Robert Bakewell.
BORN 1726 ~ DIED 1795
from a picture in the possession of J. S. Bakewell, Esq

THE

JOURNAL

OF THE

ROYAL AGRICULTURAL SOCIETY

OF ENGLAND.

17

Third Series.

VOLUME THE FIFTH.

PRACTICE WITH SCIENCE.

LONDON:
JOHN MURRAY, ALBEMARLE STREET,
1894.

Extract from the Society's Bye-Laws

(*Dating from the Foundation of the Society*) :—

"The Society will not be responsible for the accuracy of the statements or conclusions contained in the several papers in the Journal, the authors themselves being solely responsible."

CONTENTS OF VOLUME V.

THIRD SERIES.

1894.

Special Articles.

Official Reports.

Notes, Communications, and Reviews.

APPENDIX.

DIRECTIONS TO THE BINDER.

All the pages of text (1 to 824) should come first in the bound volume; and the pages of Appendix (i to cxcvi) at the end.

Text :—Pages 1 to 204 of the text are included in Part I. (March 31, 1894); pages 205 to 420 in Part II. (June 30, 1894); pages 421 to 584 in Part III. (Sept. 29, 1894); and pages 585 to 824 in Part IV. (December 31, 1894).

Appendix : Pages i to xlviii are included in Part I.; xlix to lxxvi in Part II.: lxxvii to clxiv in Part III.; and clxv to cxcvi in Part IV.

Cloth cases for binding can be obtained of Messrs. Spottiswoode & Co., price 1*s*. 3*d*.

THE JOURNAL OF THE ROYAL AGRICULTURAL SOCIETY OF ENGLAND.

Third Series.

VOLUME THE FIFTH.

PRACTICE WITH SCIENCE

LONDON:
JOHN MURRAY, ALBEMARLE STREET.
1894.

EXTRACT FROM THE SOCIETY'S BYE-LAWS

(Dating from the Foundation of the Society):—

"The Society will not be responsible for the accuracy of the statements or conclusions contained in the several papers in the Journal, the authors themselves being solely responsible."

CONTENTS OF PART I. OF VOLUME V.

THIRD SERIES.

(MARCH 31, 1894.)

Special Articles.

Official Reports.

Notes, Communications, and Reviews.

APPENDIX.

JOURNAL

OF THE

ROYAL AGRICULTURAL SOCIETY

OF ENGLAND.

ROBERT BAKEWELL.

ROBERT BAKEWELL, son of Robert and Rebecca Bakewell, was born, early in the year 1726, at The Grange, Dishley, two miles north of Loughborough, in the county of Leicester, where also, on October 1, 1795, he died, "after a tedious illness, which he bore with the philosophical fortitude that ever distinguished his character." The words here quoted, from the earliest biographical memoir, written immediately after his death and published before the close of the same year,[1] convey a guiding hint of his idiosyncrasy.

One of the memoirs of Bakewell, written within ten years after his death, describes him as a yeoman of considerable property; another, also of an early period, as the son of a farmer. The truth appears to be that his nearer ancestors, whether as landowners or as tenants, had been engaged in agricultural pursuits, and that he was the descendant of a very old and highly respectable family. The exact social position of his forefathers may not, perhaps, be of general public interest, but the offices held by some of them at different periods of the 600 years, extending over nineteen generations, through which his pedigree can be traced, suggest the inheritance of more than average brain-power, thus illustrating one of those laws of which Bakewell himself was an intelligent student.

The most remote ancestor named in the records of the family was Leverrettus, Thane of the King, and King's

[1] *Gentleman's Magazine*, Vol. LXV., Part II., 1795.

Chancellor in the reign of Henry II., presented to the rectory of Bakewell, in the county of Derby, in the year 1158. Three of his descendants consecutively were Rectors of Bakewell; and the last, on his ejectment in the reign of King John, retained the territorial name, and thus became the founder of the family. A direct descendant, Sir John de Bakewell, Seneschal of Poitou, a lineal ancestor of Robert Bakewell, was Baron of the Exchequer in the years 1322–23, and had two brothers, Sir Thomas, who represented the county of Kent in Parliament in 1321, and Roger de Bakewell, member for Derby. Four generations down the line from Sir John we find Henry, Ambassador to Rhodes in 1415; and three generations later, Thomas, having the degree of LL.D., appointed Ambassador to Brittany. It is needless to add the various Church benefices held by members of the family at different periods. Robert Bakewell, Rector of Hartingbury, was the first of five consecutive descendants bearing the same baptismal name, the last of whom is the subject of this memoir; and although the Dishley branch ended with him, the family, in its hereditary social status, is still extant. Robert, one of the sons of the Rector of Hartingbury, resided at Normanton, in Leicestershire. He had four sons, who all left issue. One of those sons, Robert, was the first Bakewell of Dishley; from what date we are not told precisely; but as he was born in 1643, and died in 1716, we may assume that an old chronicler, who indefinitely places the beginning of the connection with Dishley somewhere about the beginning of the last century, was probably not far from the truth.

Bakewell's first biographer, already quoted, says that Bakewell's father, the second Robert Bakewell of Dishley, died about the year 1760; and several subsequent writers, no doubt taking him, with or without acknowledgment, as their authority, have given that statement, by repetition, the semblance of confirmation. It has apparent support, also, from the fact that about that time *the* Bakewell began to come to the front as an experimental agriculturist and as a breeder of live-stock improved by himself. But his father, from whom, as we shall see, he derived much of his pioneering instinct, and of the enterprise which marked his character, was born in the year 1685, and died, assuredly, as his monumental inscription proves, on May 23, 1773, aged 88 years. However hale a man he may have been, he would scarcely take an active part in the business of the farm to that advanced age, but more probably at the age of 75 years, or thereabout, transferred the entire control to his able son, then in his 35th year, and qualified, by several years of participation in the management of the farm, to take it into his own hands alone.

From his father Bakewell had an excellent training for practical and experimental farming, besides many of those special mental qualities, possibly inherited either immediately from him or through him, which were manifested in his advance beyond the traditional notions and practice of the old English farmer. "His father," says the writer of the obituary notice in the *Gentleman's Magazine*, "had always the reputation of being one of the most ingenious and able farmers of his neighbourhood." According to Arthur Young, who inspected the operations at Dishley on two occasions, with the space of

Dishley Grange, as it appeared in 1790.

fifteen years between, the irrigation, which was one of the most prominent features of the Dishley husbandry, had been begun by Bakewell's father.

In *Necrology*,[1] memoirs of eminent men who died between 1756 and 1798, edited by John Lawrence, Bakewell is described as tall, broad in the chest and shoulders, with a benevolent countenance combining intelligence and sagacity. "His manners had a rustic yet polite and pleasing frankness. He spoke neatly in few words, always to the purpose, and had a store of anecdotes and stories." In politics he does not appear to have allied himself decisively with any party, or to have classed himself under any name; but the same writer tells us that "he

[1] *Necrology*: London, 1805. Article on Bakewell by "Benda." John Lawrence, in his *General Treatise on Cattle*, says: "I formerly gave the best sketch in my power of the life and character of Bakewell in a volume entitled *Necrology*."

lived and died one of the warmest supporters and staunchest defenders of liberty." He adds that one of the principal blemishes of Bakewell's character was a certain degree of acquired cunning, "the vice of his profession." The writer first quoted (in the *Gentleman's Magazine*) describes him[1] as tall, broad-set, and in later years rather inclined to corpulency, his countenance bespeaking intelligence, activity, and a high degree of benevolence; his manners frank and pleasing; well calculated to maintain the popularity he had acquired. Sir John Sinclair described him as "a person of strong natural sagacity"; and another authority as a man of unimpeachable morals, whose conversation was never disgraced with expletives.

Visitors at Dishley without exception have agreed in celebrating his generous hospitality. The doors of Dishley Grange[2] were ever open to friends and strangers alike, and the liberality of entertainment appears to have been fitly accompanied by the most genial and hearty welcome with which he received all who could show the claim of a real interest in agricultural progress.

> In appearance [says Mr. Prothero in his *Pioneers and Progress*] he resembled the typical yeoman who figures on Staffordshire pottery, "a tall, broad-shouldered, stout man, of brown-red complexion, clad in a loose brown coat and scarlet waistcoat, leather breeches, and top boots." In his kitchen he entertained Russian princes, French and German royal dukes, British peers, and sightseers of every degree. He never altered the routine of his daily life. "Breakfast at eight; dinner at one; supper at nine; bed at eleven o'clock; at half-past ten, let who would be there, he knocked out his last pipe."

The benevolence of countenance, remarked by more than one of those who have described his personal appearance, was the true index of a characteristic mentioned by many who have recorded, from personal acquaintance, their estimates and impressions of him as a man. These all concur in showing that he was eminently kiud-hearted, and that his natural kindliness made him the friend of man and beast. He was surrounded by old and attached servants, and so much disliked losing sight of a familiar face that he would not engage a farm man for a shorter term of service than four years. After spending four

---

[1] The portrait of Bakewell on horseback, which appears as the frontispiece to this part of the Journal, is reproduced from a painting in the possession of Mr. J. S. Bakewell of The Old Hall, Balderton, Newark-on-Trent, and the Society is indebted to Mr. Bakewell for his kindness in lending the portrait of his distinguished ancestor for the purpose of illustration.—ED.

[2] The woodcut on page 3 is taken from the background of a picture, by J. Boultbee (also in the possession of Mr. J. S. Bakewell), representing "the celebrated Cart Horse, the property of Mr. Bakewell of Dishley, 1790." This picture was reproduced in 1791 as a coloured engraving, a copy of which is in the possession of the Shire Horse Society.—ED.

years with such a master, the man was seldom found who desired to change his place. But the happy relations of master and servants at Dishley seem to have belonged to the traditions of the house of Bakewell, for several of the people who remained with the last Robert Bakewell to about the close of his life had lived some years in his father's service. "How long have you been here?" a visitor asked, in July, 1793, turning to William Arnold, the junior herdsman. "About twenty years" was the reply. "And you?" addressing the senior, John Breedon, who promptly answered: "Since the King was crowned, sir"—fully thirty-two years. William Peet, superintendent of the horses, said he had served the family for nearly forty years, but had been away a few years and returned to Dishley. Others had been ten or twelve years in the service.

Mr. Bakewell's kindness to brute animals was proverbial, and being in constant practice at Dishley was rewarded with extreme docility in the farm animals. Powerful bulls of terrible presence, looking the more formidable for the immense horns distinguishing their breed, were led about by mere children. One writer says he saw an animal of elephantine bulk led about with a pack-thread by a boy of seven; another, that a lad with a switch could single a bull out from his companions and guide him to any part of the farm by holding the switch to one side or the other to indicate the way; and a third had been greatly amused by a little boy, five years old, mounted upon one of the big bulls, and so guiding him with the point of his switch. Similar instances of docility, resulting from unvarying kind treatment, were noticed in the stallions; and throughout the live-stock departments of the Dishley farm confiding gentleness, as an effect, afforded the surest evidence of considerate and compassionate gentleness as the cause. On this subject Mr. Bakewell was far in advance of his day, for his generous anger was kindled instantly by the sight or report of cruelties so often practised in the times when the sufferings of the inferior animals, however discreditable and degrading to man who inflicted them, were thought beneath the notice of the law.

In quite early life, having developed to some extent his father's desire to discover or learn better methods of husbandry than those of his predecessors, and thirsting for knowledge of what men were thinking and doing elsewhere, Bakewell often left his home to travel about England, seeing the different breeds of farm stock, to find out the purposes for which the breeds severally were best suited, and the conditions under which they served those purposes; his main object, no doubt, being to ascertain what breeds would do best at Dishley. That such was his purpose appears to be indicated by the fact that after looking around him in various districts he selected a few choice specimens of different breeds, purchased and took them to Dishley. "This selection," an early writer states, "gave the original stock from which his own proceeded"; but we are not here informed whether his own proceeded from a mixture of breeds, or from a final selection of the best of those he had tested upon his own farm.

Mr. Bakewell saw much of the West of England. There he could see, carried into fairly extensive practice, the system of irrigation which his father had adopted, and which he himself was destined to extend. There, too, he found a breed of cattle—the Devon—which he pronounced incapable of improvement by a cross of any other breed. If we take this declaration in connexion with his own avowed principle of refining and reducing the bone as a means of getting a greater proportion of flesh to food consumed, and a greater tendency to fatten, may we not reasonably suggest the probability that the Devon served as his model for the improvement of the larger breed which he adopted as a breed already established in the Midlands, and perhaps as a breed capable of doing better in Leicestershire than any other breed he had tried? The same model would also serve his design of founding an improved breed of sheep, for the same principle of lessening the bone to increase the fattening propensity was applied by him to all classes of butchers' beasts. We shall see this as we come to the records of his practice and experiments.

Before, however, we consider the work for which he is reccgnised as a man of distinguished power, his improvement of sheep and cattle, we shall find a glance at his general husbandry useful in assisting us the better to gauge the man. His great prevailing idea, we should say, and that which lay at the very root and sources of his strength, was ECONOMY. If the Devon really was his model—and he assuredly admired it—he had in it economy both in structure and in the proportion of the cost to the quantity and quality of human food produced; or, say, in the return per acre. He maintained that he had secured such economy in the breeds established by himself as improvements upon all other breeds. The English farms he most admired were those of Norfolk, where he found "cheap, expeditious, and effective modes of husbandry"; the foreign farms—for he occasionally went abroad to enlarge his knowledge—those of Holland and Flanders, where he found that orderly neatness which is true economy, inasmuch as slovenly farming is wasteful. Upon the principles of management at these British and Continental farms he is understood to have founded his own system of farming at Dishley.

We find, accordingly, as we follow the testimony of the different visitors at Dishley who have recorded their impressions, most scrupulous neatness, order, regularity; ingenious time-saving contrivances; the cheapest ways of doing efficiently the ordinary work of the farm; in short, at all points, rigid economy. When Arthur Young was at Dishley, in the course of his celebrated tour through the East of England in 1770, the farm comprised 440 acres, of which 110 were under the plough. The proportions of white and root crops were generally about 15 acres of wheat, 25 of spring corn, and not more than 30 of turnips. The rest of the farm (330 acres, less the sites of buildings, the yards, watercourses, &c.) was all grass land. Bakewell is classed by Marshall as having stood first in the kingdom as an improver of grass land by watering; and from Monk's *Agricultural Report* we learn that by means of irrigation he was enabled to cut grass four times a year. Young says that his irrigation is "among the rarest instances of spirited husbandry," much exceeding anything of the kind he had seen before, even in the hands of landlords. He describes the water meadows, from 60 to 80 acres, as having been, like the rest of the country, all in ridge and furrow, covered with ant-hills and disfigured by inequalities of surface. These Bakewell had ploughed up, thoroughly tilled, and laid down again to grass with a perfectly even surface; while the old-time farmers around stared at an operation which they said was "burying good land to bring up bad," and, filled with alarm lest his overflow should "poison" their rough, untidy lands, threatened, and one chronicler declares actually commenced, legal proceedings to restrain him. "Our farmer," Young remarks, "has expended large sums in these uncommon undertakings: he richly merits the enjoyment of their profit." The meadows seen by this authority when he first visited Dishley did not, however, comprise one-half of the land—200 acres—which was eventually irrigated.

After laying down the 60 or 80 acres as already stated, Mr. Bakewell cleaned to equal depth everywhere the brook supplying the water, using the heaps and ridges of earth and sand left by the stream as filling for the hollows in its course, without throwing any out upon the banks. This process was extended to the ditches and the water conveyed to other fields away from the brook, further ditches being used to take the water off after it had flowed over the land. He did not hastily either adopt or extend his system of irrigation, but felt his way as he advanced, trying various experiments to satisfy himself of the efficacy and economy of the system before incurring further expense. Side by side he had plots of land: two plots, one watered, the other not watered; two again, one watered, the other manured; and again two, one watered from a spring, the other from the stream; so that he could form his estimates of the comparative value of irrigation as against other fertilising agencies, and of different modes of irrigation.

Mr. Bakewell's notion of economising the uses of everything within his control did not allow him to forget that water possessed other than fertilising power. One purpose to which he turned his brook was to make it a cheap and ready means of conveyance of crops of turnips and cabbages from the land to the buildings, and manure from the buildings to the land. He cut, with but little fall, a narrow, silently flowing canal, and against the cost had a large reduction of human labour and of the expense of horse-power. In the way of carrying out this improvement we have an instance of his singular ingenuity in devising cheaper and more expeditious methods than anyone else could suggest. Floating his turnips down on a flat-bottomed boat, he found that the attendance of a man with a pole was required to keep the boat from loitering on the way; so he one day hauled his boat on to the bank, discharged of its load, which went away easily with the stream and met him at the end of the barn on his return. There he placed a man to draw out the turnips as they arrived; but this plan was soon superseded by a still more self-acting method: a pit with a grate at the bottom of it, the depth of the water at its ingress to the pit being measured to the depth of the largest turnip below the water-line as it floated, so that roots thrown into the canal in the field where they grew were delivered in a heap, ready washed, down in the farmyard.

Economy in the use of straw was a great point with him, and he was strongly opposed to the practice of having it trodden down in yards, for he regarded it as of much greater value as a fertiliser after it had served the purpose of food. His stalls, therefore, were so constructed that the animals tied up could just stand upon the raised and paved floor with some difficulty, or at most with no room to spare. The refuse thus passed beyond the standing room to a lower level, and the animal lying down gathered itself up on the clean higher pavement, without litter. Barns, sheds, and other buildings were fitted up with stalls for this purpose, and the manure thus produced was kept pure. For some years Bakewell maintained that it increased in fertilising value with age, and that it should be applied in a dry, crumbled state (like peat dust); but in his later life he acknowledged a change of opinion upon this question, and made a corresponding change in his practice.[1] His conviction of the superior value of this fertiliser over the mixed contents of a straw-yard was so strong that he was willing to take in his neighbours' cattle, so far as he had room for them, and to feed them on straw without further recompense than their returns towards the enrichment of the land.

The difficulty of inducing cattle to eat up straw without waste may occur to the reader. This was overcome by giving only a small quantity at each feed. The animal, eating with a keen appetite, would not leave any, and not having at one feed fully satisfied its hunger, was always prepared to clear up the next feed to the last straw. All lean cattle in winter—from November to the end of March—had straw as their only food; young cattle requiring to be kept in a growing and thriving state, and cattle in process of fattening, straw and turnips until the turnips were finished in spring, and afterwards hay as the sole substitute for roots. Neither hay nor straw was bought, yet the cattle always looked well, and the usual numbers of the different kinds of stock upon the farm were 60 horses, 400 large sheep, and 150 head of cattle, all sorts and ages counted. More than once 170 of the latter had been wintered.

On the planting of hedges, as on every other branch of farm work, Mr. Bakewell had his own strong opinions of the way how, and how not, to do it. He preferred planting on the level, three-year old quicks, with plenty of manure. On road-making he is said to have satisfied himself that if people would only make their roads concave, instead of convex, and mend them by watering, one shilling that way would go as far as five shillings the other way! By some of his watercourses he grew willows, which were cut every seven years, peeled, and reared in a stack for making handles of rakes, forks, and other tools, and fencing for newly-planted hedges.

We have seen in the instance of his irrigated land how Mr. Bakewell tested the worth of his notions by frequent and varied experiment. He did the same in every department of the farm. This was the grand source of his power. He did not try to make facts square with his opinions, but his opinions with facts. His animals in their lifetime were often submitted to

---

[1] See Mr. George Culley's notes upon a paper entitled *Observations made at Mr. Bakewell's in* 1771, communicated by the Duke of Buccleuch to the Board of Agriculture under Sir John Sinclair's presidency, and supposed to be written by a Scotch farmer (*Annals of Agriculture*, Vol. XXVIII. [1797], pp. 588–601).

experiment to prove their rate of increase in proportion to food consumed; and after their death, to examination of the quality of their flesh and proportion of flesh to offal. But that was not all. Skeletons and pickled joints of specimens of the best of the Dishley sheep and cattle formed a little museum at The Grange, for the comparison of one generation with another, ancestors with their descendants. The degree of fineness of bone, the size and shape of the frame, the thickness of the layers of muscle, and the depth of outside fat and quantity of inside fat were thus brought under notice, and any change for the better or worse was recognised in time to serve as a guide to the breeder, to whom the animals were known, alive or dead, inside and outside. Mr. Bakewell's *post-mortem* examinations of his cattle and sheep must have helped very much to educate the senses of sight and touch for use in judging the living animals, whilst enabling him the more accurately to estimate the intrinsic value of the latter for breeding purposes by their relationships to the different specimens seen in the shambles, or represented by relics in the private museum of The Grange.

The question of the principles recognised by Bakewell has been much discussed, that of his practice somewhat warmly disputed. In the volume entitled *Necrology* (1805), already mentioned, his principles are laid down dogmatically as (1) "Like will produce like," and (2) "Animal manure the main science of husbandry," which the author says are allowed to be just; but Bakewell's application of them, he adds, was far from incontrovertible. Now we know that the first is no more a Bakewellian than it is a Shakespearian principle, for we have evidence that in many familiar passages Shakespeare recognised it two hundred years before Bakewell's day; and if an earlier reference still be required, the first chapter of the Book of Genesis may suffice. The law of reproduction after kind has been known to man certainly from the dawn of his own history. Bakewell, like other great breeders, acted upon his own observation of the workings of that law among domesticated animals, more subject to variation than animals in their free state of nature. He maintained that by the exercise of intelligent care in selecting it is quite possible "to get beasts to weigh where you want them to weigh," in the roasting instead of the boiling pieces; that the shape should give "the greatest value in the smallest compass"; that the shape which does that is correlated with a hardy constitution and great readiness to fatten; that the shape of a barrel, swelling in the middle and gently lessening towards the ends, is the true model; and that "the smaller the bone the truer the shape," and the better, consequently, the return for food consumed. The breeder, he declared, must find the best "machine" for turning the direct products of the land into products of higher money value as food for man. He scouted the old notion that the blood must be constantly varied by the mixing of different breeds, and challenged the world to show him a herd of cattle or a flock of sheep of high credit, bred on "the old system" for great bone, by the crossing of breeds, or from ever-varied blood. In his own herd and flock he showed, with natural feelings of pride and self-gratulation, the results of breeding according to "the new system," which differed from the old mainly upon those two points—small *versus* large bone, and permissible in-breeding *versus* perpetual crossing with strange breeds or strange families. In these two points we have the heart and marrow of his practice as a breeder, and upon these questions he was ever ready to maintain his position in friendly discourse.

Biographical faithfulness obliges us to consider the evil as well as the good associated with the name of Bakewell by writers whose own names are respected, and whose opinions and works are recognised as authoritative. Lightly-written detraction we may promptly dismiss. We read:—

> The mystery with which he [Bakewell] is well known to have carried on every part of his business and the various means which he employed to mislead the public induce me not to give that weight to his assertions which I should do to his real opinion could it have been ascertained.[1]

The words here reprinted are those of Sir John Sebright, in his letter on breeding, quoted by the Rev. Henry Berry in the first letter of his series upon the state of some of the improved breeds; and they are introduced by Mr. Berry, with the comment that they would show why he had preferred to look to Bakewell's *practice* rather than to what was said to have been his *declaration.* By the doubt thus cast upon Mr. Bakewell's word, Mr. Berry saws off the bough upon which he sits, and falls with it. He bases his argument upon the breeding of animals *as declared by Mr. Bakewell*, and calls that "Bakewell's *practice*." Having thus laboured to prove his own foundation false, he proceeds to show that Bakewell's system was not one of close and exclusive in-breeding, as was commonly supposed, but that it was a system of breeding mostly within his own herd and flock, occasionally from closely-related animals, and occasionally, also, from unrelated animals. His analysis is careful, and his reasoning upon it sound. The unsoundness is

[1] *British Farmer's Magazine*, 1827, Vol. I. p. 290.

down below, for he wastes his pains, because he has started with the assertion that Bakewell's declaration is unworthy of trust.

The case stands thus: Mr. Berry had declared against close in-breeding. Mr. Bakewell had declared in favour of in-breeding, and had referred to the in-breeding practised by himself. Mr. Berry does not call that, as stated, the degree of in-breeding to which he objected; and if he had kept his hands off the reputation of Mr. Bakewell, who had died many years prior to Berry's controversy upon the subject, his position would have been a strong one. His argument stands or falls according to our faith in, or doubt of, Mr. Bakewell's word.

Of the justice, or unintended injustice, of Sir John Sebright's remark we can judge only from balance of evidence. *Primâ facie*, it seems probable that if Mr. Bakewell desired, as Sir John says, "to mislead the public," he would have put his declaration of practice and his declaration of opinion, in perfect harmony, upon one common level of falsehood. If Sir John had confined himself to a single and specific charge against Mr. Bakewell, the answer would have been less obvious than it is. But his all-round charge of duplicity is too much. It dies of plethora. It affects the whole character of the man, of whom we have a very different account from his most trustworthy contemporaries.

There was one early writer, however, by whose statements, possibly, Sir John's estimate of Bakewell's character may have been unfavourably influenced. The author of the memoir of Bakewell in *Necrology* (before quoted; see note, page 3) thus writes:—

A sort of monopoly was created among the fraternity of improvers, who adopted all the arts, and put in practice all the tricks, of jockeys and horse-dealers. Sham contracts were made by purchasers at wonderfully high prices; puffers were regularly engaged to spirit up the buyers at auctions; and a young lord or gentleman, with his pockets well lined and his senses intoxicated by the fumes of improvement, was as sure to be imposed upon by these as by the gentry at Newmarket. The pens of itinerant agriculturists, whose knowledge of live-stock originated merely in their writings about it, now took up the cause and blazoned forth the transcendent qualities of the "New Leicesters." In consequence of this the country began to consider these oracular decisions as orthodox. Not so the town. The sages of Smithfield, before whom the fatted animals of all counties pass in hebdomadal review, and who try the merits of all by the unerring standard of the balance, although they were compelled to purchase the commodity, never approved the *barrel shape*, or the Dishley improvements. They pretend at this hour that the original breed was more advantageous in point of public utility than the new one; and that the Lincoln, a branch of the ancient family of Teeswater, is, in respect of form, superior to all. They do not even scruple to assert that the feeding of Dishley sheep has never fairly repaid the cultivator, Surely "the cultivator" himself ought to be at least as good a judge on this point as "the sages of Smithfield," or as "the town." Even "the unerring standard of the balance" is unerring only so far as the *weight* of the product sent to market is concerned. The *quality* is proved by other tests, known alike to producer and consumer; but the *cost of production* is best known to the producer. The strictures of Lawrence or of "Benda," stripped of a certain amount of mock-loftiness of style and affectation of smartness, are reducible to little more than another old writer, scarcely observed because of unobtrusive manner, has said, to the effect that Bakewell's conduct was in some respects unpopular, and that the measure most so was the establishment (with its rules) of the "Tup Club," or Dishley Society, which was condemned, he adds, "exactly in proportion to the rise in prices." [1]

The Dishley Society, an association (founded in 1783) for the preservation of purity of breed, had also the object—perhaps we should call it the primary object—of protecting and advancing the interests of the breeders of improved stock. They, at the cost of much time and pecuniary capital, had raised the standard of merit in the flocks of the country; they had established a breed capable of widening incalculably to other breeds the circles of improvement; and they had a just claim to recompense for their outlay and their time and skill. The club, therefore, was formed. Whether its proceedings, and those of its agents and friends, were always such as the enlightened and sensitive conscience could approve, or whether the meaner tendencies of human nature were sometimes exemplified in its transactions, and, if so, who were to blame, we cannot at this distance decide; but we can scarcely hesitate to allow that the existence of the club was justified by the certainty that the pioneers of improved breeding would be heavy losers unless they combined to protect themselves.

The Society flourished. Prices rose. Envy and jealousy rose with prices. Hence the attacks upon the associated breeders, and charges, possibly much exaggerated, of unfairness in the means employed to keep up the prestige of the new breed. Bakewell, the foremost man, was necessarily singled out as the man most responsible for the alleged knavery of the Dishley coterie, and his name more than any other is consequently associated with discreditable practices. But when we remember that men of the mental and moral type of Arthur Young were Bake-

---

[1] *Husbandry of Three Celebrated Farmers*; section on Bakewell. London, 1811.

well's friends and visitors, and that they have left on record respectful impressions of his character and work, we may discount most of what we read about Newmarket "gentry," jockeys' trickery, and the hired pens of those "itinerant agriculturists" who presumably were more familiar with the sound of Bow Bells than with the lowing of oxen and the bleating of sheep.

It appears that even before the days of railway trains, telegraphs, and cheap newspapers there was a class of hangers-on about the press, eager to "write up" a ram-letting or assist a prospective sale. If persons of that class sometimes sought interviews with Mr. Bakewell and his brother-breeders and followers, and from hospitable men, proud of their flocks and herds, obtained material for occasional notices, we can readily account for the development of a "mystery" about the Dishley system of breeding. The results of that system were sufficiently wonderful to support any hints of hidden knowledge and secrets of practice which such persons would be likely to assume as the only possible explanation of those results. To such questioners, and to farmers who came to him in the pride of deep-rooted prejudice as superiors, accounting him a man of new-fangled notions, Mr. Bakewell might not care to be very particularly communicative. But to men like Young, Holt, Nichols, Monk, and Marshall he evidently unfolded his views very freely. It is difficult to harbour the idea that he concealed either his real opinion or his real practice when we read their accounts of their visits to him at Dishley.

Bakewell's success, great as it was in one branch of his work as a breeder, cannot be compared with the success of his incalculably great work as the leader in the art of improvement by a new system. His most distinguished success, unquestionably, as a single breeder, was in the production of the Dishley or New Leicester sheep. The origin of the breed is usually regarded as uncertain. Professor Low says: "All presumption is that the basis of Bakewell's breed was the long-woolled sheep of the Midland counties, from which he may be supposed to have made such selection as suited his purpose." Young and Culley, however, who both had exceptionally great opportunities of learning the truth, concur in giving prominence to the Lincolnshire element in the origin. Bakewell himself admitted to Mr. Chaplin (as Low states) that at one time he had used Old Lincoln rams. What is meant by the term "the Old Lincoln breed" in Bakewell's day is a question quite worth asking. The Lincolns bred by Mr. Chaplin, Bakewell's contemporary, were certainly large sheep. From a passage, however, in the inaugural address of Sir John Sinclair, in

Edinburgh, to the Society for the Improvement of British Wool, established January 31, 1791, we gather that all the large breeds of English sheep were then of recent introduction, within half a century before that date, and therefore only newly imported or newly developed breeds when Bakewell began his work of improvement. Young says of the Dishley sheep: "The breed is originally Lincolnshire, but Mr. Bakewell thinks, and very justly, that he has much improved it." Culley, who, like Young, knew Bakewell at home and watched the development of his flock, describes the improvement effected in "a certain variety of the Lincolnshire," and promptly explains that he means the variety "first selected by Mr. Robert Bakewell, of Dishley, in Leicestershire, who, with singular discernment and great attention, has raised a breed of sheep unknown in any former period, and which surpass all other breeds in their propensity to get fat, and in paying the most money for the quantity of food consumed." He then describes the distinctive peculiarities of the breed, in its differences from other longwool breeds—the fine lively eyes, clean head, straight, broad, flat back, the barrel-like form of the body, fine small bones, thin pelt, and inclination to fatten early; the mutton, fat, fine-grained, and of superior flavour; wool averaging 8 lb. a fleece, and in length from 6 to 14 inches; wethers killed to best profit at two years old, when they made from 20 lb. to 30 lb. a quarter; if kept longer they get too fat for what he calls "genteel tables." James Bolton's three-year-old wether of this breed, killed at Alnwick, Oct. 20, 1787, cut straight through the ribs without any slope, measured $7\frac{1}{8}$ inches of solid fat, and had a back like the fattest bacon, from head to tail. This shows the character of the breed several years before Bakewell died, and within how short a space ot years Bakewell's will and judgment had prevailed to produce properties "unknown in any former period." No wonder the man was looked upon as a magician, possessing a secret which he would not impart to anyone.

At the time when Culley wrote, the weight of wool had been less an object than the quantity and quality of mutton obtained at the least expense of food. The next point, he suggests, for rural philosophy to obtain would be the increase in the value of the fleece. Bakewell, according to his custom, had just stuck to his main design.

In another place Culley, writing on the old Teeswater breed, records the rapidity with which it was improving from the introduction of Dishley rams. The improvement was not only in the flesh and fattening properties, but also in the wool; for whilst the fleeces were not so heavy as those of the large old breed, more wool per acre was grown. That was an illustration of one of Bakewell's points—the economy of his system—not the weight of the single animal, but the aggregate weight returned for so much grass. Young, however, says that Bakewell's sheep were individually as weighty as the individuals of nine-tenths of the sheep in the kingdom; and "his wool," he adds, "is equal to any." Marshall (in *Georgical Essays*, 1803, p. 386) shows that the breed was not greatly deficient in wool, wethers' fleeces generally going at the rate of 4 to the tod (of 28 lb.), and those of ewes about 4½—say, wethers' 6 lb. to 8 lb., ewes' 5 lb. to 7 lb.

The last-named authority also gives a minute description of the Dishley or New Leicester sheep, which is here selected from among many other descriptions for comparison with Culley's, as no two men were more competent than Culley and Marshall to describe the breed, and none, probably, have taken greater trouble to do so accurately and intelligibly. Marshall[1] takes his notes from "superior individuals, especially ewes and wethers, in full condition but not immoderately fat." Head long, small, hornless; ears somewhat long and standing backward; nose shooting forward. Neck thin, clean towards the head, but taking a conical form, standing low, and enlarging every way at the base. Fore-end altogether short. Bosom broad; shoulders, ribs, and chine exceedingly full. Loin broad; back level. Haunches comparatively full towards the hips, but light downwards, and altogether small in proportion to the fore parts. Legs ("at present," he expressly interposes, as if a new variation were probable) of a moderate length, with extremely fine bone; and the bone throughout remarkably light. Pelt thin; tail small; the wool shorter than longwools in general, but much longer than the middle wools, the ordinary length of staple 5 to 7 inches, varying much in fineness and weight.

Upon the question of utility of form, Marshall considers that the most distinguishing characteristic of the breed, the weight of its fore quarters, is contrary to the general principle of improvement, as legs and saddles, not shoulders and breasts, are the favourite joints. But, on the other hand, he quotes the arguments of the New Leicester breeders, that "eaters of mutton are of the poorer class," and the increase of their supply is the great object in view. Also, that in proportion to bones and other offal a greater weight of meat may be grown upon the fore quarters than upon the hind quarters. His description of one peculiarity must be quoted *verbatim.*

---

[1] *Georgical Essays*, Vol. XX. p. 386

"The carcass, when fully fat, takes a remarkable form, much wider than it is deep, and almost as broad as it is long; full on the shoulder, widest on the ribs, narrowing with a regular curve towards the tail; approaching the form of the turtle nearer than any other animal." He remarks, moreover, as another distinguishing character, the smallness of bone in this breed compared with the old sorts, not of the legs only, but ribs and other bones. He had seen the rib of the New Leicester compared with that of the Norfolk sheep, the latter nearly twice the size of the former, the meat on the former three times the thickness of that on the latter, showing a very remarkable difference in the proportion of meat to bone.

The Dishley rams, Marshall observes, were often grooved along the middle of the back, and he refers to the belief that this was an evidence of the best blood. The notion, like many other popular fallacies, had a long life, for in the year 1830 Mr. John Wright, of Chesterfield, in his prize essay on sheep, presented to the Manchester Agricultural Society, took pains to show that the cloven back is not a mark of merit but rather the reverse. He, too, has remarks upon Bakewell which are perhaps sufficiently instructive for repetition in substance here. He takes the Leicester as the breed of sheep which had attained to early maturity in the highest degree, and asserts that under Bakewell's masterly management the breed had reached a height of perfection never exceeded since his day (he wrote 35 years after Bakewell's death); but how the original improvement took place was a question of imperfect history, "authors" having differed widely in their opinions, and Bakewell himself having failed to record the process. His most intimate friend, however, his most frequent travelling companion, had preserved the information that it was by selections from the Lincolns without any other cross. At one period, Mr. Wright says it is well known, Mr. Bakewell's sheep had become too small, fine, light-woolled, and what he calls "effeminate," a term by which, probably, he means that the masculine character of the ram had been lost. He assumes the probability that Bakewell effected the refinement from the coarser original type by the constant use of light-boned under-sized rams. The sure result of very long perseverance in this process would be that which he says actually occurred—diminution of the average size of the sheep of that breed. It is quite possible, too, that in the effort to realise and to fix his ideal form Bakewell had sacrificed somewhat of the character peculiar to the male sex. Mr. Wright infers that "perseverance in the means which had been at first adopted for the improvement of large sheep did not preserve them in that improved state."

The statement immediately following is worthy of notice: "But at this juncture Mr. Bakewell, with his usual ability, made a judicious cross, and thereby produced a very great amendment. At his death he left two distinct characters of sheep, which breeds have been continued with various degrees of success by many very eminent agriculturists until the present day. The former sheep were called the Dishley, or New Leicester. But since the latter improvement took place, which has been designated the Improved, or New Leicester, the former are commonly called the Old Leicester." Mr. Wright proceeds to say that it is uncertain how that last improvement was effected, "as the secrecy with which every experiment was conducted by that able man is notorious." It scarcely could be otherwise. Mr. Bakewell was one of those men who would learn as long as he lived. *That* was the *secret*—the secret of his ability. Born at a time of great ignorance upon the subjects to which he early devoted his attention, he spent his professional life mainly in feeling his way out of darkness into light. Many of his experiments, in all probability, were neither expected nor intended by him to give improved results. If they answered certain questions in his own mind, they satisfied him; they gave him what he sought—an item of knowledge required. Step by step he must have toiled to gain the mastery of his art.

To the foregoing descriptions of the Dishley sheep we must just add Young's opinion and statement that better-made animals than Mr. Bakewell's rams and ewes could not be seen—bodies true barrels, backs broad, legs not more than 6 inches long, and fat on ribs just within the forelegs (where common sheep are never examined, because they carry none there), indicating the kindly tendency of the Dishley breed to fatten. This may be instructively compared with the following measurements recorded by Young:—

I have this day measured Mr. Bakewell's three years old ram, and find him as follows:—

	feet	inches
His girt	5	10
His height	2	5
His collar broad at ear tips	1	4
Broad over his shoulders	1	11½
Ditto over his ribs	1	10½
Ditto over his hips	1	9½

Dishley, 17th March 1770. H. Sandford.

This day measured a two years old barren ewe:—

	feet	inches
Height	1	11
Girt	5	9

Breast from the ground, the breadth of four fingers.

N.B.—I would have measured her breast but for a fall of snow.

Dishley *ut sup.*—H. S.

An anonymous writer, perhaps borrowing from one of the authors whose names appear, observes very truly that the quiet disposition of the Dishley sheep was favourable to their maturing and fattening at less cost than other breeds.

Vague, rambling stories about the crosses introduced by Bakewell into the composition of the New Leicester sheep very probably had their flimsy foundations in the sight of mixed breeds and crosses presented to strangers who went to Dishley and were taken into the fields to see the various agricultural improvements. Bakewell's rule, we learn from several sources, was to introduce his animals to his visitors always in the yards and buildings, and not in the fields. But besides the animals shown there were others out at grass, some which were not worth showing—ordinary farm stock. Among these, no doubt, were animals under experiment, which sometimes were shown to privileged friends, not to any casual caller. One who went over the farm saw a miscellaneous lot, including three sheep (which must have been pointed out to him and their history told), all the produce of "a Ryeland ewe," by which the visitor who tells the story may mean, perhaps, three different ewes all of the Ryeland breed. One was by a Ryeland ram, one by a Spanish ram, and one by a Dishley ram; and the difference was very great, the offspring of the Dishley sire being far superior to either of the others. This was probably an experiment, not with a view to a further infusion of strange blood into the Dishley breed, but to prove to the satisfaction of Mr. Bakewell himself the comparative merits of different crosses; testing the worth of the Dishley sheep for crossing other breeds.

Another experiment, seen by a friend of Bakewell's, was tried with five or six pure Dishley ewes turned out into the highways at May Day for a summer's range there without other food. The roads were narrow in those days, and the hedge-sides were bare; yet the ewes, at the close of their term of probation, were in excellent condition—nearly fat.

That experiment, probably, was intended by Bakewell to serve as one of the illustrations of a theory which he seems to have held from about the beginning of his experiments to perhaps the close of his life. Young mentions it in both his 1770 and 1785 notes on visits to Mr. Bakewell at Dishley. It was this: "The poorer the land the more it demands a well-made sheep"; that no land was too bad for a good breed of sheep; and that in places where a large-boned animal would be almost useless, a well-made one of smaller bone would do well. This opinion he was prepared to support by a moderate wager, "that his own breed—each sheep of which is worth several of those of poor sorts—would do better on poor soils than the stock generally found on them." This, no doubt, is true, certain conditions granted; and attentively examined it enables us the better to understand what Bakewell's work really was, and to appreciate his improvement. It was improvement obtained not so much by what he put into the animal as by effective modification of the animal's structure; not so much by generous feeding (although he kept his best breeding-stock in high condition) as by the production of an animal capable of turning any food into the most profitable product. You cannot eat bone, he argued; therefore substitute for bone the muscle and fat which you can eat. The same cost of food for your stock will give you either bone or flesh, and the food diverted from the production of the one can be directed to the production of the other.

The advance of improvement upon Bakewell's lines, since Bakewell's day, and the application of his system in the modification of many breeds, have opened and solved further questions. Whilst we still grant that on the poorest lands the stock may be improved *up to the sustaining capability of the land*, we are obliged by the overwhelming proofs afforded by later experiment to qualify the theory of Bakewell. If a breed of cattle, or of sheep, so highly improved that it can do full justice to the richest land, be kept through several consecutive generations with no better support than that of very poor land, much of the improvement is wasted and lost. The quality of the breed drops down to the level of the quality of the land.

Arthur Young, on the occasion of his second visit, in 1785, records an experiment conducted by a young Russian living at Dishley, Bakewell not having time to attend to it himself. On March 19 six rams, respectively of the Durham, Wilts, Norfolk, Dishley, Charnwood Forest, and Herefordshire breeds, were weighed, tied up in the sheep-house, and fed on turnips, their food weighed to them, and they again weighed at the end of the experiment on April 2. Particulars of the results as given by Young are incomplete, but the incident seems worthy of this notice as showing Bakewell's habit of acquiring knowledge, even to a late period of his life, by experiment, and not merely by rough guessing.

Bakewell was opposed to the practice of folding. Of the health and comforts of his flock he was most careful. We read that his sheep were kept as clean as racehorses, and were sometimes put into body-clothes. On the subject of foot-rot he had opinions based upon his personal observation. He thought it was caused only by *floods*, never by wetness from rising springs, nor from rains which do not *flow* over the land ; and he ascribed it to what he termed the "slashy" nature of the grass grown under flowing water. One of the facts he had noted was that the flooding was not followed by lameness before the end of April, and that after the middle of May, and through the summer, the disease came, as surely as ever effect followed cause, after the water had been turned on the land. He was so certain of this that in a manner highly characteristic of his habit of turning misfortunes to useful ends, if not quite consistent with his kindness of nature, he made use of his discovery. When his best-bred sheep, superannuated, were to be fed for the butcher, and he thought he had reason to fear that the purchaser would resell them to a breeder, he simply flooded a field or two, confined them to that part of his land in the summer, and invariably found them, when fat, in a sufficiently advanced state of foot-rot to prevent their transfer from butcher to breeder.

The story of "Bakewell's black ram" is purposely excluded from the foregoing scraps of tradition about the origin of the Dishley breed of sheep. Mr. Valentine Barford, for whose flock unbroken descent from that of Mr. Bakewell was claimed upon the evidence of a carefully-kept private register of pedigree, referred to it in his controversy with the Rev. Henry Berry in 1828, saying that at that time more than fifty years had passed since Mr. Bakewell, as stated by Mr. Astley,[1] had used his black ram, yet no breeder's flock had produced more black lambs than his (Mr. Barford's) own flock, although none of them had been retained for breeding. Mr. Barford had interbred his flock very closely from that of Mr. Joseph Robinson, one of the members of the Dishley Club from its foundation in 1783, and Mr. Robinson's flock had been as closely interbred from Mr. Bakewell's. This allusion to the existence and alleged use of the black ram at Dishley may suffice for the present purpose of recording, without prejudice, a statement believed

[1] The authority mentioned by Mr. Valentine Barford, I presume, was Mr. Bakewell's neighbour, Mr. Richard Astley, of Odstone, one of Mr. Bakewell's associates as a prominent breeder, and one of the founders of the Smithfield Club in 1798.

by at least the one breeder most lastingly interested in the purity of the Dishley breed of sheep.

Mr. Bakewell, as already shown, had rams of many breeds upon his premises, but we have no authentic record of their use, otherwise than for experiments outside the New Leicester flock. On one occasion, as told by the Rev. Henry Berry, he obtained, surreptitiously, from the shepherd at Holkham a couple of Norfolk rams, during Mr. Coke's absence, and when Mr. Coke, who exchanged visits with Bakewell, next called at Dishley, there was the expected parade of the splendid Dishley rams, which were led out, as usual, from their house; but after them, by way of contrast, a sight for which the visitor was scarcely prepared. Each wearing a neck-collar, his own two formidable-looking Norfolk rams, with thick spiral horns, black faces and legs, high-carried heads, and long bodies, were led past. "At a given signal, away they bolted, at the top of their speed, each clearing the hurdles in high style, and then, returning, accomplished the same feat." No one enjoyed the practical joke more than Mr. Berry's informant, Mr. Coke himself.

One of the many anecdotes of Mr. Bakewell illustrates the estimate of the value of his sheep in his own time and neighbourhood. A Dishley ram, already let for 25 guineas for the season, had not been delivered to the hirer, when a farmer of the old type of the district took a great fancy to that particular sheep, and wished to buy him. Mr. Bakewell, knowing his man, readily offered to sell the ram to him for twenty-five shillings. The farmer, as promptly, said he would give him eighteen shillings.

Mr. Bakewell's inspection of the Old Lincoln flock of Mr. Chaplin, in the year 1788, in the owner's absence, had a less pleasant sequel than his dealings with the shepherd at Holkham when Mr. Coke was away. An angry correspondence ensued.[1] The personalities, the charges, retorts, and explanations are somewhat sad reading when more than 100 years are past and gone. Bakewell's style of letter-writing does not tell us much more of him than we know from other sources. It is no better, nor perhaps worse, than might be expected of a man of his day and vocation. That part of the correspondence which most concerns us, in examining his work as a sheep-breeder, is the passage of Mr. Chaplin's letter in which he says:—

---

[1] The letter of Mr. Chaplin to Mr. Bakewell and Mr. Bakewell's reply are printed in a foot-note to Professor Low's account of the Old Lincoln breed of sheep in *Domesticated Animals*, &c.

> The small sheep that have no cross of the Durham kind, which you have had the address to impose upon the world, without size, without length, and without wool, I have always held to be unprofitable animals ;

and the answering passage in Mr. Bakewell's, saying—

> And now I take the liberty of asking you to explain what you mean by "sheep without size, without length, and without wool," which you say I have "had the address to impose upon the world";

and continuing, in one long, gasping sentence, to inform Mr. Chaplin that he, Mr. Bakewell, was fully persuaded that ten rams without a Durham or any other cross had been in that same season let "for 1,000 guineas more than the same number of the true Old Lincolnshire breed, of the long staple," &c. The same sentence goes on through several more lengthy clauses, of which the extracted cream is the assertion that some of the highest-priced of those rams had gone into the counties of Lincoln and Nottingham, to breeders who had used Dishley sheep for twenty years, and had already offered, for future seasons, higher prices than they had yet paid, and might surely be supposed to be capable of knowing the value of the sheep which Mr. Chaplin had "always held to be unprofitable animals." Here Mr. Bakewell has fairly run himself down to a full stop, after which, in two short sentences, he asks whether, unless to their own interest, they would persevere, and observes that his own address must be extraordinary to impose upon such men against their interests and long experience.

The ram-lettings, which Mr. Bakewell is said to have been the first to establish as a recognised trade, began in a small way. In 1760 rams were hired for a few shillings for the season; ten years later prices varied up to 25 guineas; and within a few years Mr. Bakewell's aggregate was declared to be 3,000 guineas for rams hired from him in one season. His celebrated ram, Two Pounder, was let one season for 800 guineas in cash, with reservation of his use to Mr. Bakewell for one-third of the total number of ewes specified in the contract, which was reckoned as making the payment equivalent to a rent of 1,200 guineas. The enormous prices obtained by other breeders belong rather to the history of the breed than to a memoir of its founder.

The shows of the Dishley sheep in the hands of Mr. Bakewell and his followers and supporters began annually on June 8 (Marshall states), and lasted nominally until Michaelmas, or until all the rams offered were let; but on October 10 the private shows closed with a public sale and letting. For a few weeks after those shows began each breeder kept open house. But few rams were sold compared with the numbers let. The principal ram-breeders saved 20, 30, or 40 ram lambs, which were "chosen more by blood than by form," weaned in July or August, and then indulged in keep to the utmost and "pushed forward" for show. Each of the principal breeders, by common consent, showed forty rams, one-shear to five-shear, comparatively few being serviceable after that age, although some retained their vigour to the sixth or seventh year. Even at that age, Marshall remarks, decay is not *natural*, but is brought on by unnatural fatness. The ewes are prolific to a greater age. The females, however, of this breed enter the stage of decay sooner than those of other breeds, because they enter the stage of fatness sooner. In the choice of rams, some farmers observed a distinction between sheep suitable for ram-breeding and those for wether-breeding, the former "cleaner and finer," the latter having more strength. Some breeders refused to recognise this difference, and Marshall held that if there was no danger of breeding too fine they were right. From this remark it would appear that they took the more refined rams as sheep of the higher and truer improved type. Their wether-breeding could be adjusted, if more strength were required, by the choice of coarser ewes for that particular purpose. But Bakewell, as we have seen, left two types of sheep, the finer, and the stronger, the latter established late in his life.

Bakewell's work of improvement in cattle, as most probably also in sheep, was expended upon what we may truly enough call the breed of his own district. As in his sheep-breeding, whatever crosses he may have taken, he certainly took the Longwools, already introduced, and perhaps we may say established, with local variations, as the prevailing race of sheep in his own and neighbouring counties, so in his cattle-breeding, however far he went to bring together different branches of the breed, he took the Longhorn, the prevailing breed of the Midlands, when he began his work of improvement.

The material he had to work upon, however, was already greatly improved from the flat-sided, coarse-shouldered, old Longhorn of Ireland and the western side of England, a slow grower, slow mover, light in the hind quarters and lean-fleshed, a fair but not extraordinary milker. That breed, in some parts of the North of England, particularly in North Lancashire, the adjoining part of Westmoreland, and the Craven district of Yorkshire, had risen to a considerable degree of excellence, both as a beef breed (time allowed) and for dairy purposes; whilst successively in Derbyshire Sir Thomas Gresley, of Drakelow, and in Warwickshire Mr. Webster, of Canley, had also effected much improvement. The reason why these two names stand out in the history of the Longhorn as an improved breed is perhaps questionable. Without detracting in the least from the excellence of their work, as compared with anything else in the same direction done in those days in the Midland counties until Bakewell came upon the scene, we may be allowed to doubt whether they excelled some of the forgotten breeders in the Northern counties. The bull Bloxedge, called by Youatt the Hubback of the Longhorns, was the son of a Lancashire sire. Thirty or forty years ago Lunesdale retained traditions which have nearly died out with old inhabitants whose memory reached back to their childhood, when their grandfathers in the chimney-nook told of the grand herds of Longhorns all up that valley and on the fell farms of Barbon and Casterton and all through the dales over Skipton way. "The Craven heifer," as portrayed on the board swinging over the doorway of many a village hostelry, displayed a degree of *embonpoint* worthy of Canley or of Dishley. But the signboard painter came again, and went, and as his American prototype in *Rip van Winkle* had dexterously metamorphosed "The King's Head" into that of the immortal Washington, the Yorkshire artist, although he left behind him, indeed, the name unaltered, had "touched up" the white back and brindled sides to a bloomy roan, and for the old-fashioned horns had substituted a dainty little pair of a waxy-yellow colour.

The original portrait may be supposed to have represented, with or without exaggeration, the Longhorn of the North of England at the time when Robert Bakewell founded his herd by the purchase of two heifers from Mr. Webster and a bull from Westmoreland. From these pure Longhorns he bred the whole of his herd; but how many others he ever had as tributaries of different but equally pure blood we have no evidence to show. The writer is not aware of the existence of any evidence to show that he crossed his Longhorns at any time with another breed. There are, however, in the imperfect records of some of his Longhorn pedigrees which have come down to us through Marshall blanks which possibly may be filled by Longhorns unrelated to his original three. One of the Canley heifers was Comely. She was slaughtered at the age of twenty-six years, and historically is known as Old Comely. Some parts of her were seen in pickle at Dishley, years after her death, among Mr. Bakewell's relics of his most remarkable animals, and it is recorded that the fat on her sirloin was four inches thick. The celebrated bull Twopenny was a son of Old Comely, and of the

Westmoreland bull. Arthur Young, writing in 1771 of his tour in 1770, says he then saw Twopenny, a very big bull, most truly made, on the barrel principle, circular, but broad across the back. Mr. Bakewell would not take 200 guineas for him. He had several cows for which he would not take 30 guineas each. The fee for Twopenny (at home) was five guineas, but his sons were let out for the season at rents varying from five to thirty guineas. In describing his visit to Mr. Bakewell in 1785, Young noticed in the cattle considerable "improvement," which in these days would be questioned. It consisted in the enormous development of masses of fat over the hip-bones and at the end of the hind quarters. Whereas Mr. Bakewell had been formerly contented to grow beasts heavy in the hind quarters, he had not until recently attempted to produce those excrescences of fat. Now, he had produced a remarkable disposition to fatten on those parts; "and I measured"—Young proceeds—"the hip-bones of one buried in a mound of fat 14 inches in diameter," with other protuberances to match, "yet she has a calf every year."

A bull named D., doubly grandson of Twopenny, and otherwise closely in-bred, was allowed to be a still better bull than Twopenny, and he became the sire of the celebrated Shakspeare, bred by Mr. Fowler, of Rollright, from a daughter of Twopenny, thus further complicating the much-entangled relationships. Shakspeare was the bull described by Marshall (whom Youatt quotes) as a striking specimen of natural varieties. Although so closely in-bred from the original purchases of Mr. Bakewell, "he scarcely," Marshall observes, "inherits a single point of the Longhorn, his horns excepted." In the description which follows, Marshall mentions "some remarkable wreaths of fat formed round the setting on of the tail; a circumstance which in a picture would be called a deformity, but as a point is in the highest estimation." Thus Marshall agrees with Young in regarding this gross extravagance of the development of fat as desirable. The difficulty had been, up to Bakewell's day, to breed animals disposed to fatten readily. The reaction from Bakewell's too ample results of his efforts to overcome that difficulty had not then begun.

An anonymous journalist, writing his impressions of Dishley soon after Mr. Paget's sale in 1793, says: "The famous white bull is a noble animal, but I found there were many who preferred that sold at Mr. Paget's sale." This man's style is more that of a town newspaper reporter than of one expert in the matter of live stock. The description as "white," therefore, may be taken for what it is worth from such a source. Possibly a large proportion of white, as compared with the characteristic Longhorn colours and marking on the sides, may account for the use of the term. The same writer records a remark of Bakewell's that "the only way to be sure of good offspring is to have good cows as well as good bulls." He mentions also a heifer, sold at Mr. Pearce's sale for 80 guineas, as being valued when driven through Leicester at 8 guineas by a party of farmers in the street.

John Lawrence gives, as seeming to accord as nearly as possible with Bakewell's ideas, the following general description of the Dishley Longhorns. Round, tight, cylindrical carcass; wide in the hips, but very little prominence in the huckle-bones; straight back, well filled behind shoulder; neck long and fine, without any superfluous skin or dewlap; horns long, taper downwards, and of a deep yellowish colour; head fine and smooth. The barrel form, gradually tapering towards the ends, was the model, as in sheep. Another authority says that his Longhorns, like his sheep, were remarkable for the fineness of their bone, and for their flesh. Marshall describes a rich mellow touch when lean, firm when fat.

Youatt, taking Marshall's remarks upon the principles of breeding as no doubt faithfully representing Bakewell's views, although Marshall, with commendable delicacy towards Mr. Bakewell, introduces them with the explanation that he does not intend to deal out Mr. Bakewell's private opinions nor to attempt to recite his particular practice, draws from them the inference that Mr. Bakewell kept four principal points steadily in view: (1) breed; (2) utility of form; (3) quality of flesh; (4) propensity to fatten, the three latter depending upon the first, and really comprised within it. Marshall's words are certainly suggestive of inspiration from Dishley; and this impression of the source of their substance is confirmed by the remarks of those other writers who, like Marshall, had frequent access to the same source of knowledge. Utility of form included fineness of bone, light offal, and the greatest weight in the best parts. Propensity to fatten, at first favourable, when excessive became unfavourable to the production of the best quality of flesh.

One of the uses to which Bakewell turned his three-year-old heifers was an example of his prevailing notion of economy throughout his business, whether in the form of an animal, the feeding of stock, the use of straw, the saving of labour, or any other way in which the most could be got out of the least. His heifers, in later years, were made to do the draught-work previously done by oxen. They lived on straw, and as soon as ready for breeding were put into the team, bringing their first calves when they were well forward in their fourth year. As the Dishley Longhorn was not an early-maturing breed, an earlier age was considered too soon for the health and strength of both the calf and its dam. Bakewell would not have taken 120 guineas, he said, for one of his teams of six "cows"—or heifers, if we must so call them until they become mothers.

Bakewell tried many experiments with cattle, as with sheep, to ascertain the return for food consumed, testing his own with other breeds. With regard to these experiments, the results being in favour of his own, he certainly did not seek publicity, and Young doubtless followed Mr. Bakewell's own sentiments in his reason for withholding the facts of which he had full knowledge. "Accuracy in such experiments," he said, "is impossible, from differences in certain beasts in feeding, fattening, &c. Besides, even supposing accuracy, other people would not give credit to such comparisons unless the breeders of each had selected specimens to represent their different breeds in the trial; nor does Mr. Bakewell's breed want such experiments to recommend them." High condition was the rule of the breeding herd at Dishley; but this, no doubt with much truth, was by Mr. Bakewell declared, and by Mr. Young believed, to be due to the superior breed of the animals, their hereditary fineness of bone, and correlated disposition to fatten rapidly. Young says: "The general order in which Mr. Bakewell keeps his cattle is pleasing; all are as fat as bears." Again he remarks: "If the degree of fatness in which he keeps all these cattle be considered, and that he buys neither straw nor hay, it must appear that he keeps a larger stock on a given number of acres than most men in England." Lawrence, in a less friendly tone, writing after Bakewell's death, says: "His animals were made to look well by high keep," and significantly adds that Bakewell himself had "shrewdly observed that 'the only way to have capital stock was to keep the price high.'" The prices, however, with which Bakewell appears to have been satisfied were generally very moderate compared with some of those realised by breeders who obtained their stock from him and hired his bulls. This, however, if pursued, takes us out of the line of Bakewell's immediate work.

On one occasion Bakewell had let a bull for the season to a gentleman who died before the animal was due to return to Dishley. The executors sold it for 8 guineas to a butcher, who retailed its beef to his customers at $2\frac{1}{2}d.$ a pound. Bakewell thereupon brought an action and recovered 200 guineas as the value of the bull and 50 guineas for the season's hire.

If Bakewell made any secret of his practice in the improvement of sheep and cattle, he was open at least in respect of his horses. George Culley authoritatively relates the circumstances; the return of the Earl of Huntingdon from an Embassy to the States-General with a set of black coach horses, mostly stallions, which became sires of horses of a capital stamp, bred by the Trentside tenantry; the excursion of Bakewell, many years afterwards, with Mr. George Salisbury, in search of the breed on the Continent; their return with Dutch or Flemish mares, and Mr. Bakewell's use of some of the imported mares to improve the old black breed of Leicestershire carthorses. In the year 1785, as we learn from several sources, he had the honour of exhibiting his famous black horse to the King in the courtyard of St. James's Palace; but a horse named K., which died at the age of nineteen years in the same year in which he took the "famous" horse for his Majesty's inspection, is described by Marshall as a far grander animal, "the fancied war-horse of the German painters," a horse under whose magnificent forehand "a man of moderate size seemed to shrink, and whose head and neck were carried so high that his ears stood, as Mr. Bakewell said every horse's ears ought to stand, perpendicularly over his fore feet." Derbyshire, the same writer stated in 1796 (the year after Bakewell's death), had been for some time indebted to Leicestershire for the best black carthorse stallions. So recently as the year 1858 an animal was exhibited at the Chester Meeting of the Royal Agricultural Society of England as a descendant and representative specimen of Bakewell's stud.

Bakewell appears to have extended to his horses the letting system adopted for the disposal of his surplus bulls and rams. He is said to have let stallions for 100 guineas and upwards; another authority says from 25 to 150 guineas. At home the fee was 5 guineas. One of the leading chroniclers remarks that he bred the horse like the ox in form, thick and short-bodied, with very short legs. Bakewell himself used to say that bad drawing horses were made so by bad management. All his were perfectly gentle and willing workers, slow, but of great power. The general practice of the country was to use from four to seven horses to the plough. He never used more than two, and these, with a Rotherham plough, without a driver, turned four acres in the day—four times the work his neighbours did with the same strength.

His pigs are variously described as of Berkshire breed and as "a mix breed sort." They were bred in-and-in very closely, until one observer, either by sight or by hearsay, found that they were "all rickety," another that they were "all fools." Bakewell and his admirers were of a different opinion, and considered the sort much improved under the working of his system. There was at Dishley an experiment-sty, where pigs, nine at a time in sets of three, were weighed, fed on weighed food, and so forth, the weights duly chalked on a board, and the complete notes finally transferred to Mr. Bakewell's book of experiments and results.

Mr. Bakewell's farming and breeding do not appear to have proved, in the aggregate, financially successful. Several authorities refer to straitened circumstances, and one writer goes so far as to say that Mr. Bakewell had become bankrupt in November 1776. As neither his flock nor his herd was ever dispersed during his lifetime, but both were bequeathed by him to his nephew, Mr. Honeybourn, who for some years after continued to breed at Dishley the descendants from his uncle's original animals, the story of failure needs confirmation and explanation. It is clear that at the time of Mr. Bakewell's death the Dishley herd comprised lineal representatives of Old Comely, the cow calved at Canley in or about the year 1765 and purchased as one of the original pair of heifers from Mr. Webster. His lavish hospitality, however, was enough to account for some measure of pecuniary trouble.

Thus, in each department of farm practice, we have traced, from widely scattered fragments of evidence, the work of Robert Bakewell, of whom it was justly said by the author of the memoir published on the announcement of his death, that "every branch of agricultural art was more or less indebted to him, his fortunate genius, and his original mind." While we remember the benefits which he has conferred upon the nations in the substantial results of his work, his breed of sheep having effected, in various degrees, through many well-known crosses and how many unacknowledged crosses no man can tell, the improvement of other breeds, we must remember to his credit the wider distribution of the good originated in his discovery of a shorter and surer way than before was known to enlist in man's service the laws and powers of nature. Had he been a man of higher education, we should have been the richer, no doubt, by his contributions to the literature of agriculture. But like other men of his educational level, he was more apt to act well than to tell clearly how he acted. There he was, perhaps wisely, silent. Yet others gleaned, and indirectly told, the secrets he was accused of studiously concealing. The correlation of form and certain propensities was one discovery upon which he is known to have acted; the fact that under some conditions consanguineous breeding might be practised with most advantageous results was another. Upon these two principal rules all the other parts of his system appear to hang. They are sufficiently known, and are indicated in the foregoing notes. Men have been really, for a century past, following Bakewell's words and practice whilst denying that he had ever disclosed the "mystery" of his success, and breeds superseding his own have risen from the use of the knowledge which the world owes to Robert Bakewell.

WM. HOUSMAN.

Lune Bank, Lancaster.

ECONOMY IN CULTIVATION.

AT a time like the present, when farming generally is at a lower ebb than at any other period during this century, when corn-growing seems impossible, and land is going rapidly out of cultivation, owing to low prices and increasing cost of labour, we, whose living depends on farming, have to consider whether we have to abandon the pursuit of a lifetime, and take up we know not what—for most of us, from one cause or another, are unfit for any other employment—or whether we should pack up what little yet remains, and try our fortunes in those countries where rent and taxes are not, whence flow those inexhaustible streams of corn and meat that have driven us to such lamentable straits.

But many of us are too old for such a change, and none of us like being beaten by anybody, whether a foreigner or of our own kin; and before taking this last desperate step, I think we should fully consider the situation, and endeavour to find some means by which the struggle against foreign competition can be successfully maintained until the tide turn.

Farming, as I do, on a very considerable scale, both as to stock and corn, my mind has been much exercised on this subject. One naturally first looks for higher prices as the remedy, but hopes in this direction seem only born to die young; bad crops in this country seem to produce a fall in prices, owing to inferior quality of grain and abundance in other lands. If we anticipate that America will soon be consuming all she grows, are there not other new fields of virgin soil, in the Argentine, South Africa, and elsewhere, all being rapidly opened up by the aid of British capital? Hope in this direction will, I fear, only make the heart sick.

If we look for any artificial means of increasing prices, such as Protection, what hope is there of this coming about before the end comes to our own career? The most sanguine cannot anticipate such a change without years of political struggle, and then it is a question whether farmers generally would be greatly benefited, whatever the advantage might be to the country at large.

Is there any hope of producing better crops, and obtaining salvation in this line? I see but little light in this direction. English corn crops are already greater than those of any other corn-growing country, excepting perhaps little Belgium; to aim at growing very big crops only means increased disaster in a wet season; and though there may be some advantage in attempting to reach a higher standard than the present average, there is no remedy for low prices here.

Cost of production seems the only question left worth considering. Can this be reduced to any considerable extent? And if so, how?

Not by reducing the price of labour. Farm-hands are not overpaid now in the corn-growing districts, and the tendency appears to be rather in the direction of higher wages and shorter hours of labour; besides, if wages were reduced a couple of shillings per week (which I should much regret to see), that would not materially affect the cost of production, but, on the other hand, would be a national misfortune. Many think that rents must fall still lower; this probably will be the case, though landlords have suffered cruelly already, and if they are to be utterly impoverished it will be to the great regret of a very large majority of all classes, including the tenant-farmers. Small occupations are the panacea of those who know nothing of practical, economical farming, in spite of every known experience that large businesses of all kinds can be more economically managed, and made to produce more cheaply, than small ones.

In what direction, then, can we look for more economical production? That is the question to which I have given a good deal of thought, and with which I propose now to deal very briefly.

The plough has from time immemorial been the chief implement of the arable farmer, and probably will continue so until the end, ploughing being the principal operation and the most expensive. No work of any other implement will compare with it in efficiency, either in the preparation of a seed bed or as a preliminary to cleaning; but it is a very expensive operation, and my object is to show that this may be reduced without sacrificing efficiency.

It is customary to have only one type of plough on the farm to do all kinds of work, an implement well suited for deep winter ploughing, but utterly out of place for spring, summer, or autumn work; and though I know too well the objection to a multiplicity of implements, I contend that it is as absurd to have only one type of plough as it would be to use only heavy drags to effect all the harrowing operations of the farm.

Being much impressed with this idea, and seeing the absolute necessity for every possible economy, my attention was attracted by the light four-furrow plough of Ransome, the "seed plough" I believe it was called. I used a very light form of this some years ago, and found it useful for a certain class of work, but it was too light for a general-purpose summer plough, and suitable only for extremely light work.

Last spring I fixed upon Ransome's three-furrow plough as being something like the implement I wanted, so ordered three of this type, one to my home farm in Monmouthshire, and the others to Salperton, on the Cotswold Hills. At this place I was about to put my ordinary digging ploughs into a piece of ground that had been ploughed four to five inches deep in the autumn and was coming into oats; ploughing was absolutely necessary, there being coltsfoot, thistles, a considerable amount of squitch, &c. No scarifier would have made a proper job of it. Had the ploughing been done by the digger in the ordinary way, one acre per day might have been ploughed. The three-furrow light plough with a pair of active little Welsh horses, without any special inducement being held out to the ploughman, turned over seventeen acres in six days. The field occupies eighteen acres; it was begun with the new plough the first time of using on the Monday morning, and by Saturday night certainly not more than an acre remained unploughed—seventeen acres instead of six, and the work done decidedly better, as a preparation for cleaning, than it would have been done by the digger; for the small furrows, eight inches wide, are more penetrable for the harrows than the clumsy, rough, broad furrows of the digger. The depth was four inches. The work was quite enough for the horses, but by no means excessive.

The next field to be operated upon had been ploughed in the ordinary way in the autumn, manured for roots, and on half of the piece the dung lay on the top of the ground (not having been ploughed in). After two consecutive corn crops, the first following a clover ley, the ground was decidedly "dirty," and, dry weather having thoroughly set in by this time, it had become very hard; in short, it was a really tough job. I sent another man with a pair of powerful half-bred horses to tackle this with the new three-furrow plough, again without any special order to make haste, because, for one thing, I knew that the work would be too much for two horses to be hurried; the result was that, notwithstanding considerable hindrance from the long dung, fully thirteen acres were ploughed in six days, and for my purpose done better than it would have been by the other ploughs. I am absolutely certain that not more than one acre per day would have been ploughed in the ordinary way, for I find it a universal article of faith that not more than one acre per day is to be ploughed by a single-furrow plough. This experience satisfied me completely so far, and my after-experience here fully confirmed my first impression.

To turn to Gloucestershire. Here the ground is by no means friable, or free-cutting, but hangs on the mould-board more or less in all weathers; moreover, the gradients are bad, and though there is no danger of very deep ploughing, three inches there are quite as bad to turn as five inches in Monmouthshire, and an occasional "rock" is trying to the implement, horses, and driver. In this case I had one plough of the same pattern as that already alluded to. This was drawn by a pair of Welsh cobs and an old nag working abreast, the three having cost with their harness 30*l.* They did a large amount of good work, generally ploughing about 2½ acres per day. The other plough was fitted with a seat for the driver, and at the suggestion of Mr. Ransome was of a rather stronger, heavier pattern than those before alluded to.

I would here say that my idea from the outset was to adapt what is known as the "gang" system to the plough already mentioned, viz., making it so that the ploughman could ride, if so inclined. Having long considered this matter, I have come to the conclusion that ploughing, as hitherto practised, is altogether too slow an operation; and my experience goes to prove that if in these days you want work done quickly, it must be done with the least possible exertion to the individual who has to do that work. Ploughing is always associated with the slowest speed, heavy horses, heavy implement, heavy, slow action in the ploughman. The necessity for all this I am unable to discover, but the result of it is utter demoralisation of men and horses. It may be said that allowing ploughmen to ride is more demoralising still. I differ from this view. Is it demoralising to allow the driver of the mowing-machine, the horse-rake, the reaper, &c., to ride? Why should he not ride the plough as well? In winter he may be unable to do so on account of the cold, then let him get off and walk fast to keep himself warm; but in summer, when weather is hot and dust abundant, it is absurd to expect anyone to walk fast with four pounds of hob-nailed boots on his feet for eight or nine hours a day. The gang plough system has long been used in America, where wheat appears to be produced more cheaply than anywhere else, and where labour is dearer than, perhaps, in any other country of the world. Here the labourer never seems to walk after an implement if he can ride it, whether it be a reaper, mower, drill, plough, or harrow; and I think the Americans can be trusted to get work done as economically as possible. Why, then, should our chief operation on the farm be effected so slowly and expensively?

This naturally brings me to the subject of deep cultivation and the cultivation of heavy land. With regard to the latter, it appears to me to be quite impossible that any such land requiring more than two horses to draw an ordinary single plough can pay for cultivation with corn and meat at present prices, and the sooner it is laid down to grass or planted to wood the better for landlord and tenant. But regarding deep cultivation, which, together with heavy land, is chiefly responsible for slow ploughing, is it clear that deep cultivation is ever advantageous in the production of ordinary farm crops? I know that it is a necessity in the case of potatoes, also where the system of dunging in the ridges for roots is adopted—a most objectionable system to my mind; also, it may sometimes be desirable to plough "ley" ground a sufficient depth to keep it clean; but I know no other case in which a depth of from three to four inches is not sufficient, if not superior to any other. Of course every inch of extra depth means considerable extra labour or cost, and though I have no data to go upon, it is probable that, generally speaking, five-inch ploughing means twice as much strain as three-inch, inasmuch as the greater the depth, the harder is the ground. Certain it is that crops grown after the old breast plough, about one to two inches deep, whether corn or roots, were equal if not superior to any that have been grown on the same land since. I have spoken to many farmers of very wide experience on this subject, who agree with me that deep cultivation has no advantages over light, or moderately light, cultivation on any kind of soil. Squitch is often ploughed down deep, only to be brought up again at great expense; weed seeds also, to germinate when least expected; manure ploughed deeply down to be near the drains and farther from the roots of plants. It appears absurd to discuss such a question as this at this period of the world's agricultural history, and it looks, on the face of it, as though I were advocating a system to suit an implement; but I am strongly of opinion that economy in this direction may be advantageously effected. Do the Americans plough deep? I am told that the general run of price for ploughing in the Far West is a dollar an acre, the contractor finding man, horses and plough. How does this compare with the cost of ploughing for wheat here? The inference is that the ploughing must be light in America; and would it be so if there were any advantage in a deeper and more expensive process?

But I will return to my own gang plough, which was the idea I had in my mind when I started on this subject. I discussed this matter with Mr. J. E. Ransome, who threw himself heartily into the question, taking the greatest pains to construct a suitable implement on the basis of the three-furrow plough before alluded to, the final result being an implement that is admirably adapted for my own and general practice.

The first gang plough, as I before stated, was somewhat heavier than the seed-plough, and the soil being more tenacious than this, and the gradients bad in many cases, we put three horses (always working abreast) to this plough, very moderate animals of no great size or strength. They got over a large amount of work, which can be well understood when I state that the driver was paid generally by the "job," and was quite content with 10*d.* per acre in lieu of wages. The same three horses worked the plough all the summer, were kept only moderately well, and were in better condition at the end of the summer than at the beginning. In many of the fields the ploughman would ride on the level ground and downhill, and walk up; and though on side-land ground he sometimes had difficulty in keeping the plough well into its work, the general result was highly satisfactory, and the work done was decidedly better for cleaning, or for a seed bed, than that of the ordinary plough. I do not wish to convey the idea that this plough is suitable for deep ploughing, or for hard ground. Three horses, of course, would not draw such an implement with its three furrows, eight inches wide and four or five inches deep, in "ley" ground; but for spring, summer, and stubble ploughing it is all that is required, and my point is that for such work the ordinary single plough (which is almost invariably used as a universal plough) is too heavy for the work demanded, and that to plough only one acre per day (which is more frequently three-quarters of an acre) is not enough work for a pair of horses, and that the cost is out of proportion to the work done.

Now, assuming that three smart horses do three acres per day, and the cost per horse per week be 6*s.*, and the wages of the man 10*d.* per acre, the cost would be 1*s.* 10*d.* per acre. On the other hand, with a single plough, a pair of horses, and a man or lad at 2*s*. per day, the cost would be 4*s*. per acre, assuming that an acre per day were ploughed. This means a very considerable saving, such as cannot be ignored in times like the present. But it appears to me that in the development of this system there are even greater possibilities of economy. Supposing, for instance, the farmer is busy with hay or corn, and wishes to concentrate as many of his hands as possible on some special operation, he might take two out of three of his horsemen, put them on this particular work—let one man work two sets of three horses each by the "job" on the gang plough—and get six acres a day ploughed, the driver earning 5*s*. at 10*d*. per acre. I see no difficulty in obtaining such a result. I know that some object to the system of driving three horses abreast, saying that they tread each other and bring side-bones. With proper "spreaders" there is no more risk in this respect than where a pair is driven, and if two men instead of three can work six horses, and get only the same work done, the saving must be worth effecting.

The mere saving of so much cost per acre, however, is not all; expedition is sometimes all-important. A good or a bad crop may depend upon the fact of its being got in properly in the "nick of time," which it might be impossible to do without means such as I have described; success or failure may depend on this. The cost of a pair of horses, man's wages, interest of money and depreciation to horse and harness, varies from about 75*l*. to 100*l*. a year: if, therefore, as I am convinced, one team out of every four can be dispensed with by adopting the most suitable labour-saving implements, it is clear at a glance how great that saving is, and what a proportion it bears towards rent. Besides this absolute saving, in place of the horses cattle or sheep might be kept, which may be presumed to pay something. Then there is often great waste of time in unnecessary neatness, in mathematically measuring out the "lands," finishing, &c. All this may be necessary in ploughing for a winter crop, where surface drainage is required; but for spring crops, roots, &c., I see no reason why the plough should not go continuously round the field, where the conformation of the land is suitable, and so save great waste of time in turning at "land's end." Again, with this gang plough, where the gradient is bad, the field might be ploughed three ways, the plough going idle up the hill. Of course it will be said that though so many horses may not be required for the actual ploughing, there are the other operations, such as harvesting, &c., in which the full complement of horses is required. In reply, I would say that, in harvesting, waggons are still very generally used when (whatever farmers' prejudices may be) one-horse carts do at least equally well, and that if there is horse-power sufficient to keep the ploughing in good place, that should be strength enough for all the other operations of an ordinary arable farm. This brings me to the question of farm horses, and their suitability for the work they have to do.

It has been for a long time the fashion to keep a heavy class of horse of the Shire type, such horses having been found very saleable for town work, and farmers have been advised to go in for breeding this class of horse, working him up to five or six years old, and then selling him at a good price for town work. This is, no doubt, a wise thing to do on grass farms, or where the production of marketable horses is the chief business of the farm—in short, where the farm is kept for the horses; but where horses are kept for the purpose of working the farm, I submit that heavy, slow horses are a mistake, and that farmers should go in for the van-horse type of animal, 16 hands high, with short legs, that will walk 25 per cent. faster than the Shire horse and do that much more work, provided he is not overweighted. I much prefer this kind of horse to any other, and if quick despatch is to be the order of the day in the future of arable farming, a change in this direction is essential. Then, if it is desired to dispose of these horses in their prime, there is no class of horse that sells more readily or, perhaps, at more money. The chief difficulty is to breed them, or buy them, as the case may be; but I have had some satisfactory results from crossing the light, active cart-mare with a thoroughbred horse, and no doubt the hunter mare and the cart-horse would do nearly equally well. The policy of farmers of arable farms selling out their horses at five and six years old appears to me to be a doubtful one, as it generally means playing with these animals for a couple of years, or, in other words, keeping two horses and a man going at slow pace for the benefit of the young horse; this man is generally the head horseman, who sets the pace for all the others, the result being general sluggishness of men and horses. It should be borne in mind that a team of horses working the gang plough at the rate of three miles per hour *continuously* for seven hours, turning 2 feet wide, ploughs five acres; a team with a single plough, turning 1 foot at the rate of two miles per hour, which is about the fashionable pace, would turn rather less than $1\frac{3}{4}$ acres in the same time.

