcels or letters containing insects, or plants apparently infested with insects, sent for examination, must be addressed to Miss Ormerod, F.M.S., Dunster Lodge, Isleworth.

The Council give notice that the following is the standard which is adopted by the Consulting Botanist in his examination of seeds:—

1. That the bulk be true to the species ordered.

2. That it contain not more than five per cent. of seeds other than the species ordered.

3. That the germinating power shall be, for cereals, green crops, clovers, and timothy grass, not less than 90 per cent.; for fox-tail, not less than 20 per cent.; and for other grasses not less than 70 per cent.

The Council recommend that purchasers should require a guarantee in accordance with this standard. They also strongly recommend that the purchase of prepared mixtures should be avoided, and that the different seeds to be sown should be purchased separately.

H. M. JENKINS, *Secretary.*