The tendency of the day, in every business excepting farming, appears to be to get as much work done as possible with the minimum exertion to the operative. This seems to me to be true economy, and to carry it into operation should, I think, be the aim of the employer. I think the plough should be ridden, the drill likewise; and I shall at once try the American Massey-Harris Cultivator (hoping to find in that implement a substitute for drags or harrows), on which the driver can ride, believing as I do that in dry, hot weather especially, when clods are hard and dust abundant, I shall get much more work done than at present. Another possibility occurs to me in connexion with this plough. I see no difficulty in attaching a light drill to drop the seed corn into each furrow, and so ploughing and drilling would go on simultaneously; the extra strain would be a mere trifle, as there would be no coulter cutting into the ground. I think a better system of planting than that of "under the furrow" cannot be devised, and the mode I have suggested seems to combine economy with efficiency.

Feeling very strongly that more economy must be practised in arable land farming, I venture to offer these experiences of mine, together with the foregoing general ideas, for the consideration of my brother-farmers, in the hope that if agricultural salvation cannot be found here, at all events the question of the more economical cultivation of the land may be fully considered, with the result that God may "speed the plough."

R. Stratton.

The Duffryn, Newport, Mon.

THE CENSUS OF 1891 AND RURAL DEPOPULATION.

I. Introductory Remarks.

With the publication of the fourth volume of the Census,[1] containing the General Report and the Summary Tables, it becomes possible to establish from the material which the Registrar-General has collected conclusions of some interest respecting that section of the population which is engaged in agricultural industry. The interval which has elapsed between the previous census and that of which the completed results are now given to the public has been one of prolonged, if not of intensifying, depression for English agriculture. It is true that the last two seasons, which have proved so disastrous to large districts of the country, have not come within the scope of the present census; but it may be argued with probability that those seasons only

---

[1] *Census of England and Wales*, 1891, vol. iv.

revealed in its full extent the mischief which had been working for several years. It is, then, a task of curious, and it may well be of melancholy, interest to attempt to detect traces of the depression in the returns of the Registrar-General; and the point which demands the closest attention is the extent to which the figures confirm complaints of depopulation of the rural districts. For there can be little, if any, doubt that among the causes to which this phenomenon may be plausibly attributed, in England at least, agricultural depression occupies an important place.

The inquiry may have its encouraging side; for it is often the case that a popular notion, brought to the test of unimpassioned figures, is compelled to modify, if not to transform, its expression, and becomes far less formidable on careful examination than vague surmise or alarmist prediction has represented. In fact, a danger appears not infrequently to arise in the opposite direction, and the careless observer, astonished to find his gloomy anticipations inadequately realised, is prone to conclude that no reason exists for his previous alarm. It would be difficult for a careful student to fall into any such mistake after examining with a moderate measure of attention the census returns of 1891. And yet comments in not a few organs of the press on an article contained in the January number of the *National Review*[1] afford an apt illustration of the ease with which such a comforting error may be disseminated.

Few topics in connection with English agriculture have occupied a larger space in the public mind during recent years than the influx of rural labour into the towns. No doubt the magnitude of this immigration has been often exaggerated. No doubt an experience, repeated in several places, of those who have known of instances among their own acquaintance that have swelled the volume of immigration has been multiplied by imaginative rumour into wholesale abandonment of the country for the attractions of the town. No doubt the wider interest which has been naturally taken by politicians and others in the condition, movements, and aspirations of the agricultural labourer since he received the parliamentary franchise has caused enthusiastic investigators to bestow upon him a microscopic observation, which may sometimes have magnified, and sometimes have distorted, what had escaped notice before. No doubt the increased attention devoted to certain social problems in the towns has given greater prominence to the competition of new-comers, whether, like Jews, they find their way in from abroad, or, like

[1] "The Decline of Urban Immigration," by Edwin Cannan.

rustics, they are allured by the quicker movement and bustle of the city. In the one case, as in the other, the precise amount and character of the competition have been mistaken, and more expert inquiry has detected and exposed the error. But all these influences have undoubtedly contributed to popularise an impression that the rural districts are being deserted, and that the great towns are absorbing, and in the process are deteriorating, the masses of the people.

By a natural sequence the impression, unquestionably founded on fact, proves unable to stand fully the test of statistics so comprehensive as those registered in a census of the whole population; and a counter-opinion is given currency, which is no more accurate a representation of the truth than the original impression. In more than one newspaper, and from more than one seemingly unprejudiced observer, we have learnt in the last few weeks that the influx of rural labour into the towns is a discredited myth, and the authority for this dogmatic statement has been generally sought in the article by Mr. Cannan to which we have referred. Before, then, we turn for ourselves to the census figures and examine this question from the positive side of the returns of the population of the rural districts, and of the numbers of the classes engaged in agricultural occupations, it may be well to see exactly what Mr. Cannan has established, approaching the question from the other side—that of urban immigration.

II. Decrease of Urban Immigration in the Last Decade.

The figures which Mr. Cannan has obtained are certainly of a nature to make hasty observers pause. He shows that "by subtracting the excess of births over deaths—the natural increase of population as it is sometimes called—from the actual increase . . . we arrive at the net immigration" into any particular district. Applying this process to nine of the largest towns in England—to London, Manchester, Liverpool, Birmingham, Leeds, Sheffield, Bradford, Newcastle, and Bristol—and including in the towns certain "registration districts"[1] which properly belong to them, he finds that in the case of London (comprising in the term the "registration division of London, the remainder of 'registration' Middlesex, and the unions of West Ham, Romford, Gravesend, Dartford, Bromley, Croydon, Kingston, and Richmond") the "natural increase" between the beginning of 1851 and the end of 1890 was 1,989,710. The actual increase between

[1] The boundaries of "registration districts" generally coincide, Mr. Cannan points out, with Poor-law Unions, but not always with towns as usually known.

the census of 1851 and that of 1891 was 2,952,324, and therefore the " net immigration " was some 962,614. Distributed equally over the four decades, the amount in each would have been 240,653. Distributed over them in proportion to the growth of London, it should have been some 178,000 in 1851–60, 213,000 in 1861–70, 257,000 in 1871–80, and 314,000 in 1881–90. " As a matter of fact, it was 245,679 in the decade 1851–60, 256,791 in 1861–70, 302,121 in 1871–80, and only 158,023 in 1881–90." As Mr. Cannan observes, " this enormous drop is far too great to be explained away." A summary table of the other eight large towns exhibits a net immigration of 184,057 in the first decade, 222,161 in the second, 157,921 in the third, and only 23,803 in the fourth.

Nor would it appear that this diminution is counterbalanced by an increase of net immigration into towns of the second rank. Grouping the statistics of twenty-two Lancashire unions and Stockport, of eight West Riding unions, of the unions in Cleveland and the Tees district, of those in the Potteries, and those in the Black Country, the figures stand thus :—An increase of 85,891 in the first decade is followed by one of 66,969 in the second, of 120,263 in the third, and by an actual decrease of 24,174 in the fourth and last.

From the manufacturing districts Mr. Cannan passes to the scattered towns outside. He finds that, with the exception of the commercial ports, which show a steady increase of net immigration with each decade, the results obtained are similar to those reached before. Adding together the totals of all his tables, which include London, the other eight great towns, the five manufacturing districts, and seventeen minor towns, the net immigration is seen to have been 613,456 in 1851–60, 620,301 in 1861–70, 695,418 in 1871–80, and 241,764 in 1881–90. Mr. Cannan remarks that " it requires a somewhat strong imagination to conceive that the inclusion of the smaller towns not dealt with could wipe out any considerable portion of the drop of four hundred and fifty thousand."

The figures are certainly startling, and have naturally attracted attention. They have been represented in some quarters as if they put the question of rural efflux out of court. But Mr. Cannan himself is too acute an observer to be betrayed into any such assertion. If the figures really justified this conclusion, they would be open to the charge so frequently levelled against statistics, that " figures will prove anything." For it would be impossible to believe that the complaints raised in so many quarters of an efflux from the rural districts, and the significant facts supported by the observations of so many competent inquirers, and recently asserted afresh in the reports of the Assistant-Commissioners sent by the Labour Commission to visit certain selected districts, could be destitute of foundation. The truth remains that Mr. Cannan's figures, fairly interpreted, do not lead to such an improbable conclusion. "A decline," he remarks, "of net immigration into the towns is, of course, not necessarily accompanied by a decline of net emigration from the country. Migration goes on not only between the towns and the rest of England, but between the towns and the rest of the world outside England."

In this circumstance is to be found the probable explanation of the congruity of what Mr. Cannan may claim to have established—the decline of urban net immigration—with the belief, so widely held, and so authoritatively supported, of rural emigration. The Registrar-General himself observes that "emigration to foreign countries increased enormously"[1] during the last decade; and Mr. Cannan shows that, as a matter of fact, the net emigration from the rest of the country outside the towns has slightly increased. "The whole country," he remarks, "lost by migration 469,189 more" persons in the last than in the preceding decade, and certain statistics render it probable that this "increased loss was divided between the towns and the rest of the country." "A large portion of the diminution of urban net immigration must be due to a change in the balance of migration between the towns and places outside England." There is no doubt that immigration into England and Wales from those places has fallen off, while emigration to them has increased.

The final conclusion, accordingly, which Mr. Cannan reaches, is that, "except in the case of a few of the most prosperous towns, the influx from the country districts is nearly or completely outweighed by the efflux to the rest of the world." This result undoubtedly supports his contention that the complaint, so often and so loudly urged, that the urban labourer is dragged down by the competition of rural immigrants, is not well founded; and it may be the case, as he affirms, that it is "highly probable that in the future our great towns will be regarded as the cradle rather than the grave of population." But his article affords no justification for the hasty inferences which have been drawn by newspaper writers respecting the unreality or unimportance of rural emigration, and it leaves this question in much the same position as that in which it found it.[2]

---

[1] He adds, also, that there has been no *corresponding* increase in migration within the borders of England and Wales.

[2] The percentage of "stationary natives" in 1891 was, the Registrar-General

III. The Occupations Returns of the Census.

Dismissing, then, the interesting figures which Mr. Cannan has brought out from the census returns, we may now proceed to investigate the problem from the positive side of rural emigration rather than the negative side, which he has treated, of urban immigration; and we may endeavour to ascertain the actual position with as much accuracy as the figures of the Registrar-General will permit. We must not expect to find that the broad evidence furnished by such vast masses of figures can correspond exactly with estimates to which the observations of individuals, however painstaking and unprejudiced, have given rise. Nor must we look with any precision of detail in the colourless records of the census for a measure of the various causes which have promoted the movement. They are probably as mixed in their origin as they are connected in their effects, and it is futile to attempt to isolate them, and to assign to each its due influence. The greater gaiety of life in the towns, which is, no doubt, reflected in the notable increase of actors, musicians, performers, and photographers,[1] who may all be regarded as "ministering to art and amusement," may, and probably does, as much by the influence of vague rumour as by any certain inducement, exercise an attraction. The growth of teachers,[2] again, testifies to the spread of education, which broadens the horizon and enlarges the ambitions of the rustic youth, and leads them to seek a wider and more likely sphere for their attainment than can be offered by the country village. But the endeavour to trace such connecting-links as these, when we pass beyond the broadest generalisations, might soon lead to fanciful illusion, and would rather afford temptation to the exhibition of audacious ingenuity than furnish any solid basis of reliable information. We may therefore pass without delay to more certain evidence.

The Occupations Returns of the census are, as the Registrar-General admits, far from satisfactory; but it is possible to draw from them certain broad deductions. The main difficulty of the returns arises, it is stated, "from the extremely inaccurate and inadequate manner in which uneducated, and often, indeed, even educated, persons describe their calling." "The most that it is reasonable to expect" is that the data collected "shall give

---

states, 74·86, as compared with 75·19 in 1881. But the agricultural counties of Radnor and Rutland had not retained 50 per cent., and the proportion was not much higher in Herefordshire, Huntingdonshire, Oxfordshire, Shropshire, and Brecknockshire.

[1] They have increased by 53 per cent. in the decade 1881–90.

[2] 15·5 per cent. in 1881–90, 36 per cent. in 1871–80.

the means of drawing such a picture of the occupational distribution of the people as shall be fairly true in its main lines, though little value can be attached to the detailed features. It is not wise to demand from a material a result for the production of which it is unsuited." Accordingly, the Registrar-General holds that the endeavour, made for the first time in the present census, to obtain statistics of the numbers of employers and employed has led to anything but satisfactory results. This distinction—adopted in deference to the suggestion of economists—does not, perhaps, possess any great importance for agriculture; but the general difficulties which confront the attempt to attain accuracy do not fail to present themselves. It is only broad conclusions which can be drawn with any certainty, and these, perhaps, are mainly useful because they corroborate evidence furnished from other sources.

The Agricultural Class is combined in the census returns with the fishing industry, but the Registrar-General observes that "the latter is too small to affect seriously the total." The subdivisions of the class have undergone variations in different censuses, and, in drawing a comparison between the figures of one and another, it is desirable to confine the attention to those subdivisions which are similar. Happily, they represent the more important constituent elements of the agricultural community. In Tables I. and II. (p. 46) are contained the classification adopted in the last three censuses of the various subdivisions, and the figures for the last five censuses of the total of the agricultural order—of the farmers, of their male relatives, of the bailiffs, and of the labourers.

From the first of these tables it will be seen that the changes made in the subdivisions of the agricultural class proper in the last three censuses do not vitiate or obstruct comparison between the numbers at the respective periods of the farmers and graziers, of their male relatives living with them in the house and returning no other occupation, and therefore presumably engaged in farming, of the farm bailiffs, and of the agricultural labourers and shepherds. For all practical purposes these classes constitute the vast majority of the agricultural population, and the broad significance of the figures relating to them can hardly be misinterpreted.

The agricultural order as a whole has fallen steadily since the beginning of the period comprised in Table II. In 1891 it was composed of 1,336,945 persons. These, the Registrar-General states, were "almost exclusively males," and "represented 6·1 per cent. of the population" of the age of ten or upwards. In 1881 the class contained 1,383,184 persons, and this total exhibited, so the Registrar-General stated, a decline of 8·2 per cent. as compared with 1871.[1] This was, in fact, the period when the percentage of diminution was the largest; but the reality of an important decrease during the last decade is shown by an examination of the separate figures of the different subdivisions.

TABLE I.—*Classification of the Agricultural Order in the Censuses of* 1871, 1881, *and* 1891.

1871	1881	1891
Land proprietor	—	—
Farmer, grazier	Farmer, grazier	Farmer, grazier
Farmer's son, brother, grandson, nephew	Farmer's, grazier's son, grandson, brother, nephew	Farmer's, grazier's son, grandson, brother, nephew
Farm bailiff	Farm bailiff	Farm bailiff
Agricultural labourer Farm servant (indoor)	Agricultural labourer, farm servant, cottager	Agricultural labourer, farm servant Horsekeeper, horseman, teamster, carter
Shepherd	Shepherd	Shepherd
Land surveyor, estate agent	(Transferred to land, house, and ship surveyor)	As in 1881
Agricultural machine proprietor, attendant	Agricultural machine proprietor, attendant	Agricultural machine proprietor, attendant
—	Agricultural student, pupil	(Transferred to all other students)
Land-drainage service Others engaged in agriculture	Land-drainage service Others engaged in, or connected with, agriculture	Others engaged in, or connected with, agriculture

TABLE II.—*Totals of Population of the Agricultural Order, and of the chief subdivisions in the last five Censuses.*

	1851	1861	1871	1881	1891
Total of agricultural order .	1,928,796	1,833,295	1,634,192	1,383,184	1,336,945
Farmer, grazier .	249,431	249,735	249,907	223,943	223,610
Farmer's male relatives . . .	111,704	92,321	76,466	75,197	67,287
Farm bailiff . .	10,561	15,698	16,476	19,377	18,205
Agricultl. labourer and shepherd	1,253,786	1,188,786	980,178	870,798	780,707

The total number of farmers returned in 1891 was, indeed,

[1] The 1871 total had to be corrected for comparison, owing to the removal of certain classes to another part of the census, *e.g.* that of Land Proprietors, amounting, in 1871, to 22,964, and that of Land Agents, numbering 4,810. The removal of agricultural students in 1891 was comparatively unimportant.

only 333 less than at the previous census, the number in the earlier year being 223,943, and in the later 223,610. Here, again, the figures for the preceding decade indicated a considerable decline, amounting to 10 per cent., while up to 1871 the number of the class had grown with each successive census. To compensate, however, for the small diminution in the number of farmers between the last and the present census there was a drop of over 10 per cent. in the number of male relatives living in the farmhouse. There was a similar decline in the number of agricultural labourers and shepherds, who have been grouped together in the last line of Table II. In 1881 the number was 870,798, of whom 830,452 were males and 40,346 females. In 1891 the number of males was 756,557, and of females 24,150. The total, which amounted to 780,707, exhibited a diminution of 10·3 per cent. In 1851 this class of the population was enumerated as consisting of 1,253,786 persons; and accordingly, within forty years it has lost more than a third of its numbers. The number of farm bailiffs, lastly, after undergoing a considerable increase in the previous decade, diminished during this. Whether the change is due to the fact that between 1871 and 1881 farms were taken in hand by landlords averse to recognising the depression as permanent by granting reductions of rent, while between 1881 and 1891 the stern logic of facts, convincing them of their error, induced them to prefer retaining an old tenant by almost any concession to indulging in the risky venture of farming their own land,[1] may be left to the curious to determine; but the change itself is certainly noteworthy.

Comparing, then, the figures of the last three censuses, we find that, as regards the first class—that of the farmers—the decline between 1871 and 1881 amounted to 10 per cent.; the decline in the number of male relatives was but slight in comparison, and that in the number of agricultural labourers was, as in the succeeding decade, some 10 per cent. Taking the three subdivisions as a whole, the decrease seems to have been similar in both periods; but it is noteworthy that in the earlier decade the farmers themselves should have diminished, while in the later the decrease should apparently have been transferred to their sons and relatives. It is true that in 1871 "retired farmers" were also included in the reckoning; but it seems that this circumstance would only account for some 2 per cent. of the diminution. Here, as in the instance of the farm bailiffs, we

[1] The Agricultural Returns of 1891 "indicate a rather larger surface occupied by tenants, and a slightly smaller amount in the owners' hands."

may suggest probable explanations; but from the nature of the case such solutions of the problem must necessarily be hypothetical.

It may be, as the Registrar-General observes, that the prospects of success in an agricultural career have ceased to hold out attractions to an increasing number among a younger generation. With the first brunt of the depression the weaker farmers may have tended to disappear; and, as it continued, those already engaged in farming may have held on for the chance of improvement, while the young have sought other occupations in preference. Or it may be that their relatives have been unable to support them at home, and in these, as in other figures of the census, we may note traces of an anxiety to diminish expense, and to cut down the unpaid as well as the paid labour bill. Or it may be that the figures reflect a change in the direction of substituting smaller for larger holdings; and the withdrawal of the older farmers, and the tendency caused by depression in any industry to produce a diminution of the numbers engaged in it, may have been counteracted by some such process, while it is natural that these smaller farmers should seek to economise in their household expenses and to limit the number of workers about the farm who are perhaps not always fully employed. Or, lastly, the explanation suggested in the case of the farm bailiffs may hold so far as regards the number of farmers, who may have taken the place of the bailiffs of the previous decade. But it is rash to assert that any one of these explanations is adequate or certain, and it seems more probable that the solution is to be found in the mingled operation of a number of such causes.

IV. The Diminution in the Number of Agricultural Labourers.

The returns of the agricultural labourers are, the Registrar-General states, "never very trustworthy. There is no doubt that a considerable number of agricultural labourers return themselves simply as 'labourers,' without anything to indicate that they are employed on farms, and these would be classified as general labourers. Similarly, there is good reason to believe that many agricultural carters and waggoners, owing to the imperfect way in which they state their occupation, get transferred to the carters, carriers, and hauliers of general traffic." It is impossible to determine how far these errors compensate one another; and it may be the case that the spread of education and of general intelligence between one census and another exercises an influence on correctness of description. But it is probably safe to assume that the amount of error in the last and the present census is not materially different, and that the figures, whatever intrinsic error they contain, are reliable for purposes of comparison.

It is also possible, as the Registrar-General shows, to counteract the causes of error to a certain extent by selecting for special examination certain counties which are purely agricultural, and where all the labour is, with exceptions which may be neglected, of an agricultural character. Taking, for instance, as examples of such counties, the East Riding of Yorkshire (excluding Hull), Lincolnshire, Norfolk (excluding Norwich), Suffolk, Cambridgeshire, Bedfordshire, Hertfordshire, Oxfordshire, Wiltshire, Dorsetshire, Devonshire (excluding Plymouth), Herefordshire, Brecknockshire, and Cardiganshire, the Registrar-General finds that "the total number of men and women returned in these counties, either as agricultural or general labourers, together with the shepherds, and the carters, carriers, and hauliers of all kinds, amounted in 1881 to 380,161, while in 1891 it was only 354,972." The decline was therefore a "fraction less than 7 per cent."

The Registrar-General mentions three main causes to which this decline appears to be due. The first is the attraction of the towns, with the prospect of higher wages and the certainty of a more varied life; the second is the natural effort of the farmer to diminish his labour bill; and the third and last is the conversion of arable land into pasture. If we consult the Agricultural Returns, this last influence would certainly seem to be a *vera causa*; for in 1891 those returns showed a diminution of 1,074,077 acres of arable land in England and Wales as compared with 1881, while the increase of pasture beyond this difference, although reaching a total of some 552,234 acres, seems to have been largely nominal rather than real.[1] And yet, in spite of the reality of the cause, it is not easy to trace the precise connexion between it and its effect in the figures of the census. Mr. Druce, in an article [2] in this Journal on the census of 1881, failed to discover any definite relation between the decrease of labourers and the substitution of permanent pasture for arable land, although such a relation was discoverable between

[1] A part may be "traced to an amended classification of certain areas reckoned for the first time as coming within the category of permanent pasture rather than that of unenclosed mountain and heath land."

[2] *The Alteration in the Distribution of the Agricultural Population of England and Wales between the Returns of the Census of* 1871 *and* 1881, by S. B. L. Druce.—Journal R.A.S.E., Second Series, Vol. XXI., 1885, pp. 96 *et seq.*

this substitution and the decline in the number of farmers. On the contrary, taking the six counties which showed the maximum decrease, and the four which showed the minimum, he found that in the two counties—Huntingdonshire and Buckinghamshire—in which the percentage of decrease was greater than in the rest, the percentage of the increase of permanent pasture was less; and that in Worcestershire, where the decrease was smaller than in any county save two, the increase in permanent pasture was also greater than in any county save two. So difficult is it to isolate causes and to trace their connexion with their effects in the mass of figures recorded in a census. So probable would it seem that a common impression may appear not to be supported in any definite, unmistakable manner by the returns of the Registrar-General.

Few opinions, for example, have been more confidently put forward, or more generally accepted, than the assertion that it is the very young and the very old who have been left behind by the influx into the towns. But no such certain testimony is borne by the census. As far as the aggregate of the male agricultural labourers of England and Wales is concerned there has been, so the Registrar-General states, "a greater proportional diminution at the advanced than at the earlier ages." In 1881 the proportion per 100,000 living of male agricultural labourers between 15 and 20 was 20,513; in 1891 it was 21,031; between 20 and 25 the figures stood respectively at 13,012 and 13,237; between 25 and 45 at 31,562 and 32,750; between 45 and 65 at 25,460 and 24,035; and for 65 and over at 9,453 and 8,947. It is true, however, that in the towns, as compared with the country, there is a great excess of persons from 15 to 45 years of age, and, except in the case of children under 5, there is a deficiency at all the other age-periods. No doubt this fact is explained, as the Registrar-General says, by the influx of adults attracted by higher wages and the other allurements of urban life; and, as they themselves are of reproductive ages, the large number of infants born swells the proportion of the first age-period, though it must be added that the notable decrease of the birth-rate, which has been one of the most significant features of the last decennium, and has disturbed many plausible predictions, has resulted in a counterbalancing of the excess of births in the towns by their greater infantile mortality.

It may be noted also as a curious fact, which has an interesting bearing on the question of rural efflux and urban immigration, that the proportion of females to males for all ages is much higher in the towns than in the country. It is 109 to 100 in the former, but only 101 to 100 in the latter. Up to 10 years of age there is no difference; from 10 to 15 the proportion of females becomes much higher in the urban than in the rural districts; between 15 and 20 it is 107 to 100 in the towns, and only 87 to 100 in the country; between 25 and 45 the migration of males, setting in later than that of the other sex, reduces the inequality very considerably; but, 45 past, the disproportion increases in the urban population until, in the last age-period—that of 85 years and upwards—the towns have 99 per cent. more women than men, while in the rural districts the disproportion increases indeed, but not at so early an age or by such rapid stages. In the last period it is only 41 per cent., as compared with the urban 99. Of this difference the Registrar-General furnishes two explanations. One is, that the conditions of town life as contrasted with life in the country are more fatal to men than to women of advanced age, and this explanation is supported by actual statistics. The other is probable rather than proven. It is that, as they grow old, men leave the towns and retire into the country more generally than women. They are probably incapacitated for their work at an earlier stage, while women can pursue their lighter occupations for a longer period of their working life. And so, alike at the beginning and at the decline of life, the females come sooner and remain longer in the towns, while the males leave the country later and find their way back to it at an earlier age.

Among the remaining particulars of interest brought out by the Occupations Returns are a decline in the number of corn-millers from 23,462 in 1881 to 22,759 in 1891, and an increase of gardeners of 20·9 per cent. in the same interval, and of woodmen of 15·9 per cent.; while the Agricultural Returns exhibit for the corresponding period an increase of some 65 per cent. in the area used for market-gardens or nursery-grounds, and of less than 10 per cent. in the acreage of woods and plantations.

V. Decrease in the Populations of certain Counties.

The returns are, as we have seen, defective. But they suffice to establish certain broad conclusions. It is impossible to ignore the general drift of the evidence that they furnish; and the conclusion to which they lead may be reached independently. In the earlier portion of the census report we are informed that in 13 registration counties of England and Wales the population declined between 1881 and 1891. The counties were, with few exceptions, those which had also fallen off in numbers between 1871 and 1881. In the earlier period Flintshire, Merionethshire, and Anglesey, had increased, while in the later they had diminished; but, on the other hand, Westmoreland, Cambridgeshire, and Dorsetshire, which had declined between 1871 and 1881, exhibited some increase between 1881 and 1891. All the counties were agricultural, and comprised eight in Wales, those of Shropshire and Herefordshire on the Welsh border, together with Huntingdonshire, Rutlandshire and Cornwall. In the last case, no doubt, the decline may be attribnted largely to the decay of the mining industry.

This actual decline of population in certain counties is one piece of evidence pointing to rural efflux furnished by the census. A second is to be found in a comparison of the urban with the rural population. The population of all the "urban districts," so called, in 1891 amounted to 20,895,504 persons, as compared with 8,107,021 in the "rural districts." The proportion of urban population had accordingly increased on this basis from 212 to 100 in 1881 to 258 to 100 in 1891. The Registrar-General, however, observes that this comparison is rendered somewhat fallacious by changes of area in some urban districts, and by the creation of others. Accordingly, adopting a fresh mode of measurement, and regarding the areas as urban in 1881 which were so in 1891, and then comparing the growth of population in the interval, he finds that the urban population so distinguished had increased by 15·4 per cent., while the remaining or rural population had only grown by 3 per cent.

But, he proceeds to urge, even this mode of comparison is hardly fair. Districts technically urban may be really rural in character. The small towns in the rural districts belong to the rural whole, although any line of distinction between them and the really urban towns must be drawn with a somewhat arbitrary hand. Two rough standards of measurement, however, may be employed. We may include in the rural division all districts with populations below 10,000; or we may draw the line lower and only include those with less than 5,000. Adopting the first standard, the urban population amounted to 17,926,210 in 1891 as compared with 15,382,403 in 1881, and the rural population to 11,076,315 as compared with 10,592,036. The one had grown by 16·54 per cent. and the other by 4·57. Applying the other standard, the increase in the former would be 16·05 per cent., and in the latter 3·29; while an adherence to the strictly technical classification would show an increase of the urban population of 15·4 per cent., and of the rural population of 2·98.

The results of these different methods do not themselves differ greatly; and they all show that, tested in this way, there has been no actual diminution of the rural population as a whole, but a growth which is relatively less rapid. Viewing the matter, then, in this comprehensive manner, it is erroneous to speak of "depopulation" of the rural districts, although the phenomenon may be found in certain districts. Proceeding by one of the two rough standards of measurement indicated before, and adding to the population of the rural sanitary districts, first, that of urban districts of less than 10,000, we find that twelve English and eight Welsh counties exhibit a decrease between the two censuses of 1881 and 1891. The eight Welsh counties coincide with those enumerated before by the Registrar-General (*vide* Table III., p. 56), and the largest decrease occurs in the cases of Montgomeryshire, Cardiganshire, Radnorshire, Flintshire, Merionethshire, and the border counties of Herefordshire and Shropshire. Of the other English counties, Huntingdonshire and Rutlandshire are so small as to be by comparison insignificant; the loss in others, such as Norfolk and Suffolk, has been very slight, amounting to less than 1 per cent., and the only counties of importance which have sustained a notable decrease are Lincolnshire, the North and East Ridings of Yorkshire, Cornwall, Bedfordshire, and Wiltshire.

It will be interesting to compare these results with those obtained by Dr. Longstaff in a paper read before the Royal Statistical Society in June last.[1] Dr. Longstaff adopted a different mode of distinguishing the rural population. He urged that counties were delusive as standards of measurement. The growth of the town of Cambridge, for example, concealed the depopulation of the rural parts of the county, and the case was similar with Poole in Dorsetshire, with Yarmouth and Norwich in Norfolk, and with New Swindon and Salisbury in Wiltshire. The method, accordingly, which he adopted was to take all the registration districts in each registration county which had exhibited a decrease of population in either of the last two decennia, to exclude all the districts comprising towns of considerable size, and, lumping the population of the districts so selected for each county, to regard this as its rural population. While, therefore, the Registrar-General, in the figures we have already cited, proceeds by the methed of inclusion, Dr. Longstaff has followed a method of exclusion. The net loss of rural population thus ascertained was, he shows, practically the same, both absolutely and relatively, between the census of 1871 and that of 1881, and between this and that of 1891. It amounted to some 160,000 persons, or about 3 per cent.

---

[1] *Journal of the Royal Statistical Society*, Vol. LVI. Part III. p. 380.

It will be remembered that the Registrar-General's calculations show no actual diminution, but only a less rapid growth, of the rural population as a whole, while the Occupations Returns exhibit a decrease in the total of the agricultural class between 1881 and 1891 amounting to less than 50,000 persons. This decline corresponds closely with Dr. Longstaff's 3 per cent. But it is to be noted that the decrease of certain subdivisions of the order represents a much higher percentage, ranging from 7 in the case of labourers in certain selected agricultural counties to 10 in that of agricultural labourers as an aggregate and in that of male relatives of farmers. We should naturally expect that, with a smaller aggregate on which to measure the percentage, the percentage itself would increase. But the increase undoubtedly points, by *a posteriori* evidence, to a conclusion to which *a priori* reasoning would naturally conduct, and emphasises the connection of the rural efflux with depression in agricultural industry.

In the first of the two decades with which he has dealt, Dr. Longstaff finds that the loss was greatest in the South-West, South Midland, and Eastern divisions, and in the latter in Wales and Yorkshire. Between 1871 and 1881 the rural depopulation in the South-West, South Midland, and Eastern registration divisions amounted to eight-tenths of the whole; between 1881 and 1891 it was less than three-tenths. On the other hand, in the former decade Yorkshire exhibited a trifling diminution and Wales an actual increase, while in the latter period Wales came first and Yorkshire third in the list. Taking the whole twenty years, eleven counties—those of Durham, Cardigan, Westmoreland, Montgomery, Huntingdon, Radnor, Leicester, Cumberland, Cornwall, Monmouth, and Devon—have lost from a sixth to a tenth of their rural population, and in twenty-three other counties the loss has varied between a twelfth and a twentieth.

Dr. Longstaff, like Mr. Druce in the article in this Journal to which we have before referred, endeavours to ascertain the connexion of this rural depopulation with arable and pastoral farming respectively. He carries back his analysis to the beginning of the century in the case of three typical corn-growing counties—those of Norfolk, Suffolk, and Essex—and of four typical grazing counties in the South-West—those of Dorset, Devon, Wilts, and Somerset. Of the fifty-six registration districts in the former group, two declined in the first decennium, all increased in the second, third, and fourth, and with 1841 to 1851 we find a diminution setting in, which has steadily continued. Between 1841 and 1851 four districts decreased; between 1851 and 1861 thirty-eight; between 1861 and 1871 thirty-two; between 1871 and 1881 thirty-three; and between 1881 and 1891 thirty. In forty years, 13 per cent. of the population has been lost. In the case of the grazing counties in the South-West the "exodus began ten years earlier" and "more gradually." "In the two decades 1851–61 and 1861–71 the numbers were curiously alike in the two groups of districts chosen; but during the last twenty years the volume of the migration has been about twice as great in the West as in the East."

In Tables III. and IV. we have combined the results of the Registrar-General and of Dr. Longstaff. In Table III. we have shown in the first column (A) those registration counties which exhibited an actual decrease of population in the last census, and we have arranged them in the order of magnitude of their decrease. In the next three columns we have shown the percentage of decrease of these counties according to each of the three methods followed by the Registrar-General, first (B) taking the rural districts by themselves, then (C) adding to them the towns under 5,000 inhabitants, and then (D) those under 10,000; and we have added to the counties enumerated in the first column those mentioned by the Registrar-General under the new heading. In another column (E) we have given the percentages of decrease for all these counties calculated according to Dr. Longstaff's method of arriving at the rural population. To these figures we have added three additional columns, showing, (α), the decrease of population between the census of 1871 and that of 1881 in the case of the registration counties, calculated according to the simple enumeration of the census; (β), the same decrease calculated according to Dr. Longstaff's method; and (γ), Dr. Longstaff's results for the whole twenty years from 1871 to 1891. In Table IV. we have shown the order in which the counties distinguished [1] by the Registrar-General as those which have exhibited an important decrease stand in the different columns. In Table V. we have given the recorded figures of the farmers, farm bailiffs, labourers, and shepherds, for the seven English counties so distinguished.

From Tables III. and IV. it will be seen that the claims of the Welsh counties of Montgomeryshire, Cardiganshire, Radnorshire, and Flintshire, to the first places in the list for the last decade are undisputed. But there are certain differences between the results of the several methods which will reward attention. The increase in the Registrar-General's list of counties which have diminished in population, from thirteen in

[1] We have omitted Cornwall for the reasons which were previously stated. Flintshire, Cardiganshire, and Montgomeryshire, also seem to have been affected by a considerable decline of lead miners.

column A to twenty-six in column B of Table III., illustrates the manner in which the growth of the towns may disguise the depopulation of the country. Even the inclusion of urban districts with less than 5,000 inhabitants serves to remove Oxfordshire and Somersetshire from the list, and the inclusion of those with less than 10,000 causes the additional removal of Cambridgeshire, Devonshire, Gloucestershire, and Carnarvonshire.

TABLE III.—*Percentages of Decrease of Population in certain Counties in the last two Censuses.*

COUNTY	A	B	C	D	E	α	β	γ
Montgomeryshire . .	11·68	12·77	12·49	11·68	11·7	2·81	2·8	14·2
Cardiganshire . . .	9·20	10·12	9·53	9·20	11·7	2·79	3·7	14·9
Radnorshire . . .	7·58	10·12	7·58	7·58	7·6	6·23	6·2	13·3
Flintshire	7·01	10·30	8·26	7·01	7·0	+ 5·19	+ 5·2	2·2
Huntingdonshire . .	5·51	8·14	5·51	5·51	5·5	8·29	8·3	13·3
Merionethshire . .	5·15	8·53	5·88	5·81	5·2	+11·01	+11·0	+ 5·2
Shropshire	4·18	3·94	4·08	4·39	3·8	0·48	1·9	5·5
Herefordshire . .	3·93	5·48	5·12	5·18	3·9	3·15	3·2	7·0
Rutlandshire . . .	3·84	3·84	3·84	3·84	3·8	1·62	1·6	5·4
Anglesey	2·57	4·14	3·66	2·57	2·6	+ 0·04	—	2·6
Cornwall	2·43	4·45	4·29	3·76	2·4	8·92	8·9	11·1
Brecknockshire . .	2·34	5·26	5·13	3·44	2·4	4·90	4·9	7·1
Pembrokeshire . .	2·00	4·27	3·61	3·59	4·9	0·23	2·7	7·5
Oxfordshire	—	1·24	+0·80	+0·80	1·9	+ 1·29	4·1	5·7
Bedfordshire . . .	—	3·59	3·37	2·55	3·0	+ 1·78	5·0	7·8
Cambridgeshire . .	—	0·17	0·30	+2·15	+1·1	0·48	5·5	4·2
Suffolk	—	2·39	1·17	0·56	2·0	+ 1·82	5·0	7·0
Norfolk	—	1·13	0·65	0·68	2·0	+ 1·64	1·5	3·5
Wiltshire	—	2·70	2·61	2·14	3·4	+ 1·02	5·1	8·3
Devonshire	—	1·47	0·87	+2·45	3·4	+ 0·38	6·7	10·0
Somersetshire . . .	—	0·50	+0·40	+1·85	1·3	+ 1·68	4·4	5·4
Gloucestershire . .	—	1·21	1·41	+0·25	3·4	+ 7·42	3·7	7·0
Lincolnshire . . .	—	5·34	4·38	4·29	5·8	+ 8·17	2·1	7·9
Yorkshire, E. Riding	—	3·40	3·03	2·41	5·0	+18·20	1·4	6·4
" N. Riding	—	7·65	5·85	4·62	6·9	+17·74	1·4	8·2
Carnarvonshire . .	—	5·10	0·02	+1·44	4·2	+11·14	+ 9·0	+ 4·4

A = Percentage of decrease in registration counties, 1881–91.
B = " " of rural districts by themselves in certain counties, 1881–91.
C = " " of rural districts by themselves in certain counties, 1881–91, adding urban districts of under 5,000.
D = " " of rural districts by themselves in certain counties, 1881–91, adding urban districts of under 10,000.
E = " " of certain rural districts calculated according to Dr. Longstaff.
α = " " in registration counties, 1871–81.
β = " " of rural districts on Dr. Longstaff's method, 1871–81.
γ = " " " " " " 1871–91.

TABLE IV.—*Position of certain Counties in the Columns of Table III.*

County		A	B	C	D	E
Welsh Counties	Montgomeryshire	1	1	1	1	1
	Cardiganshire	2	3	2	2	2
	Radnorshire	3	4	4	3	3
	Flintshire	4	2	3	4	4
	Merionethshire	6	5	5	5	8
	Pembrokeshire	13	13	15	13	10
	Brecknockshire	12	10	8	14	21
	Anglesey	10	14	14	15	19
On the Border	Herefordshire	8	8	9	7	12
	Shropshire	7	16	12	9	13
English Counties	Lincolnshire	—	9	10	10	6
	York, North Riding	—	7	6	8	5
	York, East Riding	—	18	17	17	9
	Bedfordshire	—	17	16	16	18
	Wiltshire	—	19	18	18	15

TABLE V.—*Numbers of Farmers, Bailiffs, and Labourers in certain English Counties at the three last Censuses.*

	Herefordshire			Shropshire			Lincolnshire		
	1871	1881	1891	1871	1881	1891	1871	1881	1891
Farmers	3,496	3,288	3,346	6,102	5,566	5,829	11,788	10,048	9,939
Farm bailiffs	271	304	263	449	458	385	1,215	1,161	1,441
Agricultural labourers and shepherds	12,772	11,805	9,708	21,428	19,173	17,229	48,676	44,640	42,550

	York (North Riding)			York (East Riding)		
	1871	1881	1891	1871	1881	1891
Farmers	7,552	6,790	6,913	4,273	3,649	3,593
Farm bailiffs	320	483	347	384	585	431
Agricultural labourers and shepherds	16,640	15,924	13,636	17,520	16,299	14,520

	Bedfordshire			Wiltshire		
	1871	1881	1891	1871	1881	1891
Farmers	1,527	1,301	1,270	3,252	3,011	3,275
Farm bailiffs	162	177	161	270	378	326
Agricultural labourers and shepherds	16,807	15,146	13,761	29,636	24,772	20,893

The figures for 1871 and 1881 are taken from Mr. Druce's paper (see p. 113, &c.) contributed (see footnote, p. 49) to a former volume of this Journal.

It is true that, according to Dr. Longstaft's method, the first of these four counties would fall out for the period from 1881 to 1891, although it would occupy a high place on the list for the previous decade and for the whole period of twenty years. But counties which in this list show as great a decrease as 8·3 per cent. in the case of Durham; of 7·3 in that of Leicestershire; of 7·1 in that of Cumberland; of 6·7 in that of Monmouthshire; of 5·7 in that of Westmoreland; of 5·3 in that of Northumberland; of 5·1 in that of Northamptonshire; of 5·0 in that of Denbighshire; of 4·9 in that of Lancashire; of 4·8 in that of the West Riding of Yorkshire; and of 1·0 in that of Essex, for the last decade, are entirely excluded from the list of the Registrar-General. A county, again, like the East Riding of Yorkshire occupies a high place with Dr. Longstaff, but a low position with the Registrar-General, and does not appear at all in column A. Nor do the counties of Lincolnshire, Bedfordshire, Wiltshire, and the North Riding of Yorkshire, although the first and last are high up in all the other columns.

VI. Concluding Remarks.

For these, as for other reasons, the connexion of the figures with agricultural changes is not difficult to establish. As we proceed from the counties as a whole to distinguish the more rural districts, and as the methods we adopt are more carefully calculated to eliminate the urban element, the number of counties which exhibit a decrease of population grows. In column A there are only thirteen; in column B the number is increased to twenty-six; while Dr. Longstaff's tables show as many as forty-seven counties for the last decade, forty-four for the ten years from 1871 to 1881, and forty-seven for the whole twenty years.

Of the counties, again, in Table IV., those of the East Riding of Yorkshire, of Lincolnshire, Bedfordshire, Wiltshire, Herefordshire, Brecknockshire, and Cardiganshire, are specially distinguished, as we have seen, by the Registrar-General as counties in which there are no great manufactures and all the labour is of an agricultural character; and, of the other counties so distinguished, those of Norfolk, Suffolk, Hertfordshire, Oxfordshire, Dorsetshire, and Devonshire, appear in the columns of Dr. Longstaff's tables for both decades; and Cambridgeshire, which is the only county remaining, appears in the tables for 1871 to 1881.

All the counties, again, in Table IV., with the exception of Flintshire, Cornwall, and the North and East Ridings of Yorkshire, are specially mentioned by the Registrar-General as containing a population of which at least 14 per cent. belonged to the agricultural order; and in Montgomeryshire, which on any method maintains an unenviable primacy, the proportion amounted to 21·1 per cent., while in Herefordshire and Lincolnshire, both of which are high in the list of English counties exhibiting a decrease, the proportion was over 18 per cent. Radnorshire, in which the proportion was the highest, amounting to 25·5 per cent., is third in order of decrease on columns A, D, and E, and fourth on columns B and C. Here, again, all the counties mentioned, with the exception of Cambridgeshire and Buckinghamshire, appear in Dr. Longstaff's list for the last ten years.

The figures, lastly, in Table V. exhibit a diminution for the seven English counties mentioned in Table IV. in the numbers of agricultural labourers during the last twenty years which fully corresponds with that of the aggregate class for the whole of the country, and exceeds the percentage given for 1881–1891 by the Registrar-General for those purely agricultural counties to which we have just referred as specially distinguished in his report.

It is impossible to resist the general tendency of this evidence; and from all the indications we have now passed in review we may safely draw the conclusion that the Census of 1891 bears indisputable testimony to the reality of rural depopulation in certain districts, although we must be careful not to exaggerate its dimensions, and it does not appear to have increased appreciably during the last decade. Dr. Longstaff points out very aptly, at the conclusion of his investigations into England and Wales, that Wiltshire has still a density of population "equal to that of New Jersey" in America, "far greater than that of Connecticut, New York, or Pennsylvania, and double that of Ohio or Delaware." But, on the other hand, while the figures which Mr. Cannan has extracted on the decline of urban immigration are, as we have seen, by no means incompatible with rural efflux, the diminution in the Occupations Returns of the male relatives of farmers and of the agricultural labourers combines with the actual decrease of certain rural districts to point to one conclusion, and to confirm a general impression. Whether the efflux can be arrested by wise legislation or prudent statesmanship, whether it has yet attained sufficient dimensions to call for any comprehensive or urgent treatment of this character, are questions which may be hotly argued, and will be answered differently according to the disposition and temperament of the individual; but of the reality and continuing nature of the movement itself no candid and careful student of the Census Returns can entertain any doubt.

L. L. Price.

Oriel College, Oxford.

WILD BIRDS USEFUL AND INJURIOUS.

II. Warblers, Tits, Pipits, Buntings, and Finches.

Warblers.

The Warblers include several species of birds, more or less generally known, but not always discriminated from each other. They come to us in the spring of the year from the South of Europe and Africa (the males usually arriving some days before the females), and return to a milder climate for the winter.

The **Whitethroat**, Peggy-whitethroat, or Nettle-creeper

Fig. 1.—Whitethroat, *Sylvia rufa*.

(*Sylvia rufa*), is perhaps the best-known and most widely distributed of the warblers. It is (fig. 1) a soberly clad bird, the head and neck being smoke-grey, the back reddish-brown, the quill feathers greyish-brown, the tail feathers brown with the exception of the three outer pairs, which are marked with white, and the underparts brownish-white. The whole length is five inches and a half. The whitethroat arrives in this country about the third week in April, and its vigorous song, often uttered on the wing during a sprightly and characteristic flight, soon makes it conspicuous. The nest, a slight structure, formed of bents with a lining of fine grasses or horsehair, is usually placed within two or three feet of the ground amongst brambles, nettles, or other tangled vegetation, and contains from four to six eggs, yellowish or greenish-white in ground colour, speckled with grey, light brown, and olive-green. The markings often form a zone round the larger end, and the eggs vary considerably, though there is not much difficulty in identifying them. It is pleasant to watch the fussy anxiety of the old bird, as it utters its scolding note when it thinks its offspring are in danger.

The whitethroat feeds largely on insects, particularly caterpillars, which it picks off the hedgerows, or collects in the woods which it frequents, and in this way renders good service. It also visits gardens for the sake of the ripe fruit, currants and raspberries presenting especial attractions. The latter it devours piecemeal, picking off the divisions of the fruit separately. Green peas are also laid under contribution, and the whitethroat, notwithstanding its slender bill, is able to open the pods for itself. In recompense, however, for this attack on garden produce it eats a quantity of destructive caterpillars, aphides, and other garden pests. A closely allied but less abundant species, the **Lesser Whitethroat** (*Sylvia curruca*), which may be recognised by the dark patch on the side of the head, so nearly resembles the whitethroat in the nature of its food that it needs no further notice here.

The **Blackcap** (*Sylvia atricapilla*), another summer visitor, is larger than the whitethroat, the males being about five inches and three quarters in length, and the females half an inch longer. It may be recognised (fig. 2) by the dark cap, which relieves its grey plumage, and which in the male is jet black and in the female reddish-brown. This species is often confounded with the tits, to some of which the same name is applied. It is, however, a very different bird, and its actions bear no resemblance to the comical energy of the more sprightly titmice. Though essentially a summer visitor, the majority leaving this country in September, it has been observed on several occasions in winter. It is a rather shy bird, and usually shuns observation, but when there are young birds in the slightly-made nest the parents come close to any intruder and hop about in a peculiar shuffling manner. As is the case with many species, the male bird shares the task of incubation, his jet cap rendering this fact easy of observation.

Its food consists of spiders, aphides, and many other insects, sometimes captured on the wing, and of wild fruits, including blackberries and the berries of the ivy, privet, and elder. It is also devoted to cultivated fruit, attacking currants, strawberries, raspberries and cherries, whilst, like the whitethroat, it opens pea-pods. Its visits to the garden, therefore, cannot be considered altogether desirable.

The **Garden Warbler** (*Sylvia salicaria*) in size, food and habits closely resembles the blackcap, but the pale brown upper parts are not relieved by a dark cap. Its food is, in fact, practically

FIG. 2.—Blackcap, *Sylvia atricapilla*.[1]

identical with that of the bird last described, and consists of insects, wild berries, and fruit. It is said to show a marked partiality for the destructive caterpillars of the white cabbage butterfly. Both these warblers are comparatively rare, so that any damage they may do is not likely to be serious, and if it were not for the fact that they frequently build their nests in thick shrubs or tangled vegetation in gardens, and that they make themselves conspicuous when the fruit is ripe, they would escape the notice of most people. Their insect-eating propensity and vocal power, if insufficient to atone for the loss of fruit for which they are responsible, at least render the debt against them very slight.

[1] Figs. 2, 3, 6, 7, 8, 9, 10, 11 are from Yarrell's *British Birds* (Gurney & Jackson).

Three smaller warblers deserve a passing notice—namely, the **Wood-wren** or Wood-warbler (*Phylloscopus sibilatrix*), the **Willow-wren** or Willow-warbler (*P. trochilus*), and the **Chiffchaff** (*P. collybita*). They closely resemble each other in plumage and size, though the wood-wren is the largest of the three, measuring five inches and a quarter in length, and the chiffchaff is the least, measuring only four and three-quarter inches. So great is their resemblance to each other that good observers, who have acquired their knowledge of Nature by outdoor study unaided by books, though perfectly familiar with the distinctive notes of these three small warblers, often think that the various sounds proceed from one species, to which they apply some local name, such as that of yellow-wren, ground-wren, oven-bird, or miller's-thumb. The notes may perhaps be recognised from the following descriptions. That of the wood-wren has been rendered by Blyth: "Twit, twit, twit, tit, tit, tit, ti-ti-ti-i-i-i, beginning slow, but gradually becoming quicker and quicker, until it dies away in a kind of trill," accompanied by a peculiar quivering of the wings. Of the willow-wren's song Hewitson says "there is a simplicity and a sweet cadence about the note of this species which never fails to excite within me feelings of pleasure, which none but the lover of Nature can either appreciate or understand, but which are to him amongst the chief enjoyments of his life"—a passage the truth of which will be admitted by any naturalist. The song cannot be further described in print, but it is loud for the size of the bird, and in the springtime, when several willow-wrens are singing within hearing, the woods are delightfully enlivened by their strains. The chiffchaff on its arrival contents itself with repeating perseveringly the two syllables of its name from morning till night, though after a while the monotony is somewhat varied by a change which may be represented thus: "cherry chiffchaff, cherry cherry chiffchaff."

The nests of the three species, constructed externally of hay, dead leaves, and moss, are covered in or domed, with an entrance at the side, and are placed on or very near the ground. Those of the willow-warbler and chiffchaff are nearly always lined with feathers, whilst the wood-wren is never known to employ this material. As with most birds, freaks of fancy occasionally occur in the choice of a nesting site, and both the willow-wren and the chiffchaff have been known to build their nests several feet from the ground. I knew, for instance, of a chiffchaff's nest in a yew-tree, built near the extremity of a branch, and more than six feet from the ground.

The food of these small warblers consists of insects in all stages, some of which they capture on the wing. In gardens they may often be seen picking innumerable aphides from the fruit trees, hopping about in a peculiarly gentle manner, and examining the leaves with great assiduity. They also render valuable protection to forest trees, for they feed largely on destructive leaf-rolling caterpillars, including no doubt those of the beautiful little green oak-moth, which at times is so abundant that the oak-trees are absolutely stripped of their foliage by its ravages. If these small warblers ever touch fruit, it is certainly exceptional, and for practical purposes it is safe to say that the benefit derived from their presence is not in the least degree detracted from by any loss of garden produce.

The Wren.

The **Wren** (*Troglodytes parvulus*) is too well known to require description, and with regard to its local names it need only be said that by common consent some such prefix as "Jenny" or "Kitty" is applied to this cheery little favourite. The upright position (fig. 3) in which it elects to carry its tail gives it a very

Fig. 3.—Wren, *Troglodytes parvulus.*

pert appearance, and at once distinguishes it from other small birds. Its lively song is an extraordinary production for the size of the bird, and is uttered during the greater part of the year—even in hard frost. In such weather the wren endeavours to keep itself warm at night by roosting in company with several others of its own species in some hole in a thatched roof or other snug retreat.

Its domed nest is skilfully constructed, often carefully concealed, but at times conspicuous enough. It is placed in all manner of situations. I once found one in a swallow's nest; the green mossy nest of the wren on its foundation of mud, with the owner's head peering out of the orifice, made a very pretty picture. The well-known habit which the wren displays of building nests without any apparent intention of devoting them to the reception of its eggs need only be alluded to, as at present it cannot be satisfactorily explained. Many theories have been advanced to solve the difficulty, as, for instance, that the extra nests are built by the male bird for his own accommodation, that they are designed for winter retreats, or that they have been deserted before completion owing to human interference. In connexion, however, with this latter point, it may be stated that the wren is by no means so jealous of interference as is usually supposed, provided that the nest is treated with due respect and carefully handled.

Its food consists of various insects, including aphides, and of small seeds, for which it may be seen hunting along the sides of ditches and the bottoms of hedges. In the nesting season it renders good service by feeding its numerous family on green caterpillars from fruit trees, and on other garden pests, and it need scarcely be said that it is entirely harmless.

Tits.

Though detested by gardeners, there can be no doubt that the tits are amongst the most useful of our small birds. There are five comparatively common species.

The **Blue Tit** (*Parus cæruleus*), otherwise known as the Nun, Bluecap, Pick-cheese, or Billy Biter, is pre-eminently *the* tomtit, and possesses (fig. 4) the characteristics of the race in a marked degree. Perhaps no bird endears itself more to the lover of Nature than this cheery little specimen of feathered life. Its bright blue cap, yellowish-green back, blue wings and tail, in strong contrast with its sulphur-yellow breast, form a very pleasing picture, and its ceaseless activity, loquacious cheeriness, and enterprising disposition are a never-failing source of amusement. It may, moreover, be easily studied at close quarters, for in the winter it will quickly discover suet suspended by a piece of string in a walnut-shell or other receptacle, and will constantly and fearlessly visit it, even when close to the window of an occupied room. Other species of tits take their share of this meal, and even the tiny golden-crested wren occasionally puts in an appearance. When the suet is suspended in the manner indicated, other birds cannot conveniently get at it, for they are not active enough to cling to the swinging morsel, though I have seen a robin fly up and peck pieces of the suet out of the shell whilst hovering momentarily before it. Cocoanuts and bones are also accounted acceptable dainties by the tits.

Though in winter the blue tit has sufficient enterprise to make use of animal food as just described, and will then even fly away with a few grains of maize thrown down for

FIG. 4.—Blue Tit, *Parus cœruleus.*

poultry, and though in the summer it will pick at apples, pears, and cherries, it supports itself throughout the year almost entirely on insects in their various stages. These it incessantly hunts for under the eaves of buildings, on palings, amongst the foliage of trees and in the crevices of their bark, and in any other place likely to harbour insect life, displaying extraordinary gymnastic powers during its search. Countless small beetles, flies, moths, and the eggs, grubs and chrysalids of insects of all sorts and descriptions are brought to light and devoured by the energetic and persevering tomtits. Some idea of the value of their services may be gained from the fact that amongst the injurious insects which form so large a proportion of their food are numbered aphides, the destructive caterpillars of the gooseberry-moth, the grubs of wood-boring beetles, the maggots in the round galls on oaks, and apparently the caterpillars of the little green oak-moth, the ravages of which have already been alluded to. In winter the blue tit has been known to visit sheds in which turnips are stored, for the purpose of extracting the grubs from the galls so commonly seen on the roots.

Whilst searching for its insect food it sometimes appears exceedingly and wantonly mischievous. It may be seen tearing the buds or blossoms of fruit trees to pieces in a reckless manner and most capriciously, for after a cursory survey it will leave one tree and then subject to a prolonged investigation another to all appearance exactly similar. There is, however, method enough in this procedure, for it is not the buds or blossoms themselves that are so eagerly sought for, but the eggs or grubs of insects with which they are so often infested. From their minute size these pests escape human observation, but the keen vision of the tit enables it to detect them. It is scarcely necessary to add that the insects, if unmolested, would not only destroy the buds and blossoms, but would produce a countless progeny as rapacious as themselves. I witnessed not long ago a good instance of this apparently destructive propensity. Some blue tits were busily engaged in a willow, stripping the catkins from the twigs, and showering them down on to the road, chuckling to themselves at intervals with evident delight. The whole performance looked as if it were a piece of exuberant mischief, but on examining some of the catkins scattered on the road I noticed dark-brown channels in their centres, and on gathering further specimens from the willow the secret of the tits' satisfaction was revealed. For in many of them a little white grub was ensconced, eating out the core of the catkin. It was impossible to resist the idea that chuckles of exceptional vivacity heralded the discovery of grubs of more than ordinary dimensions.

A fancy for bees occasionally brings the bluecap into disrepute with the bee-keeper, for, especially in the winter and spring, the bird will alight at the mouth of the hive and by tapping on the board entice the inmates to venture outside. It then carries them away, one at a time, to be devoured at leisure. Another instance of the intelligent enterprise which it displays in its search for food is its habit of examining street-lamps, for in common with entomologists it is well aware how attractive the light is to insects. In noticing this habit, the Rev. H. A. Macpherson says, 'I spied a blue titmouse alight on a lamp-post, and proceed to scrutinise its four sides. Before the bird crossed the road to try another post, I saw him deliberately squint through the round hole left for the gas-burner, in order to assure himself that no insects were left lurking in the interior." The benefit conferred by this and other species of tits is immense, and any mischief they may do is comparatively insignificant.

The nest of the blue tit, chiefly composed of moss and feathers, is hidden in some hole in a wall or tree, occasionally close to the ground, or in the deserted nest of another bird, in a pump, letter-box, lamp-post, or other convenient receptacle. When the nest is inspected, the parent bird does not evince any inclination to leave her treasure, but, on the contrary, puffs out her feathers, and, hissing like a snake, pecks most valiantly at the intruding finger.

The **Great Tit** (*Parus major*), often called the Ox-eye, Black-cap, or Saw-sharpener (fig. 5), is a handsomely-marked bird, nearly six inches in length. The top of the head is black, the cheeks are white, the upper surface is chiefly greyish-blue, and the under parts yellow, with a conspicuous black band running centrally from the chin to the tail. Its notes are varied and defy description, except that certain of them resemble the sound made in sharpening a saw, and hence one of the local names assigned to this species. The site selected for the nest is most commonly a hole in a wall or decaying tree, but, as in the case of the blue tit, many other situations are occasionally chosen; thus I have known the burrow of a sand-martin tenanted by a pair of great tits.

The food of the great tit is somewhat varied, but consists chiefly of insects, which it obtains much after the manner of the blue tit. Like that species, it occasionally robs bee-keepers of the inmates of their hives. It has also been known to pull straws out of thatch for the purpose of getting at lurking insects, and Gilbert White watched one occupied in this manner, to his "no small delight and admiration," though whether the owner of the thatch equally appreciated the little bird's intelligence is not recorded. Insects, however, do not constitute the whole of its diet, for yew berries, the kernels of beechmast and hazel nuts, and other vegetable food come under its notice. It has even been known to kill small birds, though it is usually in captivity that this propensity is developed.

The **Coal Tit** (*Parus ater*, fig. 6) is slightly smaller than the blue tit, being about four inches and a quarter in length. Its back is olive-grey, the wings dark-grey with two white lines across them, the tail dark-grey, the breast greyish-white, and the head glossy-black, with the exception of the cheeks and nape of the neck, which are white. The double white bar on the wings and the white nape serve to distinguish this species from the marsh tit, with which it is frequently confounded. Like the two species already described, the coal tit lives principally on insects, but in addition feeds on the seeds of the Scotch fir and on small earthworms. It is, perhaps, more addicted to

FIG. 5.—Great Tit, *Parus major*.

searching for its food on the ground than the other tits. Its nest, composed principally of moss, wool, and rabbit's fur, is usually hidden in some hole in a wall or rotten stump, or even in the burrow of a mouse, rat, or mole, close to or beneath the surface of the ground.

The **Marsh Tit** (*Parus palustris*) is the most soberly clad of the British tits. It is of the same size as the blue tit, and in colour is brownish-grey above and greyish-white beneath, relieved by a glossy black cap, but without the white nape which characterises the coal tit. Its brisk and sprightly actions at once proclaim it a tit, and, like its relatives, it spends most of its time hunting for insects, though various seeds—including those of the thistle, dog's mercury, and honeysuckle—are also acceptable. The white berries of the snowberry shrub in gardens likewise offer attractions in the shape of the little kidney-shaped seeds which they contain. A loud tapping may

FIG. 6.—Coal Tit, *Parus ater*.

often be heard in the woods, which on investigation proves to be due to an energetic marsh tit engaged in cracking some hard seed for the sake of the kernel. Whilst hunting for its insect food it sometimes splits off flakes of the rough scaly bark of the Scotch fir and similar trees. This habit is probably shared by others of the family—in fact, the various species of tits are so fond of hunting in company, and resemble each other so nearly in the nature of their food, that they naturally acquire similar methods of obtaining their prey.

A typical nest of this species, composed of moss, fur, and a few feathers, was found hidden in the rotten branch of a willow, in which the tits had made a convenient cavity with an entrance only large enough to admit themselves. I watched one of the old birds carrying away chips from the excavations, some of which I afterwards found a few yards distant.

The **Long-tailed Tit** (*Acredula caudata*), known in various districts as the Oven-builder, Bottle-tit, Mumruffin, or Long-tailed chitterty magpie, is distinguished alike by the enormous length of the tail attached to its tiny body and by the extreme beauty of the nest which it builds. This marvellous piece of work is oval in shape, composed of moss, cobwebs, and wool, adorned with lichens on the outside, whilst the interior, to which access is gained by a single small hole at the side, is densely quilted with feathers, of which there are literally thousands. A blackthorn-bush is often the site selected, though furze, ornamental shrubs, and similar situations attract the attention of the tiny builders. The parent birds are very tame, and I once induced a pair to make use of some fluffy shreds from the silk lining of my hat, placed on the bushes close to a nest, in the construction of which they persevered notwithstanding my immediate presence.

The food of the long-tailed tit consists almost entirely of "looper" caterpillars, beetles, and other small insects, of which it is able to obtain an abundant supply, even in winter.

Wagtails.

Graceful and buoyant in its actions, the **Pied Wagtail** (*Motacilla lugubris*) attracts attention by running nimbly over the lawn or by the side of some stream or pond, with its long tail in constant motion. Its plumage is a pleasing mixture of black, grey, and white, the proportion of these colours varying with the season, and with the sex and age of the bird itself. The whole length is seven inches, or rather more. In its choice of a nesting-place it resembles the robin, though it is not such a neat architect. The eggs, four to six in number, are white, abundantly speckled with grey, and are similar in appearance to those of one variety of the house-sparrow.

The pied wagtail feeds almost entirely on insects, which it frequently obtains by following the plough, and it is delightful to watch it running lightly across a lawn or roof, or picking up aquatic insects by the water's edge. No doubt small slugs, snails, worms, and perhaps a few seeds, give variety to its diet, whilst in captivity it has been known to catch and eat minnows. It may often be seen on the seashore, attracted thither by the numerous small forms of life which swarm on the tangled sea-weed. In autumn these birds flock together, and perhaps a score may be seen enlivening the scene at the same time; and at dusk the angler may notice small parties of them retiring to roost in the bushes which fringe the stream. There is a closely allied species, the **White Wagtail** (*Motacilla alba*), but in appearance and habits it is so like the commoner bird, with which it has been known to interbreed, that it is only necessary to allude to it here.

The **Yellow Wagtail** (*Motacilla raii*), so well known as a summer visitor to our fields, where it often attracts attention by following cattle for the sake of the insects they disturb, and the **Grey Wagtail** (*Motacilla sulphurea*), with its sulphur-yellow

FIG. 7.—Tree Pipit, *Anthus trivialis.*

breast, the most graceful of a graceful race, which in the breeding season is chiefly found by the side of rocky streams, also devote their energies chiefly to the discovery of small snails, flies, and other insect prey.

PIPITS.

The pipits, though lacking the bright plumage and length of tail which characterise the wagtails, nevertheless have many points in common with them. The two well-known species, the **Tree Pipit** (*Anthus trivialis*, fig. 7) and the **Meadow Pipit** (*Anthus pratensis*), Moss-cheaper, Lingbird, or Teetick, are sufficiently distinct in their habits, but from the similarity of their plumage are almost invariably confounded together under the common name of tit-lark or pipit-lark.

The food of both species consists principally of insects, worms, small slugs, and snails, in pursuit of which the birds may be seen running nimbly over the fields. Small seeds, especially in winter, form a considerable portion of their sustenance, with occasionally a few grains of oats and barley.

The Skylark.

The **Skylark** or Laverock (*Alauda arvensis*), so well known for its glorious and unmistakable song, is, happily, a common bird in most parts of this country, and at times in winter visits us in flocks of prodigious magnitude. The whole length of the male is seven inches and a quarter, the female being rather smaller. On close inspection the great length of the claw of the hind toe is at once sufficient to identify this mottled brown bird. Its song is often heard long before daybreak, and never sounds more sweet and clear than when uttered by a chorus of larks in the stillness of a summer night. This I once heard to perfection on Salisbury Plain about two hours after midnight. The nest and dusky eggs of the bird are by no means easily detected, and the nestlings also closely assimilate with the colour of their surroundings. Though some nests are destroyed by horse-hoeing and other tillage operations, the greater number are saved by the hollows scratched in the ground for their reception. As is the case with peewits, the parent birds make several of these hollows before finally adopting one as suitable for their requirements. The nest, too, frequently owes its immunity to its situation amongst growing crops, where it is comparatively safe from interference.

The food of the skylark is composed to some extent of farm produce, but for this it makes amends by eating many destructive insects, including the wireworm, as well as the seeds of such pernicious weeds as charlock, knotgrass, and chickweed. Seed corn, especially autumn-sown wheat, both before and after sprouting, possesses great attractions for it, but it is only in exceptional cases that the crop is materially injured in consequence. It should be remembered that the wireworm is known to enter into the skylark's dietary and, when a crop fails to braird thickly, it is advisable to make quite certain of the cause before accusing the birds. The injury is most felt in the case of a field sown out of season, or in an isolated position, so that the attention of a large flock of birds is concentrated on a small area. In hard weather the skylark feeds on the leaves of swedes and rape, and on any grass or other vegetation appearing above the snow. It is also accused of eating peas. Earthworms, berries, and small potatoes left in the ground are known to form part of its diet, and a specimen shot on the seashore was found to contain narrow succulent leaves, perhaps those of the sea-pink. It is tempting to give a more lengthy account of this delightful bird, but it must suffice to record the fact that it has been known to carry its eggs or young from a place of danger, that it sings from the ground or whilst perching on a bush as well as on the wing, that many lose their lives by flying against telegraph wires, and that hundreds of thousands are captured for the table. It is some satisfaction to know that this custom does not sensibly diminish their numbers.

Buntings.

The **Yellowhammer** (*Emberiza citrinella*), Yellow Bunting, Yowley, Yeldring, Yeorling, Yeldrock, Yite or Yoit, is one of our most attractively coloured birds, and the canary-like breast of the male perched on the top of the hedge and uttering at intervals his plaintive droning song, confers a charm on many a dusty road. When making the most of himself for the edification of his more soberly clad mate, he looks extremely handsome as he shuffles along the road with trailing wings and crest erect. In length the yellowhammer measures seven inches. The eggs, which may be found from April till August, or even September, are curiously marked with irregular dark lines, which suggest the idea that they have been put on with a pen —hence the name of "writing-master," applied to this species in some districts.

The yellowhammer eats a considerable quantity of corn, both in the fields and in farmyards, but it also destroys many insects, which form the chief food of the young, as well as the seeds of such weeds as plantain, dock, wild vetch, chickweed, thistle, and knotgrass. Various green leaves, blackberries and other wild fruit, are also included in its bill of fare, and in severe weather it has even been known to attack the carcass of a horse.

The **Bunting** (*Emberiza miliaria*), Bunting Lark, Common, Grass, or Corn Bunting, may sometimes be detected amongst the bundles of skylarks hung up in poulterers' shops. In colouring it resembles the lark, from which, however, it may be distinguished by (fig. 8) its much stouter bill and by the absence of the long claw on the hind toe. In length it rather exceeds seven inches. It may be recognised by its clumsy shape, stupid monotonous song, and lazy flight, during which the legs often hang down from the body—attributes which render it comparatively uninteresting, except to ornithologists. The food of the bunting resembles that of the yellowhammer, consisting of corn and the seeds of grasses, knotgrass, sorrel, and other weeds. It also destroys insects, especially when it has young, and has been observed feeding on cockchafers. Though called the "corn bunting," it is by no means confined to the vicinity of cornfields.

The Sparrow.

The **Sparrow** (*Passer domesticus*) has received an overflowing measure of abuse from farmers and gardeners, and, notwithstanding all that has been urged in its favour by enthusiastic

Fig. 8.—Bunting, *Emberiza miliaria.*

advocates, there can be little doubt that it deserves a large share of the vituperation bestowed upon it. The keynote to the sparrow's character is to be found in the delusion, under which it labours, that corn-growing is carried on for its especial benefit. This impression, coupled with a disposition sufficiently enterprising to induce it to follow the Russian colonists to Siberia, renders it little better than a parasite. Its robust form, powerful bill, and strong constitution enable it to endure intense cold, and to obtain food under most unpromising conditions, whilst its wariness and cunning ensure its comparative safety from the devices of its enemies.

Corn is undoubtedly the mainstay of the sparrow. This it obtains in the fields at seed time, when sprouting, in the unripe milky condition, and when fully matured. At this last-named period a quantity of grain is wasted by being shaken out on to the ground by the birds, in addition to the amount actually consumed. At this time, too, numbers of sparrows which live for the greater part of the year in towns are tempted to visit the fields, their grimy appearance proclaiming their usual haunts. It is no exaggeration to say that bushels of grain are pilfered from a single field, especially from the vicinity of the hedgerows. Not content with this allowance, the corn is further laid under contribution, for it is taken from the stack at threshing-time, from poultry and pheasant food, and lastly from the granaries of our docks and large towns, where greedy sparrows may sometimes be found ruptured or suffocated by the excess of food with which they have gorged themselves. They are also constantly on the watch for scattered, and therefore useless, grain from the nose-bags of horses and amongst their droppings. It is evident, then, that an enormous amount of corn is consumed by the myriads of sparrows with which the country is infested.

In gardens the sparrow finds full scope for its destructive propensities in devouring peas, of which it is very fond, as well as a few gooseberries and cherries. In the most mischievous way, too, it pulls to pieces the flowers of the crocus, dahlia, primrose, polyanthus, hepatica, heartsease, wisteria, the shoots of pinks and carnations, the pods of the laburnum, and the blossom of fruit trees. It also does considerable damage to beds of young radishes and lettuces, besides levying toll on the grass seeds sown on lawns. Another source of annoyance is its habit of destroying thatch by burrowing into it, and of building its great untidy nest, constructed externally of straw, hay, string, rags, paper, or other rubbish, snugly lined with feathers, in spouts, ornamental trees, or other situations where it is anything but desirable. In the nesting season, moreover, it exhibits another evil habit, one that appears an unpardonable crime to anyone even slightly interested in bird life. For, not content with appropriating the nests of martins for roosting-places in winter, it takes possession of them in summer, and, after stuffing a handful of straw into them, proceeds to lay its eggs and bring up its family. The robbery is of such frequent occurrence that pitiable accounts of the consequent diminution in the number of martins have been written by many observers, including Colonel Russell, who, with Mr. J. H. Gurney, has so ably chronicled the misdeeds of the sparrow. This vile habit of dispossessing the martins is much more developed in some districts than in others, but there are few places where traces of it cannot be observed. No effort should be spared to make it clear to the sparrows that such conduct will entail speedy retribution. There can be little doubt that these noisy and obtrusive birds diminish, directly or indirectly, the numbers of many desirable species.[1]

On the other hand, it must be freely admitted that the sparrow does a great deal of good. For instance, it destroys numberless insects, especially in the nesting season. The belief, however, that its young are brought up entirely on an insect dietary is certainly erroneous, for even when recently hatched they are often supplied with milky grain. Amongst the pests destroyed by the sparrow are wireworms, daddy longlegs, weevils from peas and beans, aphides, caterpillars of various kinds, chovies, house flies, "blue-bottles," "black-beetles," and white butterflies. It is unnecessary to dilate upon the injury caused by such insects as the wireworm, daddy longlegs, or chovy. In some districts chovies, otherwise known as bracken-clocks or May-bugs, occasionally do immense damage, and at such times sparrows have been seen with their mouths crammed full of them. The quantity of weed seeds which the sparrow eats must also be placed to its credit, for in this way it helps to suppress such objectionable plants as charlock, corn bind-weed, goosefoot, knotgrass, buttercup, dandelion, chickweed and dock.

It is evident, therefore, that there are two sides to the "sparrow question," and many good naturalists have been unable to decide which way the balance inclines. It can, however, scarcely be denied that sparrows are almost everywhere too abundant, and, in all probability, if their numbers were greatly reduced, other more attractive and less mischievous birds would be equally efficacious in keeping the ravages of insects within bounds.

As it is a prevalent belief that when a sparrow builds its nest in a tree it thereby becomes a **Tree Sparrow** (*Passer montanus*), it may be worth while to mention that the two species are quite distinct. The tree sparrow differs from the commoner bird in having a reddish-brown crown, two light bars on the wings, the cheeks white but conspicuously spotted with black, and a less robust shape. The sexes, too, closely resemble each other in plumage, whereas in the house sparrow they differ considerably.

---

[1] An instance of a sparrow attacking a willow-wren, which it seized and carried for some yards in the air, is recorded by Mr. J. Whitaker in the *Zoologist* for 1885, p. 263. The sparrow was driven away before its victim was much hurt.

Finches.

The **Chaffinch** (*Fringilla cœlebs*) is one of our commonest birds, and has gained for itself many local names, including the following: Spink, Skelly, Scobby, Shilfer, Shell-apple, Buck-finch, Horsefinch, Beechfinch, Copperfinch, Whitefinch, Piedfinch, and Wet-bird. The conspicuous white bars on the wings are common to both sexes, but the male is much the handsomer of the two, and is well worth a close examination. In length it measures about six inches. The lichen-covered nest, carefully lined with hair and feathers, is wonderfully compact and beautiful, but, like the bird itself, is so common that it does not meet with the admiration it deserves.

The chaffinch feeds largely on insects, and brings up its young almost entirely on an insect diet. It may be seen catching flies on the wing, or diligently searching the foliage of trees for caterpillars and aphides, including the kind known as American blight. It also eats beechmast and quantities of small seeds, amongst them those of many noxious weeds. Some of the seeds are shelled before being eaten, but others are swallowed without any such preparation. I have seen a chaffinch pecking at the flowers of a species of *Polygonum* or knot-grass before any seed was visible. The cones of the Scotch fir and similar trees also furnish food for the chaffinch in the shape of the seeds which they contain, and the membranous scales may be seen fluttering down deprived of the seed by the birds busily engaged in the branches overhead. The chaffinch may likewise be observed with other small birds picking about on the tangle of the seashore. Though it eats corn, it is only when its numbers are very great that it causes any serious loss to the farmer by so doing, but at times it does considerable damage to young turnips, radishes, and similar crops. In winter, flocks composed exclusively of one sex may be observed, but generally the sexes feed in company.

The **Greenfinch**, or Green Linnet (*Coccothraustes chloris*, fig. 9), is a stoutly built bird, rather more than six inches in length, and the colour of its plumage is green of various shades, with bright-yellow markings on the wings and tail. Young birds are light-brown in colour, with darker streaks on the breast. It is a noisy bird, and in the spring its notes, which differ widely from each other, are uttered incessantly.

As might be inferred from the shape of its powerful bill, the greenfinch feeds largely on seeds, including corn and turnip seed. When too numerous both this species and the chaffinch do considerable damage, and it may be necessary to keep them within bounds. It is worthy of remark in passing that an undue increase of small birds is the inevitable result of exterminating such of their natural enemies as the sparrow-hawk, jay, and magpie. The greenfinch co-operates with other small birds in devouring the seeds of such weeds as the dandelion, corn marigold, dock, plantain, goosegrass, corn crowfoot, charlock, knotgrass, and wild vetch. Its young are chiefly fed on insects and a few soft seeds, and immense quantities of moths, flies, caterpillars, and other pests are captured for their sustenance. The seed of spent hops in a brewery yard sometimes attracts scores of greenfinches.

FIG. 9.—Greenfinch, *Coccothraustes chloris.*

The **Hawfinch** (*Coccothraustes vulgaris*) may be at once recognised by (fig. 10) its bulky appearance and powerful bill, which in an exaggerated degree resembles that of the greenfinch. It is considerably larger than the other finches, measuring fully seven inches in length, notwithstanding its comparatively short tail. Though still generally considered a rarity, it has greatly increased of late years in the southern and midland counties of England.

The hawfinch, in spite of its shy nature, has attracted attention and excited considerable disgust amongst gardeners by visiting the rows of peas, which form an irresistible temptation. The damage undoubtedly done in this way cannot be disregarded, for the success of the pea crop is a matter of no small interest. It is, however, a great pity to kill such an interesting bird, especially as the nature of its food throughout the rest of the year renders it not only harmless but useful. It subsists principally on the seeds of the hornbeam, pine, laurel, and hawthorn, with the kernels of wild cherries and other stone fruits, which it is enabled to extract by means of its powerful beak. In summer it captures quantities of insects, principally for its young, and a

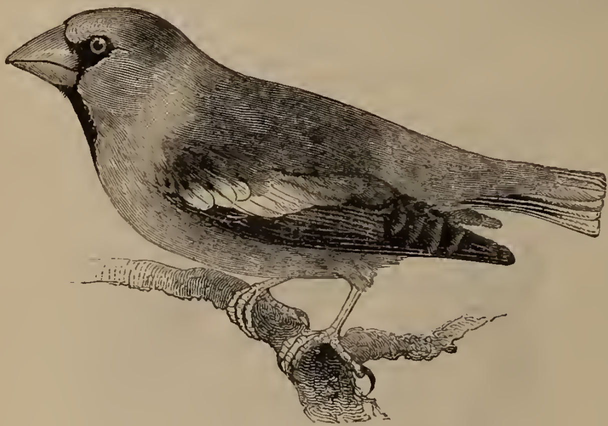


FIG. 10.—Hawfinch, *Coccothraustes vulgaris.*

female hawfinch was once found to contain no less than forty caterpillars.

The **Bullfinch**, Olph, or Hoop (*Pyrrhula europæa*), is characterised by (fig. 11) a very short, strong bill, a blue-black cap, and a pure white rump in both sexes. The male has in addition a brilliant red breast. The total length is rather more than six inches. The bullfinch would often escape observation if it were not for its mournful call-note, or for a glimpse of its white feathers as it flits through the coppice.

Most unfortunately this handsome finch is destructive in gardens, for it strips the buds, especially the flower-buds, from gooseberry-bushes, cherry, plum, and other fruit trees. It also attacks the buds of the larch, beech, hawthorn, and similar trees. On dissection the bird's crop may be found full of buds, whilst insects occur in very small numbers, though it has been stated that the winter moth, a great pest in orchards, forms part of the bullfinch's diet. It is even doubtful whether insects form the main support of the young, for they appear to be fed on seeds softened by their parents. Many attempts have been made to establish the bullfinch's innocence, or to show that it is only slightly injurious. It can, however, hardly be denied that the damage done by it is often very serious, so much so that many ornithologists have been compelled, to their sorrow, to wage war on this otherwise delightful bird. The most that can be said in its favour is that its ravages are confined to a short period, whilst during the rest of the year it leads a useful life, and that in spite of its visits the trees sometimes bear abundantly. The bird, too, is frequently blamed for a deficiency in the crop

FIG. 11.—Bullfinch, *Pyrrhula Europaea.*

due in reality to a late frost or an insect attack. A large portion of its food consists of blackberries, hips and haws, rowan berries, and the seeds of chickweed, thistle, groundsel, ragwort, plantain, dock, and other objectionable weeds. It has also been observed feeding on lilac seed. I have seen a small party of these birds eagerly devouring the seeds of a large sow-thistle, showing considerable activity in reaching the heads, and sometimes fluttering over them the more readily to attain their object. On another occasion a cock bullfinch showed to great advantage against the snow-clad ground as it stripped the seed from a tall dock.

The nest is neatly formed of small twigs with a lining of fibrous roots, and is commonly built in thick woods protected by game-preservers. This fact accounts for the comparative abundance of the species in the face of continued persecution.

The **Goldfinch** (*Carduelis elegans*, fig. 12), Thistlefinch, Flinch, Goldie, Grey-pate, Proud Tailor, King Harry Redcap, or Sheriff's-man, as it is variously styled, is most deservedly a general favourite. In length it measures about five inches. Its crimson mask set off by the white cheeks and black crown, the white breast suffused with brown, and the brilliant yellow of the wings, form a lovely picture in the sunshine. The actions

FIG. 12.—Goldfinch, *Carduelis elegans.*

and twittering notes of this bright finch are equally pleasing, and it renders good service to agriculture. As it is entirely harmless, it is evident that no bird has a greater claim to protection throughout the year. Yet such apathy prevails that no steps are taken to prevent its extermination. Not only are quantities of goldfinches illegally captured during the close time, but after August 1 any birdcatcher may ply his abominable trade with the full sanction of the law. Though the lamentable decrease in the number of goldfinches, so noticeable throughout the country, is partly due to the enclosure of waste land and the comparative scarcity of thistles and similar weeds, it is without doubt largely dependent on the depredations alluded to. There is no excuse for the present state of the law, and it is to be hoped that some change will be made in the right direction before it is too late. The fact that the decrease is equally noticed in districts which birdcatchers do not frequent is due to the migratory habits of the birds. They continually rove over the country in small parties to search for food, and in the autumn the majority journey across the sea to the Continent. Our North-country birds, therefore, may easily fall victims in the course of their wanderings to the wiles of birdcatchers on the South Coast.

The favourite food of the goldfinch consists of the seeds of various weeds, including the thistle, hardhead or horseknop, dandelion, ragwort, groundsel, teasel, burdock, chickweed, and plantain. Like the chaffinch, it picks out the small seeds from fir cones. It also attacks the twigs of the lime and willow, stripping off the outer bark for the sake of the inner tissue. Caterpillars, beetles, and other insects are destroyed by it in summer, and it is probable that its young are partly fed on aphides.

The nest is a beautifully neat structure, resembling that of the chaffinch, but rather smaller. It is frequently placed in orchard trees and in sycamores, sometimes in a furze-bush, hawthorn, ash, alder, horse-chestnut, or fir, and I once found one in a cedar.

The **Linnet** (*Linota cannabina*) has a variety of epithets prefixed to its name, and is called the Grey, Brown, Red, Rose, or Whin Linnet; whilst the terms Redcap, Gorse-cock, Paywee, Whinfinch, Whingrey, Hemplin, Lintie, amongst many others, are also applied to it. It measures about five inches and three-quarters in length. Comparatively few people are aware how handsome the male is when in full plumage, with his glossy red crown, rose-coloured breast, and chestnut back. The female is more soberly clad, and even the males are sometimes found breeding without having attained their full beauty. The plumage also varies with the season. The linnet is partial to furze-covered commons, and, especially in summer, is a characteristic feature of such localities.

When very abundant, linnets do considerable damage to turnips, rape, and similar crops, by feeding on their seed, which they attack when newly sown, and also, where the crop is grown for seed, at harvest time. With this exception they are harmless, for the amount of corn taken by them is comparatively trifling. The seeds of flax and hemp are eagerly sought by the linnet, and it devours quantities of weed-seeds, including those of the dock, sorrel, knotgrass, charlock, groundsel, ragwort, chickweed, and of plants allied to the deadnettle. Numerous insects and a few berries also form part of its diet, and it is, therefore, a bird which may well be encouraged, except in occasional circumstances.

CHARLES F. ARCHIBALD.

Rusland Hall, Ulverston.

SMALL HOLDINGS.

PROBABLY none of the English industries excites at the present time so much anxious thought as that of Agriculture. Indeed, it is impossible to overestimate the gravity of its present condition; but, unfortunately, while the depression is already sufficiently marked, it does not yet seem to have reached its limit. To enumerate the lamentable effects already evident may be unnecessary, but it may, notwithstanding, help to a clearer definition of the position of affairs. Large tracts of land have gone out of cultivation, rents have suffered serious reduction, rural districts are witnessing an appreciable decline in the able-bodied population, and, as the worst resulting feature of all, the sources of native food-supply are dangerously diminishing.

Although it is considered by many that there is little hope of relief by legislative means, yet legislation has been mnch invoked within the past few years. The exodus of agricultural labourers from country districts, one of the chief effects of the depression, has brought the question of re-creating small ownerships and tenancies more particularly forward for parliamentary consideration. But, although it has been urged that, farming being nearly profitless, it is useless attempting to recreate either the one or the other, nevertheless, possibly in hope of better times, attempts to do so are continued. It may not, therefore, be without interest to examine more exactly the reason for the migration of the labourers, the attempts to retain them upon the land, and the practical results of such attempts, so far as they may be ascertained or anticipated. To do this it is necessary to take a brief retrospect of the period from when the small-proprietary system seemed firmly established to the time of its extinction, and, incidentally, to notice the causes of the extinction.

HISTORICAL RETROSPECT.

To look backward no further than the seventeenth century, where historic proof can establish the fact, the greater part of the land was cultivated by yeomen and labourers, these latter, however, forming but a small proportion of the rural population.[1] The yeomen lived upon the land, and were its holders, either as freeholders or under such conditions of copyhold and leasehold as afforded tenure nearly as secure as freehold. The labourers held cottages and gardens under tenure as privileged as that of the yeomen, and were, in addition, entitled to rights of common, to fuel, to litter, to thatch, and to pasturage for cows and donkeys. There was a general security of possession to all grades of agricultural society. The feudal system, adapted to the needs of its time, had become replaced by a system which may now be regarded as absolutely ideal. But the system of entail, the outcome of the desire of the feudal lords to transmit their vast landed possessions unbroken to their posterity, which had been evaded during the peaceful period between the beginning of the fifteenth and near the middle of the seventeenth centuries, when land became freely dealt with and the number of owners greatly increased, at the time of the Revolution again asserted itself. In the stress of the Civil War the interests of their posterity once more became paramount in the minds of holders of land. No man was safe, nor heritage secure, in the general unsettlement of affairs. Legal subtleties were again invoked, and the system of entail, however modified, once more secured from courts of law the claims of the children to estates of which they might be deprived if the parties in power chanced to be hostile to their fathers. The system tended again to the aggregation of estates and the diminution of the number of the owners.

But other causes were at work. To the ownership of land exceptional privileges were attached, governmental, social, and sporting, and the influence and position as chiefs of the large districts which these privileges afforded. It became the ambition of rich traders and professional men to join the ranks of this influential class of landowners, and win for themselves these great and exclusive advantages. The competition amongst the landless rich led to an artificial increase in the value of all land that came into the market, and soon land became more an object of luxury than a means of investment for mere livelihood. Tempted, therefore, by artificial prices, entails were frequently rendered *nil*, and small owners readily thrust their holdings upon the market. When, at last, the common lands were enclosed, the deathblow was dealt to the

[1] Vide *Agrarian Tenures*, by the Rt. Hon. G. Shaw Lefevre, M.P., to which I desire to express my obligations for valuable information.

small-proprietary system; the yeomen had sacrificed—the labourers were unable to preserve—their former privileges. Now the rural grades are three: the landowners, the tenant farmers, and the labourers; the latter two classes having no local attachment beyond the profit that the tenant sees possible in his farm, and the price that the labourer may realise for his hire.

But change has not been the lot of the working agricultural population solely; the position of the landlords themselves has been subject to vital alterations. In these days the privileges which appertain to the ownership of land, while still as important, are no longer exclusive. The ranks of the magistracy are not open only to the possessor of the soil; parliamentary honours are no longer his prerogative; the sport of his domain has been subject to legislative interference, and sometimes he has been forced to lease it away through stress of pecuniary necessity. Political conditions have so altered that the wealthy among the mercantile class may now successfully combat his territorial influence in the race for parliamentary honours; while the spread of education and strain of competition have displaced sentiment and increased his financial difficulties. These facts have led to a startling decrease in land values and to decline of proprietary influence.

As to the farmers, though the rigidity of their covenants with their landlords has been relaxed, and their rents have become in many cases nearly nominal, yet the fierceness of present competition has tended to nullify both these advantages. While on the great virgin tracts of American soil agriculture performs its operations with a free hand, and railways and shipping encourage transport of produce by the minimum of charge for freightage, in England the farmer contends with an intrinsically less productive and less easily cultivated soil, and with the antagonism or indifference of the railway companies, which seek only how they may increase their rates, without consideration of those developments in agricultural production which a more liberal and enlightened policy might encourage.

The distress of the farmers will ultimately further affect the labourers, and these already, as a body, have felt the effects of the consolidation of the farms. The wages of individuals up to the present have not declined, but the scope for labour through the consolidation has become diminished. It is inevitable that further tracts of land will cease to be cultivated, and labourers are aware of it. They recognise that they are gradually losing all their former chances of assuming a more substantial status.

Despite industry, intelligence, and thrift, they now grasp the fact that their native villages are likely to afford them only the barest hope of independence. And the new generation of labourers has grown up under the direct influences of the peripatetic politician, popular education, and a free and cheap press. They recognise the precariousness and dependence of their position, and revolt against it. They demand conditions more approaching equality, higher wages, greater opportunities of rising in the social scale. Their imagination is stimulated by all they hear and read of town life: its higher wages, its pleasures, its variety of openings for industry, strength and ability, added to some vague sense of possibilities which they dream exist; and so they are leaving the country to the older and nearly worn-out men, to the apathetic and unambitious, adding to the crowds of the towns and intensifying their already pronounced labour difficulties. Meanwhile, in the towns, in the face of a declining trade which necessitates, for its mere preservation, lengthy hours and low rates of pay, labour clamours for increased advantages, for higher wages, and for extended leisure; and the labourers from the country are only adding to a dangerous force of the discontented and unemployed, which, if trade continue to fall away, will thrust itself against the present conditions of commerce and of government.

Recent Legislation.

Small holdings may or may not be the best and most economic method of land culture, but, if they can be secured, they will tend to relax the labour tension in the towns, and strengthen the bonds of English society by restoring to the land the thousands of yeomen and labourer-proprietors who formed in the past one of the chief sources of the power and stability of the nation. English politicians of both historic parties have, in later years, given this fact recognition. What have they accomplished in the attempt to re-create these small ownerships, to stop the abnormal immigration into the towns, and to restore the political balance?

They have passed four notable Acts of Parliament: the Allotments Acts of 1887 and 1890, the Glebe Lands Act of 1888, and the Small Agricultural Holdings Act of 1892.

The Allotments Act of 1887 was intended to obtain for the labourers, from the landlords, by hire, or purchase by agreement or compulsion, allotments not to exceed 1 acre in extent, and not to be sub-let, at a rent which should be calculated as the original rent, plus expenses of purchase, preparation, cost of rent collection, and of management. It also gave power to obtain land for letting as common pastures to allotment-holders. Boards of Guardians, who were empowered to administer the Act, regarded it with coldness, and the 1890 Amending Act was therefore passed to delegate to County Councils the powers of the Boards of Guardians, if these latter still neglected to exercise them. It may at once be ascribed to the influence of these Acts that the number of allotments, apart from cottages, increased from 1886 to 1890 by nearly 100,000; but, practically, no purchase of land for common pasture, as contemplated by the Act of 1887, has been made. Of these 100,000 allotments, about 3,000 only were actually acquired under the Acts, the others being provided by landowners, subject to private agreement. However much the Acts have contributed to this large increase in the number of allotments, that so considerable a proportion should have been let by private agreement is rather a matter for congratulation than the reverse. Under private agreements the tenants must be, in the majority of cases, better off than where land has been compulsorily acquired. In the former case the rents are lower, because the landlords generally throughout the country have themselves paid all the charges incidental to the preparation, fencing, draining, &c., of allotment land; whereas, in the cases of compulsory allotments, the local committees have had to pay all these necessary charges; and, in addition, rent is further increased to their tenants owing to the acreage for boundaries, roads, &c., which is lost in dividing and rendering the plots accessible to carts. The Acts of 1887 and 1890 have certainly justified their appearance amongst the statutes of the kingdom.

The Glebe Lands Act of 1888 authorised the sale of glebes, either in small portions to the labourers direct, or to the Sanitary Authority of each district, for distribution under the provisions of the Allotments Act of 1887. This Act, so far as the creation of small ownerships is concerned, has proved a complete failure. No labourer purchased any portion of the glebes, for there had been no provision made for part of the purchase money to remain. The sale of the glebes only resulted in further increasing the dimensions of the adjoining estates.

The Small Agricultural Holdings Act of 1892 is the most comprehensive attempt of all at re-creating the small-proprietary system, and alleviating the position of the labourers. It was determined by means of State loans at low interest, repayable by instalments, to purchase estates, divide them up, and sell or let them in small portions. Purchasers were to pay one-fifth of the purchase money, one-fifth might be secured at a rent-charge to be either perpetual or redeemable, and the remaining three-fifths were to be spread over a period of fifty years, but with power to pay all at any time. The holdings so purchased were not to exceed fifty acres in extent, nor a value of 50*l.* per annum; while the holdings to be let were not to exceed an extent of fifteen acres, nor an annual value of 15*l.* The Public Works Loan Commissioners were empowered to lend the necessary funds to County Councils at interest at the rate of 3*l.* 2*s.* 6*d.* per cent. General experience teaches that an arable holding, by cultivation of which a man may earn his entire livelihood, should be from thirty to fifty acres in extent. Under this Act, to obtain a holding of such a size, a man must purchase. Its cost, with the necessary farm-buildings, has been estimated at 37*l.* per acre. Of this sum, under the Act, the labourer must find one-fifth, or, for a thirty-acre holding, over 200*l.* In addition, he must provide money for implements, stock, the growing crops, and manure, and for living expenses until his holding begins to bring him return for the expenditure of his capital and labour. For these the estimate is another sum of 200*l.*, or a total of 400*l.*

The Local Government (England and Wales) Act, 1894, extends the principle of the Allotments and Small Holdings Acts by permitting Parish Councils to let to one person an allotment or allotments exceeding one acre, but, if the land is hired compulsorily, not exceeding in the whole four acres of pasture, or one acre of arable land and three acres of pasture, instead of one acre of arable, as permitted by the Act of 1887.

The deterrent effects of the foregoing legislation upon the immigration of the labourers into the towns will not, it is very probable, be great, unless the stress of foreign competition should slacken, railway charges be diminished, and newer systems of cultivation more generally prevail. Better prices and decrease of expenses must increase the wages of the labourer, and his means to avail himself of the advantages of the Acts. But it certainly appears improbable that the purchase clause of the Act of 1892 will be useful in raising a man to the position of owner from that of labourer. How many English farm labourers are likely to be possessed of the 400*l.* necessitated by the Act? Again, under the letting powers of the Act, the local authority may lease small holdings not to exceed fifteen acres; but while a man remains a labourer it is impossible that he will be able to stock or cultivate more than three acres of pasture, or half an acre of arable land, at the most; and experience proves that he could not support himself entirely out of fifteen acres of arable if he gave up other work, leaving hope of profit entirely out of the question.

The Small Holdings on the Stratton Estate.

The system of Small Holdings on the Stratton Estate, in Hampshire, a typical English estate, furnishes an interesting index to the probable results of the various Acts.

On the Stratton estate some small holdings of arable land were set out by the late Sir Francis Baring in 1849, with the expressed intention of furnishing means to the labourer of rising to the position of a tenant farmer, incidentally attaching him to the district, increasing his interest in his neighbourhood, encouraging habits of thrift, and fostering the hope of ultimate independence. At the outset every man was made aware that so long as his rent was paid he should retain possession of his holding; but, while punctuality of rental payment was inculcated, the tenants were allowed six months of grace after the due date, in accordance with the custom of the estate in the case of larger occupations. It was also understood that no restriction was to be imposed upon the system of cropping, neither was it to be incumbent upon the tenant to replace by artificial, or other manure, the material drain of the land. The labourers who took these small holdings lived in cottages at a rent which barely afforded return for the capital outlay. All rates, taxes, tithe, and other outgoings were paid by Sir Francis Baring, and, in addition, the cottages were kept in repair at Sir Francis's entire charge. All these arrangements were rigidly adhered to by their author, and, since his death, have been continued by the present Earl of Northbrook. He would be a harsh critic who could find fault with proposals so exceptionally favourable as these.

Applications for the small holdings were received from fifteen persons, and an area of two hundred and fourteen acres was set apart for them, being an average of fourteen and a quarter acres to each man. Of these fifteen persons, seven only were of the labouring class, the class sought to be directly benefited. The remaining eight were small shopkeepers, carriers, carpenters, and other persons immediately above the labouring grade. The tenants and their families supplied all the labour necessary to their holdings, except during the harvest and also when they co-operated, both with horses and occasional manual labour, in ploughing and preparing the land for seed. The records of the holdings during the forty-four years show that throughout the first twenty years all were continually in occupation. But in 1866 the number of holders declined from fifteen to twelve, there being six labourers instead of the original seven. In 1870 one more labourer quitted his holding, the total number of holdings in occupation being eleven. This state of things continued until 1877, when, although the number of holdings remained at eleven, the number of labourer-holders fell to four. In the year following labourer-holders numbered only three, and in 1882 only two labourers remained upon their holdings. These proved to be the last representatives of the labourer-holders of the land, for after 1887 they also disappeared, while at the same time the total number of small holdings declined to five. At the present time the small holders number four, a publican, a blacksmith, a baker, and a carrier, who occupy the whole of the original two hundred and fourteen acres; and none of them would have retained their holdings but for the support afforded them by the combination of business. The total rent through the forty-four years fell from 439*l.* per annum to 206*l.*

It has been seen that from 1849 to 1882 the number of small holders only fell from fifteen to eleven; but these thirty-three years, with few exceptions, were years of good prices and general agricultural prosperity, while during the earlier of them holders obtained the full yield of land which had been handed over to them in a good state of cultivation. But the period between 1882 and 1893 has witnessed, as farmers too well know, a continued decrease in prices; and there is, therefore, small matter for wonder that all the labourers and the small tradesmen, handicapped as they were by insufficient capital, should have been forced to relinquish their holdings. Bad harvests as well as bad prices have mainly contributed to the unfortunate result. But another evil contended with in the later years was the smaller yield of the land, resulting from the absence of restriction concerning cropping and the sale of produce, which has been mentioned. Such advantage was taken of this absence of restriction that, if the land had not been above the average of Hampshire, it could not have withstood the extreme drain to which it was submitted.

There were other instances of really bad farming, due rather to lack of capital than to laziness or ignorance, the land of some of the tenants being in a continued state of foulness. But, taking the small holders generally, it may be stated that neither the yield of their crops, nor the numbers and quality of their stock, ever bore comparison with those of the larger tenant farmers. As might have been expected, the small holders occasionally displayed some amount of business as well as farming incapacity. But they have been to a great extent crippled by causes for which they cannot be held accountable, and the evil effects of which they were unable to avoid or mitigate; their small stacks of hay were peculiarly liable to injury from rain, and dealers would not therefore give such prices for them as were commanded by the larger stacks. In addition, the materials they required to purchase—seed, corn, manures, &c.—were needed in such small quantities that merchants would not sell to them at wholesale rates; while for quantities of material under two tons in weight the railway companies charged nearly double the rates of freightage. They have been unable to keep sheep upon their limited holdings, and, in Hampshire, sheep-breeding was almost the only profitable department of farming which, until recently, remained untouched by the depression. Neither have they been able to take advantage of steam to lessen the cost of cultivation.

It appears from this experiment that the advocates of small holdings of arable land, especially in such a district as the Chalk lands of North Hants, have yet to learn from stern experience and the fruits of hard practice the vast difficulties that militate against the realisation of their hopes. In other parts of Hampshire there are still living many people who remember how tenaciously the hardy cultivators of small holdings clung to the land until they were literally starved off it, and there are many land agents of the old school who especially remember the unpleasant and difficult work they experienced in evicting the small tenants from their miserable dwellings to make way for the larger farms managed by men of education and capital, better fitted than they to cope with the intense stress of foreign competition. The larger farms produced at nearly double the rate of the small holdings which they replaced, taking into account the production of beef and mutton and the increased growth of corn resulting from the use of cake and other artificial food. The small holders were much to be pitied that in a certain sense they lost their independence; but the regular work that some of them obtained upon the large farms enabled them to enjoy comforts forbidden to them in their former condition, and certainly unknown to farmers of limited holdings like the Scottish crofters and small Irish tenants. But it should be remembered that, as has been shown, the consolidation of the farms and the employment of steam decreased the scope for labour; and while some of the former small holders benefited, many of them were forced away.

Success is undoubtedly as much a question of the man as of the conditions under which he labours; but, upon the Stratton holdings, both the industrious and the easy-going, the man of business capacity and the man who lacked it, have together come to the ground. From the *résumé* of facts affecting the small arable holdings of the Stratton estate, it will be seen that no single example has been found of a labourer having been able to retain his holding for any great length of time, and certainly not one ever seemed likely to earn the 400*l.* required to make him a purchaser of thirty acres, as contemplated by the Act of 1892. There were exceptional conditions of tenure, the land is close to the village of Stratton, the rent does not exceed 19*s.* 6*d.* per acre, the quality of the soil is above the average of Hampshire, which is a typical English farming county, and there was every facility for the disposal of produce. In spite of all these advantages, the Stratton small holdings, at least where the labourers have been concerned, have proved lamentable failures. Would not this important experience, extending over a period of forty-four years, seem to argue that the Small Agricultural Holdings Act of 1892, praiseworthy and comprehensive as it is, must remain useless towards the re-creation of the small-proprietary system with all its social, economic and political advantages? And yet, perhaps, it may not be entirely useless. When the population of the New World shall have so increased that exports of food produce shall be limited, the Act will probably be the useful instrument for which it was designed.

The most successful of the small tenancies on the Stratton Estate have been the grass lands, which have always maintained a fair standard of rent, and for which there is an increasing demand. It has never been found difficult to let by agreement any small pasture holdings of three to five acres, and to apportion these in the immediate neighbourhood of the villages. A minimum of labour is necessary to them, and their produce finds ready purchasers close at hand. Experience has shown that a pasture holding of fifteen to twenty acres is sufficient to furnish the entire means of livelihood to one family, and the present pasture holdings on the Stratton Estate do no more than supply the adjacent villages with milk and butter; but, if the number were extended, it is doubtful if the competition would tend to benefit the additional tenants. The inevitable surplus produce would scarcely pay them to send into the more distant centres of population, as the railway charges are so very high. Therefore, it would appear that only a favoured few can find profit and hope of bettering their position by means of pasture holdings of any extent; while the tenants of three to five acres may supply family wants, but will have no surplus considerable enough to help them to positions of ownership and complete independence.

Allotments on the Stratton estate of the extent of twenty poles each were largely made available for the labourers nearly eighty years ago. At the present time there are one hundred and twenty, of which a few are held by some of the village small-tradesmen; but the number shows no tendency to increase, although the available land is situated close to the villages, containing a purely agricultural population of about 1,400, and produces good crops. The reason doubtless is that the cottages built by the Earl of Northbrook have large gardens attached to them in all cases, and their occupiers have sufficient leisure to cultivate only these to advantage. No demand under the Acts of 1887 and 1890 has been received. All the rents of the allotments are promptly paid, and they have undoubtedly proved successful, but only as adjuncts to the support of the labourers' families; in no case have they contributed to the advancement of the labourer to the position of a tenant farmer.

The general conclusion from the workings of the Stratton estate small tenancies seems to indicate that the objects of the legislation of 1887, 1888, 1890 and 1892 are scarcely likely to be realised under the present hard conditions of agriculture; and it is not unreasonable to anticipate that, if the depression be accentuated, the wages of individual labourers must fall, and a further impetus consequently be given to the immigration into the towns.

THOMAS STIRTON.

West Stratton, Micheldever, Hants.

MANAGEMENT OF ABERDEEN ANGUS CATTLE.

WITH slight variations the general systems of management of pedigree breeding herds of cattle, whatever the breed may be, must of necessity be very much alike. Consequently, although I have in this paper to deal with the management of an Aberdeen Angus herd, much of what I have to say is undoubtedly applicable also to other breeds, and therefore it may to some readers appear to be stale and unprofitable. However this may be, there can be no doubt that the first and main object of all breeders is the production of high-class calves—of calves that will add to the value of the herd, and that will maintain and perpetuate the special properties of the breed.

Formation of a Herd.

The herd, I believe, is best commenced by buying a small number of in-calf cows or heifers as near to the drop as possible, and then selecting the best stud bull obtainable. As to the females, it is not, in my opinion, wise to at first buy high-priced and so-called fashionable-bred ones; these may with advantage be bought afterwards, when the establishment of the herd has become an accomplished fact.

Good thick-fleshed animals upon short legs, and with good polled heads, are the sorts not only to start with but to stick to, and the bull that is bought should be the best that can be found or that the buyer can afford to pay for. A really good bull will make a herd even from moderate cows, whilst an inferior bull will ruin a herd regardless of the high qualities of the cows it may contain.

Those who intend to start a herd should, in my opinion, consult someone who is quite familiar with the breed; of course, the man who has a natural eye for cattle can easily pick out the good sorts, but there is more than this required if the new herd is to be a success. There is the family history to consider. Were the ancestors of the animals it is proposed to buy *all* good ones? Were they regular breeders and good milkers? Were they free from white markings on the body and legs (no one objects to a white udder)? and were they sound and robust in constitution? These are important points, and should all be well considered, but it is only those who have made a special study of the subject who are competent to advise.

Experientia docet always comes in, but, alas! it generally comes too late. It is better, therefore, for the beginner to remember the law of *caveat emptor*, and to consult an expert, and pay for his advice. Or he may place himself unreservedly in the hands of a well-known breeder, but should be prepared to pay full value for good animals.

Having selected the animals and got them safely into their new quarters, it becomes a question how to treat them so as to obtain the best results. In my subsequent remarks I propose dealing with the several subjects in what may be termed chronological order.

Preparations for Calving.

The Highland and Agricultural Society of Scotland dates the age of calves from December 1, consequently Scottish breeders so arrange that their cows begin to calve down in that month.

In England, on the other hand, we breeders have to consider the rules of the "Royal," which dates the birth of calves from January 1, and so we arrange to have our calving season to commence after that date.

Up to a few days before calving the cows may remain in their stalls in the byre, always, of course, provided that the stalls are long enough and wide enough to allow the animals to have plenty of room when they lie down—an important consideration when cows are heavy in calf. For calving, the cow should be taken from the byre, and isolated either in a box or stall; and if two cows are due to calve at about the same time, they may be put together. In no case should a cow be allowed to calve in a byre amongst other in-calvers; the act of parturition sets up an undesirable amount of excitement amongst the other occupants, which in some sympathetic animals may even bring on premature calving.

Calving.

The time occupied in the act of parturition varies considerably; in some cases it is quickly completed, in others it may be protracted and delayed for hours. In the generality of cases little or no trouble is experienced, but instances do occur when the situation is an anxious and a serious one. In all cases there is a golden rule to observe: Give the cows time—do not interfere unless it is absolutely necessary. Premature interference, or trying to get the calf away before all the parts are perfectly prepared, has caused the loss of many calves, and even the cow, if not also lost, is often seriously injured.

In protracted cases it is wise to make a careful examination in order to see that all is right. If this proves satisfactory, give the cow more time, but if, on the other hand, it is not satisfactory, then send for veterinary aid at once.

Parturition being completed, we must next look after the calf. It is a general custom to attempt to dry the young creature by rubbing it with wisps of hay or straw, but the operation is much more perfectly performed by the rough, warm tongue of the cow. Besides, she likes to do it, and the operation is beneficial to both; it is Nature's way, and it has a satisfying and soothing effect upon the cow, and allays any excitability of temper that may have resulted from her calving.

Aberdeen Angus calves are very precocious, and it is astonishing how soon they are on their feet and helping themselves to the teat.

There are different systems adopted for rearing calves, but in pedigree herds, at any rate, Nature's plan is the best; therefore, let the calf suck its dam—that is, if she is healthy and in a condition to suckle her calf. There is nothing like its mother's milk, taken just as required, for making a good calf; it is the food provided for its sustenance, and it supplies all that is required to build up a healthy structure. Besides, in the act of sucking, the milk is taken just in the proper quantity and suitably mixed with the salivary secretions to ensure good digestion—a very different condition from that which exists when calves are fed from a pail at certain hours of the day, or are only allowed to suck at fixed intervals.

For the first three or four weeks after calving the udder should be frequently examined, and until the calf can consume the whole of the milk any surplus supply must be drawn off. At all times, so long as the calf is still sucking, attention must be given to see that all the teats are clean. Calves will not suck a dirty teat, and if not regularly sucked the quarter of the udder it belongs to will become engorged.

So long as there is no demand for the calving-box, the cow and her calf may remain there; but if it is required, then the cow may be returned to her stall in the byre, and the calf be tied up by her side. This tying-up of the calf is best done by means of a strap around the neck attached by a swivel to a pretty long collar shank; this allows the calf to get a fair amount of exercise, and at the same time it acts as a first lesson in breaking-in. I need scarcely add that the cow with the calf by her side requires a double stand; this may be a drawback when space is of importance, but if the plan can be adopted it is a good one, and no more interesting and instructive object-lesson can be furnished than a row of cows, each having her calf by her side.

When the bull calves are from one to two months old, those that it has been decided to alter should be operated on. And here let me point out the supreme importance of keeping only the best bull calves for stock purposes—by best I mean those that in the first place are good ones individually, and have in addition a good record as to ancestors and all other qualities that are not only desirable but absolutely needed in a stock bull.

The demand for small-priced—it is a mistake to call them cheap—bulls of this breed is considerable for crossing purposes, and breeders may be tempted to keep on animals that would be worth as much or more as steers. This is a mistake, and the sooner both the pedigree breeder and the cross breeder realise it the better it will be for all concerned. In breeding cross-breds the sire at any rate must be pure and good. When this is the case the result of the *first cross* is most marked; if the sire is an Aberdeen Angus, about 80 per cent. of the calves will be black and hornless, and will take after the breed generally for thriftiness and early maturity.

Care must be taken to see that the calves continue thriving and doing well; that they get a sufficiency of milk, but not too much; and that their surroundings, particularly the floor and their bedding, are kept sweet and clean.

The calves soon begin to pick and eat whatever is given to the cow, and when kept running loose some of them learn to steal milk from other cows. These indulgences may lead to a derangement of the digestive organs, and may perhaps bring on "scour."

Scour in calves is liable to occur in the best-regulated herds, and it is often caused by an alteration in the quality of the dam's milk; thus it may sometimes be observed to set in when she is coming in use—in fact, scour in the calf may be the first intimation of her approaching œstrum.

It may, however, be set up by some irregularity of the stomach due to errors of dieting; but whatever the cause may be, the proper treatment is to give a full dose of linseed oil *at once*. Remove the offending material from the alimentary canal, and the calf will soon be all right again.

I have just said that scour is often caused by an alteration in the quality of the dam's milk, therefore in every case her health and the quantity and character of her food must be inquired into. Milk is quickly affected by changes of food; so is it also by any derangement of the stomach and liver. To yield good milk the cow must have food that is sound and wholesome, and water that is pure, and her general system must be in a healthy condition. All these points must therefore be attended to, for it is of no use to go on dosing the calf with medicines when its illness is due to its dam's milk. We must go to the fountain-head, and the cause, whatever it may be, must be removed before health can be restored. Scour requires prompt treatment; there must be no delay, otherwise the case becomes chronic, and if the calf recovers, it will only be a wreck of its former self.

It may be well to follow this part of the subject a little further, for much of the success of breeding and rearing stock depends upon it. It has been truly said that "half of the goodness of a beast goes in at the mouth," and it may with equal truth be said that many of its troubles go in by the same road. If cattle have to be kept in a healthy thriving condition, and if cows are to produce healthy calves, and that at the proper time, and their milk is to be nutritious, the food and water supplied to them must be free from deleterious properties. It is pretty generally recognised that the quality and quantity of milk are affected according to the rations the cow is fed upon, and experts are well acquainted with the fact that when certain drugs are given traces of them can be quickly detected in the milk. To illustrate this, I may mention that I was recently asked to advise as to the treatment of a dairy cow that had lost her appetite and gone off her milk. I ordered some powders containing carbonate of ammonia to be given. The cow made a good recovery, and in a few days was feeding and milking again all right, but her milk smelt so strongly of ammonia that it could not be used. I mention this simply to show the close affinity that exists between the contents of the stomach and the quality of the milk secreted. It illustrates how special properties of food, water, or medicinal agents become absorbed, and are afterwards secreted or excreted, as the case may be, by special organs. Further, seeing that the quality of the blood depends largely upon the quality of the food and water supplied, it shows how important wholesome food and water must be to in-calvers. The existence of the fœtus depends upon a pure supply of blood from the dam; without it the fœtus cannot live—it is poisoned, and abortion is the result. In 1881 ten of my cows aborted within twenty-three days of each other, and the cause was clearly traced to the water supply, which was found to be polluted with sewage.

At all times, from calfhood upwards, it is important to try to keep the digestive apparatus in good working order; it is better to prevent indigestion and the troubles that belong to it than to have to cure them. With this object in view much may be learnt by observing the natural habits and peculiarities ot animals. During summer, when cattle, and horses too, are at grass, it may be noticed that although they of necessity consume a certain amount of soil with the grass they eat, yet still they may occasionally be seen to indulge in licking or even in eating soil; doubtless the soil is required, and it acts as a corrective to the acidity of the stomach. But this craving for soil is much more developed in winter, when the cattle are confined to the house, and the higher the quality of the food supplied the greater is the demand for soil—or its equivalents, rock-salt, chalk, or lime; even young calves may be seen to lick the lime-wash from off the walls, and the lime from between the stones of the wall. But it is in cattle that have been highly fed and forced for some time that the craving for soil is most marked. Bring an animal that has been prepared for the show-ring out of its box, and unless its particular wants have been supplied it will, if possible, get its head down to the ground and eat soil or even dirt from off the road.

It is wise to follow the natural habits of animals as closely as may be under domestication. I therefore keep a large piece of rock-salt, and sometimes chalk also, in the racks, so that both old and young may lick it when they choose to do so. Sometimes I even go further than this, and have a grass sod, with a fair amount of soil attached to it, put into the manger—and it is surprising with what relish some animals will consume both sod and soil.

Harking back to where we left the cows and their calves, the former, as soon as the weather is favourable and there is a picking of grass to be got, should go out to the fields for a few hours each day, and about the beginning of May cows and calves may go out together, but for the earlier nights, or until the weather is something like settled and fine, they should be brought into the house at sunset.

In the case of Aberdeen Angus cattle the bull and heifer calves must not be allowed to go together, as the precocity of the former keeps them always roaming about looking for work; hence they become troublesome both to the cows and to the heifer calves.

Cows with bull calves must be kept by themselves in fields separated from the cows with heifer calves. Should the dams of the bull calves begin to fail in their milk supply, which may happen towards the end of summer, it is well to give their calves a small allowance of cake per day. This is best done by placing the cake in some convenient place, the access to which is only just high enough to allow the calves to get in, but not the cows.

Weaning.

The weaning of the calves, except any odd late one, should take place in September. The heifer calves may be put all together in some large, well lighted and ventilated, covered fold; the bull calves may be put in boxes or small folds (covered) in lots of two or three, depending upon the space available. The cows should be put in a field as far as possible removed from the calves. For three days and nights both the cows and the calves are very noisy and unsettled, but at the end of that time quietness is restored, and now is the time to commence breaking-in the calves.

Breaking-in.

This I look upon as important work, and work that requires a combination of care and firmness. For the first lesson the calves are haltered, and tied up in their folds or boxes in such a position that if they show temper they are not likely to hurt themselves. After learning to stand tied up quietly, they are taken out and taught to be led and turned to right or left as required. At first two, and sometimes three, men are required at the halter. Some calves are easily broken and become quite handy in a short time, others may show fight; but with firm treatment and no ill-usage they soon all become amenable to reason, and in the course of three or four days they can be haltered and taken away in any direction. This breaking-in they never forget, and it renders them easy to handle for the remainder of their lives.

Quarter Ill.

This well-known and rapidly fatal disease carries off year after year large numbers of young cattle. Once they are attacked by it, treatment is of no avail; our efforts must therefore be directed to prevent it, and for this purpose I have perfect faith in setoning the dewlap with strong rough tape that has been previously saturated with oil of turpentine. When I was engaged in general practice I setoned large numbers of young cattle for my clients, and for twenty-two years I have setoned all my own calves just after they were weaned, and I have never had a case of quarter ill in my herd, nor have I known one to occur in the animals I setoned for my clients.

I am aware that this simple operation is now looked upon by many as antiquated and of no real service, and I admit that I am not able to explain the exact *modus operandi* by which setoning prevents the disease; nevertheless, I consider that I have good reasons for believing in its efficacy and in continuing its use.

Treatment of the Young Animals.

The ringing of the young bulls should be done in December—this allows of time for the nostril to heal up—so that they can be led by the ring when they go out for sale in February.

From weaning time to turning-out time in the following spring all the calves should be well attended to; their food must be of good quality, adapted to young growing animals, and given at regular intervals. They do not want coddling up in warm places, but should be kept in covered folds which are well lighted and ventilated, and in which they have plenty of room to move about, and twice a day they should be let out into a yard to scamper and play about. They should be accustomed to being handled, and kept clean with brush and comb, and should any of them be observed to be itchy and rubbing themselves, they should be washed with some of the dressings that are sold for the purpose.

Nothing will give better results than good care of the young ones, and if this is bestowed it is astonishing how well they can afterwards rough it. After being turned out at May Day, they need not be brought into the house again until the following spring, and then only for service. A shed in the field that they can go into if inclined to do so, and oat straw in the winter, are all they require, but if it is thought advisable to give them cake it should be linseed cake ; in my experience cotton cake is not a suitable food for heifers that are to be bred from. Before being served it is advisable to accustom them to be tied up by the neck in the byre ; this completes their education.

Having traced the calves from birth to the time when the bulls are sold and the heifers put to breeding, we may now consider the

Qualities of the Bull.

I have already pointed out the supreme importance of the stud bull—he makes or mars the herd—and I have also mentioned that the young bulls are generally sold when about twelve months old, and when they are quite fit to serve a limited number of cows or heifers. Those in want of a good young bull think it no trouble to travel hundreds of miles to find one. And there is one advantage in buying at this time—namely, that his sire, dam, and other members of his family may be seen at his place of birth.

The stud bull should have a straight top and under line, be deep and wide round the heart, have strong loins, be neat at the tail-head, have short legs well set on, a good polled head, an honest face, and withal plenty of muscular development (flesh) and masculine character. See that he walks well, and that his hocks are good ones—the latter is an important point in a bull. If to his personal qualities he adds descent from good parents, and belongs to a prolific, long-lived, sound family, that is the bull to buy, and the probabilities are that he will be a success. To obtain him neither trouble nor money should be spared.

Pedigree.

Observant breeders quickly realise the all-pervading powers of heredity and atavism. To breed good animals we must start with good parents, and to prevent any ill results from atavism (throwing back to a remote ancestor) we must as far as possible make sure that the ancestors of the animals we breed from were good ones. I have great faith in a good pedigree, and I would not buy any animal unless the pedigree pleased me. The pedigree is the title-deed by which we know whether or not its possessor is a good and safe investment. The so-called fashionable pedigree, or the long pedigree, is no guarantee of excellence, and both may be rendered objectionable by the inclusion of some inferior animal in them. Neither is the ordinary pedigree, where simply the direct dams and sires are given, to be implicitly relied upon.

To establish a good pedigree it should be possible to trace every animal to its foundation, and in none of the collateral branches must there be a stain. At the same time individual merit must be our first consideration, and the pedigree comes afterwards.

Occasionally an old bull that has proved himself to be a good getter may from one cause or another come into the market for sale; opportunities such as this should never be missed. Young bulls can always be bought, but their power to produce stock of the right sort has to be proved, and in doing so much time may be lost. Therefore a good old bull should always be looked after, and bought if still active and efficient. In using old bulls a word of caution is required. As age advances a time comes when, although the bull serves as well as ever he did, the cows break to his service at the third, sixth, or ninth week; this is evidently due to want of vitality in the spermatozoa, and when this is found to exist the bull should be sent to the butcher at once. There must be no hesitation about this step, nor any thought of giving the bull another trial; otherwise the cows will become demoralised, some will become non-breeders, and at best the calving season will be thrown inconveniently late.

Treatment of the Bulls.

Bulls should at all times be well fed—not made fat, but kept in vigorous condition—and when being used pretty freely they should have their ordinary diet supplemented by an allowance of stronger, more nitrogenous food, such as bean-meal or crushed oats. The bull-house should be well lighted and ventilated.

A mature bull disposes of a large amount of air, hence what may be considered ventilation for an ordinary animal is not sufficient for him. There should also be a walled yard adjoining the house, into which the bull can go at any time for exercise and for relaxation from the monotony of his box. During summer, and, in fact, for so long as the weather will permit of it, he should be kept in a well-fenced (walled for preference) small paddock containing a shed into which he can retire when inclined to do so.

Bulls are great thinkers and have wonderfully retentive memories; they must not be played with, teased, or ill-used—the temper of many a bull has been ruined by such treatment.

Do not make an unnecessary fuss about the bull. Be gentle yet firm, without harshness, and he behaves like a gentleman; use him roughly or strike him wantonly, and he will certainly never forget it, but will wait his time, and probably pay you back with compound interest.

In some herds the bull is allowed to run with the cows; this looks very like Nature's plan, and under certain conditions it may be permitted. But there are various drawbacks and risks attending it. In the first place, his temper may from some cause be rendered disagreeable, and trouble may result; and his powers of hearing and smelling are so acute that he may be tempted to cross hedges and ditches in order to visit some neighbouring herd; whilst if put amongst cows with bull calves the latter combine to fight him. They cannot hurt him, but they torment him, and he can get no peace for them; and if he is put amongst the cows that have heifer calves, some of the latter may be served by him. I have known a calf six months old served by a bull over a ton in weight.

Treatment of the Cows.

If the cow has calved and cleansed properly there is very little further trouble with her; of course she needs attention and careful dieting. As to food, so long as she is in the house sloppy mash, sweet hay, and a few turnips are all that are required. Cake is not necessary, neither is it advisable to give it—at any rate, until she has been again safely settled in calf.

From certain causes, such as abortion, premature calving, difficult calving, and fast or retained cleansings, the generative organs sometimes become much deranged and require careful and special treatment. Let me here say that *all such cases should be isolated.*

After a prolonged and difficult calving, particularly in heifers with their first calf, the walls of the vagina may be bruised and the lips of the vulva may be torn; for these injuries the parts should be dressed with carbolised oil two or three times a day. In cases where the cleansings (the fœtal membranes) are fast, I think that it is advisable to take away as much of them as can with safety be removed—the more of the decomposing, septic material that can be taken away the better—and the uterus should be washed out twice or thrice a day by means of a syringe, or preferably an enema funnel, with warm water in which an antiseptic such as Condy's Fluid, Sanitas, or Jeyes' fluid has been mixed.

The antiseptic should be also applied to the hind quarters, tail, and hind legs, and to the floor of the house, particularly the water channel; this is best done by means of a watering-can, which should be often used. This treatment must be continued until the parts have regained their normal condition and all discharges have ceased. During her indisposition the cow requires good nursing and nourishing food.

Cases occur in which, after an ordinary easy calving, neither the vulva nor the pelvic ligaments regain their natural condition, but remain more or less relaxed. With this condition irregularity of œstrum is often present—in fact, I have known cases of the kind where cows have quickly developed into regular bullers. The same conditions may follow ordinary cases of abortion, and also those early cases where the fœtus is so small that it is never seen, or even the act itself suspected. The latter cases are quickly followed by œstrum—which, indeed, may be the first indication that something has gone wrong—and if, unfortunately, such cows are then served, a diseased condition of the generative organs is set up that may bid defiance to all treatment.

Of these cases, and cases of doubtful and non-breeding cows, I have had some experience both in my own herd and in the herds of other owners and breeders, and I have also had opportunities of carrying out experimental treatment upon them with varied success. It is only after such treatment and many *post-mortem* examinations that we are enabled to understand the causes that may be in operation to produce them, and how futile our remedial measures must be in some of them.

Alterations in the position and condition of the uterus and of the os uteri, a diseased condition of the ovaries, and tubercular complications, set all remedies at defiance; but, on the other hand, I have seen cases of irregular œstrum, with abnormal discharges, relaxed vulva and pelvic ligaments, completely cured, and the patients have again become regular breeders. When recovery does take place, the improvement begins and progresses rapidly after treatment has commenced; this, therefore, may be our guide, and if cases do not quickly respond to the treatment they should be sent to the butcher at once. In dealing with such cases I have tried several agents and several plans, but the one that has given me the best results is corrosive sublimate (bichloride of mercury), dissolved in warm water and applied as a vaginal douche. Of course it is an agent that requires *extreme* caution in its use, and when not required it should be kept under lock and key. It is now dispensed in the form of "Antiseptic discs," and by varying the quantity of water in which they are dissolved a solution of the desired strength may be easily prepared. The strength I have used has been from 1 to 3,000 up to 1 to 2,000. It is best to begin with the weaker solution, and to inject it into the vagina with a syringe or enema funnel; it may be repeated after an interval of six or seven days, and with me cases that will recover never require more than three dressings. The cow must be tied up when the dressing is applied, as it brings on more or less severe straining.

Cows that recover must not be served again till they have passed over two periods of regular œstrum, though three are to be preferred. In all these cases I am sure that it is wise to look upon the vaginal discharges as infectious; they are undoubtedly so in many of them. Cows with the slightest abnormal vaginal discharge should not be served, for in the first place service intensifies the diseased condition, and the bull himself is very likely to contract disease, which he will transmit to cows that he may afterwards be put to. I have known such cases, and the results have been most disastrous. Occasional cases of abortion, fast cleansings, and disease of the generative organs (both male and female) will occur. By no amount of foresight can they be prevented, but the serious troubles that follow in their wake may be much mitigated by watchful care and by always being on the look-out for signs of approaching trouble, and, when these are seen, by promptly adopting strict isolation and thorough disinfection.

In some non-breeders there are no abnormal changes to be observed externally, and three months or more may elapse between periods of œstrum. These animals, after a fair but unsuccessful trial of changes of management and of bulls, should be sent to the butcher. No greater mistake can be made than to keep animals in the herd that are not regular breeders. Some of these doubtful ones take to wandering about the field, and to bellowing somewhat like a bull; when this is the case the sooner they are sent to the butcher the better.

Nothing is more hereditary than the power to reproduce stock. Some families are noted for being regular breeders—and here let me say that regular breeders are as a rule good milkers: breeding and milking go hand in hand. The cows of these families go on breeding year after year, and even if they should unfortunately suffer from abortion, they readily breed again, and continue to do so till stopped by old age. The bulls of these families are also good servers and sure getters. On the other hand, the members of some families, both male and female, are at best slow to breed, and when started they take the first opportunity or excuse to either abort or to stop breeding. So much is this the case that, instead of multiplying and replenishing the earth, their numbers dwindle down, and finally their line becomes extinct.

Service.

There is no more important problem for the breeder to consider than that of service. In the first place there is the question of properly mating the animals from which it is desired to breed; this should be carefully thought out and arranged for before service time. If it is wished to obtain strong, robust animals there must be no close in-and-in breeding. There must be no uncertainty as to the health, activity, and procreative power of the sire, and the cows must be in a healthy breeding state. Cows vary as to the time they will come in use after calving; some come early—that is, at the third or fourth week, but service at this early period is not often effective; it is therefore better to let them pass and serve them the next time. From the sixth to the ninth week after calving is a safe and reasonable time, but it may be that three months may elapse before some cows are seen to be in use; though as a rule these late ones settle to their first service and give no further trouble.

In no case should a cow or heifer be served unless œstrum is regular (every twenty-one days) and the animal is in a perfectly healthy condition. In those cases where cows are difficult to get settled in calf, perfect rest and change are advisable. Here let me strongly advise breeders to always have a *post-mortem* examination made upon all animals that may die, or that from any cause have to be sent to the butcher; by doing so much valuable information may be obtained. In cases of death the cause should, if possible, be ascertained—the knowledge will be of use in the future,—and in the case of non-breeders the condition of the generative organs is instructive, and will often demonstrate not only the futility of treatment, but also the folly of having kept them in the herd so long, which is another valuable lesson for the future.

There is, further, the opportunity of finding out if the animal were free or otherwise from tuberculosis. This disease is now recognised as an infectious one—in my experience it is also hereditary—therefore, if found *post mortem*, every means should be used to free the herd from its taint. The question is one that must be faced, and the disease should at any rate be purged from every pedigree herd in the kingdom.

Conclusion.

The Aberdeen Angus breed has many good properties. In the first place, there are no horns to disturb and injure other animals, and consequently more cattle can be kept in a given space than is the case with horned animals; it is astonishing what a number of them can live comfortably together in a fold. They are "good doers." In Aberdeenshire they are said to get fat in winter on "neeps and strae" (turnips and straw), and there is no doubt they do well when so fed; but in the high-lying lands the "neeps" are scarce, and the foddering of straw is supplemented by an out-rake upon the heather-clad hills of their native homes. The calves are strong and easily reared, the breed matures early, and they finish at the highest quotation as "prime Scotch" in the London market. Even the old bulls and cows market well, for they rarely look old.

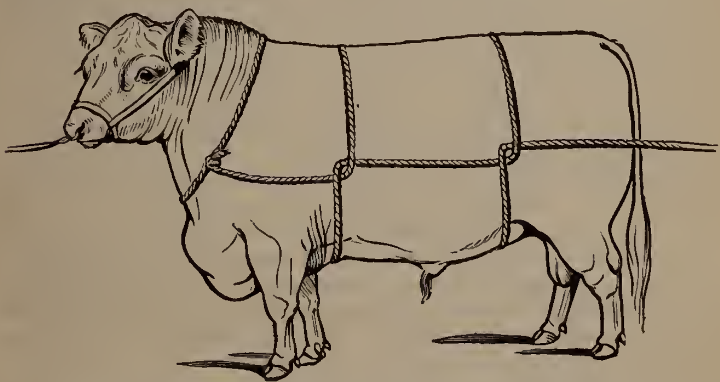
Finally, in the management of a pedigree herd a careful, steady, experienced herdsman is all-important—that is, unless the owner takes absolute charge himself, which is not often the case. The herdsman is always on the alert, nothing escapes his eye, and his experience guides him as to what is best to be done under all circumstances. He is acquainted with the peculiarities and habits of the different animals and families, and thus knows that what might be considered important in some animals is of no consequence in others. No herd can be successfully managed unless the herdsman loves his cattle, and is as much interested in their well-being as their owner is, or even more so.

I began this paper by saying that although it deals with the management of an Aberdeen Angus herd, much of it might be applicable to other breeds. How far this has been so I must leave to my readers to judge; but I will conclude by giving a hint upon a matter that may not be generally known, and that I am sure will be found useful to all who have to do with cattle.

Cattle might be taught to have their feet lifted and held up in the same way as horses, but their training has not yet been carried to this extent. As a consequence, if anything has to be done to their feet, either as a result of disease, accident, or overgrowth, they are troublesome to handle, and whatever has to be done is generally imperfectly accomplished.

The best way is to cast the animal, and this may be quickly, easily, and safely effected by the following method :—

Put a halter on. Take a sound ordinary cart-rope, make a loop at one end and pass it over the head, and let it rest close around the neck, low down like a collar ; bring the rope to the near side, pass it over the back just behind the shoulders, bring it underneath the chest, and pass it under and then above the rope so as to make a loop around the chest ; carry the rope back, pass it over the loins, and bring it underneath the belly, close to the flanks ; make another loop as before, and carry the rope straight behind the animal ; tighten up the loops, one close to the elbows, the other close to the hind flanks.



All being ready, instruct the man who holds the halter shank to pull forwards, and at the same time the men who have hold of the loose end of the rope to pull straight backwards, and down the animal goes, generally without a struggle. Keep the head down and the rope firm, and as a rule the animal lies quietly until such time as it is desired he should get up, when slacken the rope, and up he gets, none the worse for the casting.

The heaviest bull may be cast in this way ; but of course no one would think of casting an in-calf cow or heifer, either in this way or in any other.

I give an illustration of an animal ready to be cast, so that it may be seen exactly how the ropes should be placed.

Clement Stephenson.

Sandyford Villa, Newcastle-on-Tyne.

Official Reports.

ANNUAL REPORT FOR 1893 FROM THE PRINCIPAL OF THE ROYAL VETERINARY COLLEGE

In Reference to the Investigation of Diseases of the Animals of the Farm.

The following Report of the Professor of Comparative Pathology, a department which was founded a few years ago by the aid of a grant from the Royal Agricultural Society, must be taken only as a selection from the subjects which have been under investigation, and not as representing the whole of the work of the past year. Considering the short time which has elapsed since the department, with a fully equipped laboratory of research, was established, there is every reason to be gratified at the results which have been obtained. Not only are new members of the veterinary profession sent forth with a practical familiarity with modern methods of investigation, but established veterinary surgeons avail themselves in a steadily increasing ratio of the resources which the College is now enabled to offer in answer to their inquiries, and it is impossible that these facilities can fail to raise the scientific status of the veterinary profession throughout the country. In the present report the diseases which are dealt with are :—

Anthrax, especially in regard to its causes and indications.

Tuberculosis, with some important remarks on the use of tuberculin as a means of diagnosis.

Actinomycosis, which is a widely prevalent disease, to be relieved, if not radically cured, by the internal use of iodide of potassium.

Detection of glanders by the injection of mallein, a preparation from the virus of the disease.

A fatal disorder of horses which has long been known, but only exhaustively studied recently.

A new disease among turkeys causing serious fatality among them. The investigation proves that the malady depends on an organism, and that the disease is readily conveyed by inoculation to turkeys, but with difficulty to fowls.

Several parasitic diseases are considered, and among them a form of inflammation of the intestines in cattle, due to the presence of an extremely minute worm, which is not visible to the unaided eye. There is no reason to suppose that the disease is a new one. It may, indeed, have existed from an early time, but its true character would not be suspected unless it had occurred to the inquirer to examine a scraping from the inflamed intestine under the microscope.

A FATAL DISEASE AMONG YOUNG PHEASANTS was found to depend upon parasites in the intestine, the invaders in this instance being much lower in the scale of creation than the lowly worm. The parasite belongs to the Protozoa, the first dawning of animal life. The organisms are known as Coccidia, a class of beings which from their constant presence in higher animals are attracting from the pathologist special attention, which they escaped for a long period on account of a false idea of their insignificance.[1]

To the recorded investigations might have been added, if more space had been available, observations on an important investigation into the causes and nature of louping-ill among sheep; a fatal disease among calves affecting the tongue and structures of the mouth; the history of the ringworm fungus, and other diseases which have been and are still under observation, and will form subjects for future reports.

G. T. BROWN.

February, 1894.

Professor McFadyean's Report.

ANTHRAX.

During the past year a number of interesting observations have been made regarding anthrax, and an attempt will be made to summarise these in the following paragraphs.

Diagnosis.—During the twelve months viscera from forty-nine cases of suspected anthrax have been submitted to microscopic examination, and of these nineteen were found to be anthrax and nineteen not anthrax, while in the remaining eleven the examination did not justify an opinion regarding the cause of death. As regards the meaning of the expression "suspected of anthrax," it may be explained that the ground of the suspicion usually was that the animal had been unexpectedly found dead, or that it had died after a brief illness for which no cause other than anthrax could be assigned. As is well known, the returns published by the Board of Agriculture indicate that there has been a serious increase in the prevalence of anthrax during the past year, but in the light of the examinations made in the Research Laboratory grave doubts regarding the accuracy of inspectors' reports are justifiable. This is probably true at all times, but mistakes in diagnosis appear to have been unusually frequent during the summer of 1893. For such mistakes there is very little excuse, for when an opportunity to make a *post-mortem* examination soon after death is afforded, there is no difficulty in arriving at a certain conclusion as to whether a given animal has or has not been affected with anthrax.

[1] See note on "Some Relations of Biology to Agriculture" (Journal, R.A.S.E., 3rd. Series, Vol. II., Part II., 1891, p. 434).—ED.

Anthrax is caused by a comparatively large bacillus, which, on account of its size and its constant presence in immense numbers in the spleen in every case of the disease, is easy of detection. Fig. 1 reproduces a photograph of a tiny speck of spleen pulp (magnified about 750 times) from a case of anthrax, and in every case of the disease microscopic examination of the *fresh* spleen pulp would show substantially the same picture. The bacilli are short, straight, motionless cylinders, and while they are here represented under a high magnification after staining, in order to show their characteristic shape, it may be observed that they are easily recognised in the unstained blood when magnified only 300 or 400 times.

Much has been written regarding the characteristic shape of the anthrax bacillus and the means of distinguishing it from other organisms, but it may safely be said that, provided the examination is made within a few hours after death, and before the carcass has become putrid, there is little chance of mistake on the part of anyone who has once seen a preparation of blood or spleen pulp from a case of anthrax. On the other hand, if the carcass is already putrid, the safe rule for the veterinary surgeon is to abstain from basing his diagnosis on the result of a microscopic examination. For this there are two good reasons. The first is, that when putrefaction sets in, even in cases other than anthrax, the blood and the spleen become invaded by germs that may readily be mistaken for anthrax bacilli; and the second is, that in cases of genuine anthrax the bacilli rapidly degenerate as putrefaction proceeds, and their presence may thus be overlooked. It was on this latter account that a positive opinion could not be given in eleven out of the forty-nine cases examined in the Research Laboratory during the past year.

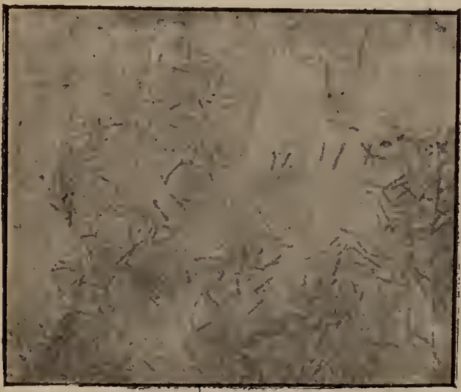


FIG. 1.

But anthrax in nine cases out of ten can be diagnosed by the appearance of the spleen without having recourse to microscopic examination. That organ in anthrax—of cattle, at least—is engorged with blood, dark in colour, and softened to such a degree that its substance will almost flow out when a cut is made into it. When this condition of spleen is met with in an animal unexpectedly found dead, or that has died after an illness of only a few hours' duration, there is *very little* risk of error in diagnosing anthrax; and, on the other hand, when the spleen is normal in appearance the diagnosis "Not anthrax" may be made with almost absolute certainty, even although the circumstances in which the animal has died have created a suspicion of that disease.

Source of Infection in Anthrax.—The anthrax germ in certain circumstances is capable of multiplying and producing spores in soil or water, and when once such spores have been formed they may lie dormant for many years, and at the end of that time cause anthrax by being taken into the system of an animal with food or drink. Such multiplication and spore-formation can only take place when the bacilli are freely exposed to the air, at a temperature over 60° Fahr., and in the absence of putrefactive bacteria. It would be a perfectly hopeless search to endeavour by microscopic examination to discover the particular spot of ground on which the cattle have picked up the germs of anthrax in any given outbreak, and this fact deserves to be brought home to stock-owners. In the vast majority of cases the most searching investigation fails to discover the exact source of the outbreak, and to declare one's inability to point out the contaminated spot is no confession of ignorance or incompetence. Occasionally the owner of an animal that has died from anthrax thinks otherwise, and the veterinary surgeon, to maintain his credit, is constrained to lay the blame on some particular article of the animal's diet.

Within recent years oil-cake and cotton-cake have frequently been thus accused. The notion appears to have arisen from a habit of reasoning loosely and jumping to conclusions. Generally the only evidence cited in support of it is that in such-and-such an outbreak of anthrax the cattle were receiving cake, and if it can be added that no more deaths occurred after the cake was stopped the case is supposed to be proved beyond a doubt. In reality, however, this is no proof that cake is ever the means of infecting cattle with anthrax; it would be evidence in that direction if it were not the case that more outbreaks occur among animals not receiving cake, and that in the great majority of cases the outbreak ends with the death of the second or third animal, even when no change is made in the diet.

When cake is the cause of anthrax there is an obvious way of putting the fact in evidence, and that is to communicate the disease by feeding or inoculating experimental animals with it. On two occasions during the past year this test was applied to cake suspected of having caused anthrax. In the first of these cases the evidence—if such it can be called—pointing to the cake being at fault was unusually strong, and it therefore appears desirable to narrate the circumstances in detail. In the month of September last portions of two spleens, in which microscopic examination showed numerous anthrax bacilli, were sent to the Research Laboratory, with the following history. One portion of spleen belonged to a bullock that had been grazing out of doors all the summer, and which had likewise been fed with a compound cake that was taken to the field daily by a cattleman. The other piece of spleen was taken from a heifer that had been confined to the byre during the preceding four or five months ; she received grass, corn, and compound cake the same as the bullock was fed upon. The two animals were a quarter of a mile apart, and yet both died from anthrax on the same day. Here, then, was a case in which the circumstances were unusually suspicious, and it was determined to test the cake. The residue of the bag of cake that the two animals had been fed upon for several days prior to the date of their death, and four or five cakes taken from as many other bags, were accordingly forwarded to the Veterinary College, where, with the exception of about 1 lb., the whole was consumed by a heifer and two sheep. The heifer consumed about 3 lb. of the cake daily for a week, while the sheep were given it *ad lib.* during the same time, but none of them developed any abnormal symptom in consequence. A small quantity of the cake from the bag that was being used at the time of the animals' death was triturated with sterilised water, and when the coarser particles had subsided about twenty drops of the liquid were injected under the skin of each of two guinea-pigs, but in neither case was anthrax thus produced.

In the second case the precise circumstances incriminating the cake were not communicated, but it was suspected of having been the cause of an outbreak of anthrax. It was tested in the same manner as the sample above referred to, and with the same negative result.

It must be admitted that these experiments do not absolutely prove that the two outbreaks in question were not caused by cake, but their negative result was the strongest evidence against that view obtainable in the circumstances, and stock-owners may rest assured that there is not on record a single alleged case of infection with anthrax by means of cake that will bear examination.

In another instance that came under observation the outbreak was attributed to infection by means of "shoddy," which is largely used in some districts as a hop manure. As it is well known that foreign wool often contains the spores of anthrax, there is nothing inherently improbable in the view that "shoddy," if eaten or inhaled, might infect animals with the disease ; but no opportunity to prove this material infective by means of experiment has yet been afforded.

Anthrax communicated to Dogs.—In most of the standard textbooks on bacteriology the dog is credited with an almost absolute immunity against anthrax, but this view is contrary to the experience of many veterinary surgeons, and, as the following observation will show, dogs sometimes fall easy victims to the disease. In October last the carcass of a dog and two dead ferrets were forwarded to the Research Laboratory for *post-mortem* examination. The only history accompanying these was to the effect that the animals had died after a very short illness, the chief symptoms in the case of the dog being great depression and twitching of the muscles. The examination disclosed the fact that both dog and ferrets had died from anthrax. In the dog the spleen was swollen to triple its normal volume, and there was marked inflammation with abundant gelatinous exudate in the region of the throat. The spleen was much enlarged in the ferrets also, and in all three animals the spleen pulp was found to be swarming with anthrax bacilli. In reply to inquiry the owner subsequently communicated the following history. Part of the flesh of a sheep that had died from what the shepherd called "cold in the chest" was given to five dogs and thirteen ferrets. Of the five dogs, one died in two days and another in three days, two others showed symptoms of illness but recovered, while the fifth dog never developed any symptoms. Of the thirteen ferrets, ten died within four days, but the other three remained well.

Protective Inoculation against Anthrax.—In only three instances during the year has advice been sought regarding the means of preventing anthrax, and in each case the owner was recommended to have all the animals on the farm inoculated according to the method devised by M. Pasteur. In two of the cases the advice has been adopted, and the result will be communicated in a future report. There can at this date be no discussion regarding the value of protective inoculation in reducing the losses from anthrax on infected farms. The method has already been practised on the most colossal scale in France, Austria-Hungary, and elsewhere abroad, and with the most beneficial results. The operation is attended with little risk, and the entire animals on a farm can be thus protected at a cost which is a mere trifle compared to the loss of even a single valuable ox or cow. The subjoined table gives the statistics regarding anthrax vaccination in France from 1882 to1892 :—

	Year	Animals vaccinated	Deaths per cent. during following year		Year	Animals vaccinated	Deaths per cent. during following year
Sheep	1882	243,199	1·08	Cattle	1882	22,916	0·35
	1883	193,119	0·77		1883	20,501	0 31
	1884	231,693	0·97		1884	22,616	0·37
	1885	280,107	0·90		1885	21,073	0·50
	1886	202,064	0·75		1886	22,113	0·28
	1887	187,811	1·29		1887	28,083	0·39
	1888	101,834	0·61		1888	10,920	0·43
	1889	88,483	1·16		1889	11,610	0 45
	1890	69,865	1·20		1890	11,057	0·21
	1891	53,640	0·67		1891	10,476	0 13
	1892	63,125	0·99		1892	9,757	0·27

The success of these vaccinations in reducing the mortality from anthrax in France may be estimated when it is stated that before the introduction of vaccination the losses amounted to from 8 to 10 per cent. per annum for sheep, and about 5 per cent. for cattle.

Tuberculosis.

During the past year some very important evidence has been obtained of the value of tuberculin in the diagnosis of tuberculosis in cattle. By far the most interesting trial was the one made on a herd of Jerseys belonging to Earl Spencer, regarding which a brief note has already appeared in the Journal (1893, Part IV. p. clxxxii.). All the animals of the herd, twenty-three in number, were injected with tuberculin, and during the course of the next sixteen hours the temperature in all save one had risen to 104° Fahr., or over (normal temperature about 101°), and in the exception it reached 103⅗°. According to previous experience with tuberculin this indicated that every animal in the herd, with the doubtful exception of the one whose temperature barely reached 104°, was affected with tuberculosis; and when an opinion to this effect was communicated to Earl Spencer, he decided that the whole herd should be slaughtered and submitted to careful *post-mortem* examination. The result afforded striking evidence of the correctness of the indications given by tuberculin, for tuberculous lesions were found in each of the twenty-three animals.

In one respect this test was not so conclusive as it might have been in other circumstances, for it is obvious that anyone might raise the objection that had the herd contained a healthy animal that would probably have reacted also. But this objection is to a large extent met by the following experiment. There happened to be at the College in the month of October last a heifer which, on account of extreme emaciation without apparent cause, was strongly suspected of being tuberculous; and a young cow in very good condition and supposed to be healthy. Both of these animals were injected with the same sample of tuberculin that was employed to test the Jersey herd, with the result that the consumptive-looking heifer did not react (highest temperature 102·8°), while the healthy-looking cow did react (highest temperature 105·6°). These two animals were afterwards killed, and the *post-mortem* showed that the healthy-looking cow had rather extensive tuberculous disease in the lung and the mediastinal gland, while a searching examination failed to discover any trace of tuberculosis in the lean heifer.

The publication of these facts has already induced several veterinary surgeons to use tuberculin in their practice, and it is to be hoped that its employment will soon become general. It is now generally recognised that tuberculosis is slowly but certainly contagious when diseased and healthy cattle are housed together, and the main obstacle hitherto encountered in attempts to eradicate the disease from infected herds has been the impossibility of detecting it in its early stages. It deserves the widest publicity among owners of stock that this obstacle has been removed by the discovery of tuberculin. In pedigree stocks especially, tuberculin ought to prove of great value, for by its means the disease may be eradicated from herds in which it has already obtained a footing (at the cost of slaughtering the animals already affected), and, in the case of healthy stocks, higher prices could probably be obtained if the animals were sold with a guarantee that they were free from tuberculosis as indicated by the tuberculin test.

Tuberculosis in Horses.—Most British veterinary authors describe the equine species as almost insusceptible to tuberculosis; but during the past year no fewer than ten cases of tuberculosis in the horse have come under observation in the Research Laboratory. In the past the lesions of this disease in the horse have generally been confounded with those of glanders or cancer. From the material collected in the Laboratory a comparative study of the lesions of glanders and tuberculosis is now being made.

Actinomycosis in Cattle.

Treatment.—In the last Annual Report attention was called to the ready manner in which this disease, formerly regarded as incurable, yields to treatment by iodide of potassium, and an account was given of the successful treatment of a heifer. At the date when that Report was written the cure appeared to have been complete; but a short time afterwards it was discovered that the animal was again slavering, and examination of its mouth showed that the disease of the tongue was returning. The heifer was therefore again submitted to a course of iodide of potassium, begun on April 5th and continued till the 29th of the same month. During this period the animal received about 1 lb. of the salt, and the improvement in the state of the tongue was just as rapid as in the first instance. Within six weeks' time the disease had apparently, for a second time, been cured or arrested; but as it appeared important to ascertain whether the cure was absolute, the heifer was kept under observation at the College until the month of November, when it was killed. During the interval the heifer had become fat, and there had not been any sign of a relapse. Nevertheless, the *post-mortem* examination, made on November 9th, showed that, while the tongue was free from actinomycosis, the glands of the throat were considerably enlarged, and contained a quantity of purulent matter in which microscopic examination readily revealed the actinomyces parasite. The cure had therefore not been complete, and had the animal been allowed to live, it is very probable that the disease would again have become active. Several other cases of relapse after the iodide treatment have been reported by veterinary surgeons during the past year, in some instances as long as twelve months after the first attack. It is possible that many of the cases of alleged cure would, if the animals were submitted to careful *post-mortem* examination, turn out like the one above referred to; but even if further observation should show that such is the case, the iodide treatment will still remain a great success, for whereas formerly the disease, except by severe surgical treatment, could not even be temporarily arrested, the worst cases are now so far curable that the animals can for a time be made apparently sound, and brought into a condition fit for the butcher.

In order to gain further evidence on this point a second case of the disease was obtained for experimental treatment in November last. The animal in this instance was a two-year-old bullock, and the disease had its seat in the upper jawbone. At the date of admission the bullock had a large swelling in this position, mastication was obviously very painful, and there was marked emaciation in consequence. The only treatment adopted was the internal administration of iodide of potassium, and during the first month little if any improvement was observable. After that the animal began to eat better, the swelling of the jaw diminished in size, and the general condition improved. Since then improvement has been steady, and at the date of writing the cure might be pronounced complete, since the animal is fat, and the enlargement of the jaw has all but disappeared. The bullock will be kept under observation for some time longer, and finally submitted to *post-mortem* examination, in order to see whether the cure is real or apparent.

During the year a considerable number of tongues, jaws, &c., affected with actinomycosis have been examined in the Laboratory, and in one instance the facts connected with the development of the disease were of such an unusual nature as to warrant their being recorded here.

In the month of July last Mr. F. L. Gooch, F.R.C.V.S., of Stamford, on three different occasions forwarded to the Laboratory pieces of tumours removed by him from yearling steers, with the history that all the animals of a lot of twenty-one had such tumours, and that he suspected they had all been infected with actinomycosis by means of setons. Owing to the hot weather prevailing at the time the first tumour was so putrid as to be unfit for examination when it arrived, but in the case of the other two microscopic examination showed the presence of actinomyces granules. The facts since communicated by Mr. Gooch are as follows: The whole of the herd were reared on a farm on the borders of the Fen district, and in the autumn of 1892 they were sent to a farm in Deeping Fen, to be wintered in a straw-yard. During their stay here they were all setoned by an "empiric" as a preventive of Black Quarter, and they were brought back to the farm on which they had been reared about the beginning of May, at which time some of them were showing signs of enlarged shoulders, and two had large "wens" on the jaw. When Mr. Gooch was first called to see the animals (in July), he found that every one of them was affected in some degree. Some of the setons were still in position, and around the seat of operation there were small tumours, while a hard cord extended up from the dewlap to a firm tumour near the shoulder. Under combined surgical and medicinal treatment (iodide of potassium) all the animals subsequently recovered. The unusual seat of the disease, and the fact that every animal in the herd was affected, hardly admit of any other explanation than that the person who performed the setoning operation had, by some means or another, contaminated the wounds, probably by means of his hands or the material with which he dressed the setons.

Detection of Glanders by the use of Mallein.

The last Annual Report of the College contained a reference to glanders, and to an attempt which was being made to introduce the substance termed mallein into veterinary practice as an aid in the diagnosis of that disease. During the past twelve months a large quantity of the agent has been prepared in the Research Laboratory, and supplied gratis to veterinary surgeons. Prejudice, and probably also ignorance regarding the nature of the substance, have prevented the general adoption of this means of detecting glanders in infected stables; but the demand for it has been steadily increasing, and it has already been used with great success in the suppression of outbreaks, both in London and in the country.

It is to be feared that in the case of some of the large horse-owning companies in London full advantage of mallein as a means of detecting cases of glanders has not been taken because, so long as compensation is not given for glandered horses destroyed, the companies shrink from ascertaining how many of their animals are really affected. Some owners, although anxious enough to discover which of their animals have contracted the disease, refuse to allow mallein to be used with this object, owing to a fear that it might be a means of inoculating their horses with glanders, and at least one eminent veterinary surgeon has publicly expressed his apprehension that the substance might have this effect. It therefore appears desirable to explain briefly how mallein is manufactured, and what are its effects when introduced into the system by hypodermic injection.

The first step in the manufacture of mallein is to obtain a pure culture of the germ of glanders. These germs are invariably present in the discharge from the diseased nose of a glandered horse, but it is generally a matter of difficulty to obtain pure crops of them from that source, because of the number of other species of germs accidentally present with them. At the *post-mortem* of a glandered horse, pure cultures may sometimes be obtained from unbroken glanders nodules in the nose, or from an unopened farcy bud; or the germs may be separated from the accidental microbes by inoculating a guinea-pig with nasal discharge or farcy pus. The guinea-pig usually dies in the course of a few weeks, and in the diseased parts in its organs the bacillus of glanders is generally present as a pure crop. The medium most suitable for the cultivation of the glanders bacilli with a view to the preparation of mallein is faintly alkaline meat extract, or bouillon, to which 5 per cent. of glycerine has been added. Small flasks of this liquid are inoculated from a glanders abscess in a guinea-pig, or from a culture of ascertained purity on agar-agar or potato, and then placed in an incubator kept at a temperature of about 100° Fahr. In the course of a few days the previously clear liquid becomes turbid from the growth of bacilli in it, while a deposit of the germs begins to collect at the bottom of the flask. The incubation of the flasks is maintained for six weeks at least, and at the end of that time they contain innumerable glanders bacilli, as well as substances manufactured by these bacilli, and products resulting from the death and disintegration of the numerous generations of them that have grown in the liquid during the six weeks. The smallest quantity of this liquid might suffice to give a horse glanders if it were injected beneath the skin, owing to the living germs which it contains ; and the next step is therefore to kill these germs. This is effected with certainty by exposing the unopened flasks to a steam temperature (212° Fahr.) for one hour ; but even then the liquid is unsuitable for use, not because it could by any means infect a horse with glanders, but because the dead glanders bacilli suspended in the liquid are unnecessarily irritating when injected beneath the skin. In order to get rid of these dead bacilli the turbid liquid is made to pass through a filter of unglazed porcelain, and before doing this it is well to add to the liquid carbolic acid in the proportion of 1 : 200. The liquid which exudes through the filter is the so called mallein ; it is a perfectly transparent sherry-coloured liquid, free from even dead germs, but containing in solution certain chemical substances upon whose presence the value of the liquid as an aid to diagnosis depends.

FIG. 2.

The appropriate dose for a horse varies in different samples of mallein, but of that manufactured in the Research Laboratory about 20 drops are usually found sufficient. When it is desired to ascertain whether a horse is the subject of glanders or not, the above-mentioned dose of mallein is injected beneath the skin of the neck ; and during the next fourteen or sixteen hours the temperature of the animal is taken every three hours, the changes that ensue at the place where the mallein was injected being at the same time noted. In healthy or non-glandered horses mallein, in the dose mentioned, has no appreciable effect beyond exciting a little transient swelling at the seat of injection ; but in a glandered horse it provokes a distinct rise of temperature, and in the majority of cases also causes a painful flat tumefaction of considerable extent at the place where the mallein was injected (see fig. 2).

The experience gained at the Veterinary College during the past year, and the information furnished by veterinary surgeons who have obtained mallein from the Research Laboratory for use in private practice, have amply confirmed the previous reports regarding the value of this substance in the detection of glanders. The accuracy of its indications, in view of our ignorance regarding its mode of action, almost deserves to be called marvellous. In many cases during the past year glanders was detected in horses that showed no external symptoms of the disease, and, conversely, the lives of horses that had been condemned as glandered by veterinary surgeons of great experience have been by these means saved.

Azoturia or Hæmoglobinuria in Horses.

The term azoturia has for a number of years been applied by veterinary surgeons in this country to a very fatal disease of the horse. A most remarkable point in connection with the disease is that it has never been known to attack an animal doing regular work. The subjects of it have invariably been standing idle for at least two or three days; but it has not been observed in horses that have been confined to the stable through illness. In the majority of cases it is found that the animal attacked has been allowed a labour diet although at rest. The disease occurs at all seasons of the year, but more cases are met with in winter than in summer. It very rarely attacks a horse while he is kept in his stall or loose-box, but the first symptoms are usually exhibited before the animal has proceeded far on the first journey after the period of illness. It attacks both sexes indifferently, although at one time it was regarded as peculiar to the mare.

The symptoms of the disease are hardly less remarkable than the circumstances in which it occurs. The onset is so sudden that in very many cases the horse falls before his driver can get him out of harness or back to his stable. Before he falls the driver may have noticed some lameness or stiffness of the hind quarters; but this is not always detected, and the driver may suppose that his horse has merely slipped on the pavement. When down the animal generally struggles violently and perspires, but it is difficult to say how far this may be due to pain and how far to the distress of the horse on finding that he is unable to get up. At this stage various groups of muscles, most frequently those of the loins and haunches, are found to be strongly contracted, and in consequence firm or almost wooden to the touch. Sometimes the horse urinates before he falls, and the urine thus passed, or that which is withdrawn by the use of the catheter after he has fallen down, is invariably found to be profoundly altered in colour, its tint being often as dark as stout or black coffee. The fatality of the disease is very great, at least 50 per cent. of cases ending in death within a few days.

Such are the main clinical points in connection with this disease; and before describing the observations that have been made regarding it at the Veterinary College during the past year, it will be well to refer to the view generally held hitherto in this country regarding its pathology.

According to the standard British text-books on veterinary medicine, (1) the urine in this disease contains a marked excess of urea; (2) the *post-mortem* does not reveal serious or constant lesions in any of the organs; and (3) the essence of the disease is the presence of large quantities of urea and allied substances in the blood.

Repeated observations have shown that all of these views are erroneous. The urine does not contain an excess of urea, but it does contain large quantities of pigment, to which it owes its dark colour. The blood-plasma (the liquid in which the blood-cells are suspended) also contains a large quantity of dissolved pigment. For such pigment there are only two possible sources, viz. the red cells of the blood or the red muscles of the body. Microscopic examination of the muscles that were rigid during the attack brings to light a most interesting lesion, which is illustrated in fig. 3. The section there represented shows only a few fibres that have retained their normal structure (A); these show regular transverse markings. But in most cases the fibres have undergone a serious alteration. They first lose their transverse markings, their substance then swells up and becomes homogeneous, and finally they break up into irregular fragments (B).

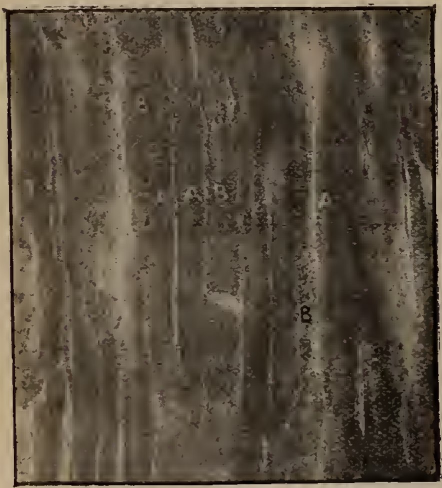


Fig. 3

That the blood-plasma in this disease contains a large excess of hæmoglobin in solution, and that the muscles that were rigid during life are altered in the way described, has for a number of years been known to German veterinary pathologists, and two theories of the pathology of the disease have been based on these facts. The first is, that the pigment in solution in the blood-plasma is derived from destroyed red blood-corpuscles, and the second, that it is muscle pigment set free by the destruction of the fibres in the rigid muscles. There are several ways in which one might obtain evidence to show which of these views is the correct one, but perhaps the most obvious way would be to ascertain from time to time during the course of an attack whether there is a diminution in the number of red cells of the blood *pari passu* with the excretion of pigment in the urine. During the past eighteen months the opportunity has been taken to make observations on this point in the case of three horses suffering from hæmoglobinuria, and the results obtained throw a new light on the real nature of the disease.

By using an instrument termed a corpuscle-counter for the examination of the blood, it was found that, even some time after the onset of the attack, the number of red cells in the blood was above normal—in one instance the corpuscles were nearly twice as numerous as they are in healthy horses—and during the progress of the disease the number gradually declined, but never fell below the normal eight millions.

In view of this discovery it would appear that the disease has its starting-point during the period of unwonted rest and liberal diet, which has the effect of raising the number of red cells in the blood. As soon as the horse is taken out to exercise the destruction of the superabundant corpuscles sets in, and the products of this destruction are accountable for the remarkable train of symptoms. The colouring matter of the destroyed red cells becomes partly dissolved in the plasma, is carried to the kidneys, and there excreted with the urine ; while part takes the form of minute granules, which become arrested in the capillaries of certain muscles, cut off the supply of nutriment to these, and thus cause their death and destruction.

If this view of the pathology of the disease is correct, the copious abstraction of blood would be indicated by way of treatment when this can be done at the very onset of the attack. As regards prevention, it is obvious that the best way of obviating an attack is to let every horse have daily exercise when that is possible, and when that is not possible to cut down his rations to a bare subsistence scale.

New Infectious Disease in Turkeys.

During the past year numerous experiments were made in the Research Laboratory in order to ascertain the cause of a very fatal disease of turkeys which prevailed on a farm near Newport Pagnell. The chief symptoms of the disease, as communicated by Mr. G. E. King, M.R.C.V.S., of Newport Pagnell, were as follows : At the outset the birds showed a peculiar twitching of the eyeballs, stiffness of the neck and legs, drooping of the wings and tail, and ruffling of the feathers. Soon afterwards a discharge from the nostrils appeared, and the affected birds made a peculiar rattling or gurgling sound in the throat, while the mouth became filled with a frothy liquid. The fæces passed during the attack were very thin, and milky-white or yellowish in colour. The woman who attended to the poultry said that she could readily find out the affected birds by the drops which collected at the end of the beak.

At the outset of the epizootic the owner had forwarded one of the diseased birds to the office of an agricultural paper in London, and in reply had been informed that it showed "every symptom of poisoning." Subsequently Mr. King was consulted, and by him three dead turkeys were sent to the Research Laboratory. By this date about twenty turkeys had succumbed to the disease, and nearly as many more died before it was arrested.

The *post-mortem* examination of the first turkey revealed the following abnormalities :—The right lung, which in the healthy state is a small spongy organ of a bright red colour, was severely inflamed, being enlarged to treble its normal volume, very dark in colour, and solid throughout. The pericardium (the bag that surrounds the heart) was much inflamed, and partly covered with flakes of fibrinous lymph. The other organs appeared to be healthy. Microscopic examination of blood taken from the heart, spleen pulp, and fluid from the diseased lung and pericardium showed in each case indescribable numbers of a very minute germ or bacterium.

The examination of the second and third turkeys revealed an almost identical state of affairs, and in these also the diseased parts were crowded with innumerable bacteria, all belonging to the same species, as far as one could judge from their shape and size.

The discovery of these germs in three successive cases suggested that they were probably the cause of the disease, but much remained to be done in order to give this supposition certainty. The germ had first to be obtained in pure culture in artificial media suitable for its growth, it had then to be cultivated in successive generations, and finally it had to be shown that by inoculating or feeding turkeys with such artificial cultures a disease could be set up identical with that which prevailed at the farm.

As regards the first of these steps no difficulty was experienced. It was found that the bacteria were easily cultivated in most of the media used for growing germs in the Laboratory. In meat extract rendered solid by gelatine the growth was very slow at ordinary temperatures, and not very rapid even when the tubes were kept at 70° Fahr. In liquid bouillon or meat extract, and in meat extract rendered solid by the addition of agar-agar, the growth, on the other hand, was rapid when the tubes were incubated at about the body temperature.

When the germ had been cultivated for several generations its power to produce disease was tested by the following experiments with turkeys :—

Experiment I.—A young turkey was inoculated with mixed gelatine and agar cultures of the bacterium by means of a sterilised hypodermic syringe, and at the same time some of the culture was poured over the turkey's throat. The turkey was found dead sixty-six hours after inoculation.

Post-mortem.—Skin removed from seat of inoculation shows the subcutaneous tissue over an area of two square inches blanched and necrotic ; around this the subcutaneous tissue is moist-looking, and its vessels are injected. On section the necrosis is found to extend into the subjacent muscular tissue for the depth of a quarter of an inch. Cardiac muscle abnormally pale; surface of heart shows a spot of commencing pericarditis. Posterior fourth of left lung in a condition of dense croupous consolidation. Abdominal organs normal. Cover-glass preparations showed immense numbers of the short bacteria in the hepatised lung, and about one bacterium for every three or four red corpuscles in blood from the heart. The bacteria were also fairly numerous in a cover-glass preparation made from the surface of the heart.

Experiment II.—Inoculated a full-grown turkey-cock with an agar culture of the bacterium (third generation from the turkey of Experiment I.). The growth on the surface of the agar was suspended in sterilised bouillon, about twenty drops of which were injected with a sterilised syringe underneath the skin of the neck. On the following day the turkey was obviously ill—refused food, purging, wattles livid, feathers ruffled. On the second day it was much worse, respiration partly oral, frequent opening and closing of the beak. It was found dead fifty-three hours after inoculation.

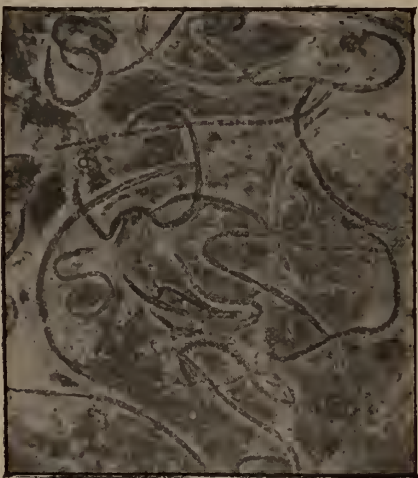


FIG. 4

Post-mortem. — Carcass very well nourished, fat abundant. No swelling at seat of inoculation. Abdominal organs appear normal. No obvious pericarditis. Blood in heart firmly clotted. Right lung almost entirely hepatised, the lesion exactly repeating that present in the spontaneous cases. Hepatised lung appears much swollen, dark in colour, and firm on section, with a slightly mottled cut surface. As regards its swollen appearance and its consistence, the hepatised lung recalls the solidification of bovine pleuro-pneumonia. Cover-glass preparations showed that the short bacteria were enormously abundant in the hepatised lung, and cultures made from the lung on agar yielded numerous colonies of the same bacteria, with one or two colonies from other organisms apparently accidentally present.

Three other experiments with turkeys, the details of which need not be given here, had a like result, the turkey in each case dying within seventy-two hours after infection, and exhibiting at the *post-mortem* a pneumonia identical with that present in the turkeys which had contracted the disease naturally. Moreover, in each case the same short bacterium was present in immense numbers in the inflamed lung, as was ascertained by a microscopie examination and by making cultures.

These experiments, therefore, sufficed to prove that this bacterium was the actual cause of the outbreak among the farm turkeys. Numerous experiments have since been made to test its virulence for other animals ; and its characters in respect of size, mode of staining, and appearances when cultivated on various substances have been studied. As a result it has been definitely established that the bacterium constitutes a new species, in many respects closely related to the germ of fowl cholera, but easily distinguished from that by its feeble virulence for pigeons and fowls.

Diseases caused by Animal Parasites.

Inflammation of the Intestines caused by Worms.—During the year several cases have come under observation in which fatal disease was excited in horses by the presence of the *Strongylus tetracanthus.* The most aggravated case was the one from which the preparation represented in fig. 4 was taken. The lining membrane of the large bowel of this colt was inflamed throughout, but even close inspection with the naked eye might have failed to detect the cause of this inflammation, al though that became very obvious on microscopic examination. A small quantity of liquid scraped from the surface of the large bowel at any point and magnified about thirty times showed young worms of the above-mentioned species in great numbers (see fig. 4). In all the cases investigated the history was the same. The disease occurred in colts at grass or recently taken up from grass, and the symptoms present were unthriftiness, soon followed by most obstinate diarrhœa and rapid loss of condition. Some of the cases died in spite of the liberal administration of worm medicines. Probably early diagnosis, which might be made from a microscopic examination of the fæces, and prompt treatment are all-important in determining success.

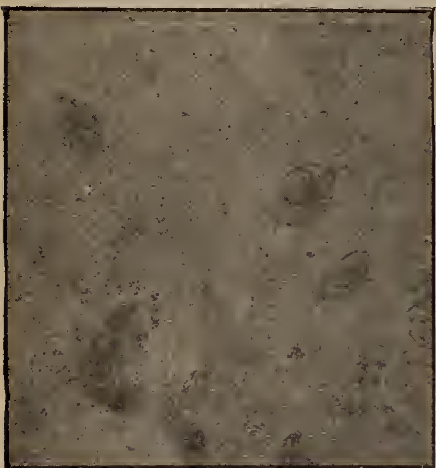


Fig. 5.

In five cases from different farms very similar symptoms in young cattle were found to be due to the presence of a minute strongyle in the fourth stomach and the bowel. In all of these cases the symptoms were at first ascribed to tuberculosis, and it is very probable that mistakes of this kind in diagnosis are not uncommon.

Great mortality among young pheasants was in one case found to be caused by the parasite of which a photograph is shown in fig. 5. This is a very minute parasite (a psorosperm), differing from the *Coccidium oviforme* of the rabbit only in point of size. Assuming that it has a life-history similar to the last-named organism, it is probable that the egg-shaped structures are passed out with the fæces of diseased birds, and then resolve themselves into spores, which are taken in with the food, and thus infect fresh individuals. Medicinal treatment in such a case would probably be impracticable or of little avail, and the course indicated is to take perfectly fresh ground for rearing the pheasants.

Pneumonia caused by Worms.—In a few cases very serious mortality among sheep was found to be caused by the *Strongylus rufescens.* The adult worms of this species are easily overlooked at the *post-mortem*, as they are considerably smaller than the well-known *Strongylus filaria*, and frequently are found exclusively in the very minute bronchi, or even in the air-cells of the lung. Here the female worms lay their eggs and the young embryos are hatched. The lung lesion takes the form of scattered greyish patches of catarrhal pneumonia, and by placing a scraping from such a patch under the microscope a correct diagnosis can readily be made (see fig. 6). The disease attacks sheep of any age and at any season of the year.

Fig. 6.

QUARTERLY REPORT OF THE CHEMICAL COMMITTEE.

March, 1894.

Since the publication of the last Quarterly Report nine cases have been brought to the notice of the Chemical Committee. Seven of these refer to linseed cakes, one to boiled bones, and one to a manure called "Silicate manure." In five of the seven cases concerning linseed cakes the purchases were made with a distinct guarantee of purity.

1. In the first instance, 7½ tons of "linseed cake" were bought from a local dealer, who signed one of the Society's "contract notes" guaranteeing the purity and good condition of the delivery, though it turned out that he had not the maker's authority for so doing. The cake was, after analysis, described by Dr. Voelcker as "a bad cake, containing a large quantity of weed seeds, as well as other impurities. Rape and spurrey are present in abundance, also mustard, polygonum, cockle, &c., besides over 3 per cent. of sand."

2. In a second case, a linseed cake was found to be "mouldy and acid, and not in fit condition for feeding."

3. A delivery of cake sold as "linseed cake" was found on analysis to be composed partly of linseed, partly of locust bean. The vendor admitted the mistake to be his in transhipping another quality of cake for that ordered, and he allowed 10*s.* a ton on it.

4. A delivery of linseed cake, costing 8*l.* 10*s.* per ton in Liverpool, was found to contain no less than 6¾ per cent. of sand. The purchaser would not give particulars as to the transaction.

5. A delivery of cake manufactured in Hull was sold by a small local vendor to a member of the Society, who received with it a guarantee of its containing "12 per cent. linseed oil." Analysis showed it to have 10·34 per cent. only of oil, and that this oil was not derived only from linseed, but also from rape, spurrey, cockle, mustard, and numerous other weed seeds, and that there was rice husk and over 4 per cent. of sand in the cake as well. On inquiry it proved that the vendor had given the guarantee in ignorance, and had received none from the manufacturers.

6. A delivery of cake sold merely as "oil cake" contained 5 per cent. of sand.

7. A delivery purchased as "containing from 10 to 12 per cent. of oil" (the vendor concluding the oil to be *linseed* oil) was merely invoiced as "oil cake," and though costing as much as pure linseed cake, viz., 8*l.* 10*s.* per ton, was found to contain, besides linseed, a lot of rape, earth-nut, and other weed seeds.

8. A purchase of ¼-inch bones, on a guarantee of their containing 3·35 per cent. of nitrogen and 40 to 45 per cent. of phosphates, was sold at 6*l.* 15*s.* per ton, and was found, after analysis, to have only 2·91 per cent. of nitrogen and 53·54 per cent. of phosphate of lime, being thus a mixture of raw and boiled bones, and not ¼-inch

bones. The error was admitted, and though full particulars were not forthcoming, a considerable allowance was made.

9. Mr. W. W. Berry, of Gushmere Court, Selling, near Faversham, sent, on February 13, a sample of what had been recommended to him as a manure for fruit, and specially for grapes. It was called "Patent Silicate manure," and the price was 7*l.* per ton.

On Dr. Voelcker inquiring under what guarantee the material was sold, the following letter was forwarded by Mr. Berry :—

The Patent Silicate Manure Co. — The Chemical Works, Hemel Hempstead, Herts.

Mr. W. W. Berry, Selling. — February 13, 1894.

DEAR SIR,—In reply to yours *re* analysis of our manure, we beg to say that, with the exception of a trace of ammonia, our manure contains *none* of the ordinary ingredients of manures. As these are what analysts look for and report on, they are disappointed. The composition of our manure is a secret—and of course we do not explain it. Many attempts have been (*sic*) by competent chemists.

If the effects of our manure were due to the presence of ordinary ingredients, they would be similar. But the early ripening and colouring of fruit is due *to its difference*. This is obvious.—Yours faithfully,

(Signed)] P. S. M. Co.

Patent Silicate Manure, artificially compounded, and containing a trace of nitrogen—guarantee under Feeding Stuffs Act.

Dr. Voelcker reported on the material as follows :—

February 28, 1894.

Moisture	5·05
[1] Organic matter, water of combination, &c.	5·65
Sulphate of lime	20·53
Oxide of iron, alumina, &c.	1·96
Insoluble silicates and sand	66·81
	100·00
[1] containing nitrogen	·88
equal to ammonia	1·07
Soluble silicates	·60

"The material contains no phosphates. Beyond some sulphate of lime (gypsum) and a little ammonia, it contains no fertilising ingredients, and flint and gypsum would, with a sprinkling of ammonia salts, make quite as good a manure."

March 6, 1894.

EMLYN,
Chairman.

Notes, Communications, and Reviews.

PANICS IN SHEEP, WITH SPECIAL REFERENCE TO THAT OF DECEMBER 4, 1893.

Sheep are notoriously timid and nervous animals, and are not only highly susceptible of coming changes in the weather (as evidenced by their nervous activity and tendency, when folded, to jump the hurdles), but are apt to exhibit fright at purely imaginary dangers, or at all events at causes of supposed danger, which, whatever portentous shapes they may assume to the eyes of the sheep, are not apparent to human beings. Witness the behaviour exhibited by sheep on some occasions when passing through a gateway.[1]

We should accordingly expect sheep to be peculiarly liable to that form of unreasoning fear which has, for want of a better word, been generally known as *panic*. And, in point of fact, panics among sheep, extending over considerable tracts of country, have happened more than once in England.

To mention the most recent instance previous to the one to be treated of in this paper: on the night of November 3, 1888, at about 8 P.M., tens of thousands of folded sheep were seized with sudden fright, jumped the hurdles, and stampeded. They were found by the shepherds early the next morning, under hedges and in roads, panting and terror-stricken. This panic took place in the country north-west and east of Reading, every large farm from Wallingford to Twyford being affected, and those on the hill-country north of the Thames most so. It was an intensely dark night, with occasional flashes of lightning. A suggestion was made that there had been a slight earthquake, which was not otherwise perceptible, but no evidence in support of the suggestion was forthcoming.[2]

Various causes for these panics have been suggested, but hitherto no reasonable one has been satisfactorily adduced.

On the night of December 4, 1893, another very remarkable panic among sheep occurred in the northern and middle parts

---

[1] I particularly noticed this on Estancias in Uruguay, chiefly devoted to wool, among the large flocks of both Merino and English sheep, which, of course, live in a much wilder state than sheep in England.

[2] *Annual Register*, vol. cxxx.; *Science Gossip*, March, 1889.

of Oxfordshire, extending into adjoining parts of the counties of Warwick, Gloucester, and Berks. Individual farmers on finding the next morning that their sheep (almost all sheep in this part of the country are folded or "penned" on turnips on the arable land at that time of year) had broken out during the night, and observing that the condition of the pens and hurdles, as well as of the sheep themselves in some cases, pointed to the fact of the sheep having been severely frightened, naturally concluded that they had been worried by a dog; some, finding that the sheep exhibited no marks of being worried, concluded that they had only been frightened, perhaps by a dog, perhaps by a fox; others applied to the police. The result of any inquiries made by the police, or privately, or by mentioning the fact among neighbours, however, was to elicit the fact that the panic had extended over a very large tract of country, and that unless it was allowed that all the dogs and foxes in the district had with concerted action simultaneously arisen and attacked hundreds of flocks on the same night, this attempt to account for the panic would have to be abandoned. The panic was then attributed by all flock-owners (save one, who seemed very loth to exonerate some sparrow-catching boys!) to some atmospheric or meteoric cause, or to an earthquake.

As the subject of the susceptibility of various birds and animals, not excepting the human species, to atmospheric changes, and especially to changes in the weather, had then recently been occupying my attention, I felt some interest in investigating the facts of the panic, and in ascertaining the cause, if possible. With this end in view I wrote a letter to one of our county newspapers, asking for information as to the extent of country over which the panic extended. The chief result of this letter was that I received one from Lord Moreton, in which he did me the honour to ask me to contribute a paper upon the subject of the sheep panic to this Journal. I had great pleasure in undertaking to prepare a note on the occurrence, but I ought to add here that the greater part of the information at my disposal was collected and forwarded to me by Lord Moreton, who has all along taken the greatest interest in the inquiry.

The general effects of the panic, and the results and consequences of it, were, roughly speaking, the same in all cases, though in some flocks the fright seems to have been greater and more lasting than in others. Shepherds on going to the sheep on the morning of the 5th found the hurdles knocked down or broken, troughs and racks overturned, and the sheep "out" and at varying distances from the folds. To give a few examples: Mr. Willocks, agent to Lord Dillon, at Ditchley, writes of Ditchley Model Farm:—

> My shepherd found the ewes had broken out of their pens, in several places all round, and eight hurdles were broken in two, and several stakes were broken over level with the ground. The ewes were found in the morning about 300 yards from their pen. They had travelled direct north, and were lying down at the side of the carriage-drive.

And of a farm at Taston Mr. Willocks writes:—

A tenant of ours, about two miles north-west from Ditchley, had all his feeding sheep mixed up together, hurdles broken, racks and troughs heaped up together, and some of the sheep were hurt.

Mr. Charles Calvert, of Fairspeir House, Ascott-under-Wychwood, writes :—

My sheep broke loose, overturning some of their racks and troughs. . . . The shepherd next morning found them scattered about the adjoining fields, apparently not much the worse for their panic.

Mr. A. Hayley Gregson writes of Potter's Hill Farm, Witney, Oxon :—

I found the 200 ewes and 110 fatting sheep (penned 500 yards one from the other) had broken their folds. Every trough and rack were overturned, one ewe lying on its back dead, apparently thrown in the rush and unable to regain its legs ; two more ewes had been on their backs for some time, as shown by the marks in the soft ground. I noticed that the ewes, after breaking from the fold, stopped directly and fed, as if their fright was the matter of a moment or so's duration.

And of High Lodge Farm, near Fairspeir :—

The whole of the sheep on that farm had been seized with the same panic, but although one was held in some netting no losses resulted.

In other cases, however, the effect of the fright was more lasting. Mr. A. F. Douglas, agent to Mr. Freeman Mitford, at Batsford, Moreton-in-Marsh, reports of Mr. Dugdale's sheep on Sezincot Farm, which broke out, knocking the hurdles down, but remaining beside the fold, although outside it :—

Ever since that night, until the moon began to shine in the morning, the sheep have been very frightened, and whenever they heard the shepherd's footstep would get up in a startled way and huddle together till they heard his voice. Never used to do so before.

Also of Batsford Home Farm :—

Three lots of sheep were in the field—two lots of feeding sheep, one lot of breeding ewes. The latter were in a more sheltered place than the feeding sheep. The feeding sheep knocked down, and more or less broke, about twenty hurdles. All the troughs and racks in their pens were knocked over. Two sheep seem to have separated themselves from the others and rushed down the field ; one fell over a clump of roots, and evidently lay there for some time, presumably either stunned or cast on its back. The other feeding sheep went down the field and joined the breeding ewes, and were found outside their fold in the morning.

And of Lower Lemington Farm, near Batsford :—

Sheep broke down about four hurdles and raced partly over the field, and were found in the morning, some lying down, others quietly eating some unburied roots. Were very frightened in the morning for some time after.

It may be remarked that Batsford Home Farm is at an altitude of nearly 1,000 feet.

It was suggested that the panic might have a disastrous effect upon the spring lambing, which is rather early on the brashy and limestone districts in West and North-west Oxfordshire. But very little information upon the point has reached me. Mr. C. Calvert, writing early in January, says :—

I regret to add that two dead lambs have been born since, and I fear that there will be some more.

Mr. Willocks writes, on January 12, from the Ditchley Model Farm :—

I have had one ewe slip since—ewe died—and one ewe died with dead lambs in her; the other ewes that have lambed are doing well, and the lambs are healthy.

In the northern part of Oxfordshire, where few lambs are dropped before February, I have at present heard of no unusual proportion of dead lambs being born.

The fact has been noticed and remarked upon that these panics in sheep always take place among those that are folded. One answer to this remark is that in December nearly all the sheep in this part of the country *are* penned upon the arable land ; another is that where sheep are running loose in a big grass-field signs of their having experienced a panic in the previous night would be very difficult to detect.

The point, however, should not be lost sight of, and the following information, supplied by Mr. Willocks, bears upon it :—

Lees Rest Farm: Mr. Harwood . . . had his ewes and feeding sheep penned in one field, the ewes *in a large pen*, and their hurdles were not disturbed ; but the feeding sheep, which were in *ordinary-sized pens* [italics are mine], were mixed up together, and had broken out of their different pens. . . .

Hill Barn Farm: Mr. Fowler. (On the Blenheim estate, and adjoining the above farm on the south-east.) Mr. Fowler keeps about 400 feeding *in small lots*; they were all mixed up together, but no sheep killed. Ewes were *not penned*, and no sign of their being disturbed was traceable [italics are mine].

With regard to the extent of country over which the panic spread, although we have information which has enabled us to trace its effects in a large number of parishes, I have made no effort to ascertain its farthest limits ; nor do I think it necessary or desirable to do more in this direction than to show that the panic did extend over a considerable tract of country. For, granting that the cause was meteorological (as I think will be admitted when this paper has been perused), it follows that the extent of the panic would be co-extensive with that of the meteorological phenomenon, and this is rather a subject for determination by meteorologists.

Taking the town of Chipping Norton, in North-west Oxfordshire, as a starting-point, we trace the panic northwards as far as Brailes, in Warwickshire, and Shipton-on-Stour, and north-eastwards thence to Mollington, five miles north of Banbury. Proceeding southwards from Chipping Norton, it extended past Sarsden and Burford, across the Isis to Coleshill, near Faringdon, in Berkshire, and is believed to have gone still farther, to Wantage. We trace it all the way from Banbury to Woodstock (but I heard nothing of it east of the Cherwell Valley, although I have no proof that that part of Northamptonshire was not affected), and on to Standlake, on the Isis. Westwards we hear of it at Batsford, near Moreton-in-Marsh, and Northleach, in Gloucestershire.

From Mollington, in North Oxon, southwards to Coleshill is not less than 36 miles.

We have been able to fix the time at which the panic took place with some approach to accuracy. It happened early in the night, at some time probably between 7.30 and 9 P.M., varying a little in different places, and usually taking place a little after 8 o'clock.

Mr. James Bliss's shepherd at Little Rollright thinks that as the sheep had not cleared up their last meal the panic seized them between 8 and 9 o'clock. Mr. Calvert writes that at Fairspeir House, Ascott-under-Wychwood, they broke out, as far as could be ascertained, at about a quarter to 9 o'clock. Mr. Stanbra, foreman on a farm at Cold Harbour, on the Heythrop estate, just as the sudden thick darkness (to be alluded to subsequently) came on, at about 8.45 P.M., met the ewes, or rather heard them coming; he could not see them, but he spoke to them, and they seemed to come to him for safety. Mr. Hayley Gregson writes :—

I have tried to ascertain the time of the fright, and found beyond a doubt that the whole thing happened at, I should say, the same moment, and some time between eight and nine o'clock—nearer, I should say, nine than eight. My Potter's Hill shepherd's wife heard the noise caused by sheep rushing through their fold a few minutes before nine (the ewes happened to be folded close to the shepherd's house), but did not tell her husband, who was in bed, until later. At 3 A.M. he got up, being unwell, and then saw or heard the sheep moving about outside the fold. He went to them, and found one ewe dead and stiff. Another point fixing the time was that the school treat was given in Leafield that night, and the children returning about nine found the Fairspeir flock of ewes out of their fold and huddled together by the gate they wished to go through. The children also at High Lodge heard the sheep on that farm about the same time moving about uneasily.

Mr. T. E. Robertson, of the Estate Office, Coleshill, Highworth (at the southern extremity of the affected district, so far as we have traced it), puts the time down as between 8 and 10 o'clock. Mr. A. F. Douglas, Estate Office, Batsford, Moreton-in-Marsh, informs us that when the shepherd left the sheep, about 5 o'clock, all their racks and troughs were full of food, and this must have been finished before the scare took place, as there was no food spilt by the overturning of the racks. P.C. Sirman, stationed at Shipton-under Wychwood, having inquired into supposed cases of sheep-worrying, informs us that, from the inquiries he made, he had no doubt most of the sheep got out early in the night. On the Wayhouse Farm, Bloxham, the sheep were said by some boys, who were occupied in clap-netting, to have been out at about 7.30 P.M.

From inquiries I made immediately after the panic I had an idea that the flocks affected were invariably on high ground, while those which were in valleys (which very few are in winter, the valleys being chiefly grass-land) escaped. Further information which came to hand, however, showed that there were too many exceptions to this rule for any theory to be founded upon it alone. Nevertheless, it has been ascertained that (with one notable exception, and some others) sheep folded on high-lying land and hills were nearly all affected, while some which were in the valleys escaped. In treating of the cause of the panic I shall have occasion to refer to this matter again, but I may here mention that, while most of the sheep in my own parish (Bloxham) stampeded, those of Mr. J. Barrett, which were in a valley, did not; nor did those on Mr. Fawdrey's farm (Choicehill), in the parish of Over Norton, which were penned in a valley; while on adjacent farms (as Mr. Hayes, of Chipping Norton, informs me), where the sheep were folded on higher ground, they all broke out.

Some other exceptions within the district are worth noticing, since in many cases it is impossible to give any reason why in the case of farms, and even of flocks on the same farm, some of the sheep should have stampeded and others should not. Several cases have already been alluded to.

Mr. R. Angas, agent to the Duke of Marlborough on the Blenheim Palace estate, writes: "I can hear of no scare in this immediate neighbourhood."[1] Mr. H. A. Warriner, agent to Lady Camperdown, writes: "On this farm (Weston Park, Shipston-on-Stour) the sheep did not break out, but they did on nearly every other farm round here," including Lady Camperdown's Long Compton Farm, where both ewes and tegs broke out (the former were lying on land about 650 ft. level, the latter, perhaps, 80 or 90 ft. lower). At Sutton-under-Brailes (about 380 ft. only), about one and a half mile distant from Weston, they were out. Weston is about 650 ft. above sea level. On Bloxham Grove Farm, near Banbury, Mr. W. H. Warriner tells me that their ewes, penned upon a level bit of high-lying land, about 390 ft. altitude, broke out (as did sheep on neighbouring farms), while their wether tegs, not a quarter of a mile away, on land sloping a little to N.E., did not stampede. Mr. W. H. Stilgoe, of Adderbury, who had two lots (in two fields separated by a hedge) on the same level, tells me that one lot broke and the other did not. The sheep on the large flat and very open field called "Farm Field," at Banbury, did not stampede. Mr. John Addy, of South Lawn, Burford, states that none of his sheep were out. This farm adjoins Potter's Hill, where the stampede was very violent. The South Lawn sheep were at about 500 ft. level, on a plateau. Mr. Willocks reports that on Mr. Mace's farm, about one mile due north of, and many feet higher than, Ditchley Model

[1] Further information brought one case at least to our notice.

Farmhouse, there was not the slightest sign of any disturbance to the flocks. He adds that the subsoil on the farm is of an entirely different nature from the Ditchley land. But I do not attach any importance to the question of geological formation, the red land (a marlstone, holding a good deal of water and iron) of the northern portion of Oxfordshire being so very different from the stone-brash and limestone of West and Mid-Oxon and East Gloucester, although the panic extended equally over both. On a farm at Fairspeir the ewes were out, but the fatting sheep (half a mile away) were not, though the troughs were overturned. The ewes on Adderbury Manor Farm broke out, while the tegs on a slope of the Cherwell Valley did not. Mr. Alfred Neild, of Dean, while sending us some valuable information, and saying that his sheep at Chalford Green had broken the hurdles down as if chased by dogs, adds :—

I have heard that sheep in the hollows were not so universally out as on the hills, especially about Tew and beyond.

A slight earthquake has been suggested as the cause of the panic. Mr. A. Hayley Gregson writes :—

I cannot help thinking that the sheep, which no doubt were lying down, heard or felt a slight rumbling or tremor of the earth, caused possibly by an earthquake too slight for anyone standing upright to observe, and yet sufficient for an animal lying down to feel.

If this was the cause we ought to find that sheep panics of a very violent character have taken place on those occasions when earthquakes very perceptible to human beings have affected England in the night during that period of the year when sheep are usually penned on the arable land. But I do not remember ever hearing or reading anything to that effect.

Various meteorological causes (in addition to the causes of dogs, foxes, boys, &c., which were at once dismissed when the extent of the panic was realised) have also been advanced. Mr. Neild writes : " Another man at Finstock is said to have seen a wonderful meteor at the same hour." Mr. Calvert thought it might have been caused by a sudden electrical or phosphorescent light playing fitfully on the ground—a sort of will-o'-the-wisp. Mr. J. Clowes, of Dunthrop, Chipping Norton, thought it was an electric disturbance, " as we had strong lightning during the night afterwards." There were also other reports of this phosphorescent light, but I have met with no thoroughly satisfactory evidence of it, and it may be pointed out that if it was the general cause of the panic all over the great affected district, it would certainly have been actually seen by many of the numerous people who must have been out of doors during the early part of the night the panic took place. The same may be said of the supposed meteor; and upon this point it is instructive to observe that the extraordinary and brilliant meteor which attracted so much attention on the night of January 26, 1894, and, as noticed in the papers, even when the sky was covered with dense clouds, illuminated the whole landscape with a light so bright that objects became nearly as visible as in ordinary daylight, was not accompanied or followed by any panic among the sheep. Lord Moreton writes from Sarsden House, Chipping Norton, of this meteor :—

> Several people hereabouts saw the strong light—so strong that our keeper said that it was light enough to pick a pin off the ground.

I may now say that I have little doubt that the cause of the panic in the sheep was not any kind of light, but simply *thick darkness.* I believe, though I have not evidence of actual instances at hand, that panics which have occasionally happened amongst the horses and working cattle of travellers in wild countries ; to big herds being driven down to the townships, or to the rail, in cattle countries ; and even to troops in hostile countries, have always happened upon intensely dark nights.

Very few people, probably, have ever been out in a really dark night, and it is impossible for anyone who has not had this experience to imagine what it is like. So long as you can see, in an unlighted village at night, the difference between the roofs of the houses and the sky, or, in the open fields, the difference between the trees, or some line of high land and the sky, it is not a really dark night, and it is perfectly possible to find your way easily, and to know exactly where you are going if you are familiar with the country. But directly you cease to be able to see these differences, you speedily lose all sense of direction, and it is impossible to find your way. I have twice, and twice only, been out in nights of this description, and although in each case I had only a short distance to go, and was exceedingly familiar with the ground, I had the greatest difficulty in getting home. In nights of this kind the sensation is that of being shut up in a dark room—let anyone turn round twice in a perfectly dark room, and try to walk straight to the door. A sensation of a thick Egyptian darkness is felt. Had the sheep in Oxfordshire followed the example of the fellaheen of former days in an Oriental acceptance of destiny, and not risen from their places until the darkness had passed away, all might have been well.

It is quite possible to imagine human beings even, who have lost their sense of direction in darkness of this kind, becoming nervous. Still more easy is it to imagine timid, susceptible animals like sheep being overcome by ungovernable terror, and then doing as sheep do when frightened badly, viz. rushing violently in some direction or other.

That a thick darkness of this kind descended upon the earth in the early part of the night of December 4 (at a time agreeing with that at which, so far as we know, the sheep stampeded) there is abundant evidence to prove.

On that evening I was being driven in the village fly to a meeting in a distant place, and was on the road from 6.15 to 7.30 P.M. ; then walked up the village to the schoolroom, which I reached about 8 P.M. I only noticed that it was a still and very dark night, with damp, heavy atmosphere. As to the degree of darkness in the village

I am unable to speak, as my conductor had a lantern. Late in the night there were several flashes of lightning, but not until some time after I had reached home, about 11.30 P.M. Mr. Henry Blea, inn-keeper, of Bloxham, who keeps traps for hire, and is out a great deal at night, says that on that night he was driving between South Newington and Tew, on high ground, about 7 P.M., and that a thick darkness came on, so that he could not see his hand in front of his face, and he had to get down and lead his horse, as he had no idea of where he was going. About 8 o'clock it got lighter, and he could see very well. Mr. Stanbra, the foreman at Cold Harbour, was coming from Swerford about 8.45 P.M., when the darkness came on suddenly, just as if the clouds were down on the ground. It lasted about half an hour, when he had to strike a light to see where he was. Another account says: "All at once he felt a curious sensation, as if the clouds were going to fall on him." A writer in the Chipping Norton Deanery Magazine (who also mentions a phosphorescent light, "to be seen at times playing on the ground," but does not say who saw it or where it was seen) says:—

It was between 8 and 9 P.M. when such a thick and heavy darkness came on that a man could not see his own hand.

P.C. Sirman, stationed at Shipton-under-Wychwood, writes:—

Respecting the weather on that night there was nothing unusual, except that a little before 8 o'clock there was an extraordinary black cloud travelling from north-west to south-east, which appeared to be rolling along the ground. I was on a hill at the time, and as it passed over it was very dark. This lasted for about thirty or forty minutes, and during that time it was like being shut up in a dark room.

He adds that, as the sheep which he heard of being out were on high ground, he believes they must have been frightened at the unusual blackness of this cloud.

The following reports were received from superintendents of the Oxfordshire Constabulary. Superintendent Sutton, at Chipping Norton:—

I beg to report that none of the P.C.'s of this division noticed anything unusual on the night, except that it was *very* dark during the early part.

The Superintendent at Witney reports that his men noticed nothing. Superintendent Jennings, of Banbury, reports that P.C. Lambourne at Swalcliffe, P.C. Bizzel at Hornton, P.C. Justice at Wroxton, and Inspector Wright at Deddington, each informed him that from 6 to 8 P.M. on the night of December 4 they saw a very thick black cloud descend, which seemed to rest on the earth until about 8 P.M.; it was so thick that they could scarcely find their way along with their lamps; that later on it got light again; and that the cloud appeared to have come from the direction of Kineton, Edge Hill, Hornton, Wroxton, Swalcliffe, for Dunston and Deddington.

Animals probably see perfectly well on ordinary dark nights and we can easily imagine a bewilderment—an entire loss of confidence if I may so express it—overtaking them when they find themselves overtaken by a thick darkness in which they can see nothing. In moving about they would knock against their troughs and one another, and the first one that got a fright from this and made a little rush would probably come into collision with one or two others, and it would need nothing more to imbue the whole pen with the idea that there was some cause for fear, occasioning this rushing about. Then they would all make a rush, and their terror and the momentarily recurring incentives to and aggravations of it in the shape of collisions would only subside when they were in the open, clear of one another and of their troughs and hurdles. If this is a true explanation of the panic (and I confess I can see no other), then it is at once clear why folded sheep are so much more likely to suffer from these panics than are those in open fields. The heavy, oppressive air accompanying this thick darkness; the susceptibility of sheep to any atmospheric disturbance; and the nervous, timid, and fanciful dispositions of these animals, must all be taken into account in forming an opinion upon the probability of the cause I have here assigned for sheep panics being the true one.

The cause of the panic being a thick black cloud rolling along so low down as to (apparently) touch the ground, the tops of hills and the high-lying ground would naturally be most affected; and this supposition is borne out by the facts adduced in this paper. We also account in this way for the fact of flocks penned in valleys, or (from the lie of the ground) in sheltered positions, being unaffected.

The line of country also usually followed by storms—whether of rain only or accompanied by thunder—which in a hilly country like ours is generally rather well marked and fairly well known, may explain why some parts of the district were not affected, while the sheep on the farms all round stampeded.

To give only one instance of this. Lord Moreton took me to the top of a low rounded hill at Sarsden, on which on the night of the panic several flocks were penned, and told me that none of them were at all disturbed. Some part or other of this hill (which at a very rough computation contains about 5,000 acres) is exposed to all four quarters of the compass, and from the top an extensive view can be obtained; the situation is therefore open and exposed. From the top of the hill Lord Moreton pointed out a long line of country passing at no great distance, along which, as far as we know, the sheep stampeded on nearly every farm. Along this line many thunderstorms pass which do not reach Sarsden and the hill above-mentioned.

Some attempt was made to discover the direction from which the cause of fright came by ascertaining on which side of the pens the sheep broke out. Subjoined is the evidence.

Bloxham Grove Farm (Mr. W. H. Warriner): E. or N.E.

Witney (Mr. Gregson):

The rush in most or all instances appears to have been from the west to the east, as the hurdles were generally down on the east side of the folds.

Bloxham (Mr. Denchfield): E.

Ditchley:

They had travelled direct north.

Sezincote:

Appears as if whatever frightened them came from the south.

Batsford Home Farm: Ditto.

Lower Lemington Farm: Ditto, or S.E.

Lord Moreton was told that in many, if not most, cases the sheep broke out at the S.E.

P.C. Sirman says that the black cloud travelled from north-west to south-east, and the evidence of the Banbury District Constabulary points to its travelling from N. to S., or perhaps N.N.W. to S.S.E. But supposing that the sheep fled from the advancing darkness, which is not very likely, we could hardly expect the rush to have taken the same direction in all cases when we remember the hilly nature of the country and the effect of the lie of the land upon the line taken by storms and clouds moving at a low elevation.

In conclusion I wish to tender my thanks to those who have been kind enough to furnish the valuable and accurate information upon which the above report on, and attempted explanation of, sheep panics is founded; without which it would, of course, have been impossible to draw up this paper.

O. V. Aplin.

Bloxham, Banbury.

THE WORK OF THE GEOLOGICAL SURVEY.[1]

Before geology became organised into a definite branch of science men had begun to perceive that one fundamental requisite as a groundwork for the study of the rocks of the earth's crust, alike in their theoretical and industrial aspects, lay in the delineation of the respective areas of these rocks upon maps. At first the maps so constructed were merely rough representations of the general distribution of the mineral masses. They were mineralogical, or, as it was called then, geognostical, that is, they only aimed at an indication of the relative positions of the rocks at the surface. They made no attempt to show the structure and sequence of the various formations. It was not until the time of William Smith that

[1] From a paper read by the Director-General of the Geological Survey before the General Meeting of the Federated Institution of Mining Engineers, and reprinted by special permission of the Council of that body.

geology was supplied with the means of determining the true succession of the stratified rocks, apart from mere lithological characters, which had previously been the only guide. Well may we look back upon that great pioneer as the Father of English Geology. In every department of the science we may trace the direct or indirect influence of his fruitful labours. But in no branch of investigation has this influence been more profound than in geological map-making, and in the assistance which geological maps have furnished to the onward progress of the science. The earliest truly geological map, as distinguished from its geognostical or mineralogical predecessors, was the famous map of England laboriously constructed by Smith himself after years of patient investigation, and published in 1815–1819. The appearance of this map marks an epoch in the history of the science. It showed for the first time how the successive stratified formations of the earth's crust could be recognised and traced, apart altogether from their varying mineral characters, and how the geological structure of one country could be logically compared with that of other countries. In fulness, accuracy, and artistic delineation, an enormous advance has been made during the last three generations in the construction of geological maps, but the initial impetus of this advance must unquestionably be traced to the early surveys of William Smith.

We are all more or less familiar with the important share which this country has taken in the development of modern geology. It is perhaps not so generally recognised how much the science has been aided here by the early delineation of the geological features of the British Isles upon maps. What William Smith did for England and Wales, MacCulloch did for Scotland, and Griffith for Ireland. MacCulloch's map, published in 1832, though less original than Smith's, and bearing more evident trace of the influence of the older geognostical school of observers, was a remarkable achievement for a single observer in a region so complicated in its geological structure and, in the early decades of this century, so difficult to traverse. Griffith had the advantage of coming later into the field, when geological methods of observation had made considerable progress. His great map of Ireland, published in 1846, is consequently much more modern in its treatment of the subject. It will ever remain a monument of extraordinary industry, sagacious observation, and felicitous inference, employed in the investigation of a country where, save in a few detached areas, he was practically the first great pioneer.

But it was not only in the British Isles that the necessity for geological maps was recognised as a basis for scientific progress in the investigation of the earth's history. I need only refer to the first sketch of a geological map of France, Belgium, &c., by J. d'Omalius d'Halloy (1822), to the excellent map of France by Dufrénoy and Élie de Beaumont (1840–42), and to the early maps of Desmarest, Dumont, Von Dechen, Naumann, and other cartographers in different parts of Europe.

Even the best of these early maps were confessedly mere outlines.

Their scale was small, and their topography often meagre and even inaccurate. For geological research they were inadequate, while for industrial purposes they were entirely insufficient and even in some degree misleading. The connexion between geological investigation and many practical affairs in daily life had now begun to be perceived. In this country the first geologist who devoted himself to the development of this connexion was Henry Thomas de la Beche—a name which we regard with pride and affection as that of one of the greatest leaders of the science whom Britain has produced. Having begun to study the geological structure of Devon, Cornwall, and West Somerset, he became greatly interested in the many problems which the rocks of that region present. He saw that an accurate delineation of the courses of the mineral veins, elvans, and faults through the masses of killas and granite could not but be of the utmost service in the prosecution of the mineral industry on which the prosperity of the country so largely depended. Accordingly, supplying himself with the Ordnance maps on the scale of one inch to a mile, he began, with a few assistants and at his own charges, to map the details of the geology. Impressed with the national importance of the work which he had undertaken, he made application to the Government of the day for assistance and recognition. In the year 1832 he obtained a small Parliamentary grant-in-aid, and in successive years he was able to so influence the official mind in favour of the views which he advocated that in the end he had the gratification of establishing a Geological Survey of the kingdom as one of the scientific undertakings of the nation, with an affiliated School of Mines, a Museum of Practical Geology, and a Mining Record Office. His aim was to conduct the whole establishment on the basis of strictly scientific investigation, but to afford in every possible direction all the aid which geology could furnish to mining industry, engineering works, agricultural progress, and other practical affairs. This design, broadly conceived by him, was efficiently carried into execution. The Geological Survey which he founded grew under his fostering care and that of his successors, and became the parent and model of the other national surveys which have since been organised so plentifully both in the Old World and in the New.

Without attempting to give, even in outline, a history of the progress of our Geological Survey, I propose to offer some details as to the nature and extent of the work that is now carried on by the Survey. The designs so ably planned by Sir Henry de la Beche were extended by his successor, Sir Roderick Murchison, and were further improved by my predecessor, Sir Andrew Ramsay. Since my own appointment as Director-General, in 1881, I have been enabled to introduce other modifications that tend to still greater efficiency. But essentially the organisation and methods remain as they were planned by the first founder of the service.

The Geological Survey is now divided into three distinct branches—one for each of the three kingdoms—but united and kept in organic connexion under one Director-General. Each staff has its separate organisation, but its members may be interchanged. It consists of two grades: (*a*) district surveyors, geologists, and assistant geologists, whose chief duty, under the superintendence of their director, is the preparation of the maps, sections, and memoirs, and (*b*) collectors, who, under the supervision of the other officers, search for fossils and collect specimens of minerals and rocks for determination and for exhibition in the museums. There is an office and likewise a museum in London, Edinburgh, and Dublin. Each branch has thus its own headquarters, with a small resident staff, the head office for the whole Survey being the establishment at 28 Jermyn Street, London, S.W. The total strength of the service in the United Kingdom, including the officers engaged in museum work, is at present 60. As the duties are practically the same in each branch of the Survey, I shall treat the whole as one service and describe its work under the following heads:—1st, mapping; 2nd, petrographical determination; 3rd, palæontological determination; 4th, the collecting of rocks, minerals, and fossils; 5th, the preparation of maps, sections, and memoirs for publication; 6th, museum work; 7th, general administration; 8th, relations of the service to other Government departments and to the general public, as regards the furnishing of geological information.

I. Mapping.

The first and most important duty of the Survey is to map in detail the geological structure of the country. When this task was first undertaken by De la Beche and his associates they employed the Ordnance Survey maps on the scale of 1 inch to a mile ($\frac{1}{63360}$) which had then been published for Cornwall and Devon. These early Ordnance sheets, however, were imperfect and incorrect in their topography, having been among the first undertakings of the Ordnance Survey, before methods of surveying had been brought to the perfection that has since been attained. The connexion between the Geological and the Ordnance Surveys was at first so intimate that the former was instituted as a subsidiary branch of the latter. The geologists belonged to the "Ordnance Geological Survey," and though they were never under military orders, they wore a uniform. The only surviving relics of that connexion are some of the waistcoat buttons, which on festive occasions continued to be worn after the rest of the raiment had disappeared. But from the first, and up to the present day, the Ordnance maps have been the basis on which all the geological work has been conducted. We have heard much in the last few years of the inaccuracies and imperfections of these maps. But the experience of the Geological Survey does not bear out this charge. I do not suppose that these maps have ever been put to a severer test than by the officers of the Geological Survey, who have carried them into every nook and corner of the country, from coast-line to mountain-top, and have checked them in many ways while fixing the positions of geological lines. It is, of course, admitted that the old 1-inch maps are unequal in value, and frequently imperfect or even inaccurate in their topography. But since the Ordnance Survey was plotted on a large scale the accuracy attained has been so great and so invariable as to fill my colleagues and myself with admiration. It is on these most excellent maps that our geological lines are traced upon the ground, and on which they are ultimately engraved and published. So that although the old outward bond of connexion between the two Surveys has long been severed, the relationship between them remains as intimate and cordial as it has ever been.

All the mapping of the Geological Survey is now conducted upon the Ordnance maps on the scale of 6 inches to 1 mile ($\frac{1}{10560}$). These maps were not available in England and Wales until about two-thirds of the country had been surveyed geologically, and it was only in the northern counties that they could be adopted. In Ireland, however, and in Scotland, they were obtainable from the commencement of the geological operations, so that the whole of the work has been conducted with them as a basis. It is impossible to overestimate the gain, both in completeness and accuracy, from the substitution of a large-scale map in the general investigation of a complicated geological region. For example, no more admirable piece of geological mapping had ever been achieved when the Geological Survey maps of North Wales, by Ramsay and his colleagues, were published. That difficult region was surveyed on the 1-inch scale, and excellent though the work still is, it is far inferior to what the same band of intrepid mountaineers could have accomplished had they had the good fortune to be furnished with 6-inch maps. Occasionally, when the structure becomes excessively complicated and when its details require to be mapped out clearly to be intelligible, maps on the scale of 25 inches to a mile ($\frac{1}{2500}$) are made use of. Ultimately, however, all the work is reduced to the 1-inch scale, this being the scale on which the general geological map of the United Kingdom is published.

Let me say a few words about the actual methods of geological surveying. The question is often asked of us, Do we bore or dig? and when we answer in the negative, an incredulous smile may often be seen on the face of the inquirer, who evidently at once begins to doubt the trustworthiness of any surmises we may make as to what lies concealed beneath the surface. In reality, however, a trained geologist can generally tell, with a close approximation to accuracy, the character and arrangement of the rocks underneath his feet. There are many indications to guide him which do not strike the eye of the ordinary observer. So far from being guess-work, his conclusions are often based upon such an array of observed facts as to be irresistible. The first experience of a recruit who joins the service is to be trained in the practice of searching for geological evidence. He soon learns how unobservantly he had walked about before, and in how many ways he may detect indications as to the direction of geological boundaries, even when the rocks themselves may generally lie out of sight. He finds that moles and rabbits help him greatly, by throwing up the subsoil for his inspection. The farmer assists him as he ploughs and drains the land. He is even indebted now and then to the gravedigger. Every ditch and cutting may be made serviceable for his purposes. Wells, quarries, pits, railway-cuttings, in short, every natural and artificial exposure of the rocks, or of their detritus, may furnish him with the information he requires. It does happen now and then that, after fairly exhausting the evidence, he has to confess himself puzzled. He cannot be quite sure how the rocks exactly lie and how his boundary-lines should be made to run. In such cases we have sometimes recourse in the Survey to the boring-rod, and by its means we have been able in one or two localities to prove the existence of formations of which no superficial evidence could be obtained.

A member of the Geological Survey may start fully accoutred for his work in the field without betraying by any outward visible token what is his handicraft. His maps are carried in a portfolio which slips into his pocket or hangs by a strap inside his coat. His hammer goes into a sheath and belt round his waist. His clinometer, compass, notebook, lens, pencils, and other small items are easily stowed away among his numerous and capacious pockets. Thus lightly equipped he may make his way over any kind of ground, and can spend a long day in the prosecution of his work.

Not only by minute observations of superficial detritus, but by measurements of the dip of rocks, where these are exposed at the surface, the observer may form tolerably accurate conceptions of the nature and arrangement of the rocks underneath and of the depth at which any given stratum may be expected to be reached. Thus in questions of water-supply he may, from such superficial observations, predict with some confidence the distance to which a boring must be sunk before a certain water-bearing stratum will be reached.

(*a*) *Drift Survey.*—Geology had made considerable progress in the study of the underlying solid rocks before much attention was paid to the looser superficial deposits. The Geological Survey in this respect followed the general rule, and for many years made no systematic attempt to represent the numerous and often complex accumulations of superficial materials. Some of these, indeed, were shown on the maps, such as tracts of blown sand and river-alluvium. But it must be remembered that in the south-western counties, where the Geological Survey began its work, and in those where for many subsequent years this work was continued, superficial deposits are of such trifling extent and importance that they were not unnaturally ignored. Only after most of the southern half of England had been completed was it determined to map the surface-deposits with as much care and detail as had been expended on the older formations lying beneath them. It had been discovered that this course was necessary both on scientific and practical grounds. In the first place, these superficial accumulations contained the records of the later geological vicissitudes of Britain, and were beginning to reveal a story of the profoundest interest, inasmuch as it dovetailed with the history of the human occupation of the country. In the second place, it was recognised that in many various ways these surface-deposits had a direct and vital influence upon the welfare of the population. In agriculture, in water-supply, in questions of drainage and of the location of dwellings, it was seen that a knowledge of the soils and subsoils, and of the formations from which these are derived, was of the utmost practical importance. It was therefore determined that thenceforth the Geological Survey should not only portray the lineaments of the solid earth, but trace out the drifts and other surface-deposits which, like a garment, overspread and conceal them. It was impossible at first to go back over the ground where the surface-geology had been omitted. But it was arranged that when the whole country had once been mapped those tracts should be re-examined wherein the superficial deposits had not been surveyed. And, in the meantime, over all new areas the survey was made complete by the tracing out both of the surface-deposits and of the older rocks below them.

No one who has not given some personal study to the complicated details of surface-geology can realise the amount of labour which the mapping of them often involves. The distinctions between the various superficial deposits, though real, are sometimes slight, and as sections are frequently few and wide apart, and the deposits so often occur in irregular patches, the ground has to be traversed with a detailed scrutiny which is generally not required for the older rocks underneath. Viewed broadly, the superficial accumulations are grouped and mapped by the Survey in two leading series. First come those which have resulted from the decay of rocks *in situ*, and then those of which the materials have been transported into their present position.

1. The first of these two series, in so far, at least, as it is capable of being mapped, is mainly confined to the extreme southern fringe of England. All over the three kingdoms, indeed, the weathering of rocks has for ages been in progress, and here and there, especially in the upland and mountainous districts, accumulations of rotted rock may be observed at the foot of the crags and on the slopes. But what can there be observed is only what has accumulated since the last glaciers and ice-sheets scraped the loose detritus off the surface to form parts of the great group of glacial deposits. South of a line, however, drawn from the mouth of the Severn to the mouth of the Thames this country seems never to have lain under a mantle of moving land-ice, nor beneath a sea covered with drifting ice, though fragmentary sheets of old marine gravels cap many of the plateaux, and traces of probable ice-transport are found on the south coast. The surface in this southern tract has thus been left undisturbed for a great length of time. Its rocks have slowly decayed and their *débris* has gradually accumulated above them with only such slight transport as may have been due to the washing of rain and the sifting of wind. We see the results of this prolonged waste in the

brick-earths, clay-with-flints, and other deposits, that form so marked a feature on the Chalk Downs. From the Chalk districts westward across the Jurassic, Devonian, and older formations, even to the farthest headlands of Cornwall, every rock is more or less buried under a covering or "head" of its own decayed material. Sometimes, as on the Oolitic strata of Dorset or the killas of Cornwall, this upper decayed layer may be traced as a yellow or orange band, varying from a few inches to many feet in thickness, conforming to the shape of the surface, and presenting a singular contrast to the black horizontal shales of the one coast and the purple vertical slates of the other. In the interior, where natural or artificial exposures of the rock are sometimes scarce, the spread of this mantle of disintegrated material is a serious impediment to the mapping of what lies underneath it.

2. But it is the second or transported series of surface-deposits which chiefly engages the attention of the Survey. In mapping it an effort has been made to discriminate each of its members, to trace out their relations to each other, and to ascertain the connected geological history of which they are the records. At the same time, regard has been had to the practical applications of the inquiry, the connexion between soil and subsoils has been kept in view, pervious and impervious deposits have been distinguished, and an endeavour has been made to collect and embody on the maps as much information as possible concerning the practical bearings of the surface-geology.

As an illustration of the detail into which the mapping in this department has been carried, I may mention that under the single term "alluvium" we now discriminate and indicate by separate signs and colours a large number of distinct deposits. Thus, there is a group of freshwater alluvia, beginning with the present flood-plains of the rivers and rising by successive terraces to the highest and oldest fluviatile platforms. Deposits of peat are separately traced, and tracts of blown sand are likewise mapped. Then there is another series, of marine alluvia ranging in position and age from the mud of modern estuaries and the sands of flat shores exposed at low water, through a succession of storm-beaches and raised beaches, up to the highest and most ancient marine terraces 100 feet or more above the present level of the sea. Regarding the origin of some of the high-level gravels there is still much uncertainty, but the Survey has taken the first necessary step for their ultimate explanation by carefully tracing their distribution on the ground.

But the most abundant and complex group of superficial deposits is that which may be classed under the old name of glacial drifts. These have been mapped by the Survey in detail, and much of the progress of glacial geology in this country has been due to the sedulous investigation thus required. The ice-striæ on the solid rocks have been observed over so much of the country, that maps may now be constructed to show both the march of the main ice-sheets and the position of the later valley-glaciers. The various boulder-clays have been mapped, likewise the sands and gravels, the esker-drifts, the marine shelly-clays, and the distribution of erratic blocks. A vast amount of information has thus been collected regarding the history of the Ice Age in most parts of the country. Even in the southern or non-glaciated fringe which I have already referred to one of the members of the staff has been able to detect interesting evidence that though beyond the limits of the northern ice-sheets, this southern tract nevertheless had its frozen soil and its rafts of coast-ice. In the north of Scotland proofs have been obtained of the long-lingering of the ice-fields in that region; while in all the mountainous districts the gradual retreat of the valley-glaciers, as the climate grew milder, has been shown by mapping the successive crescents of moraines, one behind the other, up to the very base of the crags from the material of which they were formed.

The survey of the superficial deposits thus combines a wealth of geological interest with a great deal of practical value. The geologist may find in it the solution of some problems and the presentation of many more, whilst the farmer, the water-engineer, the builder, and the sanitary inspector may each in turn gain some practical information from it for their guidance.

(*b*) *Solid Geology Survey.*—By way of distinction the mapping of the formations of every age that lie beneath the recent superficial deposits is known as the survey of the "solid geology." The object in this part of the work is to represent on the maps the exact area which every formation or group of rocks occupies at the surface, together with all indications that can be obtained of its structure, such as its variations of inclination, its changes of lithological character, and the dislocations by which its outcrop is affected. While the basis of this work is rigorously geological, an effort is made to ascertain and record any facts which may have an industrial bearing, such as the presence of useful minerals, or the depth and variations in thickness of water-bearing strata. The large scale on which the Survey is conducted allows much local detail, both of a scientific and a practical nature, to be inserted on the maps.

In those districts of the country where the rocks have long been well-known and where the geological structure is simple the duties of the surveyor are comparatively light, though it often happens in these tracts that the simplicity of the solid geology is compensated for by a great complexity in the overlying "drifts." Yet even among formations that have long been familiar the diligent surveyor may generally glean new facts or be able to throw new light on facts which were already well-known. Thus only a few years ago, even in a formation so well worked out as the Chalk, one of the members of the Survey detected the existence of a phosphatic deposit like those which have long been worked in the Chalk of Belgium and France.

It is where the rocks are varied in character and complicated in structure that the full working power of the Survey is called out.

Take, for example, such a tract as that of the North-west Highlands of Scotland. In that region the mere physical difficulties of the ground are great. With a topography of exceeding ruggedness and sometimes of great elevation, with a climate wetter and more boisterous than almost any other to be met with in these islands, and with quarters often of the most uncomfortable description, the geological surveyor needs all his enthusiasm and ardour to carry him bravely through these preliminary obstacles. But when he comes to unravel the structure of the rocks he finds it almost incredibly complex. Day after day he may be seen traversing the same face of cliff, creeping from crag to crag, hammer in hand, heedless of the eagle that sweeps out from its nest above him or the red deer that breaks from its covert in the rocks below, his eye intent on the face of each scar and cleft as he pauses to take his measurements or set down his notes on map and notebook. He encounters varieties of rock which he may be unable to identify by any of the simple tests that can be applied in the field. He takes chips of these home with him, and if they still offer difficulties he sends them up to the office, where they are cut into thin slices and examined with the microscope, or are chemically analysed, and a report embodying the results of the examination is returned to him for his guidance, while he may himself study the slides and verify or check the observations which the petrographer has made upon them. Again, he may detect in other rocks traces of organic remains, the importance of which he at once perceives. Such specimens as he can himself collect are sent up to the head office for determination by the palæontologists, and upon their decision may depend the name to be assigned to the fossiliferous rock and the colour and sign whereby it is to be designated on the published maps.

The complication of the "solid geology" in these north-western regions is enough to tax to the utmost the capacity and the energy of the surveyor. But he has besides all this to keep his eye ever open to all the varying problems presented by the superficial deposits. The ice-striæ on the rocks, the scratched stones high on the mountain sides that mark where the "till" once lay, the varieties of boulder-clay, the sand and gravel eskers, the scattered erratic blocks and the detection of their probable sources of origin, the moraine mounds fringing or filling the bottom of the glens, the sheets of flow-peat and the rugged peaty mantle that hangs down from the cols and smoother ridges, the recent alluvia and the successive stream-terraces, the lines of raised beach and the estuarine silts—all these and more must be noted by him as he moves along, and must be duly chronicled on his map and among his notes.

It is obvious that the progress of a surveyor in such ground cannot be rapid. If the work is worth doing at all, it should be well done, and if well done, it must be done slowly and carefully. It is evident also that the total area surveyed in a year, if given in square miles, affords no guidance whatever as to the amount of labour involved. There may be a hundredfold more exertion, physical and mental, required to complete a single square mile in some districts than to fill in ten square miles in others. It is customary in the service to estimate not only the area annually surveyed by each officer in square miles, but also the number of miles of boundary-line which he has traced. The ratio between these two figures affords some measure, though an imperfect one, of the comparative complexity or simplicity of the work. In simple ground a surveyor need have no difficulty in mapping from 70 to 100 square miles in a year, each square mile including from 3 to 6 linear miles of boundary. But in more rugged and difficult districts it is often impossible to accomplish half of that amount of area. In these cases, however, the ratio between area and boundary-lines usually rises to a high proportion. Thus last year, in Argyllshire, the average number of linear miles of boundary-lines was as much in one district as 17 miles in every square mile surveyed.

In mining districts an endeavour is made to express on the maps the positions of the outcrops of all seams and lodes, the line of every important fault and dyke, with the place of such faults at the surface, and where they cut different seams underground. For the information necessary to record these data we are mainly indebted to the owners and lessees of the mines and pits, who, as a rule, most generously give us every assistance. Details, as far as possible, are inserted on the 6-inch Ordnance sheets. Copies are taken of borings and pit-sections, and notes are made regarding variations in the character of the seams or lodes from one part of a mineral field to another. At the same time the district is surveyed in the usual way, and by exhausting the surface-evidence the surveyor is not infrequently able to supply important additional information beyond what can be obtained from the mining-plans.

It is the necessary fate of all geological maps to become antiquated. For, in the first place, the science is continually advancing, and the systems of arrangement of the rocks of the earth's crust are undergoing constant improvement, so that the methods of mapping which satisfied all the requirements of science thirty years ago are found to be susceptible of modification now. In the second place, in the progress of civilisation new openings are continually being made in the ground—wells, roads, drains, railways, and buildings are being constructed, whereby fresh light is obtained as to the rocks below. Geological lines which were traced with imperfect evidence can thus be corrected, and new lines which perhaps were not suspected can be inserted. If this kind of obsoleteness overtakes geological maps even where only superficial openings are concerned, much more does it affect those which depict the structure of mineral fields still actively worked. The geological maps of Devon, Cornwall, and South Wales, made more than half a century ago by De la Beche and his associates were for their time admirable in conception and excellent in execution. Nothing approaching to them in merit had then been produced in any part of the world. But the mineral industry of the country has not been standing still all these years. Enormous progress has been made in working the ores of the western counties and in developing the great South Wales coal-field. Yet the maps remain as they were originally published. The Geological Survey has of itself no power to undertake revision, and much as we would like to see all the mineral fields re-surveyed and brought up to date, we cannot go faster than Parliament will sanction or the Treasury will authorise. Two years ago, in response to an important memorial from South Wales, we received instructions to commence the re-survey of that coal-field, and the work is now in active progress. I trust the day may not be distant when similar revisions will be made of the other mineral-fields which were surveyed many years ago on imperfect 1-inch maps.

The re-surveys of the mineral districts can now be carried out on the 6-inch scale with a completeness and accuracy unattainable when the original surveys on the 1-inch scale were made. In some cases the maps of mining districts have been published on the 6-inch scale, but where the sale is likely to be small, instead of incurring the heavy expense of engraving the 6-inch sheets, we issue manuscript copies of these sheets at the cost of manual transcription. As an illustration of the kind of work undertaken by the Survey in the mining districts, I may refer to the Maps, Sections, and Memoir of the Yorkshire coal-field. There is no reason, save that of expense, why all the mining districts of the country should not be similarly treated.

Though systematic re-surveys are not undertaken by the Survey without express sanction, it is customary to make minor corrections which from time to time may be required in the published maps. Those counties in the south and south-west of England of which the superficial deposits were not originally mapped are now undergoing revision for the "Drift Survey," and advantage is taken of the re-examination of the ground for the insertion of the surface-geology to make any needful alteration on the lines of the solid geology.

II. Petrographical Work.

In the earlier days of the Geological Survey each member of the staff determined for himself, by such tests as he could apply, the various rocks encountered by him in the field. Only in rare cases were chemical analyses made for him. The study of rocks had fallen into neglect in this country, being eclipsed by the greater attraction of the study of fossils. The introduction of the microscope into geological investigation has, however, changed this apathy into active interest. It is now recognised that, apart from mere questions of nomenclature, rocks contain materials for the solution of some of the most important problems in physical geology. Accordingly, microscopic inquiry has in recent years been organised as one of the branches of the Geological Survey, and now affords constant and material aid in the progress of the mapping. Chemical analyses are likewise made, so as to afford all available information as to the composition of the mineral masses encountered in the field.

When an officer engaged in mapping meets with rocks which present difficulties, either as to their classification or as to their bearings on the structure of the ground, he takes specimens of them, which he numbers consecutively and sends up to the petrographer at the office, who enters them in a book under the name of that officer, and keeps a record of the destination of each. Those specimens which are selected to be sliced are numbered consecutively in the order in which they are cut, and are entered in books kept for the purpose. When they have been microscopically studied, described, and named, they are again entered in two distinct catalogues, one of which is arranged according to the sheets of the 1-inch map, and the other according to petrographical types. Every sliced specimen is thus entered four times, and every specimen sent up for examination (whether sliced or not) can at once be found. A report is made out by the petrographer and sent back to the officer, who is thus put in possession of all the details which can be furnished to him regarding the rocks about which he needed assistance. In many cases the thin slices are also sent to the surveyor, who often spends his evenings in the study.

The original specimens from which the thin slides have been prepared are carefully kept in cabinets, so that if any accident should befall a slide a new slice can at once be cut. The mounted slides are arranged in separate cabinets. A large number of such slides have now been accumulated. From Scotland alone upwards of 5,000 have been determined, and are ready for reference at any moment.

But besides assisting the field-work, the petrographers are engaged in determinations required for the arrangement of rock-specimens in the museums at Jermyn Street, at Edinburgh, and in Dublin. The collectors are employed under the supervision of the surveying officers to make illustrative series of specimens of the rocks of each district. These are sent up to the office for examination and for insertion in the museums. In the course of the research thus imposed on them the petrographers are from time to time enabled to make important original contributions to petrographical science. Moreover, they confer in the field with the officers who are engaged in mapping, and sometimes in concert with them make observations which are embodied in conjoint Memoirs on the geology of the districts.

III. Palæontological Work.

In a country where the geological formations are to a large extent fossiliferous, it is necessary to pay close attention to the organic remains found in the rocks, to collect specimens of them, to determine these specifically, and to regulate thereby the geological boundary-lines upon the maps. The duty of examining and reporting upon the fossils is entrusted to the palæontologists, who occasionally visit the field, but are mainly engaged at the museums. With reference to the exigencies of field-work, a somewhat similar system is followed with regard to fossil evidence as in the case of the petrography, though the same minute detail is not necessary. The officer when in doubt about any species, the names of which are needful in separating formations and drawing their mutual boundary-lines, collects specimens of them and sends them up to the office for identification. They are compared by the palæontologists with published descriptions and named specimens, and a list of their specific names as far as they can be made out is supplied to the surveyor.

Besides such specimens as may require to be identified in the course of the mapping, full collections from the formations of each important district are made by the collectors under the guidance of the officers by whom the district has been surveyed. Every specimen is numbered and registered in the collector's book, so that its source and destination can at once be found. Lists of the fossils are drawn up by the palæontologists for insertion in the published Memoirs. A selection of the best specimens is placed in the cases, drawers, or cabinets of the museum. Fortunately, in the case of the palæontologists also, though much of their work is necessarily of a routine official character, opportunities are afforded to them of making interesting and important additions to palæontological science. It was from this department of the Survey that Edward Forbes produced some of his best work, that Salter made his fame as a palæontologist, and that Professor Huxley enriched geological literature with his memoirs on Silurian crustacea, Old Red Sandstone fishes, and Triassic reptiles. Within the last few months fresh distinction has been won by one of the staff of the same department from the investigation and restoration of a series of remarkable reptiles from the Elgin Sandstones.

IV. Collecting Work.

From what I have already said it will be seen that the systematic collection of the minerals, rocks, and fossils of the country is an essential part of the operations of the Geological Survey, and is made to aid the progress of the mapping and the completion of the illustrations of British geology in the museums. Each branch of the Survey has its collector, who moves from district to district as his services are required. When he begins work in any area, he is supplied with a map on which the field-officer who surveyed it has marked every locality that should be searched, and also with a list of these localities, giving local details as to the rocks to be specially examined and the kind of specimens to be looked for and collected. When necessary the surveyor accompanies the collector to the ground and starts him on his duties. Every specimen which the collector sends up to the office has a number affixed to it, and is entered in the lists, which are also at the same time transmitted to headquarters. The specimens are then unpacked and treated by the palæontologists or petrographers, as the case may be, in the manner already indicated.

V. Preparation of Maps, Sections, and Memoirs for Publication.

The results obtained by the Geological Survey are made public in three forms—Maps, Sections, and Memoirs; to which may be added the arrangement of specimens in the three museums, with their diagrams, handbooks, and other explanatory matter, and also the original papers, which lying often beyond the scope of the Survey's publications, are prepared by members of the staff and, with the consent of the Director-General, are communicated by them to scientific societies or journals.

(*a*) *Maps.*—Every surveying officer is responsible for keeping his 6-inch field-maps inked-in and coloured-up, so that if required to be exchanged with his colleagues they shall be clear and intelligible. He is likewise required to prepare duplicate copies of these field-maps, which when completed are transmitted to the office and are kept there for consultation by the public.

As already stated, 6-inch maps of some of the mineral-fields have been published. These have been prepared by the officers who surveyed them, the geological work being put on a dry impression from the plate of the Ordnance map, which is then sent to the Ordnance Office to be transferred to an electrotype of the plate. In a few cases, also, maps on this scale, where the geology is of special interest or complexity, have been prepared and published. But for the country at large it is not desirable to publish maps on so large a scale as that of 6 inches to a mile. Over all the counties which have been surveyed on that scale, MS. copies of the 6-inch maps can be obtained by the public at the mere cost of manual transcription from the duplicate copies retained in the office.

The work surveyed by an officer on the 6-inch scale is reduced by him upon a dry impression of the 1-inch Ordnance map. A single 1-inch sheet may comprise the work of half a dozen surveyors, and in that case the sheet is passed from one to another, each adding his own share. The completed dry proof is then checked at the office, and is sent to the Ordnance Survey to be engraved on an electrotype copperplate specially prepared for the purpose from the original Ordnance plate. After the final corrections have been made in the engraved map and the scheme of signs and colours has been engraved on the margin, a copy of this map is coloured as it is to appear on publication, each surveyor again taking the portion for which he is personally responsible. The scrutiny involved in this process serves generally to detect any errors that may have previously escaped notice. This original coloured copy remains as the standard to which all subsequent copies of the same edition of the map are made to conform.

When finally checked and approved, the original coloured copy is sent to the colourists, who colour all the maps by hand, the work being done by women. Experiments were tried some years ago as to the feasibility of producing the Geological Survey maps by colour-printing. But with our system of engraving it was found impossible at the Ordnance Survey Office to ensure sufficiently accurate registration, and there was the further practical difficulty that so large an impression of each sheet would require to be printed off that a large stock would remain on hand, and new editions and alterations of the maps would be impracticable for many years. The original system has therefore been retained. It has this great advantage, that, by keeping the supply of copies of each sheet just sufficient to meet the demand of the public, we are enabled to make any alteration of a map which from time to time may be found to be necessary without the loss involved in cancelling a large stock of copies.

Some idea may be formed of the nature of the colouring work of the Survey maps from the fact that upwards of 180 different tints and combinations are employed to denote the various kinds of rocks separately discriminated on the maps. It is difficult to find colours distinct from each other, yet harmonious, and that will not fade on exposure. To guard as far as possible against the risk of fading, every colour is also distinguished by its own symbol, which is legibly engraved where the colour occurs on the map.

Two editions of the maps of England and Wales are now issued for those districts of which the Drift survey has been completed. One of these editions shows all the superficial deposits, and only so much of the underlying formations as lies bare at the surface. The other edition presents the underlying formations as these would appear if the superficial accumulations could be stripped off. Each of these editions has its value for special purposes. In all questions of sanitation, water-supply, agriculture, and building, it is obviously the Drift edition that should be consulted; while, on the other hand, where the information desired has reference to what lies deeper beneath the surface, as in the sinking of deep wells and mines, it is the "solid" edition that will be most usually consulted. The difference between the two is merely one of colouring, for they are printed from the same copperplate, and as far as the engraving goes are exact duplicates.

The prices of the maps are regulated by Her Majesty's Stationery Office, and are fixed according to the amount of colouring work upon them. In England and Wales, full sheets usually range from 3*s.* to 8*s.* 6*d.*, and quarter sheets from 1*s.* 6*d.* to 3*s.* In Scotland and Ireland the sizes of the maps are different, but the prices are calculated on the same scale, being in Scotland from 4*s.* to 6*s.*, and in Ireland (where the sheets are similar in size to the English quarter sheets) from 1*s.* 6*d.* to 3*s.* In some cases the price at which a map is sold is less than the cost of colouring, but it is estimated that the excess of selling price beyond that of cost in other cases will compensate for this loss.

The total number of 6-inch maps published by the Geological Survey up to the present time is for England and Wales, 217 sheets; Scotland, 130 sheets; Ireland, 10 sheets. The number of 1-inch whole-sheets and quarter-sheets published for England and Wales amounts to 258; 142 of these are as yet published only as "solid" maps; 89 are issued in two editions, "solid" and "drift"; of 23 only the "drift" edition is published. Four quarter-sheets of the map of England yet remain to be published, but will be issued this year. The number of sheets published of Scotland is 48, and of Ireland 205. The whole of Ireland has been completed and published. Every effort is now being made to complete at as early a date as possible the survey of Scotland, but the extraordinary complication of the geological structure of the Highlands, being far greater than was ever anticipated, renders the progress less rapid than could be wished.

The desirability of having a general geological map of the country on a smaller scale than that of 1 inch to a mile has long been recognised. When the mapping of England was completed, advantage was taken of the existence of an index Ordnance Survey map on the scale of 4 miles to an inch. This map, based on the old 1-inch maps, had been laid aside incomplete by the Ordnance Survey, but it was likely to be so useful for geological purposes that at my request it was finished at Southampton. The work of the Geological Survey is now being reduced upon this map, of which there are in England and Wales 15 sheets. Four of these sheets have now been published with the geology, embracing the east of Yorkshire and the southern counties from Essex to Torquay. Other sheets are in progress, and the whole map when completed will present at a glance a clear and vivid picture of the geological structure of the entire country.

The value of reduced index-maps for geological purposes was recognised long ago by the preparation of a map of Wales. When the Geological Survey of the Principality was finished the whole work was reduced to the scale of four miles to an inch and engraved in six sheets, which include parts of the West of England. This map has been on sale for many years.

(*b*) *Sections.*—A geological map can for the most part express only what lies at the surface, though it may afford information, more or less definite, as to what lies below. To supplement the map it is needful to construct sections to show the arrangement of the rocks beneath the surface. A complete and detailed map should contain sufficient data to allow such sections to be plotted in outline, but these details can usually be filled in only from the notes of the sections examined in the course of the mapping. Two kinds of sections are prepared and published by the Geological Survey—vertical and horizontal. They are drawn to scale, and engraved and published in sheets measuring 3 feet by 2 feet. But, besides these, numerous measured and also diagram sections are inserted in the text of the printed Memoirs.

The vertical sections are drawn usually on the scale of 40 feet to 1 inch, and are prepared almost entirely to illustrate the succession of strata in the coal-fields. Each sheet generally contains more than one section. The materials for the plotting of these sections is sometimes obtained by actual measurements taken by the surveyor himself, but more commonly they are supplied by the lessees or managers of the collieries. Sometimes tables of comparative sections are given in illustration of the variations in character and thickness between the seams of coal, ironstone, or limestone in different parts of the same mineral field.

Occasionally, where a group of strata, though of little industrial importance, possesses great geological interest, a vertical section of it has been constructed and published in the same style as the coal-field section. In this way we have issued some useful sections of the Jurassic rocks in Eastern Yorkshire, of the Lower Lias and Rhætic rocks in the West of England, of the Tertiary strata in the Isle of Wight, and of the Purbeck group in Dorset.

Altogether 87 sheets of Vertical Sections have been published for the three kingdoms. The price of each sheet is 3*s.* 6*d.*

The Horizontal Sections have always been an important feature in the work of the Geological Survey. De la Beche, recognising the practical disadvantages arising from the construction of sections without any regard to the proportion between height and distance, instituted the practice of drawing them on a true scale. He adopted the scale of 6 inches to a mile, and invented a system of patterns for the different kinds of rock, which, as he was himself an artist, are appropriate and effective, for they represent in no small measure the general structure of the rocks. The institution of such sections in lieu of the distorted diagrams too generally employed was of great service to the Survey itself, and also to the progress of geology, for it served to correct the evil influences of distorted drawing, with regard not only to geological structure but to the true forms of the ground.

When a line of section was chosen and drawn on the 1-inch map, it had to be measured on the ground with chain and theodolite. This was the invariable practice until the 6-inch contoured Ordnance Survey maps came into use. With these maps as a basis, the laborious process of chaining the sections is no longer required. The section-lines are drawn on these maps and the sections are plotted from them. The contour-lines and bench-marks allow the line of the surface to be traced with a close approximation to accuracy. But in order to ensure final correctness of detail the ground is gone over with the section in hand, and each little feature is then put in.

The sections start from Ordnance datum (mean sea level), but where the ground is low and there is consequently not room to express what is known of the geological structure above that datum, the lines are prolonged below it. The same practice is also followed in mining districts. An effort is made to illustrate every great district of the country. Each geological formation, as it varies from one point to another, is crossed by lines of section, so that by comparing these the changes in that formation from district to district can at once be seen. The length of each section varies indefinitely with the nature of the ground, many of them being upwards of 100 miles in length. Thus a series of sections runs from Anglesey and the coast of Merionethshire, across the mountainous ground of North Wales, to the plains of the Midlands. Another group crosses from the central counties to the South Coast. A connected chain of sections traverses the breadth of the island from Liverpool to the coast of Yorkshire.

As an illustration of the character of these sections and their usefulness in correcting popular misconceptions as to geological structure and form of the ground, I may refer to that which runs from Leicestershire to Brighton and passes through London (sheet 79). What is called the "London Basin" is by many people regarded as a deep trough of clay with the Chalk rising steeply from under it both to the south and north, and we may see this conception embodied in actual diagrams in text-books and elsewhere. But in reality both the London Clay and the Chalk are so flat that their inclination can hardly be detected except by careful measurement. And the section, accurately plotted from borings and well-sections, shows them apparently horizontal, though on further inspection we find that their line of junction, which is well above the datum-line at either end, lies some way beneath it in the centre.

The Horizontal Sections are engraved on copper and published in sheets, each of which, if the ground is low, may include six lines, or 36 miles of section. The same continuous line of section may thus extend over several sheets. Small explanatory pamphlets are published with these sheets, giving general information as to their formations and their local peculiarities. Each sheet of sections is published at the price of 5*s*. In all 191 sheets of such sections for the United Kingdom have been issued.

Besides the usual Horizontal Sections on the scale of 6 inches to a mile, occasional sections on a larger scale are prepared to illustrate the geological structure of particular localities. In this way the coast-line of Cromer and Yarmouth has been represented in detail, and its numerous features of geological interest have been inserted so as to exhibit a kind of picture of the arrangement of the strata in these changing cliffs. Portions of the coast-line of Dorset and of the Isle of Wight have been similarly treated.

(*c*) *Memoirs.*—Obviously, in the course of a geological survey, a large amount of detailed information is collected which cannot find a place either on the maps or on the sections. This material embraces much local detail and a large body of evidence which is of importance in general geological inquiry. It can only be properly used by being arranged, condensed, and printed. The issue of Memoirs of its work has been from the beginning one of the chief occupations of the Geological Survey of the United Kingdom. The form in which these publications have appeared has varied. De la Beche's plan was to publish volumes of General Memoirs embracing descriptions of particular regions, and also essays on special branches of geological inquiry. His own memoir on the geology of Cornwall, Devon, and West Somerset is an admirable example of his method, and has long taken its place among the classics of English geology. There were practical difficulties, however, in the way of continuing his method when the staff increased, and the literary labour had to be shared by a number of observers, who were, in many cases, more willing to wield their hammers than their pens. When Murchison succeeded to the charge of the Survey, he sought to avoid these difficulties by instituting the practice of accompanying every sheet or quarter-sheet of the 1-inch map with an explanatory pamphlet, giving the chief data on which the map had been constructed, with references to the best sections, lists of minerals and fossils, and information as to the geological structure of the ground. These pamphlets, containing essential details only, were to be eventually condensed and collated by the Local Director, so as to form a generalised view of each important geological region. This scheme was well conceived, and with some modifications rendered necessary by the progress of the Survey, has been carried out ever since. It is not always possible or desirable to prepare a separate explanation for each sheet or quarter-sheet, for much reduplication of geological information would thereby be involved. Several quarter-sheets or sheets may be described together in a single Memoir.

Each surveying officer is expected to contribute the account of the area mapped by him. Where more than one surveyor has been engaged on a map or district, the accounts furnished by the several officers are collated and edited in the office, and are published generally in paper wrappers and at a low price.

Occasionally these Memoirs, when dealing with an important district, have been expanded beyond the limits of mere Sheet Explanations, and have taken the form of thick octavo volumes. Such, for instance, are the Memoirs on the Yorkshire coal-field, on North Wales, on the geology of the Weald, on the geology of London, and on the Isle of Wight.

The chief literary work on which the staff of the Survey is now engaged is the preparation of the General Memoirs or Monographs to which the Sheet Explanations were designed to be preparatory. It appeared to me that the most generally useful plan on which these could be prepared was to make them fundamentally stratigraphical—in other words, to devote them to a description of the various geological systems which are embraced within the British Isles, and to show not only what has been done by the Survey in each of these systems, but what has been ascertained by others. Each Monograph should thus be a compendium of all that is known of its subject up to the date of its publication. The information obtained by the Survey in its progress is necessarily scattered through many maps, sections, and memoirs. The work of the service would be incomplete and difficult of consultation if it were left in this disseminated state. It needs to be gathered together, arranged, and put into connected form, so as to present an intelligible account of the geology and mineral products of these islands. The task is a heavy one, and cannot be speedily finished. But satisfactory progress is being made. We have published a Monograph on the Pliocene deposits of England, and two volumes of another on the Jurassic rocks, while a third volume is in the press. Another Monograph on the Cretaceous rocks is in preparation. Each monograph will embrace one system or group of rocks, and may consist of a number of volumes, according to the importance of the system and the area which it occupies in the country.

In the preparation of the Memoirs, and for museum purposes, much assistance is now derived from photography. Several members of the staff have become expert photographers, and a large number of views of geological sections, coast-cliffs, and other natural or artificial exposures of rock, have been taken. These serve as illustrations for the Memoirs, and some of them are mounted to accompany the specimens in the museums.

Besides the geological Memoirs, the Survey has published a series of Decades of British organic remains, with plates and descriptions, also Monographs of important genera or groups of fossils.

VI. Museum Work.

For the complete illustration of the geology of a country it is necessary not only to construct geological maps and sections, and to publish printed descriptions, but also to collect and exhibit specimens of its minerals, rocks, and organic remains. Each branch of the Geological Survey has from the beginning kept in view the gathering of such specimens, and the galleries of the museums in London, Edinburgh, and Dublin may be appealed to as evidence of the manner in which the duty has been discharged.

The Museum in Jermyn Street is intended to be primarily illustrative of the minerals, rocks, and fossils of England and Wales, but as far as space will admit an endeavour is made to exhibit what is specially characteristic of the other two kingdoms. For the more detailed illustrations of Scottish geology recourse must be had to the Museum at Edinburgh, and for those of Irish geology to the Museum in Dublin.

The portions of the Jermyn Street Museum more especially connected with the work of the Survey are the collection of fossils, the series of rock-specimens, and the remarkably fine and complete suite of ores and their accompaniments from the mines of the British Isles and those of the Colonies. The Museum was organised to illustrate the practical applications of geology. As an example of the manner in which this design has been carried out, I may refer to the section in which the connection between raw material and finished pottery is displayed. The British ceramic collection was one of the earliest formed, and is still, perhaps, the most illustrative in the country.

The fossils are arranged stratigraphically, and furnish the basis on which the Survey maps of the fossiliferous formations have been constructed. Every important subdivision of the Palæozoic, Secondary, and Tertiary systems is represented by a full series of its characteristic fossils gathered from the various districts in the British Isles wherein it is developed. These are arranged and tableted in such a way as to be readily accessible to the public. Those who wish to follow out the palæontological details of the Survey maps and memoirs, or to study general text-books of the science, have thus the fullest opportunities afforded to them.

The palæontologists, with their assistants, are continually engaged in arranging and re-tableting the collections to make room for fresh material received from the officers in the field, from donations, or from purchase. Catalogues of the fossils in several departments have been prepared and published.

The Rock-collection has in recent years been greatly increased and entirely re-arranged so as to bring it abreast of modern petrography. It includes a collection of rock-forming minerals in illustration of the characters of the more important minerals that enter into the composition of rocks; a series of typical rocks, named, classified, and so arranged close to the eye that the visitor may have no difficulty in observing their general external characters; a section devoted to illustrations of various geological structures, such as cleavage, jointing, foliation, plication, the structures of igneous rocks, the effects of contact-metamorphism, the markings made by glacier ice, and the results of weathering in different rocks. But the chief part of the collection is a series of British rocks arranged in stratigraphical order from the oldest gneisses up to the most recent shell-sand. Not only are the sedimentary rocks represented in this series, but a large suite of igneous rocks is included, so that the student of volcanic history may see samples of the lavas and tuffs which have been ejected at each of the periods of volcanic activity in the geological annals of Britain. Diagrams and maps are placed near the specimens to show the geology of the districts from which the latter were taken. Illustrations are likewise given of the more important microscopic structures met with in rocks, and especially among those of Britain. A handbook is being prepared to this part of the Museum, which it is hoped may prove to be a useful aid to students of petrography.

The Geological Survey collections in the museums in Edinburgh and Dublin are set out on similar lines. They have been arranged stratigraphically to elucidate the maps, sections, and memoirs, and furnish a tolerably full series of specimens in illustration of the geology of each kingdom. A handbook for the Edinburgh gallery is published, and one for that of Dublin is nearly ready.

VII. General Administration.

I have already spoken of the organisation of the staff. The collectors are placed under the direction of the field-officers. The assistant-geologists are promoted, as vacancies occur, to the ranks of the geologists. Over these officers come the district-surveyors, who supervise the work of a number of geologists or assistant-geologists in a wide district. The district-surveyors report to their director, who takes general charge of the work in his own kingdom. The Director-General is the head of the whole organisation, and is responsible for its conduct. He personally visits the officers in the field in each of the three countries, and is thus enabled to see that the work is being everywhere conducted on the same lines, and that the results obtained harmonise. It is his duty to bring the experience gained in one kingdom to the elucidation of difficulties met with in another, and to decide from time to time when the surveyors of one branch may usefully be sent to see the work in progress by another branch. It will be understood that to these duties in the field are added the general correspondence and administration of the whole service, and editorial labour connected with the issue of the various publications.

VIII. Relations to other Government Departments and the Public.

From the beginning of its existence the Survey has been continually referred to by all branches of the Government service for information regarding questions in which a knowledge of geology is required. The sinking of wells, the choice of sites for forts and Government buildings, the placing of graveyards, the selection of materials for buildings or roads, the nature of soils and subsoils with reference to matters of drainage—these and many other subjects have been reported on. Nor have the general public been backward in application for similar information. The offices of the Survey are always open, and every assistance which can be rendered to inquirers is placed freely at their service.

Archibald Geikie.

28 Jermyn Street, S.W.

PUBLICATIONS OF INTEREST TO AGRICULTURISTS.

I. THE SHEEP-BREEDING INDUSTRY OF ARGENTINA.[1]

Nobody can fail to be impressed by this book, least of all English farmers, who will have to meet the competition, both in wool and

[1] *The History and Present State of the Sheep-breeding Industry in the Argentine Republic.* By Herbert Gibson. Pp. xx + 297, with 13 full-page illustrations and 2 folded maps. Buenos Aires: Ravenscroft & Mills. London: Simpkin, Marshall & Co. 1893.

mutton, from what I believe I may fairly call an unexpected quarter. In his introduction the author states that the work is written for the prospective colonist and for the prospective sheep-farmer; that the outlook for the latter is especially good in a land said to carry a sheep and upwards to the acre; where the rainfall varies from 26 inches to 32 inches, and is well distributed throughout the year, and the temperature does not fall below 20° Fahr., nor rise above 96° in the shade; where there are no snowstorms or hurricanes, no diseases of an epidemic character, neither rabbits nor any other destructive animals; where the supply of wool and mutton is rapidly increasing, and where railroads have been made from east to west and from north to south; but where, unfortunately, a period of inflation, fostered by enormous sums of money lent by England for the promotion of the wildest schemes, has been followed by a period of depression; where all Argentine securities are equally distrusted, and where it is probable that the most primitive and important industries of Argentina—agriculture and stock-raising—will redeem the prosperity of the country.

The industries of South America were discouraged by the short-sighted home administration. The inhabitants were even prohibited from intercourse with those of another province. Commerce was exclusively carried on with Spain, whose yoke was finally thrown off in 1810. Sheep were introduced from Peru in 1539, and 4,000 Spanish sheep were brought in from that country in 1587. These were the origin of the indigenous flocks. The wool was long, weak, and coarse, and the sheep yielded about $1\frac{1}{2}$ lb. annually. Wool was first exported in 1660, but until the close of the eighteenth century there is little to record. Mutton was not eaten, and sheep were neglected and despised. Ten Merino rams and 20 ewes were imported from Spain in 1794, at the same time that Merinos were first imported into New South Wales. A hundred ewes were imported in 1813 by Mr. Halsay, and were dispersed in 1828; they were the origin of several famous studs. In 1825, 30 Southdown sheep were imported from the celebrated Babraham flock, and were the progenitors of the Southdown stock of Don Leonardo Pereyra, who, to the present day, is an extensive breeder of that class of sheep.

In those days wild dogs were most dangerous to the flocks, and prairie dogs undermined the grass. The wool was greatly deteriorated by a large burr, and the flocks were in danger from lawless marauders. Between 1836 and 1838 4,200 Merinos were said to have been imported, and in 1838 the first lot of German Negretti Merinos were introduced. The native Merinos at that time produced sheep giving 6 to 7 lb., and rams giving 10 to 12 lb. of washed wool. Scab is said to have been introduced with the German Merinos in 1838, but as it was known to the Indians it was probably indigenous.

It was not until 1860 that shearing became an annual and general operation. In 1843 a boiling-down factory was established by Messrs. Gibson. In 1858 the protective tariff of the United States caused a heavy fall in wool and in stock, but increased the boiling-down business, and induced owners to cull and improve their flocks, so that in 1866 the Argentine wools had so much improved as to be in demand on the European markets. The wet seasons of 1842, 1843, and 1845 had developed foot-rot in the Merinos, and the fluke and lung-worm made serious ravages amongst them, and induced the English breeders to introduce long-wool sheep. After a few years' experience most of the stock owners decided in favour of Lincoln sheep: they throve well and gave great increase in the yield of wool, which sold readily, the Merino cross wools fetching a high price; but it was not until 1882 that the Lincoln became a generally popular breed, and to-day it disputes the land with the Merino. This appears to be due to a succession of wet seasons, from 1877 to 1884, which occasioned heavy losses amongst the Merino stock in the lands by the sea-board, while the long-wools throve apace. The frozen meat trade also afforded a market for the more valuable carcass of the Lincoln, and the fall in Merino wool in 1884 further depreciated that breed of sheep. From 1856 to 1886 the stock of sheep increased from sixty millions to over ninety millions, surpassing Australia with her eighty-four millions; but while the latter averaged 5 lb. per fleece, the Argentine only reached 3 lb. The returns for 1891 give 4 lb. per fleece for seventy-eight millions of sheep, which number might be doubled in twenty-five years without overstocking the country. A certain number of Merino flocks are still kept pure, but about half the total number of sheep own to a cross of Lincoln or Leicester. The wool of the first and second cross is healthy and fine, but as the crossing goes on the wool gains in length and loses in fineness. The carcass is also of medium size and of fine flavour, but with too pronounced a Lincoln type the mutton loses in quality, though it gains considerably in weight. The cross-bred sheep fatten much more quickly than the pure breeds. The Southdown and Oxford Down have not been so successful for crossing as the long-wools, as the wool is not of great weight or value, and the produce suffers more from foot-rot.

The province of Buenos Aires, which is of nearly the same area as the United Kingdom, maintains stock at the rate of 186 per 100 acres per annum. The climate is humid, the rainfall averaging 30 inches. Being close to the meat markets it is there where most of the long-wools and their crosses flourish. The Merinos hold their ground on the drier lands more distant from the markets. The Pampas formation is undulating, with water in the hollows, and close to the surface it is covered with nutritious grasses, but is without trees; it grows a species of trefoil, the seed of which forms a burr, which is injurious to the fleeces. Saline efflorescence and salt beds are common in the west and south, and are much liked by the stock. A shepherd will look after 1,200 to 2,000 sheep, and is sometimes paid one-fourth of the profits of the flock, or has a monthly wage of 2*l.* 10*s.* to 4*l.* with allowances. He rides, but seldom keeps a dog. When the sheep graze the open country they generally lie by the shepherd's house at night. Paddocks have lately been introduced, and lessen working expenses, as one man can then look after

5,000 sheep. The paddocks consist of 3,000 to 5,000 acres, smaller paddocks being used for breeding purposes.

Shearing commences the first week of October, before the grasses and burrs shell their seeds. The sheep are shorn in the grease, and the shearers are paid 7*s.* to 10*s.* per 100, an average workman being able to clip forty to fifty sheep a day. After clipping, the stock are culled, and scab and other diseases receive treatment. In the case of Merinos, the tups should be with the flock by the end of October, in the case of long-wools by the middle of December. Lambing commences in March and in June respectively, June corresponding with December in our northern hemisphere. A month or so after lambing the sheep are ear-marked, docked, and castrated. During the winter the sheep lose condition, and fodder should be—but is not—provided; pumpkins, lucerne, and other crops might be profitably grown for this purpose.

Labour is cheap and plentiful. A general labourer gets 2*l.* to 3*l.* a month, with board at special seasons, such as those of shearing, dipping for scab, &c. The day labourer gets 3*s.* to 4*s.* a day, with meals; for very hard work 5*s.* to 6*s.* a day is paid.

Twice a year fairs are held in most of the principal towns, where breeders can buy or dispose of stock. Land which sold at 45*s.* per acre in 1889 could not be sold for 15*s.* an acre in 1891, and is now depreciated below its real value. First-class land in the province of Buenos Aires, with fences, homestead, &c., is worth 30*s.* to 50*s.* an acre; second-class land, 20*s.* to 35*s.*; third-class, 12*s.* to 25*s.*; outside lands, 10*s.* down to 1*s.* per acre.

Title deeds convey the freehold of the land, but should be submitted to a lawyer of position, and signed before a notary public: this is neither a troublesome nor an expensive transaction. Runs may also be rented at 1*s.* 6*d.* to 2*s.* 6*d.* an acre—about 6 to 8 per cent. on the value of the land.

The diseases from which sheep suffer are scab, for which dipping is the only remedy (for the construction of pens and dipping troughs excellent plans are given in the book); foot-rot, of which a contagious and a non-contagious variety are recognised; the throat- or lung-worm, which occasioned serious losses in 1892, and the remedies suggested for which are those in use in England. The fluke, or liver-rot parasite, which is not common, is found where pools of water are exposed to the sun. There are some weeds of a poisonous character, such as the romerillo, *Baccharis cordifolia*. Stock born on the land avoid it, but if it is eaten death ensues in twenty-four hours. If the plant is burnt, and the stock fumigated with it, they will not afterwards eat it. When cut up and macerated it makes an excellent blister, and it is also used as a diuretic. The chuchu, *Nierembergia hippomanica*, one of the Solanum family, is also poisonous, but it is fortunately scarce. Other species of the same family occasionally injure stock; but it may be said of the provinces of the River Plate that they are as poor in noxious weeds as they are rich in all kinds of nutritious grasses.

The first freezing companies started in 1883. There are now five establishments, which exported 1,294,344 sheep in 1892. Argentine mutton is worth $3\frac{1}{2}d.$ per lb., against New Zealand $4\frac{1}{4}d.$, the latter being better fed and of superior quality. Every portion of the sheep is now utilised except the blood. There is also another establishment which is prepared to can both beef and mutton, thus giving an outlet for the meat that is not well fed enough for the carcass trades.

The greater part of the wool is sold locally, most of it by brokers, but some by auction. There are three large markets in Buenos Aires and one at Rosario. Wool is not at present properly graded, and the lots are of an uneven character. Railroads are in a more advanced condition than high-roads, which do not at present exist, and are much required. The removal of the wool, &c., to the railway stations is generally undertaken by carters, who make a specialty of the business.

As the station of Los Yngleses is the one with which the author of the book is connected, it may in conclusion be taken as an example from amongst those which he describes. Mr. John Gibson went to the River Plate in 1818, and bought this estate in 1825. At the time of the purchase the produce in hand was 15 cowhides and one bag of tallow. The area of the estate was 68,352 acres, less 3,300 taken back by the Government; 12,000 acres were useless for grazing. The land is low, and intersected by lagoons. The soil is sandy on the uplands, a shallow covering of black earth on the intermediate lands, with a mixture of sand and clay in the hollows.

Mr. George Gibson commenced sheep-breeding in 1835. Previously the stock had consisted of 18,000 cattle and 3,000 mares, sheep having been neglected. Merinos were first introduced. The wethers of the Creole flock were clipped, but their wool was thrown away as valueless. About this time much damage was done by wild dogs. A premium was paid for them, and 2,000 were destroyed. Pumas also were troublesome, but a premium of $100 per head secured their extermination. Scab is first mentioned in 1845, the lung-worm in 1846. The first wire fence was made in 1853; there are now 84 miles of it. Boiling down commenced in 1843. The flock in 1849 reached 12,000, in 1845 it was reduced to 7,000, in 1850 increased to 14,000, and in 1855 to 23,000.

The first change in sheep-breeding dates from 1856. The delicacy of the Saxony Merinos and the loss of lambs made it apparent that the soil did not suit Merinos. In the next seven years different English breeds of sheep were introduced: in 1858 Romney Marsh sheep, in 1862 Cotswold and Improved Leicester, and the same year a Lincoln tup was sent out by Mr. Platten, with the message that he wished Mr. Gibson to have "at least *one good sheep*" upon the place. This sheep was found to cross better with the Merinos than any others that had been tried. In 1863 a large number of Lincolns were introduced, and in 1865 no other tups than Lincoln were used. In 1863, 5,000 Pampa sheep, an indigenous breed with long, coarse wool, were crossed with Lincolns, and the progeny was much improved both in carcass and in wool. The increase of the stock became marked with the diffusion of the long-wool strain; from 23,000 in 1855, it rose to 100,077 in 1883. In 1884, in accordance with a new law, 20,016 acres were taken by Government, the run being now reduced to 45,036 acres, 9,000 of which are useless. The sheep stock was reduced to 70,000 or 75,000 head. After 1882 the demand for Lincolns increased rapidly, the freezing of mutton greatly helping to spread that breed. The weight of wool has also increased, the average return from 70,000 sheep being —for 1883, 5·14; 1884, 4·95; 1885, 4·94; 1886, 5·28; 1887, 6·05; 1888, 6·12; 1889, 5·34; 1890, 6·45; 1891, 6·32; 1892, 6·03 lb. per fleece. The wool is clean, and washes out 58 to 65 per cent. of scoured wool, valued in Liverpool in 1893, first Lincolns, 8*d.* to 8¼*d.*; second, 8¼*d.* to 8½*d.*; third, 8*d.* to 8¼*d.* per lb.

The type of sheep aimed at by the breeders is one of smaller size than the Lincoln, carrying a fine woollen fleece of lustrous lock and bearing the same character of wool all over the body, the face and legs being as much covered with wool as in the Merino. Ewes give up to 21 lb. of wool, rams from 16 to 28 lb. The run is administered in two head stations. The southern station is well wooded with indigenous and imported trees, and is not at all like the generally uninteresting character of the Pampas. For house consumption 450 acres are kept under cultivation with lucerne and maize, which provide the more valuable stock with winter food. Tobacco is also grown for dipping purposes. The soil is capable of growing all the vegetable produce necessary to an advanced system of stock raising.

From the photographs of the Lincoln sheep bred by Messrs. Gibson it is evident that they have been brought to great perfection, and do credit to the enterprising owners of this typical station. We can only hope that efforts such as theirs may eventually raise the Argentine Republic from the unfortunate position into which speculators and politicians have brought it.

J. H. Thorold.

Syston Park, Grantham.

II. THE CONE-BEARING TREES.

That the cone-bearing trees, members of the Natural Order *Coniferæ*, should afford abundant material for an instructive Conference is a matter that will surprise no one who has ever bestowed more than a moment's thought upon their utility and their beauty; nor is it to be wondered at that the report of such a Conference should occupy an entire volume of the official organ [1] of the Royal Horticultural Society, under whose auspices the two days' meeting at the Chiswick Gardens was held.

---

[1] *Journal of the Royal Horticultural Society*, vol. xiv., 1892. *Report of the Conifer Conference.* Pp. vi + 588. Paper covers. Offices: 117, Victoria Street, S.W. 15*s.* 6*d.*

The proceedings were opened by Dr. Maxwell T. Masters, F.R.S., with an address on "Some Features of Interest in the Order of Conifers." He mentioned the fact that, with the exception of the Scotch Fir, the Yew, and the Juniper, no species of Conifer is wild in Great Britain, and that as a consequence we are, and always have been, largely dependent on foreign supplies. It appears that our earliest records of the introduction of exotic species only extend back to the sixteenth century. It is known, however, that the Norway Spruce, the Cypress which grew in Gerard's garden, the Arbor Vitæ, and the Stone Pine were in cultivation prior to 1548, and had probably been introduced much earlier. The Pinaster was known in this country in 1596, the Larch in 1629, and the Cedar of Lebanon in 1664, shortly before the time of the Great Fire of London. The Balsam Fir and various Atlantic-American species were introduced through the agency of Bishop Compton, whilst John Evelyn is credited with the introduction of the so-called Red Cedar, *Juniperus virginiana.* Between 1827 and 1833 the Douglas Fir, the Lambert Pine, the Menzies Spruce, and other now well-known trees were sent home by Douglas, and simultaneously the Deodar was introduced from the Himalayas. The useful Austrian Pine came into our country in 1835 from South-east Europe. In the following decade Hartweg introduced numerous species, amongst them the Redwood, *Sequoia sempervirens.* In 1850 the Wellingtonia, *Sequoia gigantea,* first made its appearance in our island.

"Conifers for Economic Planting" is the title of a paper by Mr. A. H. Webster, who regards it as a strange fact that out of nearly 250 species of coniferous trees that have been introduced into Britain only 16, so far as is at present known, can be utilised in an economic sense, or for truly profitable planting. Equally remarkable is it that, with perhaps one exception, the very trees the timber of which is imported so largely into this kingdom for constructive purposes have received but little attention at the hands of the British planter, being found unsuitable in one way or another for extensive planting in almost every part of the country. The 16 trees which the author, as the result of long personal experience, is disposed to confidently recommend for profitable planting—as distinguished from cultivation for ornamental purposes—in almost any part of the British Isles are the following, the order in which they are named denoting their relative values as timber-producers :—

1. Larch, *Larix europæa.*
2. Silver Fir, *Abies pectinata.*
3. Corsican Pine, *Pinus Laricio.*
4. Douglas Fir, *Pseudotsuga Douglasii.*
5. Weymouth Pine, *Pinus Strobus.*
6. Scotch Pine, *Pinus silvestris.*
7. Giant Arbor Vitæ, *Thuya gigantea.*
8. Norway Spruce, *Abies excelsa.*
9. Austrian Pine, *Pinus austriaca.*
10. Cluster or Maritime Pine, *Pinus Pinaster.*

11. Nordmann's Fir, *Abies Nordmanniana.*
12. Redwood, *Sequoia sempervirens.*
13. Lambert's Cypress, *Cupressus Lambertiana* (*? macrocarpa*).
14. Mount Atlas or African Cedar, *Cedrus atlantica.*
15. Pitch Pine, *Pinus rigida.*
16. Lawson's Cypress, *Cupressus Lawsoniana.*

Useful notes are added concerning each of the above species. It is maintained that the Common Larch, the first on the list, "has no equal as a profitable timber Conifer in this country"; also, "that a greater number can be grown to the acre, or, in other words, the number of cubic feet of Larchwood that can be produced from an acre is greater than that of any other Conifer."

In response to a paper of questions, which was circulated in order to obtain information upon certain points, a large number of returns were sent in. Tables drawn up from these returns, embodying the consensus of opinion as to Conifers suited for particular purposes, should prove of much value to planters. Space only permits of naming the leading trees in each section:—

I. Conifers most suitable for Park Trees.—Thirty-eight varieties received five or more votes each. At the top of the list are:—*Abies nobilis* (28 votes), *Pseudotsuga Douglasii* (2[illegible]), *Abies Nordmanniana* (23), *Sequoia gigantea* (23), *Cedrus Libani* (22), and *Abies grandis* (21).

II. Conifers most suitable for Large Gardens and Pleasure-Grounds.—Forty-six varieties received five or more votes each. At the top of the list are:—*Cupressus Lawsoniana* (32 votes), *Thuya gigantea* (22), *Araucaria imbricata* (21), *Cupressus nootkaensis* (19), *Abies nobilis* (17), *Cryptomeria japonica elegans* (17), and *Tsuga Mertensiana* (17).

III. Conifers suitable for Smaller Gardens.—Twenty-four varieties received four or more votes each. At the top of the list are:—*Cupressus Lawsoniana* (22 votes), *Cryptomeria japonica elegans* (16), *Thuya dolabrata* (14), and *Juniperus chinensis* (13).

IV. Conifers suitable for Rock Gardens.—Twenty varieties received three or more votes each. At the top of the list are:—*Picea excelsa Clanbrassiliana* (14 votes), *Juniperus Sabina* (10), *Cupressus Lawsoniana nana* (9), and *Thuya dolabrata* (7).

V. Conifers suitable for Wind-breaks.—Sixteen varieties received four or more votes each. At the top of the list are:—*Pinus Laricio nigricans* (24 votes), *Pinus silvestris* (17), *Pinus Laricio* (16), *Cupressus Lawsoniana* (11), and *Picea excelsa* (10).

VI. Conifers suitable for Exposed Positions near the Sea.—Nine varieties received three or more votes each. At the top of the list are:—*Pinus Laricio nigricans* (16 votes), *Cupressus macrocarpa* (10), *Pinus Laricio* (9), *Pinus silvestris* (9), *and Pinus insignis* (8).

VII. The Best Variegated and Coloured-Foliaged Conifers.—Eighteen varieties received four or more votes each. At the top of the list are:—*Cupressus Lawsoniana lutea* (16 votes), *Cupressus pisifera plumosa aurea* (15), *Taxus baccata aurea* (13), *Cupressus obtusa aurea* (11), and *Taxus baccata elegantissima* (10).

VIII. Conifers most suitable for Timber Trees in Woods and Forests.—Twenty-one varieties received five or more votes each, namely:—

	Votes.		Votes.
1. *Pseudotsuga Douglasii*	35	12. *Cupressus Lawsoniana*	8
2. *Pinus Laricio*	19	12. *Pinus Strobus*	8
3. *Abies grandis*	18	12. *Tsuga Mertensiana*	8
4. *Thuya gigantea*	17	15. *Abies pectinata*	7
5. *Picea sitchensis*	15	16. *Picea excelsa*	6
6. *Abies nobilis*	14	17. *Cedrus atlantica*	5
6. *Abies Nordmanniana*	14	17. *Cupressus macrocarpa*	5
8. *Pinus silvestris*	11	17. *Pinus Cembra*	5
9. *Larix europæa*	10	17. *Pinus insignis*	5
10. *Pinus Laricio nigricans*	9	17. *Pinus monticola*	5
10. *Sequoia sempervirens*	9		

By far the longest of the twenty contributions to the volume is the paper entitled "Pinetum Danicum," by Professor Carl Hansen, of Copenhagen. It bears, however, some signs of hasty work, and it would probably have been improved had it been brought within smaller dimensions. From the notes on the Yew the following are worth quoting :—

The Yew being almost always raised from seed, the male and female plants may be supposed to be nearly equally distributed, both in natural woods and in artificial plantations. According to Miller and Lamarck, both sexes are sometimes found on the same tree. "As far as we have been able to observe," says White of Selborne, "the male tree becomes larger than the female one."[1]

In a wild state the Yew affords food to birds by its berries, and an excellent shelter to them during severe weather and at night by its dense evergreen foliage, but no insects live on it; and the male plant at least is credited with being poisonous.

It is admirably adapted for underwood, because, like the Holly and the Box, it thrives under the shade and drip of other trees. When planted in masses by itself, the trees are drawn up with straight trunks, like Pines and Firs, and in good loamy soil, on a cool bottom, plantations of Yews treated in this manner must be highly valuable.

It is universally allowed to be the finest European wood for cabinet-making purposes.

Mr. D. F. Mackenzie, in discussing the timber of Conifers, mentions the following interesting fact observed in the working of various pine timbers :—

It was found that the wood of pines having three leaves in a sheath was, as a rule, much harder than those having only two, whilst all those having five leaves in a sheath were uniformly soft, and when dressed had a silky appearance. So general is this characteristic that one could almost at once tell to what class a certain plank of pine timber belonged.

Other important subjects dealt with in this comprehensive volume embrace "Conifers as Specimen Trees for Landscape Gardening," "The Decorative Character of Conifers," "The Quality of Coniferous Timber," "Diseases of Conifers," "Insects Injurious to Coniferæ," "List of Conifers and Taxads cultivated in Great Britain and Ireland," "List of Largest Specimens in the United Kingdom," and various statistical details.

---

[1] *Nat. Hist. of Selborne*, ed. 1789.

"To maintain an adequate supply of timber, to protect existing forests, renew old ones, and plant new ones, is," argues Dr. Masters, "an urgent duty upon us as cultivators." He quotes the opinion of Dr. Schlich, to the effect that out of the total area of 26,757,000 acres of waste lands in Britain, it may be assumed that at least six millions would be suitable for tree culture. "Large tracts in Ireland and the Hebrides now unproductive might be planted; and it is all the more desirable that this should be done, as the prospects of a continuous importation of timber from Canada and Northern Europe, whence at present we derive our principal supplies, are by no means assured."

W. Fream.

12 Hanover Square, W.

INDEX NUMBERS OF THE PRICES OF COMMODITIES IN 1893.

The subjoined communication from Mr. Augustus Sauerbeck appeared in the *Times* of January 15, 1894. A definition of "index number" is given on p. 396 of last year's volume of the Journal, in the course of a note[1] by the same writer. It is evident that but for the strike in the coal trade, which led to high prices for coal, the index number for 1893 would have been lower than that for any previous year:—

"I have much pleasure in giving you the result of my index numbers of the prices of forty-five commodities (1867–77=100):—

1873	111	1885	72	1890	72
1879	83	1886	69	1891	72
1880	88	1887	68	1892	68
1883	82	1888	70	1893	68
1884	76	1889	72		

"The index number for 1893 is as low as for the preceding year and 32 per cent. below the standard period, 1867–77. The articles comprised in the group of corn, which in 1892 had declined almost uninterruptedly, followed again a downward course, and their average is nearly 10 per cent. under the previous year, the prices of wheat and rice being the lowest of the century. Animal food did not show much change on the average, while sugar rose till June, falling afterwards, and closing lower than a year ago. Brazil coffee ruled distinctly higher, but tea remained on a low level. Minerals were on the whole rather cheaper; iron did not move much—independently of the corner for Scotch pig in February; but tin, copper, and lead were lower. Coals were very

[1] *Prices of Commodities during the last Seven Years* (1886–92). By Augustus Sauerbeck. Journal, 3rd Series, Vol. IV. Part II., 1893, pp. 394–404.

depressed until the time of the great strike, during which extreme rates were reached, higher than at any time since 1873. Textiles and sundry materials stood in the aggregate slightly above 1892. The average price of cotton for the whole year was a little higher than the abnormally low figure in 1892, but the closing prices were considerably lower than a year ago. Flax, silk, and English wool were dearer. Merino wool was as cheap as in the previous year, and hemp was lower. Jute, on the other hand, went much higher than in the latter part of 1892. Tallow, palm oil, and indigo were dearer, but petroleum declined to $3\frac{5}{8}$*d.*, the lowest price on record.

"The monthly fluctuations were as follow :—

1889. December	73·7	1893. February	69	1893. August	67·1
1890. December	71·1	1893. March	68·1	1893. September	68·2
1891. December	71·4	1893. April	67·4	1893. October	68·6
1892. September	66·8	1893. May	67·4	1893. November	67·8
1892. December	67·7	1893. June	67·4	1893. December	67
1893. January	68·4	1893. July	67·7		

"A tendency to a slight improvement in trade was observable early in the year, and the position of some large articles of consumption, of which the production had been arrested, was rather favourable ; but this improvement was of short duration, and general trade relapsed into a state of stagnation under the pressure of financial disasters and other adverse influences such as have rarely been experienced. These were the Australian banking crisis, the drought and poor harvest prospects here and in several other countries, the closing of the Indian mint, then the great commercial and financial crisis, the repeal of the Silver Purchase Bill and the uncertainty about tariff reform in the United States, the great coal strike, the crisis in Italy and Greece, the revolution in Brazil, and the generally unsettled state of the European bourses. Had prices not been exceedingly low, they would no doubt have severely suffered, but depressed as they were the monthly index numbers do not throw much light on the state of affairs, particularly as during the last five months they were affected by the high price of coal.

"Silver fell from over 38*d.* during the first four months to about 30*d.* in June, when the Indian mint was closed, recovered part of the decline and was worth between 33*d.* and 34*d.* from July to October, and about 32*d.* in November and December. The average price was about $35\frac{1}{2}$*d.* (against 39 13-16*d.* in 1892), or 42 per cent. lower, the closing price $31\frac{3}{4}$*d.*, or 48 per cent. lower than the old parity of 1 gold to $15\frac{1}{2}$ silver."

In a subsequent letter, which appeared in the *Times* of March 10, Mr. Sauerbeck gave the following index numbers of the prices of 45 commodities : 1867–77, 100 ; 1873, 111 ; 1893, 68 ; December 1893, 67 ; January 1894, 65·8 ; February 1894, 65. He added :—

"Since the commencement of the year coals have fallen considerably ; most of the other articles are also somewhat cheaper, and the index number for February is the lowest on record.

"The movements of silver were thus :—
"End December 1893, $31\frac{3}{4}d.$; index number, 52·2.
"End January 1894, $30\frac{13}{16}d.$; index number, 50·6.
"End February 1894, $27\frac{3}{4}d.$; index number, 45·6.
"The last-named figure represents a ratio of 34 silver to 1 gold."

OVERHANGING TREES.

In the short but interesting note on "Yew Poisoning," by Lord Moreton, in the last number of the Journal the following remarks occur :—"In the churchyard of a neighbouring parish a yew tree spreads its branches over the adjacent field. The cattle have grazed on these till they look as if they had been trimmed with shears;" but, adds the writer, "no harm has been done." This passage leads me to think that reports of the two following cases, which relate to the mischief that may be done, and the nuisance that may be caused to a farmer by the overhanging branches of trees growing on his neighbour's land, may not be uninteresting. The first is peculiarly *à propos*, dealing as it does with the overhanging branches of a yew tree. I take the report from the *Salisbury and Winchester Journal* of February 24 :—

On Friday, the 16th inst., the Hon. R. D. Yelverton (deputy-judge) and a jury were occupied in hearing an action brought in the Andover County Court by Mr. Frank Ponting, farmer, against the trustees of the Upper Clatford school premises, to recover 22*l.*, damage sustained by the death of a filly foal, which was alleged to have been caused through the defendants negligently and wrongfully allowing the branches of a yew tree in the school grounds to extend into plaintiff's meadow, in such a way as to be accessible to animals, by eating of which branches the foal died on June 25, 1893. From the evidence of the plaintiff it appeared that his meadow and the school grounds were adjacent, and separating them was a post and rail fence, on the school side of which grew two yew trees, the branches of which extended over the rail into his meadow and within reach of his horses. On the evening of June 24 he saw the foal in question in the meadow alive and well. Next morning he went away from home early, and on his return at 10 o'clock found that the foal was dead. He telegraphed for a veterinary surgeon, who made a *post-mortem* examination, and found in the stomach a quantity of yew leaves and twigs. Within five or six yards from the place where the foal was lying was one of the defendants' yew trees, the branches of which appeared to have been recently nibbled by an animal. In cross-examination plaintiff said that in an adjoining garden, occupied by a Mr. Hunt, was another yew tree, the branches of which overhung his meadow, and he wrote to the owner to that effect and asked him to have the tree cut. In another field adjacent there had also been a yew tree, now cut down, but this plaintiff stated did not overhang the meadow where the foal was. The gate giving access to this field was kept fastened. On his side of the school fence was a small ditch, but he held that a horse could have nibbled the trees without stepping into that ditch.

He denied knowledge of there being a yew bush in a corner of his own meadow. The veterinary surgeon proved making a *post-mortem* examination of the body of the animal, which revealed the cause of death to be yew poisoning. He noticed that the yew near which the horse was lying had been recently nibbled, and the position in which the animal lay led him to believe that it had dropped down dead when turning away from defendants' yew. The witness was cross-examined at considerable length with a view to showing that animals had been known to walk a mile after eating yew before dying; which he explained was due to the fact that they ate on a full stomach, whereas a horse that ate on an empty one would drop immediately. As there appeared to be considerable difference of opinion respecting the situation of the yews, his Honour ordered a view of the spot, and the jury proceeded to the spot in conveyances. On their return the defendants' counsel contended that there was no case to go to the jury, and claimed a nonsuit on the ground that, there being other trees accessible, there was no evidence to show that his clients' trees caused the death. He also argued that the hedge and ditch were, by presumption of law, defendants' property, and that, even granting for the purposes of argument, though he denied the fact, that the animal ate of defendants' yew and died, it could not have done so without coming on to the land in the ditch, and therefore was trespassing; so that defendants were not liable. He dwelt on this point at considerable length, and further argued that his Honour was not warranted in leaving it to the jury to determine which tree the animal ate from. Evidence was called for the defence, which went to show that not only were the defendants' trees nibbled, but also the one in Hunt's garden, one in an adjoining field, the gate of which a witness said was open at night, and a small bush behind some hurdles in plaintiff's own field. His Honour, in summing up, went against the defendants on the point raised as to trespass, saying that though it might apply under certain circumstances, it did not apply to a horse, which was not a sentient being. He also laid it down that if the jury thought the horse had eaten of defendants' trees, although it had eaten of the others, they must find for the plaintiff; but if they thought the identity of the tree from which it had eaten was not proved by the evidence they must find for the defendants. He also thought they would be justified in finding for the defendants if they were of opinion that the animal ate from the bush in plaintiff's field, it being proved on the view that there was one, though plaintiff did not previously know of it. The jury, after consultation, in answer to the Judge's question, said they were satisfied that the animal ate from defendants' trees; that they were not satisfied that it ate from other trees, nor that it ate from plaintiff's bush. They therefore found a verdict for the plaintiff for 22*l.*, for which amount judgment was given, with costs.

The second case [1] points out the rights which a person whose land is overhung by his neighbour's trees has to abate the nuisance caused thereby. According to the report of the case from which this note is taken it appeared that some of the branches of certain ancient oak trees growing on the plaintiff's land overhung the defendant's land, and as the defendant alleged, obstructed the entrance to his farm-yard. The defendant without giving any notice to the plaintiff cut off the overhanging branches, the points at which some of the branches were cut being a few inches within the boundary of the plaintiff's

[1] Lemmon *v.* Webb. *Weekly Notes of Cases*, 1894, p. 26.

land. The plaintiff brought the action for damages, and an injunction to restrain the defendant from cutting any of the branches. There was no evidence that the overhanging branches were likely to be dangerous to life or health. The action was tried by Mr. Justice Kekewich, who held that trees overhanging the land of another constituted a nuisance of omission, it being negligence on the part of the owner of the trees to allow them to overhang, and that the person who suffered from the nuisance was entitled to abate it, *but only on giving reasonable notice to the owner of the trees*, unless there was danger to life or health. The object of the notice was to give the owner of the trees a fair opportunity of abating the nuisance while preserving his own property. The defendant had acted wrongly in cutting the branches without giving notice to the plaintiff, but the justice of the case would be met by ordering the defendant to pay 5*l.* damages and the costs of the action. And his Lordship gave judgment accordingly.

S. B. L. Druce.

9 Old Square, Lincoln's Inn, W.C.

THE WINTER OF 1893-4.

The ruling element in the weather of last winter was the passage along our extreme northern coasts of large cyclonic disturbances, on their way from the Atlantic to Scandinavia and Northern Russia. As a result of these movements the United Kingdom was exposed to an unusually strong current of air from the south-west and west, with frequent gales, especially in the more western and northern districts, and with mild, changeable weather over the entire country. The only serious exception to the prevalent conditions occurred during the early part of January, when a strong easterly wind spread over our islands from Central Europe, and brought with it a brief spell of intense frost, accompanied in many places by gales and snowstorms. The weather appears to have been most severe between the fifth and seventh of the month, the lowest temperatures recorded over England at this time being shown in the second column of the table on p. 176. It will be seen that, with the exception of our north-western and southern counties (including the Channel Islands), the thermometer fell below10° in all parts of the country, and that in the Midlands it descended to zero, a lower point than any attained during the severe and prolonged frost of 1890–91. At several stations situated in the western and south-western parts of the kingdom the weather is reported to have been the coldest experienced for very many years past, and in some cases the truth of the statement is amply supported by scientific records extending over more than a quarter of a century. It may be noted in passing, that although the table fails to give any temperature below zero, there is evidence to show

Temperature, Rainfall, *and* **Bright Sunshine** *experienced over* **England** *and* **Wales** *during the thirteen weeks ended March* 3, 1894.

(*The Winter Season.*)

Districts	Temperature							
	Highest observed	Lowest observed	Day temperatures		Night temperatures		Day and night temperatures combined	
			Mean	Difference from average	Mean	Difference from average	Mean	Difference from average
	°	°	°	°	°	°	°	°
North-eastern counties . .	57	6	44·4	+1·8	34·1	+0·1	39·3	+1·0
Eastern counties . . .	58	9	44·9	+2·0	32·6	−0·3	38·8	+0·9
Midland „ . . .	59	0	45·6	+2·3	33·3	+0·3	39·5	+1·3
Southern „ . . .	57	12	46·0	+1·4	35·1	−0·1	40·6	+0·7
North-western counties, with North Wales . .	58	12	46·0	+1·8	36·5	+1·1	41·3	+1·5
South-western counties, with South Wales . .	59	8	47·3	+0·8	37·1	−·0	42·2	−0·1
Channel Islands . . .	58	16	49·0	+1·1	41·0	0·0	45·0	+0·5

Districts	Rainfall				Bright Sunshine			
	Rainy days		Total fall		Duration		Percentage of possible amount	
	Number	Difference from average	Amount	Difference from average	Hours recorded	Difference from average	Percentage	Difference from average percentage
			ins.	ins.				
North-eastern counties .	55	+8	6·2	−0·1	160	+28	21	+3
Eastern counties . .	53	+5	4·8	−1·3	227	+63	29	+9
Midland „ . . .	61	+15	7·4	+0·3	183	+40	23	+5
Southern „ . . .	55	+8	7·8	+0·3	230	+59	29	+11
North-western counties, with North Wales .	66	+15	11·4	+2·5	127	+15	17	0
South-western counties, with South Wales .	64	+10	12·7	+0·7	220	+31	28	+7
Channel Islands . . .	65	+5	10·1	0·0	269	+51	33	+6

Note.—The above table is compiled from information given in the Weekly Weather Report of the Meteorological Office. The averages employed are :– for Temperature, the records made during the twenty years, 1871–90; for Rainy Days, the values for the thirteen years, 1878–90; for total Rainfall, those for the twenty-five years, 1866–90; and for Bright Sunshine, those for the ten years, 1881–90.

that in some localities from which reports are received, either unofficially or at irregular intervals, this crucial degree of cold was exceeded. At Worksop, in Nottinghamshire, for example, a carefully verified thermometer in a standard screen registered a minimum of four degrees below zero, or thirty-six degrees of frost. The only other frosts of any importance during the past winter were observed respectively at the beginning of December, at the end of January, and in the fourth week of February, the thermometer on the first and last of these occasions falling to 20° or less in many parts of England.

With respect to the *temperature* of the season as a whole, we see from the table that while the day readings were above the average over the whole of England, the night values were far less high, an actual deficiency of nocturnal warmth being reported in the eastern, southern, and south-western counties. The mean temperature, as derived from both day and night readings, was in excess of the average in all but the south-western districts, the difference from the normal being greatest over the north-western counties, where the south-westerly winds blew more strongly and continuously than in other parts of England. In the eastern and southern districts, where the effects of the large storm systems in the north were sometimes neutralised by anti-cyclones, which spread northwards from the southern parts of Europe, the mean temperature was not much in excess of the average, while in our south-western counties there was a slight deficit.

The *rainfall* statistics given in the table show very clearly that the number of days was in excess of the normal in all districts, and especially so in the midland and north-western counties. With the exception, however, of the last-mentioned district, the aggregate amount of precipitation was not large, and in the eastern counties it was considerably short of the average. So far, therefore, as England was concerned, frequency rather than abundance was the main feature in the rainfall of the season. Farther north, and especially in the West of Scotland, the quantity was unusually heavy, and was mingled in several instances with hail, snow, or sleet.

The *sunshine* records for the winter were unusually good. In the intervals which occurred between the departure of one of the northern cyclones and the arrival of the next the weather frequently remained fine for several hours together, the result being that the aggregate amount of bright sunshine was in excess of the average in all parts of England. The largest excess was observed over the eastern and southern counties. In the former district the average daily amount in the winter time, as deduced from records extending over ten years, is about an hour and three-quarters. Last winter there was a mean daily proportion of rather over two hours and a half, or three-quarters of an hour more than usual. In the southern counties the average daily allowance is a little under two hours; last season the proportion was rather over two hours and a half, practically the same as in the eastern counties, and half an hour per day in excess of the average. An examination of the Greenwich records shows that while the prevalence of sunshine was nearly as large in the winters both of 1886–87 and 1889–90, the amount registered last season was actually greater than any observed at a similar time of the year since the recording instrument was first started, in 1876.

OBITUARY.

THE RIGHT HON. SIR HARRY VERNEY, BART.

Born December 8, 1801 : Died February 12, 1894.

The Royal Agricultural Society has been fortunate in many things ; and not the least gratifying part of its now long and honourable history is the continuous hold which it has retained on the affections and interest of its original founders. Fifty-six years ago a public meeting was held at Freemasons' Tavern, under the chairmanship of the third Earl Spencer (better known as Lord Althorp), which may fairly be described as historic—at least in agricultural annals. That meeting was attended by a number of men whose names were already, or have since become, household words ; and the Society may well be proud of ranking amongst its founders men like Earl Spencer, the fifth Duke of Richmond, Lord Portman, Sir Robert Peel, Sir James Graham, Mr. Shaw Lefevre (Vicount Eversley), Mr. Handley, M.P., Mr. Philip Pusey, and last, but by no means least, Sir Harry Verney.

Lord Portman, Lord Eversley, and Sir Harry Verney—each a member of the Provisional Committee appointed at the meeting of May 9, 1838—were all three associated with the Society for more than half a century. Lord Portman, active-minded to the last, and keenly interested in even the smallest details of the Society's work, achieved the at present unique distinction of being continuously on the Council for over fifty years. Appointed Vice-President on June 27, 1838, and Trustee on July 8, 1846, he served as President three times—in 1845–6 at Newcastle, in 1855–6 at Chelmsford, and in 1862 at Battersea. Only a few days before his death on November 19, 1888, I received a note from him (one of a series of three) on the subject of the early history of the Society, in which he mentioned that he was the very first member of the English Agricultural Society to pay his subscription to the bankers, and that he was, therefore, the oldest member of the Society. It appears from the records that at the first meeting of the Provisional Committee, held on May 10, 1838 (the day after the inaugural meeting), it was decided that "Any person setting down his name, and paying his subscription before June 27 next, may become a subscriber to this Society, and that subsequently all members be elected by the Committee."

Lord Portman, Lord Eversley, and Sir Harry Verney were all present at this Committee meeting, and it is doubtless on this account that they were able to claim precedence of the other founders and well-wishers of the Society whose names appear in the original list of Members published in the *Farmers' Magazine* of June, 1838. Some of these have only lately been lost to us (such as the Duke of Devonshire, Lord Winmarleigh, and the Earl of Lovelace), and two others still happily survive—Earl Grey, K.G.,[1] and Lord C. J. F. Russell.

The deaths of Lord Portman and Lord Eversley in 1888 left Sir Harry Verney the only survivor of those who attended the inaugural meeting, and then gave in their adhesion to the Society. Sir Harry was particularly gratified at the reference made to him by H.R.H. the Prince of Wales, at the Council Meeting held on February 6, 1889, as the "Father" of the Society, which was reported in the newspapers of the time; and on the fifteenth of that month he wrote me the following interesting letter:—

Claydon House, Winslow, Bucks: February 15, 1889.

Dear Sir,—I have read that at the Monthly Council of the Royal Agricultural Society, the President, H.R.H. the Prince of Wales, did me the honour of mentioning my name as the oldest member of the Society.

I am not only the oldest Member; I took the utmost interest in the formation of the Society, and I urged its great value and importance on all agricultural friends and acquaintances. I could not afford the 50*l.* that those gave as donation, but I have, from that day to this, done all in my power to forward the objects of the Society.

All we landowners have suffered from the lowness of agricultural produce; but I am happy to know that the condition of the labourer—I speak of my own neighbourhood—is greatly improved. One very cold November evening I was riding home from Aylesbury, through the village of Waddesdon, and there at the entrance to the village were 20 men standing idle, leaning on their picks, each man by a heap of broken stones. I rode up and said, "My good fellows, why don't you work, if only to keep yourselves warm?" "We're not allowed, sir; we are only allowed to break this heap of stones." "And what are you paid for each heap?" "Sixpence." And there were 20 more at the Bicester end of Waddesdon. This was before 1834, the new Poor Law.

All the work of the Royal Agricultural Society has been so directed as to render impossible such a state of things, wherever prominent Members of the Society have been at work.

Am I presumptuous in saying that there is still something to be done? England may be made more healthy, more productive. Pardon an egotistical instance. When I came to live here ague was very common: we have had no case for many years. . . .

I read in *The Times* the account of the meeting of the London Housing

[1] Earl Grey, who now becomes the "Father" of the Society, is Sir Harry Verney's junior by one year, having been born in December, 1802. Lord Grey is now the only survivor of the Parliaments before the Great Reform Bill, he having been returned, as Viscount Howick, for Winchelsea in 1826. At the date of Sir Harry Verney's death he shared with Mr. Gladstone and Lord Charles Russell—the latter also one of the founders of the Society—the distinction of having been first sent to Parliament in 1832.

of the Poor. Surely the legitimate cure is cultivation of the land. I seldom visit a parish where I do not hear of some farmers whose land is imperfectly cultivated. For good cultivation labourers are wanted. They would not leave their villages if they could get work at home.

I am, dear sir, your faithful and obedient,
(Signed) HARRY VERNEY.

The Secretary, Royal Agricultural Society.

I wrote in reply stating that as the early records of the Society were less complete than could be wished, the Council would be much obliged if he would favour them with any reminiscences as to his associations with the Society. With great promptitude Sir Harry sent from his sick-bed the subjoined reply, with a covering note saying: "I have been very ill, but my doctor tells me I am to be well enough to attend the Windsor Meeting. It will afford me great pleasure to do so."

Claydon House, Winslow, Bucks: February 21, 1889.

DEAR SIR,—You ask me, as "Father of the Royal Agricultural Society," for any recollections that I may have with regard to its establishment.

There was, at that time, a very universal feeling in the country that one of its most important interests had not received that national attention which it deserved. There were small local agricultural associations, but none in which the whole community took interest.

It was fortunate for the cause of agriculture that a man known as one of the best practical farmers was then leader of his party in the House of Commons. Lord Althorp was as much respected by his opponents as by his own party; not at all eloquent, but possessing that truthful and practical common-sense which gave him more influence than many an orator and than men of more talent. He was closely united as an agriculturist with the Duke of Richmond; they were on opposite sides in politics. These two were the founders of the Royal Agricultural Society. There were many quite ready to second them, able, good men—Handley, R. Clive, Estcourt, Childers, Philip Pusey; but it required two such men as Lord Althorp and the Duke of Richmond to bring together such a gathering as met at the Freemasons' Tavern on May 9, 1838.

Happily, party spirit, that bane of so much that would be good and admirable in England, was quite unknown among these pioneers of agriculture. When the members were to choose a chairman, no one asked whether such a man were Tory or Whig; but his knowledge with regard to agriculture, or his capacity of judging the points of a fat beast, or of the merits of South Down or Leicestershire sheep, or of a Clydesdale mare or Norfolk punch, were much thought of.

In those days Protection occupied the thoughts of agriculturists, as well as of the most thoughtful men; how much of it would enable us to grow corn enough for our own consumption and to withstand the competition of the foreigner. No one at that time thought Free Trade possible. I am afraid that many bore a secret grudge against the most distinguished political economists of the day, as if they were trying to compass the injury of the whole agricultural interest.

I was glad to hear a great number of my friends putting their names down for 50*l.* each, and I saw from the large sums subscribed at that first meeting how important a society this had become. . . .

I have mentioned the name of Philip Pusey. There is no one to whom the Royal Agricultural Society has more reason to look back with regard and gratitude than to him; he was a very clever and learned man, and he

I am Yours faithfully
Harry Verney

THE RIGHT HON. SIR HARRY VERNEY, BART.

"Father" of the Royal Agricultural Society of England,

undertook the editorship of the Journal of the Society, which all agreed he conducted admirably.

The voters of Berkshire turned him out at the next election, in consequence of his Free Trade tendencies, which I am afraid he felt very much. It was indeed a lamentable return for all his services to the Society.

The proposal that the Society should hold its meetings in different parts of the country was made soon after its establishment, and contributed much to its usefulness and popularity.

I am, dear sir, yours faithfully,
(Signed) HARRY VERNEY.

The Secretary, Royal Agricultural Society.

At a subsequent stage of the Society's year of jubilee Sir Harry Verney attended the Fiftieth Anniversary Meeting, held at 12 Hanover Square, on May 22, 1889, in order to move the adoption of the Report of the Council; and as the speech he made on that occasion has not yet been recorded in the pages of the Journal, I may be allowed to reproduce it here :—

Sir HARRY VERNEY, who rose amid cheers, said he supposed he was the only one who could look round on all the portraits in that room and recognise every one of them. The reason why he had been so very much attached to the Society from the beginning—and he had a good deal to do with the commencement of it—was that he felt it would be more useful to the country in general than any society that could be established, because it would unite the agricultural classes with those who, by position, wealth, and intelligence were able to make scientific experiments for the improvement of the cultivation of the soil. Land became more healthy by being well cultivated, there was a larger amount of produce, the labourers obtained an increase in their wages, and altogether great benefits were conferred upon the country. Above all, the greatest boon was the prevention of the agricultural labourers and their families dropping away to London and other large cities. He had known several of them who had come to London, and spent their little all in coming there, and then desired to return, but found it impossible to do so. Here they paid 2*s.* 6*d.* or 2*s.* for a single room in a miserable court or alley in London, having paid the same sum in the country for a cottage with a garden. Those who prevented the agricultural classes coming to London conferred an enormous benefit on the community. Their Society entirely owed its existence to Lord Althorp and the late Duke of Richmond. He well recollected all their efforts at the beginning of its career. His Royal Highness the Prince of Wales had lately done him (Sir Harry Verney) the honour of calling him the "Father" of the Society. It had certainly been a most prosperous family, and one which he believed had conferred great benefits upon the country. As the oldest member of the Society, he took the liberty of moving the adoption of the report, and of expressing his great satisfaction and happiness at witnessing its prosperity. The number of societies which he had seen established in England, and particularly in London, for the benefit of the working classes was something quite enormous. For a very old man like himself, who had only a short time to live, it was a source of happiness and of great gratitude to God to see this increase (Cheers).

All through our correspondence and conferences of 1889 Sir Harry was expressing the hope that his health might permit him to attend the Society's Meeting in Windsor Great Park. That hope he was happily able to realise. I have a vivid remembrance of standing outside the entrances on one of those terribly hot and exhausting days of midsummer weather, endeavouring to arrange for the mitigation of the plague of yellow dust that covered everything as with ochre, and of espying Sir Harry Verney sitting beside the driver in a fly full of passengers, that was bringing visitors to the show from the railway-station. I seized upon him at once, and endeavoured to save him further fatigue by taking him to the Grand Stand in the secretarial vehicle ; but I think he resented a little the implied suggestion that he was not equal to traversing the showyard on foot.

When the preparations for the first number of the new Quarterly Journal were on foot early in 1890, I had several interviews with Sir Harry as to a biographical sketch by him of Earl Spencer, the first president of the Society. The interesting note which appears in Part I. of Vol. I. of the New Series was the subject of numerous conferences between Lady Verney, Sir Harry, and myself, and in apologising for a day's delay in forwarding the manuscript Sir Harry (then, it must be remembered, in his 89th year) said : "I have to attend important meetings on all sorts of subjects, and have been for some hours this morning in the City, but shall immediately go to work on Lord Althorp." Next day, March 14, he wrote, in sending the manuscript :—

> It is utterly unworthy of the dear and honoured man who is the subject of it. Old age is a poor claim, but of course the only one that I have, to be permitted to write this. Anyone who is allowed to co-operate in any manner in the great and beneficent work of the Society ought to do it as well as he can. I wish that this was much better.

Notwithstanding Sir Harry's modest reference to it, the general opinion of the sketch of Earl Spencer was that it was one of the most attractive features of the number ; and it was certainly read with the greatest possible interest, both on account of the subject of it and of the biographer.

In his Buckinghamshire home Sir Harry set a splendid example as a country gentleman living on his estate, interested in county business, and solicitous for the welfare of his tenants and of all with whom he came in contact. He began life as a soldier—the son of a soldier (General Sir Harry Calvert, Bart., G.C.B.), to whose title he succeeded in 1826. In 1827 he took the name of Verney, on inheriting the Buckinghamshire and other estates of Mary Verney, Baroness Fermanagh, the last of the original Verneys. Shortly afterwards he retired, with the rank of major, from the Grenadier Guards ; though, as the Duke of Richmond and Gordon has mentioned (page xxxiv.), he retained his interest in his old regiment to the last by attending its annual dinners.

From the first Sir Harry interested himself in all the social questions of the day ; and he found an outlet for his activity by becoming a member of the first reformed Parliament of 1832.[1] Amongst the

[1] The Verneys were always a very parliamentary family. Sir Ralph Verney was Member for London in 1472, and from that time almost up to the present there was seldom wanting a representative of the name for the county of Bucks or for one of its five boroughs. Sir Harry Verney carried on

first acts of his Parliamentary life was to give a cordial support to the movement inaugurated by Wilberforce for the abolition of slavery. He also supported the measures passed for the improvement of the Poor-Law system, Municipal Reform, the introduction of the Penny Post, the extension of the Railway system, and, at a later period, the abolition of the Corn Laws. Brought, as he was, into contact with the leading men of the day, it is not surprising that his co-operation was sought in the establishment of the new Agricultural Society on a non-political basis. Though his name does not appear prominently in the Society's records, he took an abiding interest in its welfare; and a letter published in 1846 shows him to have been a pioneer in the then almost untrodden paths of experimental research. Writing on December 19, 1845, to "My dear Pusey," he recorded the results of the second year of an experiment with Spanish phosphorite and other manures, in a letter which the then Editor of the Journal thought important enough to publish (see Vol. VI., First Series, page 331).

Spanish phosphorite is a "raw" phosphatic material, used then, and still, for making superphosphate of lime.[1] Its use in the raw and ground state (as tried by Sir Harry Verney) has now no direct importance, and the interest of the experiment is confined to the demonstration of the superiority of dissolved to undissolved minerals. No one now would think of using practically Spanish phosphate in the raw or ground state; but these points were not known in 1845, when Sir Harry experimented.

Sir Harry's activity of both mind and body was extraordinary. In November, 1892, Dr. Voelcker and myself paid him a visit at Claydon, in connection with some schemes he had in view with regard to the sanitary condition of the cottages on his estate,[2] and we were charmed, as everyone was, by his old-world courtesy and geniality of manner. I remember being astonished at seeing from my bedroom window, when dressing in the morning, an active, if somewhat bent, figure walking along briskly in the distance, under an avenue of trees Sir Harry himself had planted. After breakfast, Sir Harry devoted the whole morning to walking round the estate with an old

---

this Parliamentary tradition. He was elected Member for Buckingham in the first reformed Parliament of 1832, and took his seat in the same Legislative Chamber as that in which his predecessor, Sir Ralph, had scribbled notes (still preserved at Claydon) of the proceedings when Charles I. attempted to arrest Pym, Hampden, Holles, Hazelrigg, and Strode in 1642. In 1835, 1837, 1857, 1859, 1865, and 1880, Sir Harry again sat for the town. In the Parliament of 1847, however, the Bucks farmers in the enlarged borough refused to support him, believing that the repeal of the Corn Laws, for which he declared he should vote, would ruin them; he therefore contested and sat for Bedford, which had been lost to the Whigs by Lord John Russell in 1837. In 1885 the borough of Buckingham was disfranchised after a life of 340 years, its last member being a Verney, as was nearly the first. In 1885, on Sir Harry's retirement from the House, he was made a Privy Councillor by his lifelong friend, Mr. Gladstone.

[1] For the composition of Spanish phosphorite, see Journal, Vol. XI. (Second Series), 1875, pages 409–12.

[2] For a description of the sanitary improvements in cottages effected by Sir Harry Verney, see Journal, Vol. III. (1892), p. 638 (note).

Indian friend. At luncheon he expressed his doubts as to whether a certain road on the estate (six miles off) was being re-metalled in a satisfactory manner, and intimated his intention of riding over in the afternoon to see how it was progressing. He sat his horse well,[1] and the woodcut on page 181, after an excellent photograph by Mr. Payne, of Aylesbury, gives a good idea of his appearance on horseback. At tea-time Sir Harry was back, full of information about the road; and after dinner he discoursed without flagging on subjects of special interest to him—archæology, social reform, Parliament, small holdings, and many more.

During Sir Harry's life the greater part of the Claydon estate has been drained, and in almost every case at his own expense. New farm-buildings and improvements occupied a large share of his attention, and he was particularly happy in his choice of site and situation, with a view to secure the health and comfort of the tenants and their farm-stock. The new cottages that have been built in his time—and particularly those of recent years—are a vast improvement on those which he inherited; but even the old cottages have undergone enlargement and improvement to meet modern requirements. He planted a quantity of fine timber in all parts of the estate, and the specimens of oak and elm are hardly to be surpassed anywhere.

Both he and Lady Verney were greatly interested in the subject of small holdings—which, indeed, was engaging his attention at the time of his lamented death. The subjoined letter is interesting, not only as being one of the very last which Sir Harry wrote before his fatal illness, but from several other points of view. It evidences an active mind ever busy for the welfare of his tenantry and agriculturists generally, a punctilious regard for the engagements and convenience of others, and a confident looking forward to a continuance of useful work—as witness the mention of his engagements on February 7 and 12, and his prospective visit to London at the end of March: none of them, alas! destined to be fulfilled.

Claydon House, Winslow, Bucks: Jan. 26, 1894.

My dear Mr. Ernest Clarke,—I am very anxious to persuade you to spend a day or two with me here. I am desirous that by some means the condition of tenant-farmers in this part of the country should be raised. I think that what may be understood by "the farm labourers treading on the heels of the farmers" should be avoided. I think that there is danger of it in this neighbourhood, and that no one is so able as yourself to give an opinion on the subject.

I shall also ask your opinion as to dividing a considerable portion of an estate into small holdings. I have heard that Lord Tollemache has divided a large portion of his estate near Chester in that manner. My land is almost entirely grass, some of it very good grass-land. I should think that better is hardly to be found anywhere.

If you are so good as to accept my invitation, might I suggest next week, or the week following, or the week after that, for your visit, or at a later time?

---

[1] Up to the last few days of his life Sir Harry took regular exercise on horseback, and he was in the saddle only four days before his death.

My only engagements are February 7th at our County Infirmary, February 12th, Bedford Infirmary.

I ought to add that while I invite you, I do not forget how very full of work your days must be. Perhaps you might be able to come for a Sunday. I am happy to be able to say that we have an excellent clergyman, so we are always sure of a good sermon.

I am, yours faithfully,
(Signed) HARRY VERNEY.[1]

Ernest Clarke, Esq.

I intend to remain here until the end of March, then go to London for a few weeks.—H. V.

My intended visit on Friday, February 16, was carefully recorded in Sir Harry's notebook, and was the subject of frequent mention by him to members of his family circle. Instead of this pleasurable visit on the 16th, I had the melancholy satisfaction of paying the last tribute of respect to Sir Harry's memory by attending his funeral on February 15 as the representative of the Society. It was a simple but very impressive ceremony, and fitly ended a long, honourable, and modest career devoted to works of charity and good-will towards his fellow-men.

Sir Harry Verney exemplified nobly "the grand old name of gentleman," and the remembrance of his winning personality will long remain one of the most precious possessions of those who had the privilege of his personal acquaintance.

ERNEST CLARKE.

12 Hanover Square, W.

THE WEATHER OF 1893.[2]

First Quarter.—The weather in *January* was very cold during the first week, and till the 18th, with frequent snow and rain, but was warm, with fogs, from the 19th. The temperature of the air was constantly below its average till the 18th ; the atmospheric pressure was occasionally a little below the average, but was generally above. The fall of rain at a few places was a little above the average, but at most places a little below.

The weather in *February* was warm and unsettled, with rain falling on two days out of three. The temperature of the air was above its average from the 1st to the 3rd and from the 7th to the 21st, and below it on the other days. The atmospheric pressure was generally above its average till the 7th, and below from the 8th, and particularly so from the 20th to the 27th. The fall of rain was above the average.

The weather in *March* was exceptionally fine, warm, and dry.

[1] The facsimile of Sir Harry's signature appearing under the portrait on page 181 is reproduced from this letter.

[2] Abstracted from the particulars supplied to the Registrar-General by James Glaisher, Esq., F.R.S.

The temperature of the air, with the exception of the short period from the 17th to the 21st, was above the average, and we have to go back to 1859 for as warm a March, and there are but four other instances back to 1771. The mean atmospheric pressure was higher than in any March back to 1874. The fall of rain was remarkably small; and we must go back to the year 1854 to find a March with so small a rainfall.

Second Quarter.—The weather in *April* was noteworthy for its small rainfall, unusual amount of sunshine, and fineness generally. The temperature of the air was above its average on nearly every day; after the middle of the month the temperature was that of summer. The atmospheric pressure was also above its average, and the mean was higher than in any April back to 1861. The fall of rain was only 0·09 inch at Blackheath, and we must go back to 1855 for as small a fall. The fall of rain in March and April together was 0·49 inch, and we have to go back to 1840 for so small a fall. The consequent drought became very serious, particularly in the southern and midland counties.

The weather in *May* was remarkably fine and dry, being, in fact, a continuation of the exceptional weather of the two preceding months. The temperature of the air was above its average on nearly every day till the 29th. The atmospheric pressure was above its average till the 14th, and from the 25th. The fall of rain was 0·52 inch, and in the three months—March, April, and May—it was 1 inch, giving a daily average of only about 1-100th inch, which is, so far as I know, unprecedented. The drought was general, but it was most severe at the southern stations.

The weather in *June* was very fine and dry. The temperature of the air was generally above its average, but was occasionally, for two or three days together, below. It was very warm about the middle of the month. The atmospheric pressure was above its average from the 4th to the 12th, on the 16th, 17th, 18th, and 30th days, and below on all other days. The fall of rain at Blackheath was small; a little fell on the 7th and 20th, and daily from the 23rd to the 28th. The drought, which began on March 5th, continued to June 22nd; the fall of rain

				in.		days
From	March 5	to 31	was	0·140	. . .	27
„	April 1	„ 30	„	0·086	. . .	30
„	May 1	„ 31	„	0·515	. . .	31
„	June 1	„ 22	„	0·170	. . .	22
				0·911		110

The fall of rain in the months of March to June was less than in any four consecutive months back to 1815. Hay crops were deficient everywhere, but were better in the north than in the south, where they were very light. In some places the crop quite failed.

Third Quarter.—The weather in the early part of *July* was very warm, and the month was generally fine and warm. The temperature of the air was above its average till the 11th, and from the 20th to the 25th, and below from the 12th to the 19th, and from the 26th. Between the 1st and the 8th the temperature rose on six days out of the eight above 80° at several stations. The atmospheric pressure, with the exception of the first three days, and of three days towards the end of the month, was below the average. The fall of rain was generally small, but at a few stations it slightly exceeded the average; the want of water was severely felt. Harvest work began fully a month earlier than usual.

The weather in *August* was very warm, fine, and dry, with a remarkably hot period extending from the 8th to the 18th. The temperature of the air was a little below the average till the 7th, and from the 23rd to the 29th, and above on all other days. Between the 8th and the 19th the temperature exceeded 80° on every day at the Royal Observatory, and it exceeded 90° on three days at the Royal Observatory, Camden Square, and Barnet. The atmospheric pressure was above its average from the 6th to the 17th, and from the 24th; it was below till the 5th, and from the 18th to the 23rd. The fall of rain was below the average, and grass fields were much dried up.

The weather in *September* was generally very fine and dry, particularly during the first half. The temperaturo of the air was above the average till the 8th, below from the 9th to the 13th; again above from the 14th to the 20th; below, with slight frost at night, from the 21st to the 26th, and slightly above to the end of the month. The atmospheric pressure was generally higher than the average till the 5th and from the 11th to the 15th, and mostly lower on the other days. The fall of rain was very variable, being much below the average at most stations, and fully up to it at a few. The want of water was seriously felt at many places, ponds and wells being dry.

Fourth Quarter.—The weather in *October* was generally fine, with frequent rain towards the middle of the month. The temperature of the air was generally above its average till the 29th. The atmospheric pressure was below its average from the 1st to the 9th, and generally above from the 10th to the 31st. The fall of rain was above its average at most stations. S. and W. winds were prevalent. It was a very fine autumnal month.

The weather in *November* was cloudy and cold, with frequent changes both of temperature and atmospheric pressure. The temperature of the air was generally below its average till the 27th, and above from the 28th to the 30th. The atmospheric pressure was below its average from the 1st to the 5th, and from the 14th to the 19th, and generally above on all other days. On the 18th and 19th a severe gale of wind from the N. and N.W., accompanied by a fall of snow, was experienced in most parts of England, doing much damage, and causing many shipwrecks and great loss of life. The fall of rain was a little below the average around London and at the midland stations, but generally above at the northern stations.

The weather in *December* was dull and mild, with the exception of the 1st to the 5th and of the 29th to the 31st, which were cold. The atmospheric pressure was below the average from the 7th to the 14th, and from the 19th to the 22nd, and was generally above on all other days. On the 11th, 12th, and 13th a severe gale of wind and heavy fall of rain were experienced all over England, accompanied at several places in the south by thunder and lightning, doing much damage and causing loss of life on both land and sea. The fall of rain was a little above its average at all stations.

HAY HARVEST FORECASTS, 1893.[1]

THE results of the checking of the Hay Harvest Forecasts issued in 1893 by the Meteorological Office show that the general percentage of success for the entire country was 91, or 2 per cent. higher than any previously recorded. The largest percentage was 97 in England, E.; the smallest was 84 in England, N.W.

The telegrams were sent between 3.30 P.M. and 4 P.M. on each week-day for a period of about five weeks, the issue commencing in the south of England on June 12, and extending to other parts of the kingdom in the course of the ensuing three weeks.

In addition to the recipients named in the list, the telegrams were sent to seven gentlemen at their own cost. In the two cases of subscribers of former years declining to avail themselves of the forecasts, the reason assigned was the shortness of grass, due to the continued drought, and not any doubt as to the value of the forecasts.

SUMMARY OF RESULTS.

Districts	Names of Stations	Percentages				Total percentage of success
		Complete success	Partial success	Partial failure	Total failure	
Scotland, N.	Munlochy and Golspie	61	32	7	—	93
Scotland, E.	Aberfeldy, Huntly, and Glamis	58	37	4	1	95
England, N.E.	Ulceby and Chatton	68	22	10	—	90
England, E.	Rothamsted and Thorpe	90	7	3	—	97
Midland Counties	Cirencester, Retford, Warwick, and Broseley	66	26	6	2	92
England, S.	Maidstone, Caversham, and Downton	72	23	5	—	95
Scotland, W.	Ardwell, Islay, and Dumbarton	59	31	8	2	90
England, N.W.	Leyburn	57	27	13	3	84
England, S.W.	Clifton, Tortworth, and Glastonbury	62	30	8	—	92
Ireland, N.	Moynalty and Edgeworthstown	49	38	8	5	87
Ireland, S.	Kilkenny and Ardfert	62	25	11	2	87
	Mean for all districts in 1893	64	27	8	1	91
	„ „ „ in 1892	56	32	10	2	88
	„ „ „ in 1891	58	31	10	1	89

[1] Particulars supplied by the Meteorological Office.

RECENT AGRICULTURAL INVENTIONS.

The subjects of Applications for Patents from Dec. 11, 1893, *to March* 10, 1894.

N.B.—Where the Invention is a communication from abroad the name of the Inventor is shown in italics, between parentheses, after the name of the applicant.

Agricultural Machinery and Implements, &c.

No. of Application.	Name of Applicant.	Title of Invention.
Year 1893.		
24216	Atterton, J.	Cleaning potatoes and roots.
24523	Gough, A.	Chaff-cutting machine.
24573	New, A. B., & Britton	Side hoeing, gapping, &c., implement.
24707	Duncan, J.	Drying oats, &c.
1894		
107	Dell, W. B.	Cleaning, decorticating, &c., wheat.
194	Gindler, C.	Horse hoes.
199	Ridler, E.	" "
492	Landis & Jenner	Straw stackers for threshing machines.
505	Gordon, T.	Sickle grinders.
579	Fyfe, D. A.	Treatment and preparation of hay.
662	Bamford, S. B.	Chaff cutters.
968	Smith, De W. B.	Knives for mowers and reapers.
1201	Jones, T.	Hand ploughing machine.
1825	Moore, J. C.	Mowing and reaping machine.
1880	Pollock, A.	Land roller and broadcast seed sower.
1978	Jones, L. M., & anr.	Spring tooth cultivators.
2012	Massey, F. (*Jones and others, Canada*)	" " "
2306	Thompson, W. P. (*Stewart, U.S.A.*)	Grain binders.
2399	Forbes, J.	Topping and tailing turnips.
2438	Topham, F.	Distributing, &c., manure.
2640	Johnson, J.	Drill-maker attachment to digging plough.
2794	Truscott, J., & J.	Cultivators.
2827	Wallace, R. & W.	Topping and tailing roots.
3013	Maxwell, E.	Balance ploughs.
3557	Robinson, J., and Brown, G.	Wrought metal-ploughshares.
3815	Tucker, F., & anr.	Hay-pressing apparatus.
3854	Watson, T.	Digging ploughs.
4290	Allan, J.	Topping, tailing, and lifting turnips.
4446	Bamford, S. B.	Mowing and reaping machines.
4658	Evans, T.	Distributing manure and sowing grain.
4951	Paasche, G.	Ploughs.

Stable Utensils and Fittings—Horse-shoes, &c.

1893		
23801	Livsey, T.	Roughing horses.
23840	Shepherd, C. D.	Horse-shoes.
23868	Bailey, R. D.	Harness.
23871	McLardy, J. E.	Nosebags.
23921	Chamberlain, M. L.	Horse-shoes.
24010	Baumann, R.	Draught traces.

No. of Application	Name of Applicant.	Title of Invention.
Year 1893.		
24027	Symons, & Clarke, T.	Side-saddletrees.
24067	Williams, J.	Detaching horses from vehicles.
24250	Hands, E.	Fixing horse-shoes.
24335	Carmont, H.	Shoes to prevent slipping.
24354	Hawkins, S.	Horse-shoes.
24366	Risdon, J.	"
24399	Norwood, J. E.	Automatic shaft and harness attachment.
24636	Buckingham, J. E.	Horse-shoes.
24703	Wilton, H. S.	Side saddles.
24741	De Horsey, A.	Horse-shoes.
24748	Sewell, F. G. G.	Horse-collar.
24819	Meyer, J.	Saddles.
24820	Wartnaby, G.	Compound horse-shoes.
24917	Skinner, D. M.	Reins.
25022	Hottelart, V. & L.	"
1894		
163	Meyers, J. C.	Feed-bag for horses.
236	Hencke, A.	Horse-shoes.
556	Barratt, C. W., & anr.	Stirrups.
569	Brown, J., & anr.	Horse-shoes.
615	Cree, J. S.	Horse-collars.
765	The Mail Horse-shoe Synd. Ltd. & anr.	Horse-shoes.
846	Sumner, J.	Bridles.
948	Carrington, H.	Safety stirrup.
1032	Gledhill, J. W.	Horse-shoes.
1410	Jeffries & others	Whip sockets.
1524	Fletcher, W.	Inflated linings for saddles.
1567	Punchard, W. C.	Non-slipping appliance for horse-shoes.
1702	Sharman, J. H.	Horse-shoe.
1923	Withers, W. G.	Spurs.
1951	Turner, A. W. (*Douglas, U.S.A.*)	Horse-sandals.
2273	Marshall, C. H.	Saddles.
2357	Lavine, J. F.	Horse-tail holder.
2413	Jensen (*Krause, Germany*)	Safety stirrup.
2741	Glossop, G.	Nailless horse-shoes.
2947	Mandeville	Metal fittings of headstalls.
3031	Roberts, R. A.	Saddlery and harness.
3349	Wincer, A.	Harness saddles.
3390	Tenney, D. G.	Stallion shield.
3734	Gray, F.	Nosebag.
3881	Langton, S.	Attaching frost caulks to horse-shoes.
3901	Thomas, T., & anr.	Trace hooks.
4578	Elliott, J. A. & G. C.	Training horses to step.
4673	Verity, J. M.	Tubular perforated bits.
4852	Ogden, A. E.	Horse-shoes.

Carts and Carriages.

1893		
23848	Kelvie, A.	Brake for highway carriage poles.
23935	Diss, A.	Attaching and releasing traces of vehicles.
24513	Shoemaker, J.	Carts, &c.
1894		
415	Serrf, J. B.	Adjusting the brake shoe of vehicles.
1578	Drapper & Gray	Brake.
2848	Beard, J.	Brake and weight regulators for carts, &c.

Dairy Utensils, &c.

No. of Application.	Name of Applicant.	Title of Invention.
Year 1893.		
24299	HARDY, A. F.	Collapsible box for carrying butter, &c.
24420	GILLINGS, W.	Milk churns, &c.
24564	TIPPER, L. C.	Churns.
1894		
241	VINCENT, W.	Butter churns.
400	MOURANT, P. LE S.	Churns.
1049	DOWSE & anr.	Milk cans.
1405	BOND, F. T.	Preparation of cheese.
2143	CHEELD, S.	Testing milk and drying butter.
2963	BRADFORD, T.	Churning and butter-making apparatus.
3182	MASKREY, E.	Top and cover for milk churns, &c.
4260	FOWLER, W.	Butter churns.
4520	MILLS, J. W.	Milk churns.
4537	BRADFORD, T.	Manufacture of butter.

Poultry and Game, &c., Appliances.

1894		
1099	HOOPER, J. A.	Incubators.
1564	DUKE, J. F.	Preserving eggs.
1946	BEECH, F.	Marking ring fastener for poultry, &c.
2210	CHAMPNESS, H.	Hencoops.
3216	WILSON, T. W.	Artificial mother for poultry.
3465	RUSSELL, E.	Incubators.
4518	HEARSON, C. H.	Apparatus for rearing chickens.
4900	COLLINS, G.	Poultry houses, &c.

Miscellaneous.

1893		
25078	CHEVROLAT, L. P.	Food for cattle, horses, &c.
1894		
412	RYAN, M.	Sheep-shearing machines.
1670	MCILWAINE & COMMON	Preparing rapeseed for cattle food.
2093	KUWERT, W.	Double knob for distinguishing animals.
2334	JEUNE, D. M.	Apparatus for giving medicine to cattle, &c.
3500	ROBERTSON, A.	Wash to cure scab in sheep.
3861	SINARD, A.	Sheep-shearing machines.
3971	MEADOWS, W. P.	Beehives.
4382	NEWBURGH-STEWART, H. R.	Picketing animals.

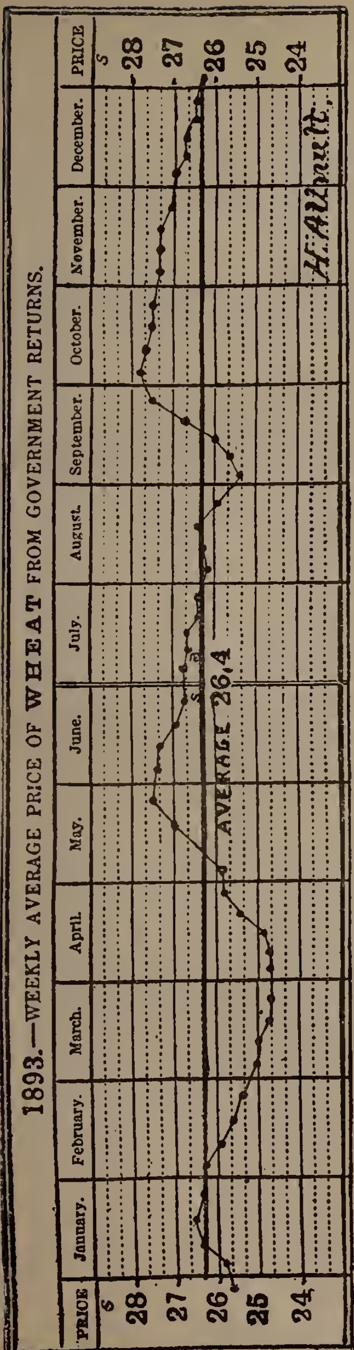
Numbers of Specifications relating to the above subjects Published since Dec. 12, 1893.[1]

(Price 8*d*. each copy.)

Specifications of 1892.
23109, 23761, 23998.

Specifications of 1893.
277, 409, 766, 1469, 1482, 1722, 1783, 1866, 1888, 2087, 2144, 2175, 2216, 2542, 2963, 2969, 3047, 3097, 3421, 3459, 3526, 3783, 3816, 3925, 4220, 4558, 4572, 4725, 5299, 5450, 6010, 6307, 6419, 6650, 6673, 6986, 7079, 7177, 7511, 7522, 7524, 7815, 8627, 10443, 12110, 13993, 19341, 19537, 20040, 20111, 20553, 20971, 21047, 21056, 21251, 21438, 21448, 21636, 21949, 22528, 22552, 22799, 23366, 23840, 23921, 23935, 24010, 24399, 42819.

[1] Copies may be obtained at the Patent Office (Sale and Store Branch), 38 Cursitor Street, London, E.C.



THE PRICE OF ENGLISH CORN IN 1893.

AVERAGES FOR 1893.

	s.	d.
Wheat	26	4
Barley	25	7
Oats	18	9

(Each space between the lines of the diagram represents fourpence.)

THE diagram shows the weekly Imperial average price of *Wheat* in the past year; the downward course is continued from 1892. The annual average has fallen 3*s*. 11*d*. a quarter; in 1892 wheat was 30*s*. 3*d*., but last year it was only 26*s*. 4*d*. a quarter. In 1883 the annual average was 41*s*. 7*d*. and in 1873 it was 58*s*. 8*d*. —more than double the price in the past year. The highest weekly average was 27*s*. 10*d*., on October 7 last, and the lowest was 24*s*. 8*d*., on March 25, being a fluctuation of only 3*s*. 2*d*., whereas in 1892 it was 10*s*. 8*d*. a quarter. The annual average price of *Barley* was 25*s*. 7*d*., being only 7*d*. a quarter under that of 1892. The highest price was 29*s*. 6*d*., on October 21 and 28, and the lowest 20*s*. 3*d*., on July 22, a fluctuation of 9*s*. 3*d*.; in 1892 it was 8*s*. 4*d*. It is remarkable that the price of Barley has exceeded that of Wheat twenty-five weeks out of fifty-two in the past year, in fact the last week in 1893 Barley was 29*s*. 2*d*., and Wheat only 26*s*. 6*d*. a quarter. The annual average price of *Oats* was 18*s*. 9*d*., or 1*s*. 1*d*. under that of 1892. The highest price was 22*s*. 9*d*., on July 15, and the lowest was 16*s*. 8*d*., on January 7, 1893, a fluctuation of 6*s*. 1*d*. a quarter; in 1892 it was 5*s*. 11*d*. The Imperial average price of Corn in 1893 was—Wheat 26*s*. 4*d*., Barley 25*s*. 7*d*., and Oats 18*s*. 9*d*. a quarter. According to Willich's Tithe Tables, the Septennial Tithe Rent Charge is 74*l*. 3*s*. 9½*d*. per 100*l*., or 11*s*. 5¼*d*. lower than last year. The average for the fifty-eight years from the commutation in 1836 is 99*l*. 6*s*. 7¼*d*. per 100*l*.

HENRY ALLNUTT.

STATISTICS AFFECTING BRITISH AGRICULTURAL INTERESTS.

Table I.—*Average Prices of British Corn per Quarter (Imperial Measure), as received from the Inspectors and Officers of Excise conformably to the Act of* 45 & 46 *Vict. ch.* 37, *in each Week of the Year* 1893.

[*From the "London Gazette."*]

Week ending	Wheat		Barley		Oats		Week ending	Wheat		Barley		Oats	
1893	s.	d.	s.	d.	s.	d.	1893	s.	d.	s.	d.	s.	d.
January 7 .	25	10	24	9	16	8	July 8 . .	26	8	20	6	21	0
January 14 .	26	4	25	6	16	11	July 15 . .	26	8	22	3	22	3
January 21 .	26	6	25	7	17	0	July 22 . .	26	5	20	3	21	9
January 28 .	26	4	25	6	17	3	July 29 . .	26	5	23	1	21	7
February 4 .	26	3	25	4	17	5	August 5 .	26	2	21	8	21	5
February 11 .	25	11	25	0	17	11	August 12 .	26	3	21	11	20	6
February 18 .	25	7	24	11	17	10	August 19 .	26	5	22	5	19	6
February 25 .	25	5	25	1	18	0	August 26 .	25	11	26	9	18	6
March 4 . .	25	1	25	2	17	11	September 2 .	25	5	26	9	18	7
March 11 .	25	0	25	2	18	1	September 9 .	25	7	27	2	17	4
March 18 .	24	9	25	0	18	7	September 16 .	26	0	27	8	17	6
March 25 .	24	8	25	5	18	3	September 23 .	26	9	27	10	17	9
April 1 . .	24	9	25	11	18	4	September 30 .	27	6	28	4	17	11
Average of Winter Quarter	25	7	25	2	17	7	Average of Summer Quarter	26	4	24	1	19	9
April 8 . .	24	9	25	6	17	11	October 7 .	27	10	29	0	17	10
April 15 . .	24	10	24	8	18	7	October 14 .	27	9	29	5	18	0
April 22 . .	25	5	24	5	18	8	October 21 .	27	6	29	6	18	1
April 29 . .	25	10	24	0	19	3	October 28 .	27	6	29	6	18	2
May 6 . .	25	10	23	11	19	5	November 4 .	27	4	29	5	18	2
May 13 . .	26	4	22	7	19	4	November 11 .	27	4	29	3	18	1
May 20 . .	27	0	23	2	19	8	November 18 .	27	4	29	2	18	2
May 27 . .	27	6	25	0	19	6	November 25 .	27	1	28	9	18	3
June 3 . .	27	5	24	2	20	2	December 2 .	27	0	28	8	18	3
June 10 . .	27	4	22	10	20	0	December 9 .	26	9	29	1	18	4
June 17 . .	26	11	23	5	21	1	December 16 .	26	9	28	10	18	3
June 24 . .	26	9	23	3	21	3	December 23 .	26	6	29	0	18	0
July 1 . .	26	9	20	9	21	5	December 30 .	26	6	29	2	17	11
Average of Spring Quarter	26	2	24	0	19	5	Average of Autumn Quarter	27	2	29	1	18	1

TABLE II.—*Annual Average Prices and Quantities of British Corn sold in the Towns in England and Wales from which Returns are received under the Act of* 45 *&* 46 *Vict. ch.* 37, *in each of the Years* 1884 *to* 1893.

[*From the* "*London Gazette.*"]

Year	Wheat	Barley	Oats	Wheat	Barley	Oats
	s. *d.*	*s.* *d.*	*s.* *d.*	Qrs.	Qrs.	Qrs.
1884	35 9	30 8	20 3	2,833,132	3,149,341	492,918
1885	32 10	30 2	20 7	2,739,515	2,765,500	393,042
1886	31 1	26 7	19 0	2,739,822	2,474,466	367,083
1887	32 6	25 4	16 3	2,495,124	2,589,667	309,478
1888	31 10	27 10	16 9	2,427,861	1,911,835	255,726
1889	29 9	25 10	17 9	2,945,408	3,329,814	415,783
1890	31 11	28 8	18 7	3,439,699	3,327,991	599,033
1891	37 0	28 2	20 0	3,248,743	3,255,518	561,713
1892	30 3	26 2	19 10	3,052,879	3,493,634	492,166
1893	26 4	25 7	18 9	2,620,060	3,366,056	575,522

TABLE III.—*Returns published pursuant to the Corn Returns Act*, 1882, *and to Act of* 6 *&* 7 *Wm. IV. for* "*Commutation of Tithes in England and Wales,*" *showing what has been, during the Seven Years ending Christmas Day in each Year, the Average Price of an Imperial Bushel of British Wheat, Barley, and Oats, computed from the Weekly Averages of Corn Returns in each of the Years* 1887–93.

[*From the* "*London Gazette.*"]

Year	Average (Septennial) Prices per Bushel		
	Wheat	Barley	Oats
	s. *d.*	*s.* *d.*	*s.* *d.*
1887	4 $8\frac{1}{2}$	3 $8\frac{1}{2}$	2 $6\frac{1}{4}$
1888	4 $5\frac{1}{2}$	3 $7\frac{1}{2}$	2 5
1889	4 $2\frac{1}{4}$	3 $6\frac{1}{4}$	2 $4\frac{1}{4}$
1890	3 $11\frac{3}{4}$	3 7	2 $3\frac{3}{4}$
1891	4 $0\frac{1}{2}$	3 $5\frac{1}{4}$	2 $3\frac{1}{2}$
1892	4 0	3 $4\frac{1}{4}$	2 $3\frac{1}{4}$
1893	3 11	3 4	2 $3\frac{1}{4}$

TABLE IV.—*Average Prices of Wool in each of the undermentioned Years.*

Year	ENGLISH[1]				AUSTRALASIAN	SOUTH AFRICAN
	Leicester	Half-breds	Kent	Southdown		
	Per lb. *d.* *d.*	Per lb. *d.* *d.*	Per lb. *d.* *d.*	Per lb. *d.* *s.* *d.*	Per lb. *d.*	Per lb. *d.*
1887	$9\frac{3}{4}$ to $10\frac{1}{4}$	10 to $11\frac{1}{4}$	$10\frac{1}{4}$ to $10\frac{3}{4}$	$10\frac{1}{4}$ to 1 $0\frac{3}{4}$	$10\frac{1}{2}$	$10\frac{1}{2}$
1888	$9\frac{1}{4}$ „ 10	$9\frac{1}{2}$ „ $10\frac{1}{2}$	$9\frac{1}{2}$ „ $10\frac{1}{4}$	$9\frac{3}{4}$ „ 0 $11\frac{3}{4}$	$10\frac{1}{4}$	$9\frac{3}{4}$
1889	$9\frac{3}{4}$ „ $10\frac{1}{2}$	$10\frac{1}{4}$ „ 11	$10\frac{1}{4}$ „ $10\frac{3}{4}$	$10\frac{1}{4}$ „ 1 $0\frac{1}{2}$	$10\frac{1}{4}$	$10\frac{1}{4}$
1890	10 „ $10\frac{1}{2}$	$10\frac{3}{4}$ „ $11\frac{1}{2}$	$10\frac{1}{4}$ „ 11	11 „ 1 1	11	$10\frac{1}{4}$
1891	$9\frac{1}{2}$ „ 10	10 „ 11	$9\frac{1}{2}$ „ $10\frac{1}{4}$	$10\frac{1}{2}$ „ 1 1	$9\frac{3}{4}$	$9\frac{3}{4}$
1892	$8\frac{1}{2}$ „ 9	$9\frac{3}{4}$ „ $10\frac{1}{4}$	$9\frac{1}{4}$ „ $9\frac{3}{4}$	$10\frac{1}{2}$ „ 1 $0\frac{1}{2}$	9	$9\frac{1}{2}$
1893	$8\frac{1}{2}$ „ $9\frac{1}{4}$	$9\frac{1}{2}$ „ $10\frac{1}{4}$	9 „ $9\frac{3}{4}$	$10\frac{1}{2}$ „ 1 0		

[1] The prices of English wool have been calculated from the list given weekly in the *Economist* newspaper.

Table V.—*Summary of Agricultural Produce Statistics* (**Wheat, Barley,** *and* **Oats**) *for England, Wales, Scotland, and Great Britain in* 1893.

WHEAT

—	Estimated Total Produce		Acreage		Estimated Average Yield per Acre	
	1893	1892	1893	1892	1893	1892
	Bushels	Bushels	Acres	Acres	Bushels	Bushels
England . . .	46,429,407	55,107,186	1,798,869	2,102,969	25·81	26·20
Wales	1,205,006	1,318,763	54,562	55,278	22·09	23·86
Scotland . . .	1,612,884	2,134,983	44,093	61,591	36·58	34·66
Great Britain . .	49,247,297	58,560,932	1,897,524	2,219,838	25·95	26·38

BARLEY

—	Estimated Total Produce		Acreage		Estimated Average Yield per Acre	
	1893	1892	1893	1892	1893	1892
	Bushels	Bushels	Acres	Acres	Bushels	Bushels
England . . .	49,032,708	59,511,003	1,751,602	1,709,587	27·99	34·81
Wales	2,802,971	3,350,862	111,851	114,520	25·06	29·26
Scotland . . .	7,699,698	7,622,732	211,644	212,703	36·38	35·84
Great Britain . .	59,535,377	70,484,597	2,075,097	2,036,810	28·69	34·61

OATS

—	Estimated Total Produce		Acreage		Estimated Average Yield per Acre	
	1893	1892	1893	1892	1893	1892
	Bushels	Bushels	Acres	Acres	Bushels	Bushels
England . . .	67,164,434	73,266,495	1,914,373	1,765,463	35·08	41·50
Wales	7,452,468	7,976,830	240,865	233,399	30·94	34·18
Scotland . . .	38,270,477	35,051,664	1,016,518	998,683	37·65	35·10
Great Britain . .	112,887,379	116,294,989	3,171,756	2,997,545	35·59	38·80

TABLE VI.—*Number and Value of Live Cattle, Sheep, and Swine Imported into the United Kingdom in the undermentioned Years.*

[*From Trade and Navigation Returns.*]

—		Number 1891	Number 1892	Number 1893	Value 1891	Value 1892	Value 1893
					£	£	£
Oxen and Bulls	From Denmark	8,602	901	—	91,481	9,455	—
	„ Spain	7,662	1,591	—	134,971	27,655	—
	„ Canada	98,376	90,012	81,232	1,629,975	1,458,142	1,436,479
	„ United States	314,228	392,679	248,825	6,053,483	7,470,333	4,667,152
	„ Other Countries	11,635	5,098	7,006	183,136	95,957	109,816
	Total	440,503	490,281	337,063	8,093,046	9,061,542	6,213,447
Cows	From Denmark	11,998	844	—	129,355	8,942	—
	„ Sweden	293	45	—	3,366	504	—
	„ Canada	9,148	7,934	1,690	140,655	118,807	28,526
	„ United States	667	255	66	10,386	4,439	1,144
	„ Other Countries	3,208	1,428	1,152	52,335	24,108	19,326
	Total	25,314	10,506	2,908	336,097	156,800	48,996
Calves	From Denmark	6,263	260	—	22,756	880	—
	„ Holland	34,168	762	—	126,776	3,484	—
	„ Canada	765	293	3	1,261	761	13
	„ Other Countries	394	135	71	1,638	544	305
	Total	41,590	1,450	74	152,431	5,669	318
Sheep and Lambs	From Denmark	65,368	[1] 38,529	[1] 29,227	95,561	48,100	35,254
	„ Germany	—	—	—	—	—	—
	„ Holland	208,443	6,686	—	441,867	14,877	—
	„ Canada	31,633	15,743	3,589	61,337	31,359	6,782
	„ United States	10,537	2,829	—	17,948	5,854	—
	„ Other Countries	28,523	15,261	29,866	46,302	25,469	46,494
	Total	344,504	79,048	62,682	663,015	125,659	88,530
Swine	From Denmark	—	—	—	—	—	—
	„ Holland	540	24	—	1,808	86	—
	„ United States	—	2,568	—	—	8,003	—
	„ Other Countries	2	1,234	138	1	4,376	413
	Total	542	3,826	138	1,809	12,465	413
Total Value of all kinds		. .	. .	. .	9,246,398	9,362,135	6,351,704

[1] Mostly imported from Iceland. That island, in these Returns, is included with Denmark, and animals from thence are allowed to be landed.

TABLE VII.—*Quantities and Values of Corn, Meat, Food Products, Kingdom in the Year* 1893, *with the*

[*From Trade and*

—	Quantities			Values		
	1891	1892	1893	1891	1892	1893
ANIMALS, LIVING (for food) :—	No.	No.	No.	£	£	£
Oxen and Bulls . . .	440,503	490,281	337,063	8,093,046	9,061,542	6,213,447
Cows	25,314	10,506	2,908	336,097	156,800	48,996
Calves	41,590	1,450	74	152,431	5,669	318
TOTAL CATTLE .	507,407	502,237	310,045	8,581,574	9,224,011	6,262,761
Sheep and Lambs . .	344,501	79,048	62,682	663,015	125,659	88,530
Swine	542	3,826	138	1,809	12,465	413
TOTAL . . .	—	—	—	9,246,398	9,362,135	6,351,704
CORN :—	Cwt.	Cwt.	Cwt.			
Wheat	66,312,962	64,901,799	65,417,308	29,448,204	24,857,902	21,193,648
Wheat Meal and Flour .	16,723,003	22,106,009	20,408,168	10,184,887	12,267,453	9,761,510
Barley	17,465,698	14,277,342	22,842,257	5,941,899	4,313,902	5,772,313
Oats	16,600,394	15,661,394	13,976,982	5,471,279	5,013,545	4,306,289
Peas	2,419,381	2,501,492	2,302,443	862,427	863,235	728,294
Beans	3,672,413	4,429,933	3,946,985	1,206,916	1,365,221	1,127,561
Maize	26,825,625	35,381,224	32,880,003	8,411,763	9,425,211	7,884,613
Maize Meal . . .	55,700	173,664	71,428	39,740	70,426	37,748
Other kinds of corn and meal	—	—	—	455,294	556,197	487,826
TOTAL . . .	—	—	—	62,022,409	58,733,092	51,299,802
MEAT :—	Cwt.	Cwt.	Cwt.			
Beef, Salted . . .	247,759	275,394	200,514	356,022	388,588	278,997
„ Fresh . . .	1,920,511	2,079,637	1,808,052	4,038,495	4,413,148	3,830,599
Mutton, Fresh . . .	1,662,994	1,699,966	1,971,500	3,282,001	3,447,102	3,873,863
Bacon	3,510,209	3,881,378	3,198,887	6,650,324	7,930,121	8,479,815
Hams	1,204,803	1,253,132	988,411	2,791,437	2,963,712	2,890,252
Pork, Salted (not Hams) .	226,798	228,354	186,921	295,932	306,262	289,577
„ Fresh . . .	127,518	132,107	183,091	302,725	310,165	455,544
Meat, unenumerated—Salted or Fresh	113,357	150,573	177,509	255,898	344,945	399,912
Meat preserved otherwise than by Salting	776,261	799,501	591,919 [1]	1,888,061	1,951,765	1,545,207 [2]
Rabbits . . .	103,685	107,630	103,823	286,981	303,262	287,737
TOTAL . . .	9,893,895	10,607,672	9,410,627	20,147,876	22,359,070	22,331,503

[1] Beef, 386,617 cwt.; Mutton, 83,882 cwt.; Other sorts, 121,420 cwt.
[2] Beef, 961,359*l.*; Mutton, 154,818*l.*; Other sorts, 429,030*l.*

and Articles affecting Agriculture, Imported into the United Corresponding Figures for 1891 *and* 1892.

Navigation Returns.]

—	Quantities 1891	Quantities 1892	Quantities 1893	Values 1891	Values 1892	Values 1893
DAIRY PRODUCE :—	Cwt.	Cwt.	Cwt.	£	£	£
Butter	2,135,607	2,183,009	2,327,473	11,591,183	11,965,180	12,754,233
Margarine	1,235,430	1,305,350	1,300,033	3,558,203	3,712,884	3,656,224
Cheese	2,041,325	2,232,817	2,077,482	4,813,404	5,416,784	5,160,918
TOTAL	5,412,362	5,731,176	5,704,988	19,962,790	21,095,858	21,571,375
POULTRY, &C. :—						
Poultry and Game, alive or dead	—	—	—	456,979	583,430	578,959
Eggs	Gt. Hunds. 10,628,314	Gt. Hunds. 11,139,419	Gt. Hunds. 11,025,908	3,505,522	3,794,718	3,875,639
TOTAL	—	—	—	3,962,501	4,378,148	4,454,598
FRUIT, VEGETABLES, &C. :—						
Apples (raw)	Bushels 3,147,373	Bushels 4,514,700	Bushels 3,463,917	1,033,997	1,353,812	844,312
Other Fruit (raw)	3,490,226	2,870,175	4,090,146 [1]	1,762,406	1,413,033	1,849,715 [2]
Onions	4,281,046	4,420,276	4,673,710	733,745	724,040	783,399
Potatoes	Cwt. 3,192,836	Cwt. 3,008,336	Cwt. 2,828,125	1,196,824	950,332	906,952
Vegetables, unenumerated (raw)	—	—	—	932,917	1,016,280	1,076,752
Hops	195,266	187,507	204,592	980,050	960,280	1,141,294
TOTAL	—	—	—	—	—	—
OTHER ARTICLES :—						
Lard	Cwt. 1,051,284	Cwt. 1,239,051	Cwt. 1,118,106	1,720,051	2,223,011	2,808,519
Flax	1,678,940	1,733,100	1,445,320	2,771,568	2,743,305	2,517,953
Wool, Sheep and Lambs'	Lb. 715,470,708	Lb. 738,251,203	Lb. 671,663,194	27,856,546	26,839,319	24,437,178
Wood and Timber : Hewn	Loads 2,250,692	Loads 2,469,139	Loads 2,127,891	4,500,667	4,885,850	4,048,697
Sawn or Split, Planed or Dressed	4,379,060	5,090,798	4,762,752	9,384,916	11,171,920	10,269,960
Staves	129,987	136,063	131,708	589,362	593,539	512,567
Oil-Seed Cake	Tons 270,671	Tons 311,872	Tons 283,101	1,843,285	2,147,099	1,935,989
Seeds: Clover and Grass	Cwt. 256,920	Cwt. 297,321	Cwt. 333,412	552,979	635,135	790,061
„ Cotton	Tons 350,437	Tons 409,668	Tons 389,867	2,047,747	2,363,375	2,409,942
„ Flax and Linseed	Qrs. 2,200,112	Qrs. 1,902,152	Qrs. 1,699,425	4,564,669	3,730,341	3,473,112
„ Rape	261,169	244,017	252,560	388,446	315,484	313,424

[1] Cherries, 346,148 bus.; Plums, 777,842 bus.; Pears, 915,213 bus.; Grapes, 978,505 bus.; Unenumerated, 1,072,438 bus.

[2] Cherries, 194,581*l.*; Plums 331,731*l.*; Pears, 347,191*l.*; Grapes, 530,448*l.*; Unenumerated, 445,761*l.*

TABLE VIII.—*Quantity and Value of Dead Meat Imported into the United Kingdom in the Four Years,* 1890–93.

[*From Trade and Navigation Returns.*]

Thousands ("000") omitted.

DEAD MEAT		1890		1891		1892		1893	
		Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
BACON :—		Cwt.	£	Cwt.	£	Cwt.	£	Cwt.	£
	From United States .	2,935	4,891	2,675	4,518	2,896	5,354	2,177	5,523
	„ Other Countries	856	2,087	835	2,132	985	2,576	1,022	2,957
	Total . . .	3,791	6,978	3,510	6,650	3,881	7,930	3,199	8,480
BEEF :—									
Salted . . .	From United States .	263	359	235	335	268	376	188	257
	„ Other Countries .	12	23	13	21	8	13	13	22
	Total . . .	275	382	248	356	276	389	201	279
Fresh . . .	From United States .	1,693	3,630	1,748	3,745	1,952	4,206	1,490	3,296
	„ Other Countries .	162	293	173	293	128	207	318	535
	Total . . .	1,855	3,923	1,921	4,038	2,080	4,413	1,808	3,831
HAMS :—									
	From United States .	1,094	2,584	1,117	2,580	1,131	2,669	921	2,687
	„ Other Countries .	115	285	88	211	122	295	67	204
	Total . . .	1,209	2,869	1,205	2,791	1,253	2,964	988	2,890
MEAT, Unenumerated :—									
Salted or Fresh	From United States .	17	33	20	40	21	46	22	46
	„ Other Countries .	87	195	93	216	130	299	156	353
	Total . . .	104	228	113	256	151	345	178	400
Preserved, otherwise than by Salting . .	Beef	551	1,424	527	1,210	568	1,321	387	961
	Mutton	79	182	92	221	68	139	84	155
	Other Sorts . . .	105	340	157	457	163	492	121	429
	Total . . .	735	1,946	776	1,888	799	1,952	592	1,545
MUTTON, Fresh :—									
	From Holland . .	116	275	57	128	165	393	197	444
	„ Australasia . .	897	1,823	1,063	2,109	977	1,981	1,187	2,305
	„ Argentine Republic	435	823	436	791	471	866	516	959
	„ Other Countries .	208	527	107	254	87	207	71	166
	Total . . .	1,656	3,448	1,663	3,282	1,700	3,447	1,971	3,874
PORK :—									
Salted (not Hams) .	From United States .	205	282	170	233	162	233	109	195
	„ Other Countries .	95	59	184	63	66	75	78	94
	Total . . .	300	341	354	296	228	306	187	290
Fresh . . .	From Holland . . .	26	62	90	216	93	214	121	291
	„ Belgium . . .	11	27	31	76	22	56	25	63
	„ Other Countries .	8	20	6	12	17	40	37	102
	Total . . .	45	109	127	303	132	310	183	456
RABBITS :—									
	From Belgium . .	129	357	84	234	89	248	82	225
	„ Other Countries .	14	41	20	53	19	55	21	62
	Total . . .	143	398	104	287	108	303	104	288

TABLE IX.—*Quantities and Values of Butter, Margarine, Cheese, and Eggs Imported into the United Kingdom in each Year from* 1891 *to* 1893 *inclusive.*

[*From Trade and Navigation Returns.*]

—	QUANTITIES			VALUES		
	1891	1892	1893	1891	1892	1893
BUTTER	Cwt.	Cwt.	Cwt.	£	£	£
From Sweden	234,987	228,885	267,400	1,269,187	1,243,016	1,451,739
,, Denmark . . .	876,211	863,532	934,787	4,865,842	4,848,735	5,279,875
,, Germany . . .	115,509	124,233	164,985	615,791	713,859	830,706
,, Holland . . .	146,539	141,838	142,811	770,460	750,314	763,897
,, France	535,196	542,687	468,309	3,038,063	3,027,648	2,679,075
,, Canada	46,267	59,571	43,139	187,392	255,652	194,806
,, United States .	63,693	46,846	22,930	251,750	191,145	104,220
,, Other Countries.	117,205	175,417	283,112	592,698	934,821	1,449,915
Total. . . .	2,135,607	2,183,009	2,327,473	11,591,183	11,965,190	12,754,233
MARGARINE	Cwt.	Cwt.	Cwt.			
From Norway. . . .	26,466	25,426	14,071	77,863	70,477	38,761
,, Holland . . .	1,104,050	1,196,756	1,229,737	3,093,595	3,360,707	3,417,377
,, France . . .	69,016	56,002	41,302	263,574	192,675	160,377
,, Other Countries.	35,898	27,166	14,923	123,171	89,025	39,709
Total. . . .	1,235,430	1,305,350	1,300,033	3,558,203	3,712,884	3,656,224
CHEESE	Cwt.	Cwt.	Cwt.			
From Holland. . . .	307,925	273,821	269,384	761,387	678,573	676,001
,, France	43,756	45,605	58,346	138,521	143,208	181,763
,, Canada	857,841	1,038,599	1,046,704	1,991,597	2,493,625	2,575,893
,, United States .	774,893	818,433	645,235	1,779,260	1,961,407	1,578,531
,, Other Countries .	56,910	56,359	57,813	142,639	139,971	148,730
Total. . . .	2,041,325	2,232,817	2,077,482	4,813,404	5,416,784	5,160,918
EGGS	Great Hundreds	Great Hundreds	Great Hundreds			
From Russia	1,439,954	1,254,323	1,504,615	383,791	354,705	426,106
,, Denmark . . .	1,161,174	1,247,964	1,098,013	395,963	413,469	376,793
,, Germany . . .	2,714,484	2,751,340	2,129,076	782,094	827,195	618,631
,, Belgium . . .	1,768,155	1,985,768	2,040,692	540,699	629,264	682,636
,, France	3,119,754	3,512,174	3,820,636	1,259,009	1,437,203	1,611,495
,, Other Countries.	424,793	387,850	441,876	143,966	132,882	159,978
Total. . . .	10,628,314	11,139,419	11,025,908	3,505,522	3,794,718	3,875,639

TABLE X.—*Value of Corn, &c., Imported into the United Kingdom in each of the Five Years*, 1889–93.

[*From Trade and Navigation Returns.*]

	1889	1890	1891	1892	1893
	£	£	£	£	£
Wheat	22,530,838	23,584,616	29,448,204	24,857,902	21,193,648
Wheat Flour	8,559,563	9,074,290	10,184,887	12,267,453	9,761,510
	31,090,401	32,658,906	39,633,091	37,125,355	30,955,158
Barley	4,968,947	4,985,406	5,941,899	4,313,902	5,772,313
Oats	4,472,598	3,908,497	5,471,279	5,013,545	4,306,289
Maize	8,580,080	9,863,034	8,411,763	9,425,211	7,884,613
Maize Meal	19,365	30,060	39,740	70,426	37,748
Beans and Peas	1,676,736	1,598,604	2,069,343	2,228,456	1,855,855
Other kinds of Corn and Meal	—	—	455,294	556,197	487,826
Total of Corn, &c.	50,808,127	53,044,507	62,022,409	58,733,092	51,299,802

TABLE XI.—*Quantities of Wheat, and of Wheat Meal and Flour, Imported into the United Kingdom in each of the Five Years*, 1889–93; *also the Countries from which they were obtained.*

[*From Trade and Navigation Returns.*]

Thousands ("000") omitted.

	1889	1890	1891	1892	1893
Wheat from—	Cwt.	Cwt.	Cwt.	Cwt.	Cwt.
Russia	21,322	19,389	14,553	4,363	10,062
Germany	2,539	1,101	714	606	362
France	127	1	126	26	1
Turkey	667	900	1,510	494	104
Roumania	2,862	4,654	1,088	738	89
Egypt	325	425	937	385	11
United States	17,016	17,201	24,195	33,887	32,263
Chili	573	24	2,120	2,288	2,580
British East Indies	9,217	9,112	13,006	12,495	6,184
Australasia	1,406	3,058	2,086	2,017	2,655
British North America	1,168	1,128	3,174	3,875	3,157
Other Countries	1,380	3,482	2,805	3,728	7,949
Total Wheat	58,602	60,475	66,314	64,902	65,417
Wheat Meal and Flour from—					
Germany	1,155	895	364	163	116
France	91	103	44	40	52
Austrian Territories	1,838	1,370	1,218	977	1,100
United States	10,068	12,026	13,703	19,467	17,996
British North America	1,169	933	1,029	1,360	1,081
Other Countries	378	446	364	98	63
Total Wheat Meal and Flour	14,699	15,773	16,723	22,106	20,408

TABLE XII.—*Numoer of Horses, Cattle, Sheep, and Pigs Imported into Great Britain from Ireland in each of the Years* 1886–92.

[*From Agricultural Returns.*]

——	1886	1887	1888	1889	1890	1891	1892
HORSES:							
Stallions . . .	43	68	67	80	105	125	113
Mares	12,497	11,801	12,388	13,647	14,625	14,055	14,273
Geldings . . .	16,239	15,769	17,373	18,097	19,422	19,216	18,095
Total . .	28,779	27,638	29,828	31,824	34,152	33,396	32,481
CATTLE:							
Oxen, Bulls and Cows — Fat . .	285,156	331,119	282,537	248,362	216,339	240,183	256,538
Oxen, Bulls and Cows — Store. .	388,917	302,878	405,540	372,682	360,758	323,075	305,373
Oxen, Bulls and Cows — Other cattle .	1,247	2,283	2,941	1,432	1,152	3,985	6,278
Calves	42,069	32,973	47,698	47,367	53,449	63,559	56,268
Total. . .	717,389	669,253	738,716	669,843	631,698	630,802	624,457
SHEEP:							
Sheep	493,983	321,644	400,836	373,313	387,220	569,698	713,528
Lambs	240,230	226,924	236,748	240,374	249,761	323,477	366,674
Total. . .	734,213	548,568	637,584	613,687	636,981	893,175	1,080,202
PIGS:							
Fat	391,509	438,155	495,680	428,103	543,417	459,596	457,977
Store.	29,776	42,765	49,292	45,448	59,745	43,988	42,974
Total . .	421,285	480,920	544,972	473,551	603,162	503,584	500,951

TABLE XIII.—*Number of Horses, and their Declared Value, Imported into, and Exported from, the United Kingdom in each of the Years* 1888–93.

[*From Agricultural Returns and Trade and Navigation Returns.*]

Year	Imported		Year	Exported	
	Number	Value		Number	Value
		£			£
1888	11,505	192,624	1888	12,880	848,311
1889	13,832	277,388	1889	14,266	984,611
1890	19,404	336,496	1890	12,916	687,978
1891	21,672	432,268	1891	11,234	525,035
1892	20,994	425,401	1892	11,233	563,364
1893	13,719 [1]	376,954	1893	11,965	472,790

[1] NOTE.—The countries from which horses were *imported* in 1893 were as follow:—Germany, 5,626; Denmark, 1,764; Holland, 1,253; France, 471; Belgium, 357; United States of America, 1,319; Canada, 1,815; Argentine Republic, 351; and 763 from other countries.

TABLE XIV.—*Quantities of Certain Articles of Foreign and Colonial Production Imported into the United Kingdom in each of the Years* 1890–93.

[*From Trade and Navigation Returns.*]

——	1890	1891	1892	1893
Bones (whether burnt or not) tons	69,949	83,095	63,008	44,979
Guano . . . . . tons	28,005	23,623	27,874	18,311
Cotton, Raw . . . cwt.	16,011,350	17,811,476	15,850,324	12,649,822
Hemp . . . . . . "	1,890,367	2,053,500	1,857,040	1,628,740
Hides untanned: Dry . "	455,098	451,380	368,191	357,118
" " Wet . "	584,948	555,690	541,286	589,245
Petroleum . . . gallons	104,809,146	130,615,360	130,186,085	155,125,987

TABLE XV.—*Number of Carcasses of Frozen Mutton Imported into the United Kingdom from the Countries named in each Year from* 1880 *to* 1893.

[*From Messrs. W. Weddel & Co.'s "Review of the Frozen Meat Trade*, 1893," *corrected to date.*]

Year	From New Zealand	From Argentine Republic	From Australia	From Falkland Islands	Totals
1880	—	—	400	—	400
1881	—	—	17,275	—	17,275
1882	8,839	—	57,256	—	66,095
1883	120,893	17,165	63,733	—	201,791
1884	412,349	108,823	111,745	—	632,917
1885	492,269	190,571	95,051	—	777,891
1886	655,888	434,699	66,960	30,000	1,187,547
1887	766,417	641,866	88,811	45,552	1,542,646
1888	939,231	924,003	112,214	—	1,975,448
1889	1,068,286	1,009,936	86,547	—	2,164,769
1890	1,533,393	1,196,531	207,984	10,168	2,948,076
1891	1,894,105	1,111,137	334,684	18,897	3,358,823
1892	1,539,605	1,247,861	504,738	17,818	3,310,022
1893	1,893,604	1,373,723	605,692	16,425	3,889,444

TABLE XVI.—*Home Product and Importations of Sheep and Mutton (United Kingdom) in each Year from* 1883 *to* 1893.

Year	Population at the middle of each year	Number of Sheep and Lambs enumerated annually in June (from *Agric. Returns*)	Number assumed to be slaughtered annually, *i.e.* 40 per cent. of those enumerated	Number of live Sheep imported in each year	Number of Carcasses of Frozen Mutton imported in each year
1883	(estimated) *35,612,000*	28,348,000	11,339,200	1,116,000	201,791
1884	„ *35,962,000*	29,377,000	11,750,800	945,000	632,917
1885	„ *36,325,000*	30,086,000	12,027,200	751,000	777,891
1886	„ *36,707,000*	28,955,000	11,582,000	1,039,000	1,187,547
1887	„ *37,092,000*	29,402,000	11,760,800	971,000	1,542,646
1888	„ *37,454,000*	28,939,000	11,575,600	956,000	1,975,448
1889	„ *37,809,000*	29,485,000	11,794,000	678,000	2,164,769
1890	„ *38,187,000*	31,667,000	12,667,000	358,458	2,948,076
1891	(census) 37,704,283	33,534,000	13,414,000	344,504	3,358,823
1892	(estimated) *38,082,000*	33,642,000	13,456,000	79,084	3,310,022
1893	„ *38,463,000*	31,775,000	12,710,000	65,000	3,889,444

JOURNAL

OF THE

ROYAL AGRICULTURAL SOCIETY

OF ENGLAND.

THE FIRST TWO COUNTRY MEETINGS OF THE ROYAL AGRICULTURAL SOCIETY:

OXFORD, 1839; CAMBRIDGE, 1840.

It is difficult for a *fin de siècle* chronicler to give from the imperfect materials at his command anything like a faithful picture of the earliest Country Meetings of the Society, when visitors from a distance had all to come to the shows by road, in coaches, postchaises, or their own vehicles; when an attendance of 20,000 people was deemed phenomenal; and when 247 entries of live stock and 54 of implements were described as constituting a show "on a scale of unprecedented magnitude." The circumstance, however, of the Society revisiting, after an interval of 54 years, the place where it held its first Country Meeting as a chartered organisation, affords an opportunity of reproducing from old records some particulars as to the very earliest gatherings of the Society, which may offer, perhaps, some food for reflection on the general advance of agricultural science, and on the growth of the agricultural shows which now cover the face of the country.

The story of the origin of the English Agricultural Society, which blossomed forth two years after its establishment (in 1838) as the Royal Agricultural Society of England, has already been told elsewhere,[1] and it is to be noted that from the very first the holding of an annual show was regarded

[1] Journal, Third Series, Vol. I., 1890, pp. 1 *et seq.*

as an integral part of its functions. When, in December 1837, Lord Spencer, as President of the Smithfield Club, suggested the establishment of "an English national society for agricultural purposes exclusively," he mentioned the success of the system which had then for some years been adopted by the Highland and Agricultural Society of Scotland, of holding annually a peripatetic Country Meeting; and his great ally and supporter, the Duke of Richmond—himself a Scottish as well as an English landlord—spoke of this example as an excellent one to imitate. Mr. Handley, M.P., followed in the same strain, and shortly afterwards planned an elaborate scheme of organisation for the new Society, which, published as a pamphlet in January 1838, had a considerable circulation at the time. In this pamphlet Mr. Handley thus referred to the proposal to hold Country Meetings in different parts of the provinces:—

> It will be matter for due consideration how far or in what form it may be desirable to adopt the migratory principle of the Highland Society and the British Association. London should, doubtless, be the seat of direction of such an institution; it is the natural focus from which all communications can best emanate; where all information can be most readily collected; it is the easiest of access to the general mass of subscribers, and the place in which the co-operation of men of science may be most readily obtained. London, however, is probably not the spot in which the greatest number of practical agriculturists can be brought together to discuss or acquire information on subjects interesting to themselves. The multifarious demands upon the time of those visiting London operate irresistibly against a continuous attendance upon a course of lectures or discussions, in which it is so desirable there should be no interruption; and which, once in the year at all events, it may be presumed may afford much new matter and valuable information. If, however, such annual meeting were held alternately at some considerable town situated in an important agricultural district, such, for instance, as York, Lincoln, Norwich, Bath, Northampton, &c., not only would it be attended by a vast assemblage of gentlemen from distant parts who had communications to impart, and from others whose desire for information would induce them to be present, but it would excite a deep interest in the proceedings amongst a large class of resident yeomanry, who would be induced to contribute their assistance, both by subscription and practical experience, and who, by adopting various proposed improvements, would, as it were, convert the district, containing probably many varieties of soils and different modes of culture, into a large experimental farm.[1]

The publication of this letter had so far prepared the way that when the Inaugural Meeting of the new "English Agricultural Society" was held on May 9, 1838, unanimous assent was given to the third resolution, proposed by Earl Fitzwilliam, and seconded by Mr. Philip Pusey, M.P.: "That, with the view of effecting the objects of this Society, the annual meetings be held successively in different parts of England and Wales."

---

[1] *The Farmer's Magazine*, March 1838, p. 197.

At a meeting of the Provisional Committee, held on May 12, 1838, the objects of the Society were defined, and amongst them was the following: "At the Meetings of the Society in the country, by the distribution of prizes, and by other means, to encourage the best mode of farm cultivation and the breed of live stock." At a later meeting, held on June 26, the Committee resolved to recommend to the General Meeting on the following day "to hold the first meeting in the country at Oxford, on Wednesday, July 17, 1839."

The Committee had a variety of sittings to discuss the details of the prizes to be offered, but eventually they reported to the General Meeting held in December 1838, that "The prizes for cattle to be given at Oxford next year, through which improvement in the breeding of stock is mainly contemplated, will be publicly announced in a few days. And your Committee trust that the owners and occupiers of land in Oxfordshire and neighbouring counties will co-operate in rendering the first Meeting of this Society efficient for the objects for which it was instituted."

Oxford Meeting, 1839.

The prize sheet for the Oxford Meeting was published in the form of a huge placard, a copy of which has been presented to the Society by the courtesy of Mr. J. Kersley Fowler, and is now hung up on the walls. It is interesting amongst other reasons as illustrating the state of things existing before the establishment of the Penny Post. Our veteran Trustee, Sir Thomas Acland, then a young member of the Committee of the Society, used his privilege as a Member of Parliament to frank a copy of the prize list to Mr. Fleetwood Wells; but misdirecting it to Ellesborough, *Andover*, instead of Wendover, it travelled over a great part of England before it reached its destination, and is covered with postal memoranda. Mr. Acland's "frank" saved the Society 7*d.* for postage for sending this prize sheet 40 miles.

It is evident from the newspapers of the period and from the recollections of many of the older members of the Society, that the first Show was awaited with the greatest interest and excitement by agriculturists at large. *Bell's Weekly Messenger* of July 22, 1839, thus prefaces its account of the Show :—

For some months past, but more particularly the last few weeks (the interest being, if possible, more intense as the time of meeting drew near), the all-absorbing topic of conversation, not only amongst those immediately engaged in agricultural pursuits, but also the community at large, residing in England, Ireland, and Scotland, has been the formation of the above-named praiseworthy, and, in every respect (viewed with regard both to present and prospective benefits which must inevitably accrue from it), most excellent Society; indeed, we may venture to affirm without the least fear of contradiction, that no event tending in any way to ameliorate the condition of the British yeoman, or advance the cause of agriculture, has produced that almost universal approbation which this Institution has done.

In those days before railways, exceptional efforts were made by visitors to reach the Show-ground, and we have a glimpse of these in a communication from Mr. George Drewry, of Holker, Carke-in-Cartmel, Lancashire, who was at that time living in the neighbourhood of Tavistock, and who has attended nearly all the Society's meetings. Mr. Drewry journeyed to Oxford in company with Mr. Benson, the Duke of Bedford's agent, Mr. George Turner, and several others, and states that they put up at Exeter the first night, on the second they reached Cheltenham, and on the third day they arrived at Oxford, travelling by coach part of the way and posting the rest. "The Show," he adds, "was considered to be a wonderful one; there had been nothing like it before, and many people said there would never be another like it."

Another old member of the Society, Mr. Kersley Fowler, writes:—"The Duke of Bedford was very desirous that his tenants should visit the first Meeting of the Society, and I recollect seeing Mr. Bennett, the Duke's steward, Mr. Thomas of Bletsoe, and others—about thirty altogether, coming in two coaches-and-four to Aylesbury from Woburn, and posting on to Oxford, ordering dinner at the White Hart at Aylesbury on their return, and bringing with them interesting accounts of the wonders of the great exhibition. I myself went on the 'dickey' of a yellow postchaise, with three friends of my father's from Northamptonshire stowed inside the chaise, and we came home nearly starved to death, from the difficulty we had in obtaining food at Oxford."

An even more striking illustration of the difficulties attending the locomotion of men and animals at that period is given by Mr. Fowler in his entertaining *Recollections of Old Country Life*, published quite recently by Messrs. Longman:—

I can perfectly remember my father being applied to, one evening in June of 1839, to arrange for the reception of some Shorthorn cattle which were going to the Oxford Show. These animals had come in a freight boat from London, by the Aylesbury branch of the Grand Junction Canal. He sent them to the Prebendal Farm, which I some time afterwards tenanted for over thirty years. This farm was alongside the turnpike road to Oxford; and I have not forgotten the beauty of those animals, which far exceeded in style and character any that I had ever seen before. The animals, I am informed, were driven from the residence of their breeder, Mr. Bates, at

Kirkleavington in Yorkshire, to Hull, and there shipped to London, then put into the canal boat, and forwarded to Aylesbury. They remained the night, and the next day were driven ten miles to Thame, and finally, the day after, another thirteen miles to Oxford, having been nearly three weeks on the road! If the renowned "Tommy Bates," their owner, now wished to send his cattle to Windsor or Oxford from Darlington, he could put them into a close van, and in twenty-four hours they would reach their destination—(page 232).

The animals thus referred to were the four exhibits sent to the Oxford Meeting by the famous Shorthorn breeder, Mr. Thomas Bates, of Kirkleavington, viz., a roan bull, "Duke of Northumberland" (1,940), a roan cow (dam Matchem Cow) afterwards named the Oxford Premium Cow, a roan in-calf heifer, "Duchess 42nd," and a yearling red heifer, "Duchess 43rd." Mr. Bates accompanied his beasts on board during their adventurous sea journey, and looked after their treatment. Whilst in the London Docks, the "Duke of Northumberland" became restive and slipped, lying across the gangway; but he was quieted by Mr. Bates and suffered no injury.

The site of the Show-yard was "Mr. Pinfold's pasture ground, Holywell," which is now covered with the buildings of Mansfield College. This field was about seven acres in extent, conveniently adjacent to the town, and forming part of a farm at Holywell, in the occupation of Mr. John Pinfold, a wealthy bachelor, carrying on a large butcher's business in Oxford market, chiefly in connexion with the college kitchens. During the Show Mr. Pinfold entertained Mr. Bates at Holywell; and Mr. Frederick King, of Wealdstone, Middlesex, who was present with his father at the Oxford Meeting, writes that as they were personal friends of Mr. Pinfold, who was much engaged in his ordinary occupation at such a busy time, they saw a good deal of his guest. "Mr. Bates" (says Mr. King) "spent most of his time with my father and myself, and confided to me how his bull was descended from the breed of the celebrated Durham Ox, even now admitted to have been the grandest specimen of the Shorthorn breed ever yet produced."

A handbill (for a copy of which the Society is indebted to Mr. King) was extensively circulated as to the arrangements for the Show, and on page 210 is given a reduced copy of it, as nearly as possible in facsimile.

Lord Spencer, the President of the Society, with Mr. Humphrey Gibbs, the Director of the Yard, and the Stewards (Messrs. S. Druce, E. Franklin, and B. T. B. Gibbs, "on the part of Mr. Trinder"), were early at Oxford directing the arrangements, and during the whole of Sunday and Monday

ENGLISH AGRICULTURAL SOCIETY.

General Regulations for the Oxford Meeting, July 17, 1839.

SHOW YARD,

In Mr. Pinfold's Pasture Ground, Holywell.

No Stock can be admitted for exhibition unless the necessary Certificates, in the form prescribed, and signed by the Exhibitor in the manner directed, be delivered to the Secretary, or sent post paid, so as to reach the Society's Rooms, 5, Cavendish-square, on or before the 1st of July.

Non-Subscribers to pay Five Shillings for every head or lot of Live Stock before obtaining a ticket of permission to bring their Cattle into the Show Yard.

Persons intending to exhibit Extra Stock must give notice to the Secretary on or before the 1st of July.

No Stock will be admitted into the Show Yard before Seven o'clock in the Morning, nor later than Nine o'clock on Monday Evening, nor before Four o'clock on the following Morning, Tuesday the 16th of July; and Stock of every description must be in the Show Yard before Eight o'clock that Morning, and will remain in the charge of the Society until Seven o'clock on Wednesday Evening.

No Animal can be removed during the Show without an order obtained from the Stewards of the Show Yard.

Whenever reference is made to Weights or Measures, it is to be considered that the Imperial Weights and Measures are alone referred to.

Persons intending to exhibit Implements, Roots, Seeds, &c. must give notice of their intention to the Secretary, and furnish him with a description, on or before the 10th of July; and all such Implements, Roots, Seeds, &c. must be brought to the Show Yard on Monday the 15th of July.

Tickets of Admission to the Show Yard can be had before Twelve o'clock on Wednesday Morning the 17th of July, by exhibitors of stock, gratis; by the Public at a charge of Two Shillings and Sixpence each; and after Twelve o'clock that Morning the Public to be admitted at One Shilling for each person.

The Tickets to be had at the entrance into the Show Ground, and at the Star and Angel Hotels.

All Stock, and other Articles for Exhibition, to enter the Show Yard at the approach by Holywell Church, and Visitors to enter from the Parks, next Wadham College Gardens.

No Person to be allowed to enter the Show Ground without a ticket of admission.

Arrangements will be made for a Sale by Auction on Thursday the 18th, in the Show Yard, of such portions of Stock exhibited as Proprietors may decide to submit for Sale, of which due Notice will be given, and Catalogues prepared.

Admittance to the Yard, on the day of Sale, One Shilling each person.

All Exhibitors having Animals for Sale are requested to give notice thereof to the Secretary, 5, Cavendish Square, on or before the First of July.

DINNER,

In Queen's College Quadrangle, High Street,

On WEDNESDAY the 17th of July.

Books to be opened both at 5, Cavendish Square, and at the Star Hotel, Oxford, for the insertion of Names of Members of the Society desirous of engaging Tickets for the Dinner, which will be kept open until the First of July.

Tickets will be reserved for such applicants at Oxford.

LODGINGS, &c.

Registers will be kept at the Bars of the Star and Angel Hotels, Oxford, to enter particulars of Lodgings, &c. offered for the occasion; and all Persons having Rooms, Stables, or Coach-Houses to Let, or requiring such accommodation, are requested to apply to Mr. Griffith, at these Hotels.

N. B. On Tuesday the 16th Trials of Agricultural Implements will take place; and the Prize Essays will be read in the Town Hall, open to all Subscribers to the Society.

Committee Room, Star Hotel, Oxford, June 15, 1839.

H. HALL. Printer, Oxford.

caravans and conveyances of all kinds, capable of containing cattle, sheep, &c., were seen hastening to the centre of attraction. By Monday evening the greater portion of the stock for exhibition had arrived, and by eight o'clock on Tuesday morning the entire space allotted for the exhibition was occupied.[1]

The proceedings commenced on Tuesday morning, July 16, with a trial of implements in a field adjoining the Show-ground, those tested being a subsoil plough, Biddell's scarifier, a drill for depositing manure for turnips, and one or two others; but the ground was not in very good condition for displaying their action to the best advantage. In the afternoon a meeting was held at the Town Hall, where various prize essays were read—viz., one by Col. Le Couteur, of Jersey, on the most approved varieties of wheat hitherto introduced into England; another by Mr. Handley, M.P., on the comparative advantages of wheel and swing ploughs; and a third by Mr. Richard Hopper, of Nottingham, on the advantages of drawing turnips from the land and consuming them in houses or yards. Mr. J. W. Childers, M.P., sent a communication on the advantages of shed-feeding for sheep; and the President, Earl Spencer, read some physiological observations on the gestation of cows, deduced from his own experience. These matters disposed of, a party of about three hundred and sixty gentlemen made an agreeable ending of the day's proceedings by dining together at the Star (now the Clarendon) Hotel, under the presidency of Lord Spencer.

Next morning Oxford was astir at an early hour, for the Show-ground at Holywell was opened to the public at seven o'clock, and from that time until the evening a continuous stream of visitors passed through the gates. "The influx of visitors from many miles around Oxford was exceedingly great, the principal streets being completely lined with gigs, coaches, and other conveyances, whilst the town throughout the whole day presented such a scene of bustle as was never, perhaps, before witnessed. The crowd waiting for admittance to the Show-yard was so extensive that, immediately the gates were thrown open, the rush was so tremendous that many gentlemen had their coats torn from their backs. Although 5,000 tickets of admission had been printed, before ten o'clock the whole had been disposed of at 2*s*. 6*d*. each. The consequence was that some thousands who were unable to obtain them were refused admittance to the Show. It was calculated that upwards of

[1] *Bell's Weekly Messenger*, July 22, 1839.

15,000 noblemen and gentlemen and farmers reached the town by various conveyances." [1]

Exhibitors of stock were admitted without payment; until one o'clock tickets were issued at 2*s*. 6*d*.; after that time shilling tickets became available, and, though 12,000 had been prepared, these were soon sold, and the Committee had to take money at the entrance. Altogether not fewer than 20,000 persons attended the Show in the course of the day, and the receipts amounted to 1,189*l*. Though not unaccustomed to functions of special interest and attraction, Oxford had never before seen such an influx of strangers. The day being very fine, the streets were thronged with vehicles and pedestrians, the inns with company, and many found no little difficulty in securing food and lodging. The attendance, indeed, surpassed the most sanguine expectations, and must be regarded as extraordinary, when we consider the difficulty and expense attendant on locomotion in those days.

Although there is nothing specifically stated in the records as to the time of the judging, it must have taken place on the day (Tuesday) before the Show was open to the public,[2] as all the animals had to be in the yard at 8 A.M. that day, and in the early years of the Society's history it was considered to be of cardinal importance that the utmost secrecy should be observed as to the names of the Judges, the animals brought before them, and the awards made. For a considerable period, indeed, after the Oxford Meeting, the most elaborate precautions were taken to ensure the privacy of the Judges whilst they were engaged upon their awards. Sir Brandreth Gibbs, who commenced his long series of eminent services to the Society at Oxford in the capacity of assistant to his brother, Mr. Humphrey Gibbs, thus describes the original system of judging in a letter which was published in the Journal for 1885 [3]:—

> Public judging was not contemplated, and so great was the desire for secrecy, that the animals arrived under a fictitious number, which was changed for a permanent number early in the morning of the judging day; this being intended to frustrate any knowledge on the part of the Judges as to the ownership of the animals. Such a precaution now seems strange

---

[1] *Bell's Weekly Messenger*, July 22, 1839.

[2] Probably the artist who drew the picture of the Oxford Meeting which is reproduced as an illustration to this article intended to portray the calm of the judging day, and not the bustle of the Show itself. The group in the right-hand corner appears to consist of the Duke of Richmond, with his back to the post; Mr. Handley arguing with his Grace, but seemingly not making much impression; and Lord Spencer in a characteristic attitude, with his hands in his pockets.

[3] Journal, Vol. XXI, Second Series, pp. 614, 615.

THE ENGLISH AGRICULTURAL SOCIETY'S SHOWYARD AT OXFORD, 1839

From a contemporary lithograph]

indeed, because the number of shows at which animals compete, and their coming year after year, from calves up to full maturity, makes all the notable stock so well known, that the best precaution is to have Judges in whose honour and integrity perfect confidence may be placed. The award also was, as far as possible, kept secret until it was publicly announced at the Council dinner, which took place on the judging day.

At Oxford the awards were apparently not announced until the great dinner, held in the quadrangle of Queen's College, on the afternoon of the Show day; but at Cambridge, in the following year (as will be seen on p. 226), they were made known on the evening previous to the opening of the Show-yard.

As the list of Judges at Oxford has never been published in the Society's Journal, I subjoin it below:—

List of Judges at Oxford Meeting, 1839.

Class I. [Shorthorns.]
Mr. T. Charge
Mr. W. Smith
Mr. J. Hall

Class II. [Herefords.]
Earl Talbot
Mr. J. Ashdown
Mr. W. Warner

Class III. [Devons.]
Mr. W. Wyndham
Mr. E. Pestur
Mr. W. Umbers

Class IV. [Cattle of any other Breed.]
Mr. W. F. Paley
Mr. T. Charge
Mr. J. Asbdown

Class V. [Dairy Cattle.]
Mr. C. Stokes
Mr. S. Bennett
Mr. W. Smith

Class VI. [Oxen.]
Mr. W. Wiley
Mr. Short
Mr. W. Pratt

Class VII. [Horses.]
Lord Moreton
Sir F. Lawley, Bart.
Mr. Quarterman

Class VIII. [Leicester Sheep.]
Sir F. Lawley, Bart.
Mr. W. Wiley
Mr. T. Chapman

Class IX. [Southdown or other Short-woolled Sheep.]
Mr. T. Weall.
Mr. T. Northeast.
Mr. H. Overman.

Class X. [Long-woolled Sheep.]
Mr. Clark
Mr. R. Martin
Mr. Edmunds

Class XI. [Pigs.]
Mr. Dodd
Mr. Salter
Mr. Stokes

Class XII. [Extra Stock, Implements, Roots and Seeds.]
Mr. H. Handley
Mr. J. Parkes
Mr. Morton

The following were the awards of the Judges, as announced by Mr. Handley, M.P., at the great dinner held on the Wednesday afternoon:—

Prizes awarded at the English Agricultural Society's Meeting at Oxford, Wednesday, July 17, 1839.

Class I.—Shorthorns.

			Entries
Bull . . .	30 sovs.	Mr. Thos. Bates, Kirkleavington, Yorkshire	7
Cow in milk .	15 "	Ditto ditto	4

PRIZES AWARDED AT OXFORD, 1839—*continued.*

			Entries
In-calf Heifer, not exceeding 3 yrs.	15 sovs.	Mr. Thos. Bates, Kirkleavington .	3
Yearling Heifer .	10 ,,	Ditto ditto .	9
Bull Calf . .	10 ,,	Marquis of Exeter, Burghley Park, Northamptonshire . . .	4

CLASS II.—HEREFORDS.

Bull . . .	30 sovs.	Mr. Thos. Jeffries, jun., The Grove, Pembridge, Herefordshire . .	6
Cow in-milk . .	15 ,,	Mr. Jas. Walker, Northleach, Gloucestershire	6
In-calf Heifer, not exceeding 3 yrs.	15 ,,	Mr. E. West, Littlefrome, Herefordshire	5
Yearling Heifer .	10 ,,	Mr. J. Hewer, Hampton Lodge, Herefordshire	3
Bull Calf . .	10 ,,	Mr. J. Walker, Burton, nr. Wrcstr. .	4

CLASS III.—DEVONS.

Bull . . .	30 sovs.	Mr. M. Paull, Compton Paunceford, Somerset	4
Cow in-milk . .	15 ,,	Mr. J. W. Peters, South Petherton, Somerset	5
In-calf Heifer, not exceeding 3 yrs.	15 ,,	Mr. M. Paull, Compton Paunceford, Somerset	2
Yearling Heifer .	10 ,,	Ditto ditto .	2
Bull Calf . .	10 ,,	Ditto ditto .	2

CLASS IV.—ANY BREED OR CROSS, not qualified for the foregoing Classes.

Bull . . .	30 sovs.	Mr. R. Hortin, Sherbourne, Warwickshire (pure Longhorned bull).	6
Cow in-milk . .	15 ,,	Mr. J. Putland, Firle Place Farm, near Lewes (pure Sussex cow) .	5
In-calf Heifer, not exceeding 3 yrs.	15 ,,	No entry.	
Yearling Heifer .	10 ,,	Mr. T. Stephens, Whitelackington, Somerset (Hereford and Devon heifer).	4
Bull Calf . .	10 ,,	Mr. Cother, Middle Aston, Oxon. (Hereford and Durham bull calf).	2

CLASS V.—DAIRY CATTLE.

Cow in-milk .	15 sovs.	Rev. J. R. Smythies, Lynch Court, Hereford (9-yr-old Hereford cow)	6
	10 ,,	Mr. Joseph Badcock, Pyrton, near Tetsworth, Oxon. (14-year-old Durham cow)	

CLASS VI.—OXEN.

Best 5 Oxen, shown as grazing animals . . .	20 sovs.	Mr. R. Rowland, Creslow, Bucks, (5 Hereford oxen)	3
	20 ,,	Mr. W. Trinder, Wantage, Berks. (5 North Devon oxen). . .	

PRIZES AWARDED AT OXFORD, 1839—*continued.*

CLASS VII.—HORSES.

			Entries
Cart Stallion .	20 sovs.	Mr. T. Freeman, Henham, Suffolk, "Briton" (8 years old) . .	10
Cart Mare and Foal	10 „	Mr. J. Osborne, Chilton, Bucks .	6
Stallion for breeding Hunters, Carriage Horses, or Roadsters .	30 „	No merit	8

CLASS VIII.—LEICESTER SHEEP.

Shearling Ram .	30 sovs. 10 „	Mr. S. Bennett, Ridgmont, Beds . Mr. J. Inskip, Marston, Beds . .	10
Ram of any other age . . .	30 „	Mr. J. Earl, Earl's Barton, Northamptonshire (3-year-old) . .	15
Pen of 5 Ewes, with their lambs	10 „	Mr. R. Archer, Tachbrook, Warwickshire	2
Pen of 5 Shearling Ewes . .	10 „	Mr. T. Umbers, Wappenbury, Warwickshire	3

CLASS IX.—SOUTHDOWN, OR OTHER SHORT-WOOLLED SHEEP.

Shearling Ram .	30 sovs. 10 „	Mr. S. Grantham, Stoneham, Sussex . . . . . Mr. J. Harris, Hinton, Berks . .	10
Ram of any other age . . .	30 „	Mr. T. Crisp, Gedgrave, Suffolk . .	15
Pen of 5 Ewes, with their lambs	10 „	Mr. J. Maton, Collingbourn, Wilts.	2
Pen of 5 Shearling Ewes . .	10 „	Ditto ditto .	7

CLASS X.—LONG-WOOLLED SHEEP.

Shearling Ram .	30 sovs. 10 „	Mr. C. Large, Broadwell, Oxon (Oxfordshire and Long-woolled) . Mr. W. Slatter, Stratton, Gloucestershire (Improved Cotswold) .	6
Ram of any other age . . .	30 „	Mr. C. Large, Broadwell, Oxon (Oxfordshire and Long-woolled)	5
Pen of 5 Ewes, with their lambs	10 „	Mr. J. Hewer, Eastington, Gloucestershire (Cotswold) . . .	3
Pen of 5 Shearling Ewes . .	10 „	Mr. C. Large, Broadwell, Oxon (Oxfordshire)	3

CLASS XI.—PIGS.

Boar	10 sovs.	Right Hon. C. S. Lefevre, M.P., Heckfield Place, Hants . .	8
Sow	5 „	Mr. G. Carrington, jun., The Abbey, Great Missenden, Bucks . .	4
Pen of 3 Pigs of same litter above 4 and under 9 months . .	10 „	Mr. R. Smallbones, Hordley, Oxon., (Chinese and Oxfordshire) . .	4

It will be seen that of these animals Mr. Bates's Shorthorns only were brought from a very long distance, and one can very well understand the interest they excited amongst the visitors, most of whom had never set eyes on such bovine perfection before. There were, indeed, several animals that had to travel a hundred miles or more, from Suffolk, Sussex, and other counties, and this enterprise on the part of distant breeders was very commendable, considering the circumstances of the time; but, taken as a whole, the stock was necessarily drawn from a somewhat limited radius.

The Shorthorns especially, with the exception of the Kirkleavington stock, were bred in the neighbourhood, and the great superiority of the Duchess tribe impressed all who saw them. Indeed, many of the older authorities have been known to declare that, notwithstanding the great progress which has since been made in all departments of agriculture, it is questionable if any advance has been made upon these representatives of a famous breed. That excellent judge, Mr. George Drewry, writes, "The two things I remember best at Oxford were the 'Duke of Northumberland' and 'Duchess 43rd,' which I still think the two best Shorthorns I ever saw." The two tribes of cattle from which the animals exhibited by Mr. Bates were bred have become famous in the history of Shorthorns, and in the prosperous times of a few years ago realised fabulous prices. It is worthy of note that the cow (out of the Matchem Cow) with which Mr. Bates won the first premium for the best cow in milk was afterwards named the "Oxford Premium Cow," and from her and her half-sister was bred the famous "Oxford" tribe, a strain which was so long and successfully bred by the late Duke of Devonshire at Holker Hall.

One other class remains to be noticed—Class XII. for Extra Stock, Implements, Roots and Seeds, for prizes in which 50*l.* was placed at the disposal of the Judges. In this most comprehensive class, which even included the implements, a prize of 10*l.* was awarded to Mr. S. Druce, of Eynsham, Oxon., for a Hereford ox; 5*l.* to Mr. John Pinfold (on whose ground the Meeting was held) for another ox of the same breed; 5*l.* to Mr. J. H. Langston, of Sarsden, Chipping Norton, for a Shorthorn cow; 5*l.* to Mr. R. Pratt, of Spilsbury, Oxon., for 3 long-woolled wethers; and 3*l.* to the Duke of Norfolk for 3 two-shear wethers. The extra stock also included a 9-year-old Nogore cow, from Delhi, exhibited by Mr. Wood, of Bramdean House, Alresford, Hants, remarkable for its alleged ability to travel at the rate of eight miles an hour—one of a breed utilised in India for State purposes. There were also 4 horses, 10 sheep (including Doomba rams from Allahabad, shown by Mr. H. Newnham, of Silchester Bungalow, Basingstoke, and Mr. T. Gibbs, of Half Moon Street, Piccadilly), and 4 pigs.

In addition to the prizes originally contemplated, the Committee had decided on December 18, 1838, in pursuance of a suggestion made by the Rev. J. R. Smythies, at the General Meeting held earlier on that day, that two prizes of 50*l.* each should be offered for the best 14 bushels of white and 14 bushels of red wheat of the harvest of 1838, grown by the exhibitor. Keen competition was excited for these prizes, there being no fewer than 22 entries. The Judges selected four samples, shown respectively by Lieut.-Gen. Sir Edward Kerrison, Bart., M.P., of Oakley Park, Eye, Suffolk; Mr. H. Seawell, of Little Bookham, Surrey; Mr. Wm. Spencer, of Adderbury, near Woodstock; and Mr. Wm. Fisher Hobbs, of Mark's Hall, Coggeshall, Essex; and it was intended that these should be sown in the following autumn by three farmers, under the direction of the Society, that the results should be duly reported, and that 10*l.* should be given to each of the two unsuccessful competitors. But it so happened that when the public had satisfied their curiosity by personal examination of the selected samples in the approved market fashion, they were not over-particular in restoring the handfuls of corn to the sacks from which they had been taken. The consequence was that before the close of the day they became hopelessly mixed, and at a meeting of the Committee it was resolved that, as it had become impracticable to carry out the contemplated experiments with any satisfactory degree of accuracy, the exhibitors of the selected samples should receive a "complimentary premium" of 20*l.* each, "with the Society's regrets," and have their wheat returned to them.

The only portion of the "Extra Stock" left unnoticed is the implement section, so modest in its proportions that the list of exhibits occupies less than one of the sixteen pages which sufficed for the Oxford catalogue. As this list is of special interest now, it may be worth while to give it complete:—

EXTRA STOCK.—IMPLEMENTS.

Mr. J. Le Boutillier, of St. Mary's, Isle of Jersey, a small one-horse plough, for setting potatoes, and a paddle plough for tilling the ground.
Mr. W. J. Hannam, of Burcott, Oxon., a wilkie (of Udington) expanding horse-hoe and harrow.
Mr. W. J. Hannam, of Burcott, Oxon., a ridging and moulding plough.
Messrs. W. & C. King, of Southmore, Berks., a narrow-wheeled Berkshire waggon, with iron axle-tree.
Mr. J. Springall, of Ipswich, Suffolk, patent wrought-iron corn stack stand.
Mr. James Gardner, ironmonger, of Banbury, patent turnip-cutting machine.

Mr. J. Gibbs, of Elsfield, a draining plough.
Mr. H. J. Hannam, of Burcott, Oxon., a one-horse harvest cart.
Messrs. Jones & Draper, of Charlbury, a "scorcher" machine.
Mr. J. Adams, of Great Tew, Oxon., a wrought-iron plough, with mould-boards, &c.
Mr. W. J. Hannam, of Burcott, Oxon., a one-horse heavy roll.
Mr. Samuel King, of Buckland, Faringdon, a swing plough and other implements.
Mr. W. J. Hannam, of Burcott, Oxon., a Perry and Barnett's (of Reading) light plough for a single horse.
Mr. T. White, Coundon, near Coventry, a new subsoil plough.
Mr. C. Hart, of Wantage, a four-horse portable thrashing machine, a swing plough for two horses, a wheel ditto for three ditto, and a 14-wheel land presser.
Mr. T. Salter, of Great Hallingbury Hall, an improved corn-dressing machine.
Mr. T. Grounsell, of Louth, a newly invented drill, to deposit seed and manure at the same time.
Mr. W. J. Hannam, of Burcott, Oxon., a Cumberland one-horse cart, with a spring key or tilting stick.
Mr. W. Armstrong, Hawnes, Beds., newly invented harrow.
Mr. R. Edmunds, of Banbury, two improved turnip machines.
Mr. J. Russell, of Kenilworth, Warwickshire, a subsoil plough.
Mr. P. Cox, of Stow, Gloucestershire, a dynamometer, &c.
Mr. E. J. Lance, Barossa Cottage, near Bagshot, machines for sowing manure and seeds at the same time.
Messrs. Ransome, of Ipswich, Suffolk, ploughs, chaff-cutters, thrashing-machine, &c., &c.

Messrs. Ransome, of Ipswich (according to the Journal), "sent up their waggons laden with more than six tons of machinery and implements, the superior manufacture and variety of which commanded universal approbation," and were awarded the Gold Medal of the Society for their excellent display, especially their chaff-cutting machines and Biddell's scarifier.

Although they do not appear in the list as actual exhibitors, the Journal also makes mention of the names of Howard, Garrett, and others familiar to agriculturists, as having been represented by implements shown at the Meeting. As some readers may be curious respecting the "scorcher" exhibited by Messrs. Jones and Draper, it may be explained that it was a machine for destroying weeds, having at the lower end a fire-place with a revolving blower; and it was stated that, by the consumption of 5 cwt. of coals, it would in a day kill all the weeds on an acre of ground as soon as it was cleared of its crop.

Viewed in the light of modern experiences, the display was a meagre one indeed; but insignificant as the Show was in comparison with the gigantic displays of later years, it was nevertheless regarded as "on a scale of unprecedented magnitude"—to use the words of a very sedate contemporary authority, the

Gentleman's Magazine. The Society's Journal, in its somewhat vague and sketchy account of the Meeting, states that "the show of live-stock was numerous, and in most of the classes there were as many superior animals as have often been exhibited together before." But it adds, with commendable candour, that there "were several of a very inferior description." We are further told by the Journal that "it must be admitted that, if a foreigner had come to Oxford, expecting to see the best show of breeding stock which England could produce, he would have been led to form a very inadequate idea of the merits of the different sorts of live-stock bred in this country." Nevertheless, "the number of excellent animals shown, and the admirable arrangements for showing them which had been made by the Stewards, rendered the exhibition a most interesting and attractive one to the thousands who came (some from great distances) to view it." [1]

A more independent authority, the *Quarterly Journal of Agriculture*, says that "upon the whole the Show was not so great, nor the stock so generally good, as might have been expected," and that, "with the exception of a few animals in each kind of stock, the quality was in no way remarkable." After noticing Mr. Bates's animals as "the only Shorthorns worth looking at," and referring in commendatory terms to Mr. Hortin's Longhorned bull, Mr. Paull's Devon "queys" and bull-calf, Mr. Jeffries' Hereford bull, and Mr. Druce's fat ox, the writer proceeds to state that the sheep "were in general good, and proved a pretty extensive show," but the pigs were "neither numerous nor good."

It is pretty obvious, however, that the Show itself was regarded as of subsidiary importance to the great gathering of agriculturists at the annual dinner of the Society. For this dinner immense preparations had been made. The quadrangle of Queen's College had been roofed in and adapted for the purpose at a cost of over 800*l.*, and accommodation had been provided for 2,450 guests—a goodly company indeed, considering that the price of the tickets was 10*s.*, and that not more than fifty were distributed gratis amongst the representatives of the press, &c. Every window of the surrounding buildings was filled with ladies, who were thus enabled to lend the charm of their presence to the proceedings in the banqueting-hall, a representation of which appeared in various forms, and was also published in the *Oxford Herald* a week later.

[1] Journal, Vol. I., 1840, pp. lviii–lix.

At least 1,000 prospective diners were waiting at the doors an hour before the feast began, and punctually at 4 P.M. the outgoing President (Earl Spencer) took the chair. The company included nearly all the leading members of the Society, together with several distinguished guests, amongst whom were the Chevalier Bunsen, and the great American statesman—perhaps the greatest orator the United States has ever produced—Daniel Webster, who was then, for the first and only time in his life, on a visit to Europe, and devoted particular attention to the agriculture of England and Scotland. Lord Spencer was, of course, overjoyed to witness the successful issue of the Meeting. During the proceedings his Lordship remarked that for many years past the formation of such a Society had been his urgent desire, and he had been apprehensive lest the effort might be attended with failure; but if he had entertained any feeling of concern as to whether it would meet with the real support of the farmers of England, the question had now become no longer a matter of doubt, for he saw before him the most convincing proof that the movement had resulted in the highest success.

Amongst the other speakers were the Duke of Richmond (the President-elect), the Vice-Chancellor (replying for the University in the absence of the Duke of Wellington, the Chancellor), Sir James Graham, Chevalier Bunsen, the Earl of Devon, the Provost of Queen's, Mr. Daniel Webster, the Mayor of Oxford, Mr. Handley, M.P. (who read out the lists of the successful competitors), Lord Moreton, the Marquis of Downshire, Lord Stradbroke, Lord Talbot, Lord Sandon, Sir Thomas Acland, the Rev. Dr. Buckland, Mr. Philip Pusey, and Mr. Shaw (the Secretary).

Those were the days of portentously long toast lists, and interminable after-dinner speeches; but the visitors present appear to have maintained their enthusiasm to the last, for "loud cheering" and "immense cheering" punctuate the report of almost every speech up to the last, when the toast of "the Agricultural Labourer" was drunk with "loud applause and three times three." The success of the evening was, however, made by Mr. Daniel Webster, the American statesman, whose stirring oratory appears to have thrilled all present.

Lord Spencer having coupled his name with the toast of "Distinguished Strangers," as that of "a most illustrious visitor from the country whose people we are obliged legally to call foreigners, but who are still our brethren in blood," Mr. Webster, in responding, said that he was more than ordinarily moved by the spectacle of so great an assemblage of persons, whose interests, hopes, objects, and pursuits were connected with the cultivation of the soil.

Whatever else (he continued) may tend to enrich and beautify society, that which feeds and clothes comfortably the great mass of mankind should always be regarded as the great foundation of national prosperity. I need not say that the agriculture of England is instructive to all the world; as a science, it is here better understood; as an art it is here better practised; as a great interest, it is here as highly esteemed as in any other part of the globe. The importance of agriculture to a nation is obvious to every man; but it, perhaps, does not strike every mind so suddenly, although certainly it is equally true, that the annual produce of English agriculture is a great concern to the whole civilised world.

After speaking of the great advantage to agriculture which must result from the formation and operations of the Society, Mr. Webster went on to remark that societies on a similar principle had been found very advantageous in the United States, and that among other means of improving agriculture they had imported largely from the best English breeds.

I am sure (he continued, alluding doubtless to Mr. Thomas Bates of Kirkleavington) that a gentleman who has to-day deservedly obtained many prizes for stock will not be displeased to learn that I have seen, along the rich pastures of the Ohio and its tributary streams, animals raised from those which had been furnished by his farms in Yorkshire and Northumberland.

In conclusion, Mr. Webster made a noble response to the fraternal tone of Earl Spencer in proposing his health :—

The noble chairman (he said), was pleased to speak of the people of the United States as kindred in blood with the people of England. I am an American. I was born on that great continent, and I am wedded to the fortunes of my country, for weal or for woe. There is no other region of the earth which I can call my country. But I know, and I am proud to know, what blood flows in these veins. I am happy to stand here to-day, and to remember that, although my ancestors, for several generations, lie buried beneath the soil of the Western continent, yet there has been a time when my ancestors and your ancestors toiled in the same cities and villages, cultivated adjacent fields, and worked together to build up that great structure of civil polity which has made England what England is.

Confirmation has been received from various sources, including the vivid reminiscences of Mr. W. P. Hoblyn, of The Fir Hill, St. Columb, Cornwall, and others who were present, of the statement appended to this striking speech in the first volume of Webster's collected works, to the effect that "he made a deep impression on those who heard him." His "flowing eloquence," says a later writer,[1] "contrasted strangely with the hesitating and involved sentences of Lord Spencer, whose style of speaking in the House of Commons, subtracting nothing from his great

[1] Hon. Francis Lawley, in his report on the Exhibition of Horses at Kilburn. See Journal, Second Series, Vol. XV., p. 572.

and deserved influence, is elaborately described in Mr. Greville's famous Memoirs;" but his Lordship's utterances, as well as those of the Duke of Richmond—an illustrious soldier who had fought through the Peninsular War and at Waterloo—secured for these most earnest friends of the Society the warmest reception.

The late Mr. J. Chalmers Morton, who was present on the occasion, thus incidentally describes the scene in the Journal for 1885 [1]:—

I remember the faces and the voices of many of our great leaders present at the Oxford Show—the homely, kindly presence of the late Earl Spencer, our first President; the sonorous voice of the late Duke of Richmond, who succeeded him; Mr. Pusey's pale and anxious, somewhat absent-looking face; Mr. Handley's hearty jollity; Baron Bunsen's staid and placid countenance; the voice, good nature, and the humour of the Rev. Dr. Buckland—a distinguished row, seated as they were with others at the daïs; Daniel Webster, also evidently a great power both bodily and intellectually; Sir Thomas Acland, bright-eyed, eager-looking; and Sir James Graham—all of them speakers at the banquet. These were men and faces likely to impress themselves on the memory; and perhaps it is not surprising that, in comparison with them, I do not remember the young man [Mr. Brandreth Gibbs] then already busily engaged in the Show-yard in assisting his elder brother, Mr. Humphrey Gibbs, to whom the Stewardship of the Yard had been committed.

The remnants of the dinner—about 2,000 lb. of meat—were distributed to 700 poor families recommended by the parochial clergy, and on the following day (Thursday) the Meeting was brought to a conclusion by a sale of stock from the Show-ground, at which the following prices were obtained for some of the prize animals:—Mr. Paull's Devon bull, 3 years 2 months, 94*l.*; Mr. Hortin's Longhorned bull, 4 years 4 months, 43 guineas; Mr. Peter's Devon cow, 9 years 3 months, 35 guineas; Mr. Paull's Devon heifer, 2 years 3 months, 140*l.*; Mr. Thomas Stephen's yearling heifer, Hereford and Devon, 37*l.*; Mr. Paull's Devon bull calf, 23 weeks, 43*l.*; Mr. Archer's 5 Leicester ewes (with their lambs), 9*l.* 10*s.* each; and Mr. Thomas Crisp's Southdown ram, 30*l.*

Remarking generally on the results of this Oxford Meeting the *Quarterly Journal of Agriculture* says:—

As a first effort, the getting up of the Meeting was highly creditable to the English Agricultural Society, and it fully indicated that, if they are capable of such exercise in infancy, what will they not be able to accomplish in maturer years? Indeed, we conceive that the impulse which the Society is likely to give to agricultural improvement in England will draw so many of the agriculturists of that wealthy and powerful nation around their banners, that they will soon become a larger body than it will be possible for one board of managers to wield their movements.

[1] Journal, Second Series, Vol. XXI., p. 612.

Cambridge Meeting, 1840.

The first Country Meeting having been held in one University town, it was but natural that the other should be similarly honoured, and, even before the Committee quitted Oxford, a requisition to that effect was presented from Cambridge. Two days later (on July 20) the second annual Stock Fair took place at the latter town, and at an "ordinary" held in the afternoon at the Red Lion Hotel, the proposal to hold the 1840 Meeting at Cambridge was viewed with cordiality by Mr. Jonas Webb, Mr. Witt, and others, who had just returned from the Oxford Show. A local committee was appointed, with the Mayor (Mr. R. Foster) as its chairman, and Mr. F. Barlow as secretary, and the Minutes of this Committee show how zealously they worked to secure the success of the Meeting, being in constant communication with the Society's Secretary, Mr. James Hudson, who had, on July 24, been appointed to that office on the resignation of Mr. Shaw.

We find here, amongst other matters, the proud intimation to Mr. Barlow that "our title is 'Royal Agricultural Society of England'" (a Royal Charter having been granted by Her Majesty on March 26, 1840); an application from Messrs. Ransome for an area of 30 yards by 15 yards, "they to be at the expense of fencing, &c.," with similar requests from other implement-makers; an expression of a desire that the ordinary on the first day "should bear a good price, in order that the great dinner the next day may be offered to the farmers at the lowest possible rate;" an intimation that "the sealed award of the Judges would be opened at the ordinary," and "catalogues ready by next morning," and that "no attendant is to accompany stock into the yard except in case of bulls and stallions;" a minute to the effect that "a great inconvenience having been felt at Oxford from the want of places to put hats in the great dining-hall, it is now proposed to remedy that inconvenience by nailing a piece of twine opposite each seat on the under-side of the table, to which the band of the hat may be tied—nails, twine, and labour for 2,500 hats, 1*l.* 10*s.*;" and so forth. Could anything show greater concern for the comfort of the guests than this last entertaining minute?

The Prize Sheet for the Cambridge Meeting amounted in all to 900*l.*, as against 890*l.* at Oxford. The prizes for Shorthorns, Herefords, Devons, and Other Breeds were repeated as before, with the addition of a Yearling Bull prize for each breed. The prizes offered at Oxford for Dairy Cows and Oxen were not given again, but the value of the two prizes for Cart Horses was increased at Cambridge from 20*l.* and 10*l.* to 30*l.* and 15*l.* The prizes for Sheep and Pigs were the same as at Oxford, and it is significant of the importance then attached to sheep-breeding, that the only classes for which two prizes were offered either at Oxford or Cambridge were those for Shearling Rams, and that these ram prizes were worth 30*l.* for the first, and 10*l.* for the second.[1] As at Oxford, 50*l.* was set apart for prizes for "Extra Stock, Implements, Roots and Seeds," and the two prizes of 50*l.* each for the best 14 bushels of White and Red Wheat respectively were repeated.

The Council, including the Duke of Richmond, Earl Spencer, and other leading members, met at the University Arms Hotel on Saturday, July 11, and settled the following programme of the business of the week:—

ROYAL AGRICULTURAL SOCIETY OF ENGLAND.

TUESDAY, JULY 14, 1840.

1. The trial of agricultural implements will take place in a field belonging to Mr. Grain, about a quarter of a mile beyond the turnpike gate, on the Hills Road, at ten o'clock. Near to this, on the premises of Mr. Emson and Mr. Grain, thrashing and dressing machines, and other implements, will be at work.

2. A ploughing match will take place near the field where the implements are to be tried; to commence at ten o'clock.

3. The prize essays will be read at three o'clock, by permission of the Vice-Chancellor, in the law schools.

4. The dinner in the hall of Trinity College will take place at five o'clock.

WEDNESDAY, JULY 15, 1840.

1. The Show-yard will be open from six o'clock to twelve o'clock at noon, at 2*s.* 6*d.* each person, and from that hour till seven P.M., at 1*s.* each.

2. The dinner of the members of the Society will take place in the quadrangle of Downing College, at four o'clock.

3. Members to apply for tickets for the dinner on Monday, from twelve to six; on Tuesday, from eight to six; on Wednesday, from six to twelve o'clock, at the Town Hall.

4. Tickets for the Show-yard to be applied for at the booth on Parker's Piece, fronting the entrance doors.

(Signed) RICHMOND (President).

Cambridge, July 11, 1840.

N.B.—The prizes for the ploughing-match will be distributed by His Grace the Duke of Richmond at half-past two o'clock in the ploughing field.

A sale by auction of stock and other articles exhibited at the Cambridge Meeting will take place in the Show-yard, and on Thursday morning, the 16th inst., at ten o'clock precisely; entrance 1*s.* each, the Society paying the auctioneer for his attendance on the occasion.

---

[1] The Babraham flock was then in its glory, and at the fourteenth annual letting, held, with a discreet eye to business, on the day before the Cambridge Show, Mr. Jonas Webb declined the Duke of Richmond's offer of 100 guineas for one of his ram lambs. Those were, however, days of good prices generally, for only a week earlier the Osbaldeston hounds, which had hunted the old Berkeley country under the mastership of Harvey Combe, were sold at Hyde Park Corner, and the 13 lots, comprising 127 hounds, brought 6,511 guineas, or upwards of 100 guineas per couple.

By permission of the Mayor and Corporation, the Show was held on Wednesday, July 15, on the well-known Parker's Piece, and was on that account viewed with some disfavour by at least one who has since become a prominent member of the Society—Mr. Albert Pell, then an undergraduate of Trinity, who tells us among other things that on visiting the Show-ground his chief thought was how it would spoil the pitch for cricket! The following description of the internal arrangements of the yard, taken from the *Cambridge Advertiser*, will be read with interest:—

The plot enclosed for the cattle yard is upwards of 450 feet square, containing an area of nearly five acres, and is nearly level. The fence is a close-boarded one, nine feet high, with four entrances for visitors on the west side, and one as an outlet only on the opposite or east side. In the middle of the north and south sides are wide entrances and outlets for carriages, cattle, implements, &c. Within this fence at the distance of sixteen feet from it, on every side, are buildings, roofed in, sixteen feet wide, open at the sides, of which ten feet were occupied by cattle, horses, &c., the remaining six feet forming a covered way for visitors. The whole extent of these buildings is upwards of sixteen hundred feet. Within this square, at the distance of eighty feet from the last-mentioned buildings, is another entire square of buildings, roofed in, fourteen feet wide, open at the sides, and upwards of eight hundred feet in length. These buildings were occupied by sheep, pigs, corn, grain, seeds, vegetables and roots, and the smaller agricultural implements; the open spaces in the centre and between the rows of buildings were occupied by the larger agricultural implements of the most celebrated makers. There are two extra sheds, ninety feet long each, in which their implements, models, &c., were exhibited. At the south-west and north-west angles of the inner square of buildings are two rooms, fifteen feet by twelve, furnished complete, for the use of the Judges, Stewards, Committee, &c. These rooms are on a peculiar construction (the invention of the contractor, Mr. Manning), they having been made for exportation to Australia; they are fitted together as a bedstead, with screws, no nails being used, and can be put together and struck as easily as a tent.

On the Tuesday the Judges commenced their mysterious labours in the Show-yard, and the following extract from the President's speech at the first public dinner, held in the hall of Trinity College that evening, gives some curious further details as to the secrecy in the judging then considered essential:—

The noble Chairman (Duke of Richmond) said the lists had just been put into his hands, containing the awards of the Judges on their inspection of the stock that morning. It might be thought right that he should allude to certain rules which the Judges had observed, and which had had their origin with the Council, especially as there were some gentlemen for whom he had a high respect, who did not think the plan that had been pursued in all respects right and proper. On former occasions, when no lists were put upon the animals, and in which Lord Spencer had acted as a Judge, those having the charge of the animals were allowed to be present. If the members of the Association had not full confidence in the Judges, it might be thought that an *esprit de corps* would bias them in giving a prize. This plan had been altered. He was a Southdown breeder, and he confessed that he possessed the *esprit de* *corps* in favour of the county to which he belonged (hear, hear). If, then, it was permitted for the shepherd to be with the animals exhibited, the object in view—strict impartiality—might be defeated. Now, the Royal Agricultural Society of England had thought it better that the shepherds should be excluded (loud cries of hear, hear). The shepherd, who might be considered as the father of his flock, did not like to see his sheep pass over to the care of another; he watched with jealous attention, and was almost certain to be known by the Judges. The permitting the shepherds to be present during the inspection by the Judges was therefore a half measure, and which afforded no security at all (loud cheers). Under the new system all persons were excluded who were connected with the animals (hear, hear). The Judges were selected by the Council from parties from every county. The Judges, therefore, were entitled to consideration. He (the Chairman) was not at present aware if he had gained a prize or not.

Whereupon Earl Spencer (one of the Stewards, his colleagues being Messrs. S. Druce and F. Pym) rose and said that not one of the Judges at that moment knew who were the successful candidates; a remark greeted with loud cheers. They only knew the numbers affixed to the animals to which prizes had been awarded.[1] The list of awards then read by the President contained what was doubtless to His Grace the highly agreeable announcement that he had carried off the prize for a shearling Southdown ram—the first of a long series of successes for the Goodwood flock in the Royal Show-yards.

To make the story complete, it may be well to append here the list of the Judges who officiated at Cambridge, and the awards made by them:—

List of Judges at Cambridge Meeting, 1840.

Class I. [Short-horns.]

Mr. J. Wright
Mr. Eaton Clark
Mr. W. Smith

Class II. [Herefords.]

Mr. John Buckley
Mr. Robert Lucas
Mr. H. Chamberlain

Class III. [Devons.]

Mr. W. Wyndham
Mr. Stace
Mr. G. Smythies

Class IV. [Cattle of any other Breed.]

Mr. George
Mr. John Ellman
Mr. John Hall

Class V. [Horses.]

Mr. G. Clark
Mr. C. Bowman

Class VI. [Leicesters.]

Mr. John Manning
Mr. Thomas Chapman
Mr. W. Pratt

Class VII. [Southdowns or other Short-woolled Sheep.]

Mr. J. Bevan
Mr. J. Raymond Barker
Mr. H. Chamberlain

Class VIII. [Long-woolled Sheep.]

Mr. Hindley
Mr. J. Elliot

Class IX. [Pigs.]

Mr. Wilkie
Mr. Oakden

Implements.

Mr. J. Morton
Mr. R. S. Graburn
Mr. G. Legard

Seed Wheat.

Mr. G. Kimberley
Mr. B. Wilton
Mr. Samuel Jonas

[1] See *ante*, p. 212.

Prizes awarded at the Royal Agricultural Society's Meeting at Cambridge, July 15, 1840.

Class I.—Shorthorns.

			Entries
Bull . . .	30 sovs.	Mr. William Paul, Pentney, Downham, Norfolk	7
Yearling Bull .	15 „	Mr. R. M. Jaques, St. Trinian's, near Richmond, Yorkshire . .	11
Cow in-milk. .	15 „	Mr. Thomas Bates, Kirkleavington, Yorkshire	6
In-calf Heifer, not exceeding 3 yrs.	15 „	Right Hon. Charles Arbuthnot, Woodford, near Kettering . .	4
Yearling Heifer .	10 „	Mr. R. M. Jaques, St. Trinian's, near Richmond, Yorkshire . .	11
Bull Calf . .	10 „	Mr. Thomas Bates, Kirkleavington, Yorkshire	8

Class II.—Herefords.

Bull . . .	30 sovs.	The Duke of Bedford, Woburn Abbey, Beds.	3
Yearling Bull .	15 „	No entry.	
Cow in-milk .	15 „	Sir Hungerford Hoskyns, Bart., Harewood, near Ross, Hereford .	1
In-calf Heifer, not exceeding 3 yrs.	15 „	Ditto ditto	2
Yearling Heifer .	10 „	Mr. Francis Hewer, Hereford . .	1
Bull Calf . .	10 „	No entry.	

Class III.—Devons.

Bull . . .	30 sovs.	Mr. W. Porter, Hembury Fort, near Honiton, Devon	5
Yearling Bull .	15 „	The Duke of Norfolk, Fornham, Bury St. Edmunds	3
Cow in-milk .	15 „	Mr. Thomas Umbers, Wappenbury, Warwickshire	3
In-calf Heifer, not exceeding 3 yrs.	15 „	Mr. G. Turner, Barton, near Exeter	8
Yearling Heifer .	10 „	Ditto ditto	3
Bull Calf . .	10 „	Mr. Thomas Stephens, Atherstone, near Ilminster, Somerset . .	3

Class IV.—Any Breed or Cross, not qualified for the foregoing Classes.

Bull . . .	30 sovs.	Mr. J. Putland, West Firle, Sussex (Sussex)	4
Yearling Bull .	15 „	Sir E. Kerrison, Bart., M.P., Oakley Park, Suffolk (Suffolk Bull) .	3
Cow in-milk .	15 „	Mr. J. Putland, West Firle, Sussex (5-year-old Sussex) . . .	4
In-calf Heifer, not exceeding 3 yrs.	15 „	Ditto ditto (2-year-old Sussex)	1
Yearling Heifer .	10 „	Ditto ditto (Sussex) . .	4
Bull Calf . .	10 „	Ditto ditto (Sussex 5-month-old Bull Calf) . . .	1

PRIZES AWARDED AT CAMBRIDGE, 1840—*continued.*

CLASS VI.—HORSES.

			Entries
Cart Stallion .	30 sovs.	Mr. John Bell, Welton-le-Wold, near Louth, Lincs. . . .	19
Cart Mare and Foal	15 "	Mr. T. N. Catlin, Chillesford, near Orford, Suffolk	6
Stallions for breeding Hunters, Carriage Horses, and Roadsters, which shall have served Mares during the season of 1840 at a price not exceeding £3 each .	30 "	Mr. John Reynolds, Wisbeach, Cambs.	10

CLASS VI.—LEICESTER SHEEP.

Shearling Ram .	30 sovs.	Mr. Samuel Bennet, Bickering's Park, Beds.	19
	10 "	Ditto ditto .	
Ram of any other age . . .	30 "	Mr. T. E. Pawlett, Tinwell, near Stamford	19
Pen of 5 Ewes, with their lambs	10 "	Mr. T. Inskip, Marston, Bedfordshire	1
Pen of 5 Shearling Ewes . .	10 "	Mr. W. Pawlett, Barnack, Northamptonshire	2

CLASS VII.—SOUTHDOWN, OR OTHER SHORT-WOOLLED SHEEP.

Shearling Ram .	30 sovs.	The Duke of Richmond, Goodwood Park, Chichester. . . .	26
	10 "	Mr. T. Crisp, Gedgrave, near Orford, Suffolk	
Ram of any other age . . .	30 "	Ditto ditto . .	32
Pen of 5 Ewes, with their lambs	10 "	Mr. Jonas Webb, Babraham, Cambs.	4
Pen of 5 Shearling Ewes . .	10 "	Ditto ditto . .	10

CLASS VIII.—LONG-WOOLLED SHEEP.

Shearling Ram, not qualified to compete in Class VI.	30 sovs.	Mr. C. Large, Broadwell, near Burford, Oxon. (New Oxfordshire) .	9
	10 "	Mr. J. Harradine, Needingworth, near St. Ives, Hunts. . .	
Ram of any other age . . .	30 "	Mr. C. Large, Broadwell, near Burford, Oxon. (New Oxfordshire) .	10
Pen of 5 Ewes, with their lambs	10 "	Rev. J. Linton, Hemingford Grey, Hunts (Lincs. and Leicester Ewes)	2
Pen of 5 Shearling Ewes . .	10 "	Mr. E. Smith, Charlbury, near Enstone, Oxon. (Improved Oxford Ewes)	4

PRIZES AWARDED AT CAMBRIDGE, 1840—*continued.*

CLASS IX.—PIGS.

			Entries
Boar . . .	10 sovs.	Mr. E. G. Barnard, M.P., Gosfield Hall, near Halstead, Essex . .	13
Sow . . .	5 „	Mr. W. F. Hobbs, Mark's Hall, near Coggeshall, Essex . .	3
Pen of 3 pigs of same litter, above 4 and under 9 months old .	10 „	Mr. G. W. Kirkby, Eppingbury, Essex	2

On the day that the judging was going on in the Show-yard, more than fifty ploughs engaged in a ploughing match [1] on the farm of Mr. Peter Grain, on the Hills Road, and a large company, in carriages, on horseback, or on foot, assembled to witness this competition and the trial of various implements in a field near by. The late Mr. John Hicken, of Bourton, Warwickshire, who was present at this and many subsequent Meetings, wrote before his death to say that though the ground was dry and hard, some of the ploughing was exceedingly well done, and that "a boy of fifteen, with a pair of horses, made such good work with a plough with one handle, and a foot standard instead of a wheel, as to cause great attraction and general admiration."

In the afternoon, the Prize Essays (five in number) were read before a numerous company in the Law Schools, and in the evening upwards of 400 noblemen and gentlemen dined together in the magnificent hall of Trinity College, under the presidency of the Duke of Richmond, Earl Spencer occupying the vice-chair. The company also included the Dukes of Rutland and St. Albans; the Marquesses of Northampton and Downshire; Earls Lucan, Chichester, and Lincoln; Viscounts Bridport and Neville; Sir Robert Peel, Sir James Graham, the Vice-Chancellor of the University (Dr. Tatham), Professors Whewell, Buckland, and Henslow, and many others—Peers, members of Parliament, heads of houses, landowners, and tenant-farmers.

In the course of the proceedings the President congratulated the company on the fact that since the Oxford Meeting the number of members had increased from 1,200 to 3,500; the Vice-Master of Trinity (Rev. John Brown) regarded with favour the possible establishment of a Professorship of Agriculture in that University; Professors Henslow and Buckland pointed out the great advantages to be derived by agriculture from a study

[1] This did not form part of the Society's proceedings, but was under the patronage and sanction of the Council.

of geology; and Colonel Le Couteur urged the desirability of forming an Experimental Farm. The "sealed award" of the Judges was, as already stated, opened and read to the Meeting.

"On the morning of Wednesday, July 15, so early as 5 A.M. the approaches to Cambridge in every direction, so far as the eye could reach, presented one continuous line of carriages and vehicles of all kinds, horsemen and pedestrians; and these continued to increase as the day advanced. At 6 A.M. (the hour of opening), Bridge Street, Sydney Street, and St. Andrews Street were thronged, persons crowding from all parts to the centre of attraction, Parker's Piece. Immediately on the opening of the doors, at six o'clock, the yard became thronged with company, amongst whom we observed most of the nobility."[1]

The sum realised for admission during the day was between 1,600*l.* and 1,650*l.*, or some 500*l.* more than at Oxford, and it was estimated that about 25,000 people entered the Show-yard. By ten o'clock in the morning it became thronged with an immense assemblage of persons, and as it was impossible to find accommodation in the town for all the horses and carriages bringing visitors, owners were compelled to resort to the fields near the borough to stand their horses.

The entries of stock in the yard numbered 337, reckoning a pen of sheep or pigs as one entry—if counted separately there were about 460 head of stock. The various classes included 47 Shorthorns, 7 Herefords, 25 Devons, 17 "any Breed or Cross," 35 Horses, 138 Sheep, 18 Pigs, and 50 entries of "extra stock." As it had been determined that no animal which had won a first prize at Oxford should be allowed to compete for a similar premium at Cambridge, the Kirkleavington Shorthorns were not in such strong force as at the first Meeting, but Mr. Bates completed his triumphs by showing that it was as easy for him to win with a bull calf as with older animals, and he also took the prize for a six-year-old cow. This cow, by Belvedere from Red Rose 9th, was afterwards named "Cambridge Premium Rose," and became the ancestress of a tribe of cattle, long bred by Lord Braybrooke, almost as famous as Mr. Bates's Duchess and Oxford tribes. The bull prizes in the Shorthorn class were awarded to Mr. Wm. Paul and Mr. R. M. Jaques; in the Herefords, to the Duke of Bedford; and in the Devons, to Mr. Wm. Porter and the Duke of Norfolk. In the Sheep, attention was divided between Shortwools and Longwools—between the Southdown classes, in which the prizes for rams

[1] *Cambridge Advertiser*, July 16, 1840.

THE ROYAL AGRICULTURAL SOCIETY'S SHOWYARD AT CAMBRIDGE, 1840

From a contemporary lithograph]

were taken by the Duke of Richmond and Mr. Thomas Crisp, of Gedgrave, Suffolk, and those for ewes by Mr. Jonas Webb, of Babraham; and the Leicesters, in which the prizes went to sheep of the Dishley breed shown by Mr. S. Bennet, Messrs. T. E. and W. Pawlett, and Mr. Thos. Inskip.

The implement exhibitors were 31 in number, and amongst them were the names of Messrs. Ransome and Co., Garrett, Crosskill, Howard, Woods (Stowmarket), Hornsby, and Smyth (Peasenhall). A prize of 20 sovs. had been offered for a cheap and effective gorse-crushing machine; but the Judges made no award, as they did not consider the conditions were fulfilled by any one of the three competing machines. No other prize was offered for implements at this Meeting, but the Society's "honorary rewards" were given to Mr. Beart, of Godmanchester, for a tile-making machine; to Mr. Grounsell, of Louth, for an improvement in his dropping-drill; to Messrs. Garrett, for a corn and turnip drill; to Mr. Woods, for a barley roller; to Mr. Crosskill, for a clod-crushing roller and a liquid manure cart; to Mr. Wedlake, for a corn and stubble rake; and to Mr. Hannam, of Dorchester, for a skeleton harvest-cart. In justice, however, to the exhibitors, who had sent from various quarters "such a selection of implements as, beyond controversy, were never before collected in one Show-yard," the Judges also particularised others, "which, although on this occasion they were unrewarded, yet are not the less entitled to notice." Amongst these was the collection of machinery shown by Messrs. Ransome, whose "bank of ploughs (86 varieties) were arranged and elevated on planks to the height of at least twenty feet, and struck the eye of the beholder as he entered the yard"; the turnip-cutter of Messrs. Gardner & Hart; Messrs. Bond, Turner, & Co.'s cake-crusher, &c.

In the afternoon, the Duke of Richmond, as President, took the chair at the great dinner of the Society, which was held in a pavilion erected, at a cost of about 1,300*l.*, in the quadrangle of Downing College. The tables were arranged (as at Oxford) in the form of an amphitheatre, so that every one was seated with his face towards the raised platform occupied by the President, Vice-Presidents, and Council, behind which was a gallery filled with ladies.

The papers of the period are full of details of this dinner, which they seem to have regarded as the feature of the Meeting most worthy of record, the show itself being dealt with in somewhat cursory fashion. None but members had the privilege of buying tickets, and "to prevent members who cannot be present themselves selling or giving them to their friends," tickets could only be purchased at Cambridge. The *Cambridge Advertiser* described the structural arrangements of the pavilion in great detail, and a lithograph was afterwards published showing the disposition of the tables.[1]

The dinner began at four o'clock, a trumpeter stationed behind the President's chair proclaiming silence by sound of trumpet. Grace having been sung by choristers of the University, the 2,650 guests sat down to the following bill of fare: "56 lambs, 600 fowls, 100 hams, 100 tongues, 100 raised pies, 100 pigeon pies, 550 fruit tarts, 120 pieces of roast beef, 120 pieces of boiled beef, 120 pieces of roast veal, 500 salads, and 500 dishes of hot potatoes." "The appearance of the hall at the commencement of the repast was," says the reporter, "animating beyond description, the ladies' gallery forming not the least interesting part."

There was a very long list of toasts, and the after-dinner proceedings appear to have been most enthusiastic. Sir Robert Peel especially met with a great ovation. On the Chairman calling on Sir Robert to propose the toast "Success to the Royal Agricultural Society," "the most deafening acclamations arose, which lasted for at least five minutes, after which the rallying cry of 'one cheer more' was responded to with immense vehemence. The hon. baronet was about to address the company from the position he occupied on the floor (the Duke of Richmond having previously stood upon a chair in announcing the toasts), when there was a general call of 'forward,' 'stand up.' After a short lapse, during which the call of 'forward' became general, Sir Robert, stepping across the table, appeared in front of the platform and was received with the utmost applause." The Duke of Buckingham, Duke of Rutland, Marquess of Northampton, Marquess of Downshire, Earl Spencer, Earl of Hardwicke, Sir James Graham, Mr. Handley, Mr. Philip Pusey (the President-elect), and others, also took part in the proceedings.

As a record of the great event, the *Cambridge Advertiser*[2] went to the length of publishing an extraordinary edition, containing "two lithographic drawings of the cattle yard and the great dining hall, which we hope our readers will receive as a welcome and pleasing memorial of the events the anticipation of which, for some time past, has occupied the attention of the agriculturists of Great Britain, we might say of Europe, and which has brought together into this town not less than 30,000

[1] A copy of this has recently come into the possession of the Society.

[2] For the loan of a copy of this paper, I am indebted to the kindness of the present Mayor of Cambridge, Mr. E. H. Parker, J.P.

visitors—namely, the Grand Meeting of the Royal Agricultural Society of England—a Society which promises to become the means of infusing into the science of agriculture a strong and healthy vitality, pregnant with wealth and prosperity to our great nation."

The Society itself was less florid in its description of the Show; for with little regard for the efforts of the future historian, the Council contented themselves with reporting to the General Meeting of December 12, 1840, that "the success which attended the Society's Annual Meeting at Cambridge, in July, is too recent to require any comment on the part of the Council, but they beg on this occasion to report to the General Meeting that at the first Council held after the Cambridge Meeting they had the pleasure of expressing by their unanimous votes the deep obligations of the Society to the Vice-Chancellor, the heads of the colleges, and the municipal authorities of the town, for their co-operation in promoting the successful issue of the Meeting."[1]

There is little doubt that the Cambridge Meeting was a very real success, and the memories of those who attended the Show and still survive are full of pleasant recollections of it. Mr. Clare Sewell Read, amongst other contributory notes, writes: "My earliest recollections of the R.A.S. are connected with the Cambridge Show in 1840. I was then a schoolboy, and I remember in my summer holidays driving my good father to Norwich, where he was joined by five relatives, all bound for the great Agricultural Show. It was before the days of our London railway, so they started very comfortably in a roomy 'post-chay,' with four good horses and two postboys. These were no more horses than were needed, for they were such a sample of Norfolk yeomen as you could hardly find in the county now—all save one standing six feet, and he made up for his want of stature by weighing over sixteen stone. This jolly party had their head-quarters at Newmarket, driving to Cambridge while the Show lasted. I felt very proud that week, being left in charge of a big farm to make the hay and finish off sowing the turnips for the ewes and lambs, which were drilled with rape-cake and malt-dust, a dressing for such turnips still considered by our best flockmasters preferable to any artificial manure."

By way of complement to these details of the Society's earliest shows, I have compiled the following comparative statement showing the amount of Prize money, numbers of animals

[1] Journal, First Series, Vol. II., 1841, p. iii.

exhibited, &c., at the first and second meetings held at the two University towns :—

—	First Meeting at Oxford, 1839	First Meeting at Cambridge, 1840	Second Meeting at Oxford, 1870	Second Meeting at Cambridge, 1894
Amount of Prizes offered .	£890	£900	£3,525	£5,433
Number of Entries of:				
Horses	24	35	203	617
Cattle	92	96	435	659
Sheep	81	138	548	588
Pigs	16	18	191	—
"Extra Stock" . .	34	50	—	—
No. of Implement Exhibitors.	19	31	406	442
Number of Paying Visitors .	about 20,000	about 25,000	75,749	—
Total Receipts . . .	£2,394	£3,416	£11,892	—
Total Expenditure . . .	3,556	4,354	14,397	—

The contrast between the five acres of Parker's Piece and the 64 acres of Midsummer Common, between the 337 entries of stock and 115 of implements in 1840 and the 1,864 entries of stock (besides 705 of poultry, and 538 of produce) and the 6,031 entries of implements in 442 stands in 1894, gives rise to many reflections as to the origin, progress, and probable future of the Society's annual gatherings, which have now become so important a part of agricultural history. It is gratifying to find the same interest and the same enthusiasm in the Show displayed by members in these latter days as at the beginning of the Society's life; and it may be hoped that the annual gatherings of the Society may never lose the hold which they have so long retained upon the affections of agriculturists at large.

Ernest Clarke.

12 Hanover Square, W.

WILLOWS AND THEIR CULTIVATION.

Classification of the Willows.

The genus *Salix*, to which the Willows belong, is admittedly one of the most complicated sections of the British Flora. There have been numerous lists prepared, both by botanists and by those engaged in the consideration of the subject from a more strictly commercial point of view, and it is scarcely possible to find two lists, prepared independently, that on comparison will even approximately agree with each other. The points of difference are quickly confusing, for there is at the outset remarkable difference of opinion as to the range of the genus in the number of its species and varieties, and the difficulty is increased the moment we consider the subject of nomenclature. Thus William Scaling, a cultivator of willows and a shrewd observer of facts in connexion with his calling, in 1871 and 1872 prepared and published a series of papers on "The Salix or Willow," and he there tabulated as many as 207 varieties. He was under the belief that each of these possessed some characteristics sufficiently distinctive to entitle its separate mention in the classified list.

Botanists, too, are free to admit the extreme difficulties presented by the genus, and it has been frequently noted that varieties seem to overlap and intermingle, and that hybrids constantly come in to add to the perplexities of those engaged upon the study and separation of species, and the determination and definition of features sufficiently constant and marked to constitute distinct varieties. Loudon [1] after describing the characteristics of the genus goes on to say: "The appearance of the male plant and of the female plant (for the plant is diœcious) is generally more or less different, and hence one of the difficulties in the study of this genus, the species of which may be described as in a state of inextricable confusion." The latter part of this statement seems to be extreme, and does not, probably, put the matter in its true light; but that there is some show of reason in the view thus put before us, in the sentence as a whole, a critical examination of natural specimens will quickly confirm; or, if access cannot readily be had to the plants themselves, a reference to the excellent plates in Sowerby [2] may serve to indicate what Loudon had in mind when he wrote a sentence so sweeping.

As against the 207 varieties tabulated by Scaling, however, it may be noted that Babington [3] only makes 29 species, but with these he interweaves some 60 varieties. Hooker [4] gives 17 species, whilst Bentham,[5] whose classification has at least the merit of simplicity,—so far as simplicity is safe, consistent with correctness, on the less critical basis of broadly defined differentiation, reducing the number of varieties to a minimum, and noting more particularly only clearly marked and well-maintained features,—remarks that 15 species can

---

[1] Loudon's *Trees and Shrubs of Great Britain*, 1883 Ed.
[2] Sowerby's *English Botany*, edited by John T. Boswell Syme, F.L.S.
[3] Babington's *Manual of British Botany*, Seventh Edition, 1874.
[4] *The Student's Flora of the British Isles.* By J. D. Hooker, C.B. 1870 Ed.
[5] *Handbook of the British Flora*, by George Bentham, F.R.S. 1865 Ed.

include all variations. In another field, that of Topographical Botany, the late Mr. Hewett Cottrell Watson[1] remarks: "*Salix* is another genus much like *Rubus* and *Rosa* in being inconveniently numerous in uncertain species and little-known varieties, in novelties about which most botanists must agree to differ. David Don enjoyed telling an anecdote of somebody having offended the estimable William Borrer by a remark that all sensible botanists eschewed Willows, while the crazy ones had each their own ideas about the species." He proceeded to say: "Perhaps the most sensible among us are those who rest content to look at Willows in the wilds and take least heed of their names and arrangement in books . . . 23 salices (reckoning in the omitted *aurita*) have been treated in the synopsis as quasi-specific groups or correct species. . . . I cannot make out that Hooker, Babington, Bentham, or even Boswell Syme, have subsequently written under the advantage of very complete or very clear knowledge of these difficult plants in their living reality and wild confusion. At any rate they have more usually re-said than added to their previous knowledge."

The fact of the Willow being a diœcious plant and therefore at once doubling the number for the sexes, taken in conjunction with the further fact that salices are peculiarly susceptible to hybridisation, will readily suggest that the investigator may soon find himself involved with puzzles which take a great deal of thought and examination to solve.

There have been excellent specialists who have given the closest attention to the genus—Professor Koch, William Borrer, J. E. Leefe, James Ward, N. J. Andersson, and Dr. Buchanan White, to confine the list to half a dozen names—but it often happens that we have to face paradox and perplexity in this field of investigation and registration thus narrowed when we look at the groupings as they are put before us. It seems pretty clear, however, that, with very few exceptions, the types of each species are well distributed over the divisional provinces of Britain, into which Watson has divided the home area, under numbered geographical sections.

Different methods for the better determination of species and their classification as applied to Willows have been suggested and worked out. Andersson seemed to have got a fairly clear division in the initial stages by parcelling out the genus into three families, which he terms Pleiandræ, Diandræ, Synandræ. Classification has been worked out by type form of

---

[1] Watson' *Cybele Britannica*, 1870 Ed.

the plant taken in conjunction with character of the foliage. Divisions have been arranged upon the basis of features of variation in the inflorescence, assisted by colour variation in the wood, and by natural phenomena connected with growth and development; but the matter is complicated and technical, and too complex and difficult for us to follow, satisfactorily, in a paper of this character. Anyone interested in the scientific aspect of the question will do well to consult the able and exhaustive essay on "A Revision of the British Willows," by Dr. F. Buchanan White, F.L.S.[1] This valuable review is unique in its treatment of a difficult subject, and is usefully supplemented by diagrams.

Trade Uses of the Willows.

Leaving the scientific aspect, we may next glance at the commercial side of the subject. Willows are always in demand. It cannot accurately be estimated what amount is paid year by year for imported Willows, as in the official Board of Trade accounts they are not separately distinguished in the tabulated statements from imports of other "unmanufactured goods unenumerated." Mr. Scaling wrote that in 1866 we imported, chiefly from France, Belgium, Holland, and Prussia, 4,400 tons, of the estimated value of 43,609*l.*, and baskets to the value of 45,840*l.*, and he further mentioned that there was a greatly increasing demand even at that time.

From general inquiry it seems safe to say there is now a well-sustained upward tendency in the market demand for home-grown willows. This may be in some measure attributable to the rapidly increasing area of British land devoted to fruit cultivation, an industry which makes immediate claim upon the resources of the basket factories. There are also hampers for potatoes and for other produce of the farm and the market garden; and with the extension of the railway system and of holiday excursions there continually arise new calls for packages and increased demand for crates, skips, and baskets, in the production of which the willow forms an element.

Willows for basketwork are employed in the two conditions, 'unpeeled' and 'peeled.' The unpeeled rods are, of course, the natural growths of the willow with the bark unstripped. They are further divided into two kinds, spoken of as green and brown. Green rods are those which are worked up as freshly cut. The brown rods are those which have been left to dry unpeeled and are afterwards used. The peeled willows, again, are divided into two kinds—white and buff. The white are those which have

[1] *The Journal of the Linnean Society*, Vol. xxvii., Nos. 185 and 186, 1890.

had the bark stripped off at once whilst green and sappy, so that the white wood is exposed, and thus prepared it is worked into pattern. The buff are those which have been boiled when in a brown state unpeeled, and the colouring-matter in the bark has been thus given to the underlying wood, which assumes a buff tinge, though the effect is now often secured by dyeing the white rods to the required tint.

The stronger rods are used for uprights and corners of hampers and baskets; branches of the tree kinds are used as stakes, handles of garden tools, implements, &c., whilst the timber is excellent for stone carts and barrows, and is used also for sides and bottom boards of trucks, brake blocks for railway wagons, mills, &c. In the domain of sport the cricket-bat is made of the willow. In building construction the wood is used for purposes where lightness and durability are desirable features. There are many other purposes to which willows may be put and are put, which cannot be classified as associated exactly with either commerce or trade, but are more or less accidental, as, for instance, the lining of the submerged banks of artificially formed waterways, and it is noticeable that during late years the increasing demand has been steadier, and in some districts difficulty has been experienced in getting sufficient osiers for the purposes of manufacture to which they have been applied.

Cultivated Varieties of Willows.

There is some difficulty in giving, under accurate botanical name, the identical varieties most used in particular districts and for particular work, inasmuch as the willows employed by the wicker-workers carry local names rather than scientific titles. In some cases the name is distinctly geographical, as, for instance, the name Dee Willow, here applied to the salices found growing along the margins of the river Dee, in the upper reaches, by some of the basket-makers who cut their rods from the plants found in this district. Probably at first the local name Dee Willow would include the several species found in the locality, but, gradually, the basket-makers would come to reject the kinds least suitable for their purpose and confine themselves to the use of the one kind which they found best adapted to their requirements, so that the Dee Willow is now merely the common osier used for making agricultural hampers and baskets, employed largely in the county for the transport of market-garden produce and for early potatoes and other farm crops grown for market. Another instance of the mutation of words and change of idea, in a similar way, has recently come under my notice. Amongst basket-makers a certain variety of willow is known as "Spanish." In bestowing an individuality upon the species it became known as "the Spaniard." Confusing measure with locality, it became the span-yard—its "span," or measure, a yard. These peculiarly introduced errors offer a wide field for the follower of folk-lore and antiquarian research.

There is in most districts a fairly well-recognized distinction of the sections, or groupings, of the varieties under the headings Osiers, Willows, and Sallows, but the application of these terms is not identical as to the ground covered by each in the different districts to which the terms apply, so that what may be a Willow in one place may become an Osier in another; and altogether there seems to be as much difference of opinion in the popular mind in the application of popular titles as there is in the scientific world in the effort to systematize botanical nomenclature. Then, again, sometimes salices take distinctive common names from some characteristic or quality they possess, whilst others appear to have taken their local name from some individual who had grown the variety or had in some such way become identified with some particular kind either in cultivation or in commerce.

At the Willow Beds and the Salicetum in our Chester nurseries (Dickson's) the two willows most in demand and evidently the best suited for basket-making, including heavy hampers and all such work, are the Green Willow and the Bitter Osier. These are the popular names under which these two species are grown in great numbers to meet the demand for sets or cuttings. The Green Willow here referred to is a variety evidently of *Salix viminalis*. It only seems to differ from the type plants of *S. viminalis* in that this particular variety (Dickson's Green Willow) does not seem so liable to throw out the occasional lateral branchlets found in *S. viminalis*. The Bitter Osier is evidently *Salix Kerksii*. In the Salicetum there are other varieties which seem to be nearly, if not equally, as good as these two kinds, specially grown in quantity to meet the demand for cuttings for basket rods. Amongst the more noticeable in this respect are *Helix pyramidalis*, *triandra*, *phylicifolia*, *lanceolata*, *rubra*, *rubra Forbyana*, *Lambertiana*, *Smithiana*, &c.

In a recently issued work on "British Forest Trees," [1] the following are given as the best willows for basketwork:—

Salix viminalis
Salix triandra (including Salix amygdalina)
Salix purpurea (including Salix rubra)

[1] *British Forest Trees and their Sylvicultural Characteristics and Treatment.* By John Nisbet. Macmillan & Co. 1893 Ed.

William Scaling,[1] in dealing fully with the different varieties, gives the following list as the best for ordinary basketwork:—

Salix longifolia	Salix Merriniana	Salix inflexus
„ mollissima	„ longifolia alba	„ Harrisoniana
„ rosea	„ Ballardiana	„ rubra

but as these names do not fit with the nomenclature of recognised botanical standards, we cannot, by Mr. Scaling's method, get at the exact varieties indicated under his specific titles. It seems likely, however, that several of the varieties here tabulated are of the *S. viminalis* type, and others of the *S. rubra* group.

For the heavier work it seems clear that the Green Willow (under the sections *viminalis*, *Smithiana*, or whatever name may be given to this particular variety in different localities) and *Kerksii*, the Bitter Willow (useful especially where there is fear of ravage by game), are the best. For coppice, probably *Salix caprea*, the Goat Willow, or English Palm, would be best, and for finer basketwork the varieties known commonly as the Purple Willow and the Yellow Osier are most suitable.

Cultivation and Harvesting.

We proceed to consider the cultivation of the plants. There seems to be a widely spread notion that willows will only grow in wet boggy land, and indeed that the more water in which they can be placed the better. This popular idea is entirely erroneous, but it is likely that it may have given some colour to the supposition, often indulged, that the willow crop is not profitable.

A willow plantation is usually called a "Holt," an Anglo-Saxon word meaning probably, shelter or cover, and subsequently applied to pieces of protective plantation, fitting best the character of such a tract of cultivated ground as willow beds might be likely to suggest. In the formation of a Willow Holt due care should be taken as to the kinds to be grown. Soil and situation, as well as market demand, must be well thought out. It may here be mentioned, as showing the wide range covered by the variation in growth of the willow tribe, that whilst *Salix herbacea* in its native habitat grows scarcely an inch in a year, some of the basket willows, under favourable conditions, and when regularly cut for basket rods, grow eight to ten or twelve feet in a season.

[1] *The Salix or Willow*, by William Scaling. 2nd Ed., revised and enlarged 1871.

All the varieties of the soft-wooded kinds will grow in a much damper soil than the harder-wooded kinds; but, in any case, one of the first things to be done is to secure proper drainage. All stagnant surface water should be drained off, and the bed should be well prepared by trenching the ground to the depth of twelve or fourteen inches at least, and so clearing it of surface weeds. If the land is poor it should be well manured, and if the land is strong and cold lime may be used, but with care, as if lime is applied to light land it is liable to cause the crop to canker. A deep alluvial soil is the most suitable, as it affords a rich and moist bed for the cuttings, but any heavy soil inclined to moistness may be planted. Hot land should be avoided.

Difference of opinion exists as to drains. It used to be the practice to plant willow holts in beds with broad open drains between them. This plan is still followed, but it has also become a practice to lay down the holt in a flat area with covered drains, using drain pipes in the usual way; and it is argued that this system admits of the land being cleared much more economically than where open drains have existed, though there is of course the danger that the drains may sooner or later be choked with the roots of the willows.

When the ground has been prepared carefully, the next matter is the planting; for this cuttings are required. Much difference of opinion exists amongst planters under this head also. It is pretty generally admitted that the better plan to follow is to obtain cuttings from two-year-old shoots. They may be taken, however, from one-year-old shoots, and it has been said that cuttings from such shoots strike more easily, and in many instances carry more rods than two-year-old cuttings, but they are the more quickly exhausted, and a willow bed planted with cuttings from two-year-old shoots will be likely to last the longer. The cuttings need not exceed twelve to fourteen inches each in length. The rod should be cut into these lengths with a sharp knife in a slanting direction, the cut being a clean one made with a sharp decided stroke. Taking the rod in the hand, the bottom of the cutting (the thicker end, leaving the buds directed upwards, of course) should be properly sharpened, the length for the first "set," or "cutting," properly gauged, and the cutting then made. The point at which the cutting was made will then be the bottom of the next—this will now be sharpened, the cutting measured, and a clean cut made as before; and so on until the rod shows that the point has been reached where the wood is not sufficiently matured for the purpose of making good cuttings from the ripened wood. As a rule, one-year-old shoots will give three cuttings; a two-year-old shoot may be cut up to the entire length of the first year's growth.

Planters have different ideas as to the distances which should separate the cuttings in the beds. For the ordinary basket-willows 18 inches or even less each way may be found best. Some calculate to put in about 20,000 cuttings to the acre, which would mean about 20 inches between the rows and nearly 16 inches between the cuttings in the rows; others allow about 2 feet each way, that is, between the rows and between the sets in the rows; if so arranged, about 11,000 sets to the acre would be needed. For the smaller kinds for finer work 15 or 16 inches between the rows and 8 or 9 inches between the sets in the rows may be regarded as a safe distance. Pains should be taken to insure accuracy of line and regularity of space and distance, as unevenness and irregularity would be permanent disfigurement and also a waste of land and of growth; the closest adherence to methodical arrangement insures the maximum yield of produce with the minimum expenditure of labour.

The cuttings should be pushed carefully into place, the usual practice being to put, say, two-thirds of the cutting beneath the surface, thus allowing one-third to remain above; but cuttings should not be so long as to require that they be pushed into the ground too deeply where there is moisture beneath the surface, or the ends rot. Mr. Scaling advocates, however, that the whole of the cutting should be pushed quite into the ground, so that no part of it should remain uncovered. Many advantages are claimed for this system, *e.g.*, that the rods so planted send out straight shoots—that manure can be led on to the land and spread so much better, and that the holt can be much more readily cleaned. It is a fact, too, that cuttings thus pushed quite beneath the surface strike better than those which rise above the ground-level. In the latter case it not unfrequently happens that that portion of the cutting above the ground dies down to the ground-level. In such cases the decayed portions are simply pruned away. When the cuttings have been pushed into their proper position in line, the ground should be firmly trodden about them and, the work thus completed, root action and surface growth will very quickly commence.

It is most important that the holt should be kept clean. Rank grasses and quick-growing weeds and under-scrub quickly establish themselves, and, if allowed to remain, choke the growth of the shoots and otherwise impair the success of the planting. It is desirable when cleaning to have the rubbish and débris removed at once—to compost heaps if to be rotted into manure, or to the fire if to be burned. The weeding of the beds can be done at moderate cost, as the work is not arduous and can be accomplished by unskilled labour under supervision. In going through the beds care should be taken to see that there are no blanks allowed to remain. If through any cause a dead plant is found it should be removed and an unshortened rod (not a cutting) set in its place, as, if a cutting only is put in, the rank weeds will smother it and choke it, thus leaving the blank still unfilled, whereas a rod will break at once and can be cut to its proper level the succeeding season.

In the cutting of the crop, a sharp hook, something like a short-bladed sickle, is to be used, as it is desirable to sever the rods with a clear, clean, sharp cut, avoiding split rods or torn bark. It is essential that this process should be so carefully carried out as to insure the rods being cut off close to the stools, not leaving spurs, as if spurs are left they throw out weakly shoots, and thus injure the crop of the succeeding season, and also tend to exhaust the stools. Cutting may commence in the later weeks of November or in December. The buds will then swell during the winter and will be more likely to put forth vigorous shoots than if the cutting is delayed until nearer the succeeding spring; it is also better for the land that it should be opened up to the winter frost by being stirred up after the crop is taken and cultivation made possible by the removal of the rods from the stools. It may be safe to decide the time of cutting not by the calendar so much as by the conditions of season and of crop; that is to say, the rods should not be cut until the leaves have fallen, or the stools will be weakened by the flow of sap which would follow the process if conducted at this period. On the other hand, the harvesting process must not be too long delayed, or it may encroach upon the period of the flow of sap for the coming season. During the early summer the spaces between the rows should be cleaned by hoe or fork or both. As a rule one cleaning will be found sufficient for the summer. The cost need not be much, but would necessarily vary. Estimates have been formed at from 10*s.* to 20*s.* per acre for this summer cleaning, but it is money well spent, and even if the weeds are not abundant the soil so stirred acts with quickly apparent benefit upon the health and growth of the plants.

It may be thought desirable to let some part of the crop stand for the second year's growth. Sometimes, when stakes and uprights for hampers and baskets are scarce, the second year's shoots command a price in the market sufficient to warrant the decision that the crop shall stand for the second year. A Lancashire basket-worker tells me that this happened to be the case in the season of 1893.

In the case of leaving the shoots for a second year's growth that particular part of the holt should be brought back again to the one-year system afterwards, and another part of the planting reserved for the portion for the two-year growth next arranged. When it is decided to leave the shoots upon the stools for the second year it is desirable to remove all the small crooked or rough rods, only leaving the sound rods to grow on. If the second year's growth has been allowed to remain upon the stools with the object of providing cuttings to plant up an extended area, the finest rods may be selected and put in their places in carefully prepared ground, as rods in their entirety (that is, without shortening them into cuttings), and left in that state to be cut off at the harvesting period in the following season. An excellent crop of Osiers will thus be secured and the new ground planted up at the same time.

The cultivation of the Willow in woodlands as a timber tree, in parks and gardens for decorative effect, and in other situations more or less connected with arboriculture or horticulture, does not quite come within the scope of our present purpose, but we may point out that the growing of Willows might be safely extended not only in holts and properly prepared beds, but as hedges and for shelter the Willow might be introduced with great advantage, with safe return from an economic point of view, and with good effect considered decoratively. The Bitter Willow is not, as a rule, damaged either by cattle or game, so that willow hedges could be planted in certain positions on the farm or homestead where thorns and other hedge plants are now used. Several methods of planting are available. Willow stakes four or five feet in length might be used, the ends sharpened, and pushed ten or twelve inches into the ground, which must have been properly prepared by trenching, as previously shown, cleared of weeds, and manured. Should the ground be low and hold stagnant water, a ridge should be thrown up whereon to place the rods. After the "sets" have been placed in position, they may be temporarily "wattled" or laced at the top to hold them in position. Or they could be so arranged, sloping at opposite angles, as to form a kind of lattice-work, and fixed at the top as before. The rapidity of growth of the Willow quickly secures a good fence, and an efficient shelter for either stock or vegetation, and it eventually becomes almost impenetrable, whilst the natural growth in the shape of shoots can be utilised for the same purposes as the usual produce of a willow holt proper.

The numerous railway cuttings also offer themselves for experiment. They might, I think, be turned to profitable account by being planted up with Willows, especially the lower portions of the cuttings lying nearest the level of the railway track, as in such a situation there is moisture sufficient to insure all conditions needed for healthy permanence and vigorous growth. Then there are screens for divisional fences in fruit gardens and vegetable beds needing shelter, the margins of streams and watercourses to prevent subsidence of the banks in waterways, besides other purposes, places, and positions which will readily suggest themselves.

The essential condition wherever willow-growing is carried on, and for whatever purpose it may be followed, is due attention and care—keeping the plants clean and the ground in good condition, sticking in rods to take the place of failures, and keeping down the growth of the shoots, with due regard to regularity and order. Where only small patches are to be utilised it is better to plant for stakes or poles rather than to grow for basket rods.

Planting may be safely carried out when the ground is clear from frost at any time from November to March, or even early April. Different growers select different periods as the best for their purpose, but it is generally agreed that one time is about as good as another, provided it is not before the sap has settled in the autumn, or after it has risen in the spring. There are possible reasons why the autumn may be considered as possessing advantages over spring, but either season will be found perfectly safe under ordinarily favourable conditions.

Insect Pests of Willows.

Nothing has been yet said as to the diseases of the Willow, nor yet as to insect and other pests. It is probably best that each case of infestation or attack should be considered separately at the time, and with actual specimens before one. It is difficult to say where to begin, and more difficult to determine where to leave off, when dealing with a subject so wide. In the case of *Salix caprea*, for instance, no less than seventy-five species of lepidopterous larvæ are known to feed upon the leaves and wood of this species alone. Some of the caterpillars feed upon the leaves; in other instances the larvæ are found in the wood, as is the case with the larvæ of the Clearwing Moth, *Trochilium crabroniformis*. The Coleoptera infesting the Willows are more general feeders. The large green Musk Beetle, *Aromia moschata*, is found in the wood and on the leaves. The small blackish larva, so abundant on the various species of Salix, is that of the beautiful bright green Willow Beetle, *Phratora vitellinæ.* A keenly observant naturalist, Mr. Robert Newstead, F.E.S.,[1] tells me that when touched this little creature emits a double row of liquid globules along its back. A tiny drop of the liquid placed upon the tongue produces a peculiar numbing sensation—a fact which he has proved by personal experiment. There are, further, the various galls upon the leaves of Willows manifesting themselves in different ways. In the case of *Salix Helix*, the so-called Rose Willow, the terminal shoots are often converted into rosette-like forms, for which reason, apparently, this variety is called in many country places Rose Willows or Rosy Willows. The fusiform or hard oval swellings on the stems or twigs are produced by the dipterous fly *Cecidomyia salicis.* There are other features of entomological interest which we need not here follow further. Little can be said, with any degree of certainty, as to the best methods for dealing with these insect pests. "Spraying," with some of the insecticides most generally used, would probably be in great measure effective, but the results of insect attack in this particular field of cultivation have not been so seriously harmful as to call for special remedial measures.

Cost of Cultivation and Yield per Acre.

I have not said anything as to the profit and loss account. This, indeed, is a matter that can scarcely be spoken about with anything like certainty. After the preparation of the land the account need not contain a long array of items, which might be set down somewhat as follows: 20,000 cuttings at 10*s.* to 15*s.* per thousand; planting at say 1*s.* per thousand; summer cleaning, say 20*s.* per acre; cutting the crop, say 30*s.* per acre. The first cost would then be, say,

	£	*s.*	*d.*
Preparation, &c.	10	0	0
Cuttings, say	10	0	0
Planting ,, ...	1	0	0
Cleaning ,, ...	2	0	0
Harvesting ,, ...	2	10	0
	£25	10	0

But after the first preparation of the holt the items of expense would naturally be curtailed, as there would only be the making up of deaths and deficiencies, cleaning and cutting; so that apart

[1] Memorandum from Mr. R. Newstead, F.E.S., curator of the Grosvenor Museum, Chester, 1893.

from rent and taxes an outlay of 5*l.* to 7*l.* per acre would probably cover cost per annum. It has been estimated that it takes three years to cover the cost of preparation and planting; after that period the profit upon a properly cultivated willow holt is well assured.[1] At certain intervals the beds would have to be manured. Under ordinary circumstances every fifth year might be regarded as the time for this attention, otherwise the stools would suffer and eventually exhaust themselves.

The yield varies naturally, but as a rule in a fair season from 6 to 8 tons of willows, weighed green, may be expected per acre, and a fair average price might be set down as from 2*l.* 10*s.* to 3*l.* per ton for the ordinary osiers. Exceptional seasons may give a greater or less yield, and exceptional years may also lead to variation in prices, but the figures here set down appear to be approximately correct.

Timber.

James Brown in his book upon Forestry[2] speaks of *Salix alba*, *S. Russelliana*, *and S. fragilis* as the best varieties to grow as timber trees. He remarks of *Salix alba* :—

Its growth is very rapid, and it is thus well adapted to plant in any situation upon the park where it may be wished to hide any disagreeable object. Upon the estate of Arniston I have planted this tree rather extensively, and find it grows well in almost any soil provided it has a little

[1] The following estimate of the cost of cultivation has been furnished by a Lincolnshire grower :—

First year's expenses, per acre.

	£	s.	d.
Trenching and preparing land, 12 to 14 in. deep, say	13	0	0
Cuttings, 20,000 per acre at 10*s.* per 1,000	10	0	0
Planting at 2*s.* 6*d.* per 1,000	2	10	0
Cleaning	1	0	0
Total, first year	£26	10	0

Second year's expenses per acre.

	£	s.	d.
Hoeing, first time, 2*l.*, second time, 1*l.*	3	0	0
Cutting, tying, and carrying rods (2 years old)	2	10	0
Carriage, loading, stacking	2	10	0
Total, second year	8	0	0
Return for crop, say 6 tons at 2*l.* 10s. per ton	£15	0	0

Thus the total working expenses for the first two years amount to 34*l.* 10*s.* 0*d.*, exclusive of rent, rates, and taxes, and the value of the crop to 15*l.*, the adverse balance at the end of the second year being 19*l.* 10*s.* 0*d.* per acre. In a succession of favourable seasons, he adds, the return for the second and third years' crops will just about balance the expenses incurred during the first three years, whilst should blight affect the crop in the first year of growth, as was the case in the summer of 1893, no profit can be expected under four or five years.—Ed.

[2] *The Forester.* By James Brown. Third Edition. 1861. Blackwood & Son.

shelter and moisture. I could point out young trees only three years planted standing from twelve to fifteen feet in height; and I believe that were it introduced extensively into all hollow parts of forest ground the planter would have a return from his crop which is but seldom realised by the planting of our common hardwood and fir trees in such situations.

He further states the wood of all the tree willows is much sought after and preferred in all cases to that of the poplar. It is reckoned more tough and durable than the latter, and is used for a great variety of country purposes. It makes excellent charcoal for powder manufacturers, and is much sought after on this account.

He proceeds:—

In making harrows for agricultural purposes, the wood of the saugh or willow is much used, and as a paling rail it will last much better than the young wood of the Scots pine or spruce fir. Its branches make excellent posts for palings, but they are very apt to grow and set out young shoots. To prevent this tendency of the wood the posts should be made and laid aside to dry for a few weeks before they are used.

In order to have the wood of the willow clean and tall for useful purposes, the trees should be planted in a mass and drawn up considerably either among themselves, or planted at 12 feet distance with a few larch or spruce firs among them as nurses for a time. This is particularly necessary with the Huntingdon willow, which is extremely liable to set off into large branches if left to itself in any open part without confinement, but where planted close together, or mixed with a proportion of firs it rises to a great height before branching off, and when timeously thinned excellent timber is produced. As its wood is soft and open in the grain the willow, and indeed the poplar too, should never be pruned except in the young state. If any branch of considerable size be taken from a full-grown tree, the wound never heals up; the weather takes effect upon the cut part at once, and soon produces rot, rendering the timber near it useless. Therefore, in pruning, let them be put into proper shape while young, and in order to do away entirely with pruning, grow them for a few years closely together, which will prevent the side branches spreading to any undue proportion.

This is corroborated by facts before me. We had in the Chester Nurseries some large specimen trees of *Salix alba*, which had been standing for some 30 or 35 years, effective and beautiful from a decorative point of view. They had, eventually, to be taken down some four or five years ago. They were over 60 feet high and proportionate in girth. They commanded ready sale at good prices, and the timber merchant who bought them wrote us more than once to ask if we could spare more.

Willow-Culture on Sewage Farms.

A modern feature of osier-farming, which deserves at least a brief notice, is the growing of willows under a system of irrigation on sewage farms. The not unnatural dislike to sewage grown vegetables and other produce for human consumption has given occasion for the suggestion of new methods of utilising land irrigated by sewage. The Willow lends itself admirably to this method of cultivation. Upon a 'farm' of this nature which I have recently inspected the beds are laid out in flats. The inlet for the sewage is arranged with flood-gates regulating the flow and also the direction of the stream, the sewage being thus turned on alternately to the different sides of the quarters through broad diverting channels. In the first tolerably wide open channel there are "weirs" or "locks," arranged so that the solid matter is retained before the smaller channels which are cut between the beds are reached. The surfaces of the beds are not saturated, but the water level is maintained some few inches below the surface level. The channels or open gutters, however, keep the subsoil in a state of moisture, and this is so regulated as to be beneficial to the growth of the plants without injuring their vitality. There is no odour, no appearance of filth, and at the point where the outflow is arranged, the water, having passed this so far natural process of filtration, flows away without serious discoloration and with no trace of odour. Many Local Boards have adopted some such plan for the right disposal of the sewage of the districts under their control, and this seems a common-sense solution of a troublesome and difficult sanitary problem.

Conclusion.

In writing upon Willows and Basketwork and the different phases of this fertile industry we may call to mind that we are dealing with a subject of ancient interest and importance. Mr. Leo. Grindon [1] remarks that we may form some idea as to how long basket-making from osiers has been practised in our island by the fact that the word "basket" is, with a trifling difference in the spelling, the very same that was used here two thousand years ago. The shields and the coracles of the ancient Britons were also made of wicker—osier-work having apparently been with this rude and simple people just what papyrus work was with the ancient Egyptians.

It has been pointed out that the osier industry has not thriven and extended as it might have done of late years, on account of cane and other pliant woods and fibres being largely used for purposes which otherwise would have made demands upon the willow. Boxes and barrels have been largely used for

[1] *The Trees of Old England.* By Leo. H. Grindon. 1870 Ed.

packing purposes where baskets and hampers might be employed; but with the fact before us that our importations both of the raw material and of manufactured basketwork are every year large, and that the industries which provide occasion for the use of baskets and hampers are extending and increasing, the subject of the cultivation of Willows as a source of profit deserves and demands closer attention than it has hitherto received.

EDMUND J. BAILLIE.

Woodbine, Upton Park, Chester.

ADVANTAGES IN AGRICULTURAL PRODUCTION.

ADVANTAGES in agricultural production may be divided into two categories—natural and artificial. The first division includes advantages of climate, soil, and situation or aspect; the second, acquired knowledge, skill, nearness to markets, rail or water transport facilities, cheap labour, protective duties or bounties, currency bonus, co-operation, security of property, and legislative action. Cheap land may belong to either division—to the former, if its cheapness is the result of abundance; and to the latter, if it is due to human consideration. Natural and artificial advantages in production may be concurrent or conflicting. In the former case they carry all before them; in the latter, the balance is in favour of one division in some instances, and of the other in different cases.

The importance to the agriculturist (a term which will include the horticulturist throughout this article) of paying due attention to advantages of both kinds is obvious, and yet many lamentable failures are constantly resulting from the disregard of this precaution. Mistakes, however, are not always avoidable, because our knowledge upon the subject is greatly lacking in comprehensiveness and precision alike. I am not presumptuous enough to imagine that I can supply the lacking information. My object is rather to compare advantages in agricultural production so far as they are recognised, and to point to certain reasonable deductions which may be derived from such recognition. It will be necessary, moreover, as a rule, to keep to generalities, for the complications involved in the details of my subject are almost endless, and would require a volume for their full elaboration.

ADVANTAGES OF THE UNITED KINGDOM.

Let us consider first the case of the United Kingdom as a whole. So far as I know, it was the late Mr. James Howard who first published the statement that no other country in the world could boast of natural advantages in agricultural production, taking animal as well as all classes of vegetable products into consideration, equal to those of this country. There are soils more fertile than the average of our own, and climates far more stimulating to certain kinds of vegetation; but for combined advantages of soil and climate in relation to pasture, corn, roots, other forage crops on arable land, tubers, hops, and fruit, taken together, the country equal to the United Kingdom has yet to be discovered. It is straining a point to take vegetable products alone; but I think that our country can stand the test of the division. The position is strengthened, however, if we add animal products; for the inquirer will look in vain for another country in which horses, cattle, sheep, and pigs together can be bred and matured in perfection equal to that which they attain in the British Isles. New Zealand, which probably comes nearest to our own country, taking all things into account, falls behind in quality of permanent pasture, in quality of barley, in flavour of fruit, and in the constitution and size of cart-horses, to say nothing of other stock.

There are great tracts of land in Manitoba and the North-west of Canada, in parts of the United States, and in Russia, more fertile naturally than any equal area in the United Kingdom; but in all three countries the climate at one season or another is less favourable both to variety of vegetable and animal production and to full fruition or perfect maturity. The soil of Manitoba, for example, would produce better crops of wheat than we grow, with equally good farming, if it were not for the severity of the winter, which prohibits the growth of winter varieties, and for the early autumn frosts, which frequently destroy or badly injure the grain just before it has become ripe. The climate of Manitoba also prevents the growth of clover, roots of prime quality, and fruit of any but the hardiest kinds. In countries hotter than our own, such as Australia, India, and the Argentine Republic, too, there are vast tracts of very fertile land; but the extreme heat of the summer, frequent droughts, and insect scourges prevent the growth of heavy crops of cereals, which must have time for their perfect development. Holland alone among the countries of the world equals Great Britain in yield of corn and in fatness of pastures together; but, apart from the fact that some of her most fertile land has been reclaimed from the sea, the severity of her winter and the greater heat of her summer place her slightly below us for all-round agricultural production. If we take any other European country, not excluding the fertile Danubian lands, into consideration, it will be found that the climate at one season or another is less favourable to a high average of quantity and quality in the fruits of the soil, taken together, than our own. The Channel Islands we claim, of course, as part of the United Kingdom.

It may be asked how it is, if we have such paramount natural advantages, that we suffer so severely from foreign and colonial competition. I think that the answer to this question is twofold. In the first place, we had farther to fall than any other country; and secondly, in the supply of certain commodities, some of our competitors have artificial advantages over us. Owing to the high degree of prosperity at one time attained by British agriculture, our landowners and farmers had become accustomed to higher standards of living and expenditure than those owning or occupying equal areas of land in any other country had reached. "He that is low need fear no fall," and the farmers of certain countries which compete with us most keenly have lost less because they had less to lose, and have been less reduced in style of living because they were never above the status of superior labourers. Again, our former prosperity led to the imposition of burdens upon agriculture greater than have been put upon it in any country not protected by heavy duties on imports; and the same remark applies to the high value to which land, as an investment, rose in this country. Nor is this all, for in many parts of the world where land is extremely cheap, railway charges and ocean freights to England are also very low, while here railway rates are so high that bulky produce will often not yield enough money to cover its conveyance from one end of England to a central market. Moreover, it is difficult to compare degrees of depression in different countries. We know how the shoe pinches here, but have not equal facilities for gauging the pressure elsewhere.

On several occasions recently men of position, in Parliament and elsewhere, have affirmed that agricultural depression is even worse in some other countries than it is in England. For reasons already given I doubt this, though I believe that, in proportion to preceding prosperity, the fall has been as great elsewhere as here, and that the difficulty of making ends meet has become as serious. But where farmers can live entirely off the produce of their land, and are accustomed to a life which the best paid of English or Scottish labourers would disdain, they have an advantage over our farmers in ability to sustain depression, although a very miserable advantage.

To claim that agriculture in this country has natural advantages superior to those cf any other is not to say that they are greater than the concentrated advantages of the whole world. Our great trial is that of having to meet in our own markets every country which has a special superiority in the cheap production of one or two or three particular commodities. One country can produce wheat more cheaply; another, meat; a third, fruit; and a fourth, wool; and each makes the United Kingdom the dumping ground for its surplus. Under such circumstances the wonder is, not that our agriculturists have suffered severely, but that they have been able to exist all. No other country in the world has been subjected to such a trial, and it may safely be declared that no other would have stood it without even greater suffering than we have experienced. If this be true, it must be regarded as evidence in support of our superior natural advantages. No doubt we have the best markets in the world, but, as already stated, our farmers are handicapped in reaching them, and then other artificial disadvantages, in the forms of rent, fiscal burdens, and high commissions to middlemen, have also to be taken into account.

On the other hand, it must not be forgotten that British farmers are in possession of certain artificial advantages in a high degree. In knowledge of their business and skill they have no superiors, if they have any equals; and they also enjoy the benefits of moderately cheap labour, cheap manures and feeding-stuffs, and security of property as far as it is conferred by a strong system of civil government and freedom from internal wars.

Taking all things into consideration, and in spite of the fall in prices which has taken place since, I am not disposed to depart from the position which I took up in 1891 in this Journal, when writing upon "The Future of Agricultural Competition:" namely, that it is possible to remove the artificial disadvantages of British farmers to such an extent as to enable them to stand up against a world of competitors, whose superior advantages are certain to diminish on the whole by growth of population and consequent changes.

The Production of Wheat.

Let us now consider the advantages of certain countries in the production of a few of the principal agricultural commodities. For many years it was the fashion to represent the United

States as the country best suited for the production of wheat, though it was obvious that where the average yield was only a little over 12 bushels an acre, the natural advantages could not be high, apart from the great abundance of cheap land. Extremely cheap methods of production and very low rail and ocean freights, however, greatly helped the American wheat-growers. Yet, after having grown two phenomenally great crops in succession and a moderate one to follow, evidence of the unremunerative character of the wheat-growing industry is stronger than ever. Last year the area under wheat, which had risen to 39,916,897 acres in 1891, according to the Department of Agriculture, fell to 34,629,418 acres, and it is well known that the area under winter wheat for next harvest is much smaller than it was in 1893, while less spring wheat also has probably been sown. If we compare last year's average with that which was grown nine years ago, we find a decrease of nearly five million acres, in spite of an increase of more than eleven millions in the population. In a country where it is practically imperative to sow wheat on new land, this great decrease in its cultivation is sufficient to prove that the advantages of the United States in the production of this grain are not sufficient to enable her to stand up against the tremendous fall in prices. In this connexion it may be mentioned in passing that the Senate Committee on Agricultural Depression, in a report recently issued, came to the conclusion that, in the great State of Illinois, wheat has not paid the cost of production in six out of ten years ending with 1892.

South Australia used to boast of being able to grow wheat more cheaply than any other country in the world, in spite of her miserable ten years' average of 6½ bushels an acre. But there has been a decrease in the wheat area since 1884–5, when 1,942,453 acres were grown, or 207,000 more than in 1893–4; and it is generally admitted in Australian papers that the industry is not now remunerative. In India, in spite of a great currency bonus, the wheat area is less than it was nine years ago; and in Canada, notwithstanding the increase in Manitoba, the advantages and disadvantages of which have already been mentioned, the advance does not keep pace with the population. Let us turn, then, to the country which is the latest favourite as a wheat producer.

Agricultural statistics in the Argentine Republic are compilations of the roughest of rough guesses. There is no doubt, however, that the wheat area has greatly increased in recent years, while favourable harvests have raised Argentina to the third position among the wheat-exporting countries of the world, putting her in India's place in succession to America and Russia. According to the Buenos Ayres *Standard*, the wheat area has risen from 120,000 acres in 1850 to 6,100,000 acres in 1893, while as recently as 1880 it was only 490,000 acres, and in 1890 no more than 2,800,000 acres. Seeing that this is the only country in the world in which any considerable increase in wheat growing has taken place since 1880, it is obvious that Argentina possesses peculiar advantages of one kind or another. It is worth while, then, to inquire what they are.

In the first place, a practically unlimited area of cheap land, a good deal of which is very fertile, must be noticed; but that this fertility is neutralised by climate, or by climate and locusts together, is obvious from the fact that the average yield in an exceptionally good harvest, that of 1893, was represented as only $10\frac{1}{2}$ bushels per acre. The authority named above put it at 13 bushels, but only by making the strange mistake of converting weight into measure at the rate of 50 lb., instead of 60 lb., per bushel. The estimate, probably much exaggerated, was 1,920,000 short tons (of 2,000 lb.), or 64,000,000 bushels from 6,100,000 acres, which will work out at barely $10\frac{1}{2}$ bushels an acre.

What, then, are the advantages? First, there is the tremendous gold premium, which has frequently been over 200 per cent., and occasionally over 300 per cent. Mr. Gastrell, of Her Majesty's Legation at Buenos Ayres, in a very interesting report on the agricultural condition of the Argentine Republic, written last June, says:—

> During the last five years the continually rising gold premium made wheat growing unusually remunerative. Wheat, whether sold locally or for export, naturally fetched a price based on its gold value in European markets, which price meant a great deal in depreciated paper currency, in which the wheat grower paid all his outlay, except for agricultural instruments and a few other articles, which were paid for at gold rates. His wages and expenditure being consequently so much less when converted to gold, his profits were therefore considerably higher than in former years. Again, the high gold premium enabled persons having gold to buy wheat lands cheaply, for their value in depreciated paper dollars remained much the same. A great impetus was thus given to wheat cultivation, and a demand created for labour and capital to still further increase its area.

Another advantage is the level surface of almost the entire country, which renders transport easy and comparatively cheap wherever there are roads or railways. The absence of forests, too, renders the expense of breaking up fresh land small, though, for that matter, the lack of fuel is a disadvantage, and one that causes rail rates to be higher than otherwise would be the case.

The great difficulty is that of labour, which is often so scarce in the wheat districts that portions of the crop are lost because they cannot be harvested in due time. Italians form the great majority of immigrants, and they do well, while the Englishman of the labouring class, Mr. Gastrell says, "is not a success in this country." The bulk of the labour is performed by Italians, the natives being averse to agricultural pursuits.

The cost of producing wheat depends upon whether it is done with hired labour or by the colonist and his family. In the former case it is put at about 21*s.* 6*d.* per acre, delivered at a local railway station in bags; but Mr. Gastrell makes the cost, including transport (presumably to the coast), commission and brokerage, 32*s.* 6*d.* an acre. He adds that, at the price realised in 1893, namely, 10*s.* per 220 lb., there was a profit of at least 1*l.* per hectare, or 8*s.* an acre, and often much more. But in this reckoning he allows for a yield of 13 bushels an acre, which is much above the average. Allowing for this over-estimate, the profit must have been very small at the price in 1893, where hired labour was necessary, and if the extension of wheat growing depended upon the operation of large farmers, who employ labourers, it would probably be slow. But, as will be shown presently, this is not the case.

It is not much to the purpose to mention the extent of cultivated land in Argentina. Mr. Fliess, the statistician, puts it at nearly 240,000,000 acres; but Mr. Gastrell believes this to be much too high. At all events, he says, wheat beyond a certain radius would not be profitable, and it is already grown 300 miles from a railway. He goes on to say that it is highly improbable that any more than a small portion of the great area will be cultivated, as the stock-raising acreage, a large proportion of which is included in the total, is certain to be extended. But the Italians, he thinks, would probably go on growing wheat even at lower prices than those of 1893, as it is almost the only thing they understand; and this brings us to an advantage in cheap wheat production which must be taken into account.

A writer in the *Review of the River Plate* makes the following significant remarks upon the subject under consideration:—

The opening-up of the Argentine wheat fields appears to be mainly due to the labour of the Italian colonists. Except, perhaps, Chinamen, no people in the world, we are told, are such steady, hard workers as Italians, and no people are content with such mean living, spend so little, and are so keen to make money. Consequently an immense amount of hard work is bestowed upon wheat growing, and with no taste for spending money at all equal to his thirst for making it, the *chacarero* puts all his profits into the purchase of land and machinery. It is useless to attempt any calculation of cost of production of wheat, because the great item of labour is not to be estimated if you deal with an Italian who will plough by moonlight, and with all his family will work at harvest from 4 a.m. till 7 p.m. in a blazing sun.

But we are told that the farmers of the country have very little knowledge of agriculture, and do not practise rotation of cropping. Unless they improve their ways, then, they will find their land becoming less and less productive. As the native Argentines are greatly averse to agricultural pursuits, the extension of tillage depends mainly upon immigration.

The great question is whether the bonus now enjoyed by the cultivators will continue or not. The Governor of Santa Fé, in his message to Congress last year, said :—" Our growing prosperity is mainly due to the depreciation of the paper currency, which is a great boon to the producer." Referring to this bonus, Mr. Gastrell remarks :—" Hence the possible doubt as to the continuance of agriculture on its present large and rapidly increasing scale, and of many now promising Argentine industries, should the premium on gold fall greatly and again approach par." Even if it does not fall, is it not probable that, in course of time, the bonus will disappear, through everyone who is paid for land, labour or goods, demanding his gold premium ? Certainly the remarkable agricultural inflation in Argentina cannot be said to rest upon a very secure foundation.

The Production of Cattle.

For the production of cattle several countries claim to be peculiarly well fitted. The United States, besides the advantage of vast tracts of cheap land and ranges which have been free, or practically free, have the benefit of comparative nearness to Europe. But the great wild tracts are being steadily settled, and the cattle interest has been badly depressed for some years past. In the greater portion of the country the winter is so severe that cattle perish by hundreds of thousands. For this reason the natural advantages of Argentina and other River Plate countries, and possibly those of the Alberta region of Canada, are superior to those of most of the States. Australia, in spite of having to set starvation by drought against starvation by frost and snow in the United States, has probably the better natural advantages for cattle raising, taking into account the rapidity with which the latter country is being settled. The number of cattle increased in Australia from 7,843,399 in 1882 to 11,415,729 in 1892. In the Argentine Republic the number is said to have increased from 10,000,000 in 1861 to 18,200,000 at the beginning of 1890. A more recent report has made the number about 20,000,000 for 1892 or 1893, but has been questioned. There is never any certainty about Argentine statistics, and it is said that the pastoral industry there has not increased since tillage took up the running. A well-known Victorian pastoralist, who visited Argentina in 1891, having heard such favourable accounts of the country that he thought of selling out in Victoria and emigrating to the other country, was altogether disappointed. He was told that cattle did not pay, but were kept only to eat off the rank grass for sheep. This proved to him, he said, that Argentina was not a sheep country, and if cattle would not pay in it, he decided that he had better stay in Australia. Although his visit was made in summer, when the country was "a sea of grass," he never saw what would be considered in Australia a fat bullock or a fat sheep. The natural grasses of the country, he said, were of two kinds, hard and soft, and equally useless. They had to be got rid of by over-stocking, after which they were replaced by better grasses. Probably this account is greatly exaggerated, though many other visitors to the country have preferred Australia or New Zealand for pastoral farming. But Argentina has the great advantage over those countries of comparative nearness to Europe. Nor should the magnificence of the growth of alfalfa, or lucerne, in Argentina be ignored. Hitherto, it must be admitted that the country has not produced any considerable quantity of beef or mutton of good quality.

The Production of Sheep.

The writer just mentioned objected to the wetness of the soil in Argentina for sheep, which, he says, are much subject to foot-rot and lungworm in consequence. He remarked upon the absence of signs of wealth having been made by pastoralists in Argentina. In the suburbs of Buenos Ayres, he said, there are no mansions denoting incomes of 5,000*l.* to 10,000*l.* a year, as there are in Australia; nor do you hear in England of many men who have returned from the River Plate with fortunes made out of stock. The statistics regarding sheep in Argentina are conflicting. In 1880 there were about 61,000,000, it is stated, and in 1893, 72,000,000 according to one account, and 85,000,000 according to another. The latter number is given by Mr. Gibson, who has written a highly laudatory book [1] on the country as one for sheep farming. He predicts that there will be 150,000,000 sheep there in 1900.

[1] Reviewed in this volume of the Journal, Part I., p. 162.—Ed.

Probably for natural advantages, in respect of the breeding and fattening of first-class sheep, there is no country in the world superior to New Zealand. Tasmania is also noted for the quality of her sheep, and it is well known that many of the splendid rams which realise enormous prices in Sydney are bred there. But the vast expanse of cheap land in Australia gives that island continent an advantage over the smaller islands in respect of cheap production, though her merinos will never equal the New Zealand crossbred sheep for mutton. The number of sheep in Australia increased from 61,661,610 in 1882 to 101,690,597 in 1892. For New Zealand the corresponding figures are 12,500,597 and 18,570,752. North America is simply "nowhere," as a sheep-producing country, in comparison with Australia and the River Plate.

If mutton and beef should hereafter be sent in a chilled, instead of a frozen condition to Europe, it would be a serious blow to producers in European countries, although, with an increasing population, the demand for fresh-killed meat in our own country will always remain an advantage which nothing can take from us. It is a significant fact that, in spite of the export of chilled beef from the United States, the cattle industry in that country has suffered at least as severely from depression as it has in Great Britain; but we cannot feel at all confident that this would be the case with Australia if the meat could be sent chilled. Nor can we be sure that, as the breed of cattle in the Argentine Republic and other River Plate countries becomes improved, our beef producers will be able to stand up against the natural advantages of their rivals in those countries.

Dairy Produce.

With respect to dairy produce there is nothing new to say about the natural advantages of the United States and Canada. We know what they can do with cheese. They can render our third-rate cheese unprofitable, but cannot touch the best, or beat the second-rate article out of the market. In butter they do not take a considerable position. Until recently, Denmark, Sweden, and Normandy have been our chief competitors in the supply of butter; but their natural advantages in this connexion are not equal to our own, and it is only by superior organisation in making and marketing that they have obtained and kept a strong foothold in our markets. In Denmark and Sweden, at any rate, neither the pastures nor the cattle are equal to our own; and in Normandy the pastures are not better, while the cattle are not generally as good. Nor are there any advantages in any of those countries in cheapness of land. Labour is a little cheaper than it is in most English counties, but not much. Where these European competitors have the "pull" of our dairy farmers is in the employment of less labour, most of the work being done by the farmers and their families and in the dairy factories.

In the supply of butter during the winter season, which has now been made a very long one, Australia and New Zealand bid fair to beat Denmark and Normandy. I believe there is no country in the world which has as great natural advantages for dairy farming as New Zealand, in consequence of the abundance of grass food grown there all the year round. Yet Victoria, with greatly inferior natural advantages, has left New Zealand far behind in our markets, by means of her factory system and her Government inspection of exports. There are a few good brands of New Zealand butter which realise the same prices as the best of the Victorian supply; but the bulk of the former commodity is so far inferior to that of the latter that wholesale dealers have given up the name "New Zealand" as applied to butter, and adopted "Colonial." In all probability New Zealand, by extending the factory system, and by ceasing to send strong butter, which is a drug in our markets, will attain the position which her natural advantages entitle her to aspire to; but the great superiority of quality in the Victorian exports of butter is a striking example, just as the Danish success has been, of what can be attained by taking trouble. Whether the export trade from Victoria will pay if the bonus paid by the colonial Government should be entirely withdrawn, as it has been partially, remains to be proved. It is no longer paid on exports; but a considerable sum is devoted to refrigerating stores, and this goes into the pockets of the shareholders of the factories, many of whom are the dairy farmers themselves. The only natural advantages which Victorian dairy farmers possess are cheap land, cheap cattle, and—most important of all—their antipodean position, which gives them summer during our winter. Wages in Victoria, as well as in New Zealand, are double those of most parts of England. Neither colony has yet done much with cheese, though New Zealand has sent some quite equal in quality to the best Canadian.

Fruit and Vegetables.

In the production of early fruit and vegetables, it is hardly necessary to say, many countries have advantages greatly superior to those of Great Britain or Ireland. But it is also true that many have natural advantages superior to those of our Channel

Islands, and yet those portions of the United Kingdom have attained a degree of success not exceeded, if equalled, in any other part of the world in this respect, as far as the supply of European countries is concerned. In raising new potatoes out of doors there are only a few districts in England as well suited in respect of climate and soil together as Jersey is; but in that island, and still more in Guernsey, the earliest potatoes, as well as other vegetables and fruit, are produced under glass. Owing to the mildness of the climate and the abundance of sunshine, a good deal can be done without artificial heat, and in this respect the Channel Islands are better placed than England is. But glass and coal, as well as labour, are cheaper here than in Jersey or Guernsey, where a great deal is done in hothouse culture. In this, then, as well as in the great enterprise shown in the production of early potatoes, success in the little islands is largely due to that "infinite capacity for taking trouble," which is certainly the genius of business. The growth of tomatoes and grapes under glass in this country has been extending rapidly for some years past, with great success to those who have engaged in the industry, and there is no reason why the other early produce which will stand heat, grown in the Channel Islands, should not be grown here also.

As an example of the neglect of natural and artificial advantages, it would be difficult to beat the case of the South of Ireland, a tract of country admirably suited to the production of early vegetables, and within easy reach of good markets by means of cheap transport by sea.

Differences in England.

Within the bounds of England there are great differences in the natural and artificial advantages of agricultural (including horticultural) production. This fact is too commonly ignored by advocates of small holdings. Now, holdings of twenty acres or less are successful only, as a rule, when devoted to the production of milk, cheese, culinary vegetables, or fruit. Taking them in this order, it may safely be asserted that a small dairy holding pays well generally only where there is a good sale for milk, or where the land is well suited to the production of first-class cheese. Butter-making may pay where there is a retail sale for it in a large town; but the disadvantages of this industry on a small scale are well known, and there are very few small dairy farmers who can turn out butter of good quality regularly. A twenty-acre dairy farmer cannot make a good living for a family by butter, as a rule, if he has to sell it wholesale, or has it made for him in a factory. At the best, this industry is not highly remunerative. For cheese, distance from a market is of comparatively little importance, and some of the most successful small holders I have met with are those who make Stilton. According to a high authority, there is no reason why this cheese should not be made in any part of the country. That it can be made well far from its special district is certain, as results have proved that excellent Stilton can be made in Yorkshire, Bucks, and Hampshire. But even in the Stilton district there are pastures upon which good cheese cannot be made, because they are too rich, and are more suitable for butter-making or cattle-fattening. At any rate, this is the opinion of the local dairy farmers, and their conviction is, without doubt, based on experience.

For the production of vegetables either an exceptionally suitable soil or nearness to a good market is essential to success, especially in the case of a small holder. In some parts of Cornwall the advantages of climate for early produce neutralise the long railway carriage to the best markets; but even there the soil must be suitable to insure success. Favoured spots on the Greensand, such as Sandy in Bedfordshire, and limited districts in Hunts and Sussex, grow potatoes and other vegetables so well that somewhat long distances by road or rail do not preclude financial success. But a few yards beyond the limit of the Greensand, where there may be a clay subsoil, the attempt to pursue the same industry is useless, or at any rate an arduous undertaking, yielding a poor return to great labour. The large increase in allotments in the suburbs of towns has seriously added to the difficulty of making market gardening pay, by reducing to an enormous extent the number of purchasers of culinary vegetables, as well as by increasing the supply. Therefore, suitability of position, or exceptional fitness of soil, is more than ever essential to the market gardener. Even in the Isle of Axholme, where much of the soil is exceptionally well suited to the production of potatoes and other vegetables, the small holders have lately had a hard struggle to "make ends meet," because most of them have to cart their produce several miles, and then to pay high rail rates to the markets.

For fruit-growing in the open air, aspect and altitude, as well as soil, the general climate of the district, and nearness to a good market have to be taken into consideration. Many of the old orchards were planted in the valleys and other low situations, under the impression that such places, being sheltered, were more suitable to fruit than exposed situations. Apparently it was not known in the old times that frost is most injurious in low-lying places, because of the dampness of the atmosphere. But now it is well known that a hill slope, with a sunny aspect, is the best situation for a fruit plantation. Not long ago I visited a fruit plantation in a Kent valley which had every appearance of prosperity. The soil is excellent, and the trees and bushes were of the best varieties, while the cultivation was all that could be desired. The occupier, who had acquired a considerable capital in business, thoroughly understood fruit-growing, and did not stint expenditure. His trees in blossom were a magnificent sight, and any visitor would have supposed that the grower was doing remarkably well. He informed me, however, that during his lease he had lost thousands of pounds which he did not expect to recover. The reason he gave was that his plantation was not only in a low situation (for there is lower land to the south, to which his plantation slopes), but mainly because there is a hill to the east of him, and when the sun rises over that eminence, its rays are in full heat, and fatal to fruit blossoms with hoar-frost upon them. If the hill was not where it is, the heat of the sun would be slight to begin with, and the thaw would be gradual; instead of which scorching rays suddenly strike the frost-touched blossoms, and frequently destroy the promise of a great crop.

For the growth of ordinary farm crops farmers generally know pretty well "the length of their tether." That it is useless to attempt to grow mangel in the North of Scotland or on thin chalky soils, or sainfoin where there is hardly any lime in the soil, or beans on gravel, or potatoes on clay is generally recognised, though there are men who always insist upon buying their experience. But what is less generally known is the best substitutes for crops which do not succeed in particular districts. For example, it is the special hardship of farmers in the Eastern Counties that on a great deal of the land now unprofitable for corn permanent pasture does not flourish, on account of the dryness of the climate. Suitable mixtures of grasses and leguminous plants, however, do fairly well for temporary pastures on that land, and there is a great lack of knowledge as to the best mixtures to use. The Scotch settlers in Essex owe their moderate success in great measure to the economy in horse and hand labour which they have effected by laying down most of their land in temporary pasture, and stocking it with cows for the London milk trade. I believe that one of the most valuable and yet most neglected of all forage crops, lucerne, would grow well on the land referred to, or on a good deal of it. The old plan of growing lucerne in drills, and keeping on hoeing it, is too expensive, and yet we see experienced agriculturists still recommending that out-of-date method when writing on the subject. In Guernsey and Alderney the visitor sees magnificent crops of lucerne and rye-grass, sometimes with clover added, sown broadcast to stand for five or six years. It would be well to try such mixtures in the Eastern Counties, when permanent pasture does not succeed.

Differences in natural advantages may also be illustrated by the familiar case of barley. It is well known that malting barley cannot be grown in some parts of the United Kingdom, and that where it can be grown there are great differences in colour, body, and texture, which go to make up quality. Grinding barley hardly pays for growing nowadays, and it is strange that the crop should still be cultivated in so many parts of the kingdom as it is, where it never produces a good malting sample. Fortunately, the best of oats can be produced in many places where prime barley will not grow.

A point which has not yet received sufficient attention is the difference in natural advantages for the growth of roots, and particularly swedes and other turnips. The great superiority of the turnip crops (including swedes) in Scotland and the North of England to those of the Eastern and Southern Counties, in bulk and quality alike, has often been noticed. It is a question whether it pays at all to grow swedes on heavy land which will not bear sheep in the late autumn, winter, or spring, even if it pays to grow early turnips which can be fed off before the land becomes wet in some seasons. Further than this, it may be questioned whether it is good policy to grow a large acreage of roots of any kind on heavy land, which is liable to be seriously deteriorated for years by either feeding roots upon it or carting them off in a wet autumn. In addition to the damage done in the way indicated, it must be borne in mind that roots are nitrogen-exhausting crops, and that loss of fertility in any soil upon which they are grown is only prevented by feeding them on it, or manuring very heavily for them or after them. This being the case, the reasonable policy for heavy-land farmers to adopt seems to be that of growing the greatest quantity of roots (mangel for choice) on the smallest acreage, by means of heavy manuring, and devoting the rest of the area intended for feeding purposes to the growth of nitrogen-accumulating crops. There is the question of cleaning the land to be considered in this connexion, no doubt; but to clean heavy land on a large scale by growing roots upon it is too costly a process.

Other illustrations of my subject might be given; but enough has been written, I trust, to commend it to the thoughtful consideration of agriculturists who know a little of science and a great deal about practice.

William E. Bear.

Thorpe, Riggindale Road, Streatham, S.W.

THE PREVALENCE OF ANTHRAX IN GREAT BRITAIN.

The returns for the past year indicate that anthrax has been more widely spread among animals of the farm in this country than in any previous year during which statistics have been collected. In explanation of the large increase of reported cases it has been suggested that many deaths which have been attributed to anthrax were due to other diseases, and the results of the examination of specimens sent to the Royal Veterinary College lend support to this view. Nevertheless, it is certain that anthrax is more extensively distributed throughout this country than it was supposed to be, and there is no doubt that the obscurity which is associated with the disease on a farm and the fatality which always attends its progress have given rise to considerable alarm among stock-owners.

It is known that anthrax depends on the introduction into the blood of a minute rod-like body, the *Bacillus anthracis*, the spores of which may be brought on to a farm in many ways, and obtain an entrance into an animal's system through any slight abrasion in the skin or mucous membranes. Treatment of the disease is scarcely ever successful; in fact, the death of the animal follows too quickly on the declaration of the disorder to give time for the action of medicines. To prevent the extension of the disease by destroying the activity of the infecting germ is all that the stock-owner can hope to effect.

The following observations by Professor McFadyean and Professor Brown may be accepted as an important contribution towards the attainment of this object. The experimental evidence is conclusive and consolatory, proving, as it does, that, under certain easily assured conditions, the blood of an animal dead of anthrax loses its virulence in a comparatively short time; and it is also satisfactory to know that, as an outcome of this inquiry, the most ready and convenient method of disposing of carcasses, *i.e.* by burial, is at the same time the most safe and effectual. The apprehensions which have been hitherto entertained in regard to the risk of the contamination of the soil by buried carcasses need no longer exist, always provided that the very simple precautions suggested to prevent the escape of blood are strictly observed. Contamination of the soil is usually the result of the morbid materials which are distributed over its surface, and not of the substances put underneath it.

Ed.

I.—On the Disappearance of the Anthrax Bacillus after Death.

That anthrax bacilli, in certain circumstacces, rapidly disappear from the blood and organs of animals dead of the disease is a fact not so well known as it ought to be. Ignorance of it is accountable for some mistakes made in diagnosis by those who have resort to microscopic examination in suspected cases, and it is further accountable for a great deal of unnecessary alarm regarding the alleged spread of anthrax from places in which animals dead of anthrax have been buried.

When a cow or sheep dead of anthrax is opened immediately after death, the bacilli which are the cause of the disease are found unmixed with other germs in the blood all over the body, and in special abundance in the spleen. It is mainly during the last few hours of life that the complete invasion of the blood takes place, and it might be supposed that the germs in the blood would continue to multiply even after death. Such, however, is not the case. As soon as the breath has left the animal, growth and multiplication of the bacilli cease, because the germs of anthrax belong to the class of so-called aërobes, for the growth of which oxygen is strictly necessary. During the life of the animal that harbours them the bacilli obtain the necessary oxygen from the same source as the animal cells—viz. from the blood, which becomes charged with oxygen in passing through the lungs. But as soon as respiration ceases the supply of oxygen is cut off, and the growth of the bacilli is promptly arrested.

But in the blood of an animal dead of anthrax the bacilli do not merely cease to grow or multiply—they degenerate and die. The alimentary canal of the sheep, ox, and horse always contains large numbers of putrefactive bacteria, which, during life, are unable to penetrate into the blood or tissues, but immediately after death these bacteria rapidly make their way into the wall of the bowel, and gain access to the blood-vessels, along which they soon spread over the whole body. Chief among these putrefactive germs is the so-called malignant œdema bacillus, which, as regards size and shape, is so like the anthrax bacillus that the one may readily be mistaken for the other. The malignant œdema bacillus belongs to the class of anaërobic organisms—that is to say, it will not grow or multiply in the presence of free oxygen—and hence the deoxygenated blood of the dead animal is a most excellent medium for its propagation. As soon as the breath is out of an animal that succumbs to anthrax the invasion of the blood and organs by putrefactive germs begins, and, *pari passu*, the anthrax bacilli disappear. The invasion always starts from the bowel, and it proceeds with great rapidity in the chest and belly, as these parts cool slowly after death, and warmth is favourable to the growth of bacteria.

When an anthrax carcass is left unopened, the invasion by putrefactive bacteria is sometimes so complete within twenty-four hours that not a single anthrax bacillus can be detected by microscopic examination in any of the organs in the chest or abdomen; but in the blood of the ears or the feet the anthrax bacilli may be recognisable on the third day after death. These statements are based on observations that have been made in the Research Laboratory during the last three months, and they indicate that when an animal is unexpectedly found dead, and anthrax is suspected, if the carcass is already partially putrid blood from an ear or a foot ought to be examined in preference to spleen-pulp or blood from one of the large veins of the body. At the present time the material sent to the Laboratory for examination in suspected cases of anthrax is almost always the spleen or a part of it, and in a considerable proportion of cases a positive opinion cannot be given because of putrefactive changes.

When the *post-mortem* can be made within an hour or two after death the naked-eye appearance of the spleen is by itself generally sufficient to enable one to decide whether the case is one of anthrax or not, and if any doubt remains a microscopic examination will remove it. But if, as is generally the case in anthrax of sheep, the animal is not found until some hours after death, and if putrefactive changes have already made considerable progress, it would probably be a wise plan to abstain from a complete *post-mortem* examination, and to simply cut off an ear in order that the blood in its veins may be submitted to microscopic examination. Such a proceeding obviates the soil contamination inseparable from an ordinary *post-mortem* examination, and it is attended with no risk to the operator. Besides, as already said, although simple it is much more likely than the ordinary *post-mortem* to lead to a correct diagnosis.

The destruction of anthrax bacilli which takes place during the putrefaction of the carcass is very important in another respect. When one follows step by step the invasion of the carcass by putrefactive bacteria, and the disappearance of the anthrax bacilli which accompanies putrefaction, one cannot help surmising that putrefaction may in this case be a valuable means of disinfection. The experiments hereafter given prove that this surmise is correct. They appear to warrant the conclusion that in certain conditions complete putrefaction renders an anthrax carcass innocuous. The conditions referred to are those that exclude the possibility of spore-formation on the part of the anthrax bacilli before putrefaction sets in. The conditions necessary for this spore-formation are—(1) *free* exposure to the air, and (2) a summer temperature (about 70° F.). It is obvious, therefore, that prompt burial at even a moderate depth, since it puts the carcass in conditions under which the formation of spores is impossible, and in conditions which are eminently favourable for putrefaction, is a perfectly safe method of disposing of an animal dead of anthrax. The experiments furnish good grounds for believing that soil contamination is much more frequently brought about by the shedding of blood in making *post-mortem* examinations, or by the discharge of anthrax bacilli from the body before death (in urine, &c.), than by the liberation of the bacilli from buried carcasses.

Experiment I.

April 4.—Inoculated two rabbits by scarifying the ear and rubbing in spleen-pulp of a sheep dead of anthrax. The spleen had been removed from the body on the same day, about eighteen hours after death, at which time the carcass gave evidence of advanced putrefaction. No anthrax bacilli could be identified in the pulp on microscopic examination.

Result.—The rabbits remained unaffected.

Experiment II.

April 4.—Inoculated two rabbits as in Experiment I. with spleen-pulp from a sheep dead of anthrax. In this case, also, about eighteen hours had elapsed before the spleen was removed from the body, and the carcass was putrid, but bacilli were still recognisable in the veins of the extremities.

Result.—The rabbits remained unaffected.

Experiment III.

April 4.—Inoculated a rabbit by scarifying one of its ears and rubbing in pulp from the spleen of a cow dead of anthrax. This cow had died on March 30, and the spleen had been removed shortly after death. While still fresh (on the 31st) it showed on microscopic examination enormous numbers of anthrax bacilli, unmixed with any other bacteria.

Result.—The rabbit died from anthrax on the afternoon of April 9.

Experiment IV.

May 9.—Inoculated a rabbit by scarifying its ear and rubbing in spleen-pulp from a lamb dead of anthrax. This lamb had died on April 9, and its ear-blood when examined on the 10th showed great numbers of anthrax bacilli unmixed with other bacteria. The carcass was left unopened for three weeks, and the spleen was then removed and left exposed to the air till May 9.

Result.—The rabbit remained unaffected.

Experiment V.

May 9.—The lamb's spleen referred to in the preceding experiment was cut into small pieces and pounded up with about half a pint of water. The liquid thus obtained was poured over the throat of a sheep.

Result.—Negative.

Experiment VI.

May 9.—Repeated Experiment III. with spleen-pulp from the cow which died of anthrax on March 30. The spleen was now very putrid, and no anthrax bacilli could be detected in it by microscopic examination.

Result.—The rabbit remained unaffected.

Experiment VII.

May 9.—Took a portion of the cow's spleen (weighing about 4 oz.) referred to in the preceding experiment, cut it up into small pieces, and pounded it with about half a pint of water. The liquid thus obtained was poured over the throat of a sheep.

Result.—Negative.

Experiment VIII.

May 9.—Inoculated a rabbit by scarifying its ear and rubbing in pulp from the putrid spleen of a sheep dead of anthrax on April 26. The ear-blood examined on April 27 had shown enormous numbers of anthrax bacilli. The spleen was left in the body for a week after death, and after its removal it stood exposed to the air.

Result.—Negative.

Experiment IX.

May 9.—The putrid spleen referred to in the preceding experiment was minced and pounded with half a pint of water, and the mixture, with the exception of the coarser particles, was poured over the throat of a sheep.

Result.—Negative.

Experiment X.

May 9.—Inoculated a rabbit by scarifying its ear and rubbing in spleen-pulp from a sheep dead of anthrax on April 27. The ear-blood examined on the day of death showed anthrax bacilli unmixed with any other organisms. The body was left unopened for about a week and the spleen after its removal stood exposed to the air. On the date of inoculation no anthrax bacilli could be detected in the spleen-pulp by microscopic examination.

Result.—Negative.

Experiment XI.

May 9.—The spleen of the sheep referred to in the preceding experiment was minced and pounded with half a pint of water, and the mixture, with the exception of the coarser particles, was poured over the throat of a sheep.

Result.—Negative.

J. McFadyean.

Royal Veterinary College.

II.—On the Disposal of Carcasses of Animals dead of Anthrax.

It is admitted that the risk of infection of man and animals with anthrax exists whenever the blood of an animal recently dead of the disease comes in contact with them. On this account it is essential that the greatest possible care should be taken when it is necessary to make *post-mortem* examinations and in the subsequent disposal of the carcass.

Burial is the ordinary method of getting rid of a carcass, and it has the merit of being the most convenient one, but the expediency of this plan has recently been much criticised. It is contended that a buried carcass is likely to infect the soil with which it is covered, and that earthworms may bring the anthrax organism to the surface, and that in various ways the infective matter may be distributed even years after the carcass has been buried.

To what extent the above statements deserve consideration is an open question, but it is quite certain that the objections do not apply to a carcass buried without being cut so as to let the atmosphere come in contact with the blood in the tissues, and thus apply to the organism the oxygen on which the maintenance of its activity depends.

The fact that the anthrax bacillus disappears from the blood when the carcass has undergone decomposition has long been admitted, but the experiments of Professor McFadyean prove that the destruction of the bacillus occurs a very short time after death.

In the experiments numbered I. and II. the blood of the spleen when taken from an anthrax carcass eighteen hours after death proved harmless to rabbits, and in subsequent experiments negative results followed inoculation with the spleens of animals which had been dead for different periods varying from thirteen days to a month. The explanation of this loss of virulence is given in the article. The two essential conditions for the maintenance of the activity of the virus are oxygen and a temperature not below 70° Fahr.: both these conditions cease to exist when the animal no longer breathes, and the carcass is covered with earth, while the destruction of the organism is further aided by the action of the septic bacteria which already exist in the digestive canal, and are developed in large numbers when decomposition commences.

Complaints have been made by professional men that in the present state of the law it is impossible to study the morbid appearances of anthrax if dissection of a carcass is prohibited.

There is no law, in fact, to prevent anyone making a *post-mortem* examination; but the caution has been given in order to avoid risk of spreading the disease, and so far as the identification of anthrax is concerned it is only necessary to cut off the ear or foot of the animal to obtain all that is required for microscopic investigation. The real difficulty and the great danger are due to the circumstance that carcasses are frequently flayed, cut up, used for the purpose of feeding dogs or pigs, or perhaps thrown upon a manure heap, without the slightest suspicion being entertained that the animal has died of anthrax; and the only possible way of avoiding this risk seems to be to conclude that, in every case when an animal dies suddenly, anthrax is the cause of death. The question can be settled in a very short time by the microscopic examination of a drop of blood taken from the ear.

Alternative methods of disposing of carcasses are permitted by the Anthrax Order—*i.e.* by exposure to a high temperature or by chemical agents. High temperature, of course, refers to the processes of burning or boiling, or the employment of high-pressure steam in a digester. The use of chemical agents is only practicable in the immediate vicinity of a chemical manure manufactory.

All the above processes have the common objection to be urged against them, that they necessitate the removal of the carcasses to a convenient place for the purpose of destruction, and in the majority of instances cutting would be required before burning, boiling, or steaming could be effected.

Under all the circumstances—of the different methods of getting rid of a dangerous carcass—burial, under proper precautions, appears to be the safest. It is obvious that the burial should take place as near to the spot where the carcass is found lying as possible. When removal is necessary the soil which is contaminated by blood which may flow from the carcass should be covered with quicklime or commercial carbolic acid.

In selecting a place for burial the possible contamination of water-courses with septic matter must be considered. This caution is necessary, as it has more than once happened that carcasses have been buried in such a position as to be dangerous to public health, and it has been necessary to exhume and re-bury them under the supervision of the sanitary authority.

G. T. Brown.

Royal Veterinary College, Camden Town, N.W.

IRRIGATION AND THE STORAGE OF WATER FOR AGRICULTURAL PURPOSES.

The memorable drought of the summer of 1893 served to revive the interest in the subject of the conservation of water supply, even in this generally humid island. If man cannot command the seasons, he may do much to lessen their disasters. Some seasons bring far too much rainfall, others scarcely any whatever. The lesson learned should be to store up water when plentiful, that by means of irrigation the absence of rainfall upon the land may be compensated for.

Irrigation in Continental Countries.

Nowhere perhaps is irrigation practised to greater perfection than in Italy. Travellers have often remarked that the plains of Lombardy present a perfect network of canals and irrigating streams. The water is got either from springs or from the rivers, and is measured out to those who use it, and paid for as exactly as the water and gas taken into London houses. The existence of springs on a farm is valued as a blessing, and is considered to enhance the value of the property very much, as it saves the proprietor having to purchase river or canal water. Thus when there is the slightest indication of a subterranean spring, boring is resorted to; and if water is discovered it is conducted by wooden pipes to the fields most requiring to be irrigated. The meadows north of Milan are almost entirely irrigated by spring water; yet from the copious supply combined with high manuring they are considered very little inferior to the meadows on the south of the city, which are enriched by its sewage. The latter are said to be cut seven or eight and sometimes nine times a year. The meadows are watered every sixth or eighth day in summer, and are almost continually covered with a sheet of flowing water in winter. Very often, from November to March, two or three abundant crops are cut, so that dairy cows and other cattle are not deprived of fresh grass for more than thirty or forty days during the entire winter. The plains of Lombardy have, however, a great natural advantage, as they receive a vast supply of water from higher levels—the lakes at the foot of the Alps. The fertilising power of these waters has been known to convert wild heaths into luxuriant meadows, and to raise the value of land three-fold. The farmer not infrequently pays for his water three times as much as he pays in rent for the land itself.

In Spain also irrigation receives great attention, and meadows capable of being irrigated are considered worth three or four times as much as ordinary dry meadows. In the Ampedan plain the farmers find that the produce of their meadows can be increased at least 200 per cent. by their being watered, and in the valley of the Tagus there has always been a considerable enhancement of fertility by irrigation, the increase in produce being estimated at twelve times as much as it otherwise would have been. Water is bought and sold in Spain as in Italy, as much as 1*l.* per acre being often the outlay for it in the Tagus valley; while in Arragon it is said to approach 27*s.* an acre. At Alicant, about a century ago, the King of Spain made a reservoir which brought him a revenue of 2,000*l.* per annum.

On irrigation as practised in Switzerland there is an instructive paper, by Mr. H. T. J. Jenkinson, in Vol. XI. 1st Series of this Journal (1850), wherein it is stated that it was pursued in that country as early as the fourteenth century. According to Mr. Herzog's system in the canton Aargau the meadows are irrigated during October, November, and December, till the hard frosts commence and the winter snows fall. In March the system is recommenced and continued throughout summer, with the result of four crops of grass and sometimes five being obtained per year. M. de Fellenberg at Hofwyl, in another canton, also obtained four crops in one season, and occasionally he had six. One year the grass was being cut for his cattle as late as Christmas. In general, however, the first crop is cut in May and the last in October. M. de Fellenberg believed that he could not irrigate too much, and Mr. Jenkinson after inspecting his farm gave (p. 610) the following description of his water meadows:—

> I never saw fields look brighter or greener than the water meadows, and the grass was thick "like a brush." M. de Fellenberg irrigates as late as possible in the year, and only stops when there is danger of the water freezing in a mass on the land. As long as the water trickles underneath a surface of ice he continues watering, and considers that this surface of ice protects the roots of the grass. The water is made to flow over a certain portion of land for twenty-four hours. It is then shifted farther on, and in about a week they return to the point where they commenced, this shifting being owing to the scanty supply.

Irrigation was also extensively adopted by the Romans. Cato says:—"As much as in your power make water meadows." Columella also alludes to the advantages of irrigating, but deems it more profitable for weak, poor, thin soils than for those more fertile, his language being, " Land that is naturally rich, and in good heart, does not need to have water set over it, because the hay produced in a juicy soil is better than that exerted by water; yet when the poverty of a soil requires it, water may be set over it."

Irrigation in England.

In Arthur Young's "Farmer's Calendar" the following appears under November :—

> In this month you may begin to winter water the meadows and pastures wherever it can be done; and be assured that no improvement will pay better: a winter's watering will answer in the hay fully equal to a common manuring of the best stuff you can lay on the land; and the expense, in some situations, is trifling. The lower parts of a farm are generally in grass; the farmer should attend to his ditches, so that the water from all the higher parts of the farm may have an unobstructed course to a ditch a little above the bottom, from which it may be let at pleasure over the meadows, observing that it only runs over them, and does not stagnate.

Underneath April Young also wrote :—"Throughout this month if there are watered meadows on a farm the use of them in supporting ewes and lambs is exceedingly great," than which nothing can be more true, as has been amply exemplified in the April of 1892 and of 1893, when the flockmasters of the South-West of England who had water meadows were able to give their sheep abundance of luxuriant fresh grass, while all others devoid of this resource were compelled to fall back almost entirely on dry winter fodder in conjunction frequently with costly meals or other feeding stuffs. These water meadows often appear to the eye of a traveller from a railway carriage as oases in a desert—specks of emerald brightness with sombre surroundings. They had this appearance well-nigh throughout last summer, and proved invaluable for yielding abundant crops of grass for hay when no cuttings could be taken elsewhere. Mr. J. Deane Willis, the well-known Shorthorn breeder, obtained three successive crops of hay from his Bapton Manor Meadows in the Wylie Valley of Wilts.

Arthur Young's advice to utilise the drainage water from arable fields at the higher part of a farm for irrigating meadows at the lower part has been carried out practically in several instances since with the additional service being required of the water to drive a turbine and machinery at the homestead. In Vol. VI. 1st Series of the Journal (1845) appeared (p. 518) an interesting prize essay on the reclamation of an extensive tract of waste land on Brendon Hill by Mr. John Roals, and the conversion of a portion of it into a water meadow. The arable land at the upper part had to be under-drained, and the pipes were made to discharge into a reservoir at the homestead to drive the machinery of the farm, after which it was made to irrigate meadows laid out for the purpose at a lower level. Mr. B. Daniel, of the Brinder Ironworks, Glamorganshire, in the seventies, reclaimed 100 acres of land near Cefn station, and he also caused the drainage water of a considerable portion of it to discharge into a reservoir and drive machinery by means of a water wheel before it was utilised for irrigation.

Another improvement of a similar nature is recorded in Vol. IV. 1st Series (p. 314) of the Journal (1843), wherein it is stated that when Lord Hatherton came to reside at Teddesley, Staffordshire, his house was surrounded by heaths and alder bogs. Of these he under-drained 500 acres at a cost of about 3*l.* per acre. All the water thus tapped from these bogs was conveyed to the farmyard, where it turned a water wheel to drive the threshing machine and other machinery of the homestead. Thence it was made to flow over 80 acres, which were converted into catch meadows at a cost of 224*l.*, or about 50*s.* an acre. The water in passing from the farmyard carried with it the liquid manure from more than a hundred beasts kept in the yard summer and winter. The late Mr. Philip Pusey, M.P., in commenting on this grand improvement, said:—

> The beauty of this arrangement, which resembles the complicated functions of an animal body, is as striking as the practical benefit of changing a morass into a sound corn and stock farm, for 1,250 acres carries 1,500 sheep, besides more than 200 head of cattle. I know of no farm which offers so perfect a model for the improvement of moorland lying towards the west side of England.

The same authority, after witnessing these seemingly magical effects of watering meadows in Devonshire, determined to ascertain the effects of irrigation on some of his grass lands in Berkshire, and afterwards described the result in Vol. X. 1st Series (p. 462) of the Journal (1849). He admitted at the outset that the money he had spent in forming and laying out his meadows for watering had yielded him a return of 30 per cent., and that consequently this means of improvement was well worth the attention of all landlords.

Very graphically did he describe the effects of watering lands in winter as follows:—

> It is well known that in forming water meadows to moisten them is not the main object, the stream being laid on chiefly in winter, when commonly the ground is already too wet. Yet a slight film of water trickling then over the surface—for it must not stagnate—rouses the sleeping grass, tinges it with living green amidst snows and frosts, and brings forth a luxuriant crop in early spring, just when it is most wanted, while the other meadows are still bare and brown. It is a cheerful sight to see the wild birds haunting

these green spots among the hoar frost at Christmas, or the lambs with their mothers folded on them in March.

As to the cost of forming water meadows, and their returns, Mr. Pusey in the same essay (p. 470) wrote :—

Flat meadows are spreading widely in South Devon. That they pay for this function there can be no doubt, costing from 3*l.* to 4*l.* an acre to form, and yielding 3*l.* of rent, whereof 2*l.* may be taken as the new value imported by the operation. This, for an average rate of profit, is a very high one. In single cases it is exceeded. About 2 miles from Exeter there is a small property of 156 acres, all but eight of which, that are orchard ground, are watered by two moderate brooks. *It is let at more than 6l. per acre all round* to different occupiers—three acres, worth naturally 3*l.* an acre, let at 10*l.*, and six acres at 8*l.* an acre. The whole was worth about 2*l.* an acre originally, and the portion recently made cost about 3*l.* 12*s.* per acre to form.

In reference to his own meadows in Berkshire Mr. Pusey added :—

It is mainly these catch meadows which enable me to keep a flock of 550 ewes, and winter their lambs also, on nearly the same farm upon which my predecessor kept 170 ewes with their lambs. There is one test, however, often applied by farmers when a person adopts and recommends some improvement in farming. They ask, "Has he gone on with it?" I may therefore mention that I have contracted this winter (1849) for 26 acres of catch meadows to be made at 3*l.* 10*s.*, and 30 more at only 2*l.* an acre.

In Vol. IV. of the Journal, 1st Series (1843) Mr. Pusey gave (p. 313) the following particulars of what he had seen in West Somerset and North Devon :—

A hill farmer at Winsford showed me a field so steep that one could not climb it without the aid of the hands. It had been rough ground, worth 5*s.* per acre. He had limed it, and allowed his labourers to break it up, and take potatoes for two years, after which time they returned it to him with the water-gutters traced along the slope, so that, instead of waste at 5*s.*, he obtained almost for nothing a field bearing perpetual grass, worth certainly 40*s.* an acre. Great as the change is, and strange as it appears, the practice is a part of everyday farming in this hilly district, and these catch meadows meet you at every turn—indeed the word meadow means here only watered land. Mr. Blake, of Upton, has brought less than 400 acres, which had not let for 400*l.*, to produce him 1,200*l.* a year chiefly by catch meadows, which he formed out of moorland, and lets every year as summering ground to the lowland farmers. There are some beautiful catch meadows at Cutcombe Pass, on very high ground, south of Dunster Castle. In Devonshire, too, Mr. Hoare, at Luscombe, near Dawlish, has made them from very poor land, on which he turns the water, first in the winter to feed, then to mow, and then three times afterwards in the summer to feed off the herbage in the course of the year. On one farm at King's Brompton, near Exmoor, the tenant had drained a piece of moorland, collected the runnings into a reservoir which Lord Carnarvon had built for him, and used the water, which had been poison above, as food for the field below. I do not mean that these catch meadows were all made without expense; but, where the land was previously dry, 2*l.* or 3*l.* per acre would be a fair estimate of the cost. I will only mention one case pointed out to me by a farmer of Winsford as perfectly easy to be carried out upon a neighbouring farm.

That hill farm consists of 232 acres, and is let for only 75*l*. But, as the farmer observed, 100 acres are a steep slope, covered with rough grass and short furze, worth about 5*s*. an acre. Now there are two copious springs gushing forth near the brow, which might be turned along the wild land, and thus for 2*l*. or 3*l*. an acre the worthless slope would be converted into catch meadow, which elsewhere would be worth 60*s*., and even in that secluded spot 40*s*. an acre: so that the value of this farm might be raised, for 300*l*., from 75*l*. to 250*l*. yearly. There are several practices of English farmers changing the nature of land at a moderate cost—transformations of soil which I have brought before the Society—but no discovery has surprised me so much as the marvellous effect of hill-side irrigation. In West Somerset a mere rill is made to produce on the barren flank of a moor more abundant herbage than the old grazing land of Northamptonshire yields. The method seemed to me capable of wide application, as it requires but trifling outlay. There is no doubt that it might be greatly extended in its native district round Exmoor, and I should think also in Wales. There are many tracts in the North of England, and many valleys in Scotland, which, if they were in Somerset, would be covered with catch meadows.

The very first volume of the Journal (1840) contains two articles on this subject, the one being Mr. W. Paxton's account of the formation of an Economical Water Meadow at Bicester, Oxfordshire, and the other Mr. John Evelyn Denison's deeply interesting paper on the Duke of Portland's Water Meadows at Clipstone Park, Nottinghamshire. The latter is no doubt the most stupendous undertaking in artificial irrigation ever carried out in this country, and deserves more than a passing notice. The Clipstone Water Meadows were formed in the heart of Sherwood Forest, so famous in old English traditions as the haunt of Robin Hood. Mr. Denison in his report says:—

The eye, after wandering through the glades of the forest, and resting on the brown carpeting of fern and heather with which it is clothed, is amazed at coming suddenly in view of the rich grass of the meadows, extending for miles before it, laid in gutter slopes and artificial terraces, and preserved in perpetual verdure by supplies of water constantly thrown over this surface. The land immediately occupied by these meadows was in its wild state a line of hill-sides covered with gorse and heath—a rabbit warren, over which a few sheep wandered—and a swampy valley below thick set with hassocks and rushes, the favourite haunt of wild duck and snipe, through which the little stream, the Mann, wound its way in its descent from the town of Mansfield. The whole tract, both upland and lowland, was of very little value. The valley was in many parts from 9 to 10 feet deep in bog, and almost worthless. The hill-sides varied in quality, but 80*l*. a year would have been a full rent for the 300 acres. Indeed, the whole of the Clipstone Park farm, when taken in hand in 1816, containing 1,489 acres, had been let for 346*l*. In 1819 it occurred to the Duke of Portland to carry the stream over the sterile hills, and to drain the bog in the valley. No less than 300 acres were by this means reclaimed, and converted to fertile water meadows. His enterprise did not stop here. A large reservoir of 70 acres was constructed above the town of Mansfield to secure the means of working the mills of that town and of irrigating the meadows in dry seasons.

In his prize report on the Agriculture of Nottinghamshire, in Vol. VI. 1st Series of the Journal (1845), Mr. R. W. Corringham wrote (p. 40) as follows:—

These meadows comprise an area of 300 acres of land, extending over a distance of about 7 miles in length. The value of the land has been raised from the annual sum of 80*l.* to that of 3,660*l.* at a cost (from their commencement in 1816 to their completion in 1837) of 40,000*l.* The profit upon each acre, after defraying all expenses, is computed at nearly 12*l.* a year, without taking into consideration the great benefit they are to the arable land adjoining them, which, in the words of Mr. Denison, they "enrich to an extent of five times that of their own." Stretching through a dry sandy district for so long a distance, and thus fertilising increasingly land so dependent on foreign aid, must show at a glance their almost incalculable value. As a triumph of art they must be considered one of the most brilliant and complete of any that is known.

Advantages of Irrigation.

Attentive consideration of the subject naturally leads to the conclusion that the manurial is only one of at least three beneficial influences calculated to be imparted when grass lands are irrigated. The thin water covering causes a higher temperature than the chill atmosphere, and the moisture supplied to the roots permits growth to be active even in the midst of winter under such conditions. In a summer drought the chief benefit derived would of course be that of bringing abundant moisture to excite active growth. All waters except those possessed of properties absolutely pernicious to vegetation would have been ardently prized could they have been utilised for irrigation in the drought season of 1893, whether bringing minerals in solution or not. Gardeners by watering their plants are well known to grow three or four times the amount of produce they would otherwise be enabled to do, and of course the same resource is open to the agriculturist.

The provision of shelter and warmth by a thin covering of water in winter or early spring is great also—much more, indeed, than is generally understood. Sir Humphry Davy in one of his lectures[1] observed:—

Even in cases where the water used for flooding is pure, and free from animal or vegetable substances, it acts by causing the more equable diffusion of nutritive matter existing in the land, and in very cold seasons it preserves the tender roots and leaves of the grass from being affected by frost. In 1804, in the month of March, I examined the temperature in a water meadow near Hungerford by a very delicate thermometer. The temperature of the air at 7 a.m. was 29°. The water was frozen above the grass. The temperature of the soil below the water in which the roots of the grass were fixed was 43°.

As to the shelter afforded in winter a coating of snow will often provide it, so as to have the same magical effect in causing

[1] Davy's *Elements of Agricultural Chemistry* (1846 ed.). P. 277.

grass and all young plants it has covered to appear fresher and more luxuriant when the covering disappears. And the selfsame influence, although in a less degree, becomes manifested when thorns or brushwood remain over the portion of a grass field nearest the fence when the latter has been trimmed or made just before or during winter. Moreover the favourite custom of many light land farmers of spreading long dung on their young seeds or mixed clovers and grasses in winter or early spring has its chief utility in sheltering the tender plants from frosts and nipping winds. There is fertilising influence also, no doubt, more or less according to the feeding of the animals which made the manure ; but some farmers are so well aware that the provision of shelter is the chief benefit rendered that when they have insufficient long dung, and straw happens to be abundant, they have strewn the latter over their young clover and grasses, and found that the beneficial result has nearly, if not quite, equalled that of the dung.

The following is a fact bearing on the matter. Mr. Gurney, having observed what many may have remarked, that whenever any loose object, a bare branch or an old gate, lies on a meadow in March the grass grows luxuriantly beneath it, conceived the idea of spreading straw over a field at the rate of about a ton to the acre with the object of promoting the growth of the grass. The scheme succeeded so well that it was adopted by many neighbouring farmers in Cornwall, and thus, interestingly enough, a thin coat of dry straw produced the same effect which had hitherto been obtained only by a thin sheet of moving water.

Mr. Pusey, reasoning as to the cause of this, remarks on p. 464, Vol. X. 1st Series of the Journal (1849) :—

I can see but one. Gardeners, it is well known, spread nets over their young crops to protect them from morning frosts in the spring. This effect is clearly due to the interception of the radiation of heat. The earth is constantly sending forth in a perpendicular direction, upwards into empty space, its warmth derived from the sun, just as a stove darts its heat around it. But a very slight interruption, such as the gardener's net, is found to check the passage of the heat, and thus to prevent that morning frost on the surface, so much dreaded by gardeners.

The technical arts in relation to the formation and management of water meadows were, for the matter of that, just as well understood in Arthur Young's days as now. He insisted on an intimate reliance on the spirit-level in laying them out, and gave facts to prove that by relying merely on the eye practitioners have often been deceived as to the extent of areas possible to be irrigated by available streams. He quoted some interesting examples illustrative of the imperative necessity of this, one being that Mr. Bakewell lent his irrigator to a friend that he might ascertain whether he could water the church meadow, and on the level being taken it proved that the water might be carried over the church steeple, had the land been high enough to receive it. Also that at Euston, the seat of the Duke of Grafton, doubts having been entertained in a discussion whether certain meadows below the hall could be watered or not, he himself, to solve the point, took the levels for more than five miles from Sappiston Mill, and found that the sand fox covers on rather high hills near the hall might be converted into water meadows. The following extract from the "Farmer's Calendar" also bears on this point:—

The lands usually chosen for the first operations are just those that ought to be the last, namely, the low flat meadows by the river. These are often improvable to a very high degree by draining and manuring with sand, gravel, earth, chalk, marl, &c., but they are by far the most expensive to irrigate, and when done, unless very well executed indeed, yield the worst hay. They are best watered and in many cases only to be watered advantageously by ploughing them into broad and highly arched ridges, the delivering trenches to be on their crowns and the drains in the furrows, but the profit of irrigating dry slopes and gravel, &c., and poor, dry, ling moors is immense. The expense is comparatively trifling and the improvement beyond conception. Such lands may be raised from 2*s*. or 3*s*. an acre to 40*s*. or 50*s*., while the flat meadows may be worth 20*s*. before the undertaking begins, and may not when ended be worth more than the others, though effected at ten times the expense. I once found a friend in the full speculation of watering some meadows which were worth 25*s*. an acre, and just ready to set a man to work, who ought to have known better. I thought by my eye that the water (the quantity very limited) might be better employed on some dry arable land above the meadows but further down the vale. I took the levels and found it as I conjectured. The plan was adopted, and I have since heard that the undertaking was remarkably profitable. The meadow at Sixmile Bridge in Hampshire, which lets for above 5*l*. an acre, was a gravel worth only 10*s*. before watering, yet formed at little other expense than converting a ditch into a carrier. Nor was the conduct of the water when I saw it correct by any means.

Still another quotation may be taken from Arthur Young's "Farmer's Calendar," as it illustrates very forcibly a fact about to be insisted on, namely, that vast areas of comparatively high lands, chiefly on hill-sides, might be subjected to irrigation if only there was that provident storage of water which seems so necessary when we consider the ruinous results of such seasons of drought as the summer of 1893 gave us experience of. At p. 307, in his "Farmer's Calendar," Young states:—

I am confident that with a little attention out of from 20,000 to 30,000 acres on a range of mountains I have viewed in Ireland water might be thrown over three parts in four. The declivities through which the streams run are considerable, and extensive tracts of land slope off on either side, so that by obstructing those streams, by piling torrent stones across them at various heights, and drawing small channels in the mountain-sides just above such obstructions to receive the water, this most advantageous work might be done at small expense, and a single experiment of it would presently show the prodigious advantage of the practice.

He adds:—

The application of this system to mountainous moors is one of the most profitable speculations which agriculture has to offer, and yet there are none so much neglected. From viewing them I have been greatly surprised at this, because there would be scarcely any that do not contain such spontaneous proof of the advantage as might have been sufficient for a hint to the stupidest clown. The firm spots by the sides of the torrents, from flooding, acquire a beautiful verdure, that proves a perfect contrast to the dreariness of the waste around; and where there are little rills on the mountain-sides, not considerable enough to cut a regular bed for their waters, but which spread, they are attended so universally with the verdure, owing simply to the water, as shows the advantage in the clearest manner.

Mr. Robert Smith actually undertook to convert absolute wastes—the wild rough heather land of forest hill-sides—into water meadows without previously reclaiming them by tillage, and he appears to have been tolerably successful in this grand enterprise. Another aim equally novel, and almost as bold, he likewise successfully accomplished, that of making his water carriers convey manure from his cattle yards to the fields wanting it. He diverted his main stream so as to pass through the farm premises, when, after driving a water wheel, "the waste water passed through the yards, and under every office to collect and wash out the sewerage of the whole establishment, and then pass it away to a pond at the outside of the buildings from which the adjacent meadows were watered."

Not only so, but Mr. Smith made this stream convey to considerable distances large quantities of the solid farmyard dung likewise. In this Journal, Vol. XII. 1st Series (1851), he says (p. 144):—

By means of the stream passing through the yards any portion of the farmyard dung may be thrown into it, and washed at leisure to the different meadows below, and at periods when possibly horse labour might be invaluable for other operations on the farm.

Moreover finding that the heath water is impregnated with injurious properties for irrigation, he remedied the evil by mixing the excrements of cattle with it by a method described by himself as follows:—

To effect a proper change in these waters, arrangements should be made along the main carriages—which take their rise from the brook course at the foot of the uncultivated hill—to form sheds for young cattle upon them, that the dung and urine may continually mix with the passing stream.

These sheds were placed at the higher end of the meadows, a short distance above the water carriage, just leaving sufficient space between for the passing of the cattle. Upon the main watercourse and opposite the sheds a small pond was formed for the reception of the manure when thrown out from the cattle shed. The water on its route thus passed through the pond, and by mixing with the manure and sewage from the shed became changed for the better, and the effect was deemed certain and cheap.

The following will show that Mr. Smith's enterprise in these respects was attended by important results. He says:—

> The water which has passed through my yard has been used upon a selected portion of hill-side land as an experiment, which in its natural state was partially covered with rough grass and heather, while on some parts not a plant of any kind was ever seen to grow. That below the water carriages upon which the water has been used is now covered with green and daily improving grasses, the chief of which is white Dutch clover, not a single seed of which has ever been sown there.

Construction and Cost of Water Meadows.

The Rev. Joseph Jekyll, in the Journal, Vol. XI. 1st Series (1850), p. 675, thus describes details and cost of forming catch meadows in the Western Hill districts of England:—

> The cost is but trifling. The gutters should be cut with a spirit-level about 3½ perches apart, 4 inches deep, and 18 inches wide, decreasing in width (according to length) to not less than a foot; a 2-feet gutter may be required at the top, and also some intervening gutters of the same width as the water descends the combe. This can be effectually done for 1½*d.* per perch, and as 50 perches will be required for an acre the cost will reach 6*s.* 3*d.* per acre. My valley meadow of seven acres is a flat uneven piece of ground; it was filled with large stones, covered with bushes and briars, and not worth 8*s.* per acre when I took it in hand. I merely cleared and cropped it with turnips at a cost of 5*l.* an acre, and had a fair return for the outlay the same year. I then laid it down to grass and the third year conveyed over it the Bazle water in a 2-feet gutter through its centre, cutting the smaller gutters, some at right angles, some serpentine, from the main gutter ascending to the level. The expense of this, sluice and all, did not exceed 5*l.*; it is now worth 2*l.* per acre.

The technical art in the formation of a catch meadow depends very much on the employment of the spirit-level. Thus Mr. Smith, who in the fifties managed the newly reclaimed estate of Mr. Knight, of Exmoor Forest, wrote as follows in the Journal, Vol. XII. 1st Series (1851), p. 141:—

> The hill-side being already formed by Nature to our hands, the spirit-level beautifully traces the varied slopes and marks the onward course for the gutterer or waterman, who should be a man of some taste in the art of levelling, as the marking out the intermediate spaces upon irregular ground is found to be a nice point, that the water may flow in an even stream over the sides of the gutters. The arrangement of the "main water-carriages" depends solely upon the formation of the land and supply of water.

Mr. Smith's estimate of the cost of laying out catch meadows on Exmoor was 10*s.* per acre for cutting gutters and water-carriers at an average distance of 22 yards—large or small—and 5*s.* per acre for all other works, such as the necessary culverts through the fences, under gateways and flood-gates, hatches, and extra water-carriers for fetching distant water to any given point or pond.

The Rev. Mr. Wilkinson in his report on the farming of Hampshire (p. 288 of the Journal, Vol. XXII. 1st Series, 1861) says of the water meadows in that county:—

They are expensive both to make and to maintain, their construction costing from 15*l.* to 40*l.* an acre, according to the form of the surface. If the soil be not naturally dry it must be under-drained, and that deeply, so as not to interfere with the irrigation. The ground has to be turned by manual labour into ridges and furrows, or, as it is called, "bedwork," the beds being some eleven yards wide, with an elevation of 2 feet in the centre; but this width generally and the gradients of their sides depend much on the soil; the drier this is the broader the beds and the less the declivity of the sides. The great object is to give the water a quick run, for if it stagnates the grass will suffer in quantity and in quality. The water is admitted by a main carriage; subordinate carriers or feeders at different angles to the main convey the water along the summit of each ridge; the water soaks down and through the sides of the ridges into the drains which run along the furrows. The used water is not returned to the river for perhaps two miles from the spot whence it was originally abstracted and does duty meanwhile. A "head" meadow is one flooded with the water first coming from the river; a "tail" meadow with that previously used in a head meadow. The meadow receiving the tail water is not the one immediately contiguous to that receiving the head water, but the next but one. If it were attempted to make a tail meadow next to a head meadow it would be necessary to raise the water by hatches so high that it would flood the head meadow; the intermediate meadow is generally watered by an "over-carrier."

As to the period of watering he says:—

The watering is continued throughout November and December six days in the week if possible; in January five; in February four. If the frost be hard the water is turned off until a thaw. The meadows are dried the first week in March and trodden by men's feet—a roller and horses would do injury to the carriers and the drains—and about Lady Day the ewes and lambs are turned in, being taken out at night and folded on the arable. They stay in about six weeks; if longer the meadows are liable to injury. As soon as they are out the hatches are drawn and the water is admitted, but very thinly and scantily at first in order that the grass may have time to grow above it. Two days a week will be sufficient watering till the grass is cut, and the hay made in the middle of June. Water may again be applied once a week, and eight weeks after there will be a second crop of hay. As to the produce the spring feed of one acre will easily keep twenty couples, which will fold three-quarters of an acre of arable in the time. Each hay crop will be from 1½ to 2 tons per acre.

A range of valuable water meadows lies on each side of the Kennet and of the Lambourne from Shefford to Newbury, and a small quantity by the stream running from Hanstead Norris to Pangbourne. These are usually fed off in the spring from April to May with sheep, being let for 3*l.* or 4*l.* per acre for the feed—in some backward seasons they make more. They are watered from the middle of May to about the middle of July and afterwards fed up to the end of November by cattle and horses.

The Storage of Water.

One inch of rainfall represents, as is well known, 100 tons of water per acre, and the average annual rainfall of England varies from about 20 to 25 inches on the East Coast to 40, 60, and even 80 inches or more on the Western Hills and the West Coast generally. If 30 inches be taken as the average downfall, this would be equivalent to 3,000 tons per acre, a quantity equal to about 13,000 hogsheads of water. An immense portion of this rainfall runs to waste, some authorities being of opinion that it amounts to as much as nine-tenths. Why should not a large quantity of it be stored in reservoirs at hill-sides, the drainage water of farms, ditches, and brooks being intercepted and made to fill them before it reaches valleys and lowlands? This idea recommended itself to Mr. Pitt before the present century commenced, and he says in his survey of Staffordshire:—

> The great desideratum in this species of improvement seems to be the introduction of reservoirs constructed so as to contain large quantities of flood water, which may be successively and at pleasure distributed upon any land below its surface. This idea as applicable to agriculture is, I believe, novel, and may be treated as visionary; but I am so thoroughly convinced of the great advantages to be derived from it that I will venture a prediction of its being in some future time practised to a great extent.

Mountain torrents are by no means so considerable in the greater part of England as in Ireland, but there are hill-sides and plains everywhere which might be profitably irrigated by the drainage water, running in ditches from higher lands, being intercepted and stored in reservoirs or catchponds, as they are termed in the West of England. As the construction of these is a matter attended with expense, it is important to consider what this would be. The late Mr. Bailey Denton in a lecture on water storage, delivered some years since, calculated that a reservoir to hold 720,000 gallons would require four-tenths of an acre to be excavated at a depth of $7\frac{1}{2}$ feet, and that the cost of excavating and putting the earth round to form a bank would be 62*l.* 10*s.*, the calculation being that it would be 2,500 yards at 6*d.* per yard. If the bottom of the pond had to be puddled, the cost would be considerably more, but it is a fact well known to practical agriculturists that in many districts ponds can be made water-tight without expensive puddling. Thus Major Staveley on his Royal Prize Farm on the Chalk Wolds in Yorkshire, finding it difficult to get sufficient water for his stock to drink in a district where wells have to be sunk from 180 to 240 feet deep to obtain it, formed an inexpensive pond, at a convenient spot where the ditches of four fields met and could be made to discharge themselves, at a cost of only 30*l.* As recorded in the Journal, Vol. II. 3rd Series (1891), p. 562, his method was after digging to the required depth to spread a coating of lime; then one of clay well worked; then another layer of lime, on which some straw was spread; and over all a thick stratum of chalk. A pond thus constructed he found could be made quite water-tight, and would be capable of collecting a considerable quantity of rainfall and surplus surface water; a fact worth noting by those who suffered so severely last summer in having to fetch water long distances for their stock, which unfortunately was the case in numerous instances.

When the provision of drinking water for stock is the sole object a better and perhaps a cheaper way under certain circumstances would be that of pumping up water from a lower level to an upland farm. Thus the late Earl Bathurst effected a grand improvement at North Cerney, Gloucestershire, about eighteen years since, whereby the greater part of that village and the large hill farm of Mr. T. R. Hulbert, consisting of about 1,400 acres, were fully supplied with ample pure drinking water for human kind and for cattle, sheep, and horses. Advantage was taken of there being a deep well close to an old grist mill on the stream just below the village, and its water wheel was utilised to work pumping machinery to send water from the well to the upper part of Mr. Hulbert's land, some 500 feet above the level. A reservoir of solid masonry was then constructed whence water was conveyed by piping to cisterns placed in every field, as well as to all the houses in the village requiring it. As the entire undertaking only cost about 1,000*l.*, a surcharge of 1*s.* per acre per year on the land alone would have given 5 per cent. interest on the capital expended; and no doubt if no portion of the water supply had been required for human consumption, a much greater volume might have been pumped up from the stream itself sufficient to have irrigated considerable areas. As the case stands, however, Mr. Hulbert derives some ulterior benefit from the supply other than a perennial source of drinking water for stock. He is enabled to use a water-drill in depositing turnip, mangel, cabbage, and other seeds, whereby their germination is ensured in a droughty season such as that of last summer. In the Royal Agricultural Society's Prize Farm competition of 1878 Mr. Hulbert won first prize in Class 1, and some further details of this improvement will be found in the Judges' Report of the prize farms in Vol. XV. 2nd Series of the Journal.

There are a great many other places in England, no doubt, where existing water wheels or turbines might be usefully employed in pumping up water to moderate heights both to supply drink for stock and water for irrigation. Referring to the supply of water for towns, in a paper read before the Society of Arts,[1] Mr. Bailey Denton said :—

When the relative height of the brook and the town will not allow of a reservoir being directly filled by the former, recourse can be had to a wheel or ram to raise in winter the summer supply. The best formed hydraulic rams, made by Easton and Amos, or Freeman Rowe, with an available fall in the stream of 7 feet, will raise to the height of 30 feet one-eighth of the quantity that sets them in motion; and, assuming a reservoir formed above the village to receive the water raised, a stream discharging 23 gallons a minute during the winter and spring will be sufficient to raise in 180 days 720,000 gallons for use during the summer and autumn. A turbine or an overshot wheel might take the place of the ram with advantage when the quantity of the water to be raised is greater than that stated. But, of course, the expense of either ram or wheel, and attendant works, would be saved in those instances where water can be brought from a height, and conducted at once into the service reservoir, with an overflow to discharge the excess when the reservoir is filled. But in many instances even where streams exist a better supply may be obtained by the under-drainage of land in the neighbourhood; and if we resort to it we have data which will quite satisfy the most fastidious inquirer, showing that the minimum discharge will afford a sufficient quantity of the very best water if the area of drained land be sufficient. It is surprising, too, how few acres of land will suffice for the purpose.

Mr. Bailey Denton also observed that the proportion of drainage water to the rainfall would vary, according to the nature of the soil and other circumstances, from more than two-thirds to above one-fourth; and that thus "with a winterfall of 10 inches of rain and snow the maximum may be taken at 160,000 gallons per acre and the minimum at 60,000 gallons per acre for every acre drained." Moreover, he estimated that "the mean discharge of drained lands may be fairly taken at 100,000 gallons per acre."

Only comparatively small portions of the above would be required for human consumption, so that the greater part would be available for agricultural purposes if we could but have the reservoirs. The cost of construction of these would not in all cases probably be so great as Mr. Bailey Denton's estimate previously given, because it would vary considerably in accord-

[1] See *Society of Arts Journal*, January 5, 1859.

ance with the nature of the land and its value for other purposes. Thus Mr. Pitt in his survey of Staffordshire, before quoted from, argued that a reservoir of a few acres and of two yards average depth might be constructed at from 10*l.* to 20*l.* per acre, according to circumstances of situation. Of course he could not have taken into the calculation the value of the land itself, or that the bottom of the reservoir would require puddling, and manual labour was, perhaps, only a little more than half its present cost a century ago. But he calculated that such reservoirs would serve for fisheries which, under proper management, would be equal or superior in value to an equal breadth of land.

Water like fire is one of the best of servants, but the worst of masters, and the devastations caused to riparian meadows and lowland moors by excessive injurious floods have perhaps raised a prejudice against extending irrigation artificially. But if so, the great drought of the spring and summer of 1893, and its direful, calamitous results, ought surely to be sufficient, not only for its removal, but to make everybody anxious to do everything possible to prevent the recurrence of catastrophes which wrecked the prospects and minimised the crops of thousands. This can only be done by storing up the drainage water of the hills in reservoirs and catch ponds; arresting alike the trickling dyke and the swelling brook, utilising every gushing torrent in those seasons when the rainfall is more abundant and preventing the rushing down to the main streams of the element which if conserved would be sure to prove a great blessing, but by being allowed to run to waste where it is not wanted becomes a curse to the plain.

Injurious floods will be lessened in their ravages in good time no doubt, for such a season as 1879 shows the urgent necessity of it just as much as the severe drought of 1893 has inculcated the absolute need of much more water storage than has ever yet been contemplated. Indeed, the two gigantic undertakings of water storage for droughts and regulating the outflow of rivers so as to prevent excessive inundations are inseparably connected.

The favourite scheme of Mr. Ridley and of the majority of the civil engineers who gave evidence before the House of Lords' Committee on River Conservancy was that of embanking the main streams, and by placing the embankments far enough back from the bed of the river to have a watershed between sufficient to convey the excess of water in the most rainy season. Both Mr. Ridley and Mr. Abernethy stated, however, that if rivers were thoroughly embanked so as to prevent any overflow whatever, it would still be easy enough by means of weirs and sluices to keep back a certain head of water in the bed of the stream, which at any time could be drawn from for irrigation and other objects. Moreover, it was stated in connexion with this scheme that a rhine could be cut all round the edge of the moor where it abuts on the high land, which would of course get filled after heavy rains with discharges from the hill ditches and brooks, and that the water there collected might be always utilised to irrigate the adjoining parts of the moorland.

Water Supply for Stock.

Many farm homesteads in hill districts are badly off for drinking water for stock, especially in those localities where wells have to be sunk from 200 to 300 feet ere water-bearing strata or a spring can be reached. In these cases the cattle and horses have to drink out of a pond, while too frequently it is nothing but a cesspool which takes the drainage of the farmyard and all its offices. The spoutings of the farm buildings contribute a great deal to the contents of all such ponds, and by keeping the water from this source separate the evil might be obviated and an ample supply of drinking water for all the stock of the farm provided, not only for winter, but the entire year.

Cisterns are often employed to serve this object, but they are seldom large enough to hold a full supply for any great length of time, and a large proportion of the surplus water in winter still runs to waste. When the largeness of the supply from this source is considered, nothing less than a tank or reservoir at most farmsteads would be requisite thoroughly to carry out the object. As is well known, the rainfall is much greater in some districts than it is in others; but it has been calculated that in the Home Counties the fall of rain-water is about 4,800 gallons for each 400 square feet of roof surface, and that taking the entire kingdom it would be something like 5,000 gallons for each 500 feet of roof surface. As to the cost of tank construction the calculations made by Mr. Love in Vol. XX. 1st Series of the Journal (1859) may be quoted, for although they applied to the construction of liquid manure tanks, the same kind would serve for the storage of drinking water for stock. These will be found in the following table for tanks of the depth of 10 feet, the depth of excavation for which would be 12 feet. The clay required to pack 4 inches thick behind the brickwork is also given, and the number of bricks required for the interior, 9 inches thick, with a 4-inch top and a 4-inch bottom, and a manhole $3\frac{1}{2}$ feet in diameter. The bottom is recommended to be concave, forming a portion of a sphere, the radius of curve of which is equal to the diameter of tank:—

Contents in gallons	Diameter of tank		Diameter of excavation		Cubic yards in excavation	Stanching, clay in cubic yards	Bricks required	Total cost		
	ft.	in.	ft.	in.				£	*s.*	*d.*
2,269	6	10	9	0	28	5⅔	4.200	8	6	2
4,538	9	8	11	10	49	8	6,100	12	4	0
6,807	11	10	14	0	68	10¼	7,900	15	17	4
9,076	13	8	15	10	87	12¼	9,600	19	7	0
11,345	15	3	17	5	106	14	11,000	22	5	4
13,614	16	8	18	10	124	15⅔	12,400	25	3	6
15,883	18	0	20	2	140	17⅛	13,700	27	17	0
18,152	19	4	21	6	161	19	15,100	30	16	3
20,421	20	5	22	7	180	20⅔	16,500	33	15	0
22,690	21	7	23	9	199	22	17,900	36	13	0

Tanks for the collection and storage of pure rain-water to serve as drink for stock[1] appear to be very badly wanted in those districts where the soil itself impregnates the spring and drainage water with medicinal and in some cases poisonous properties. In 1862 there were several bad cases of splenic apoplexy on farms in the neighbourhood of Ilchester, Somerset, and lengthy reports were published from Professors Simonds, Buckman, and Voelcker in the Journal, Vol. XXIV., 1st Series (1863). One paragraph in the late Dr. Voelcker's report was as follows :—

> There can be no question that in a lias district there are materials in the waters having a tendency to produce disease; whether it be splenic apoplexy, scouring, or some other affection I cannot say; but that such water cannot be drunk with impunity is certain.

In another report on the same subject Dr. Voelcker suggested that "it is highly advisable to cut off the supply of hard lias springs and to provide cattle with soft drinking water," and also that "rain-water tanks for the supply of soft water should be constructed in localities where cattle are obliged to drink hard waters that rise in the lias clay."

Conclusion.

Irrigation, water storage, and the provision of pure drinking water for stock are all old, time-honoured practices, and it is certainly noteworthy that the great Bacon's ideas on the theory of the former were quite as sound as any propounded to-day. He recognised the truth that the influences work beneficially in three different ways, for he said that "meadow-watering acts, not only by supplying useful moisture to the grass, but likewise the water carries nourishment dissolved in it, and defends the roots from the effects of cold."

55 Benthal Road, Stoke Newington, N. JOSEPH DARBY.

[1] See, on this subject, Professor J. Wortley Axe's paper on *Water in Relation to Health and Disease.* (Journal, Vol. IV., 3rd Series, No. 16, 1893, pp. 726-750.)—ED.

SOME MINOR RURAL INDUSTRIES.

THE steady increase year by year in the quantities of poultry and eggs imported into the United Kingdom can hardly fail to suggest the question as to whether the money which is thus expended could not, without very much trouble, be kept at home. Sometimes the finger of scorn is pointed at the English farmer because he does not produce from English soil all the beef and mutton, or all the wheat, which is needed for home consumption. The rejoinder is that in the case of almost any staple article of agricultural produce we could raise in this country all that is required, but that this would necessarily involve an equivalent displacement of production in the case of some other article or articles.[1] With regard to poultry and eggs, however, it is submitted that, within limits, this is not so. It is believed that the rearing and fattening of poultry—including fowls, ducks, geese, and turkeys—as well as the output of eggs, might be very largely extended at home without displacing any other kind of produce. That there is considerable inducement to embark upon these minor industries appears evident from the following figures, which show that even within the brief space of the last five years the value of our imports of poultry and eggs has risen from 3,480,306*l.* to 4,454,598*l.*, an increase of nearly one million sterling :—

VALUE OF POULTRY AND GAME (ALIVE OR DEAD), AND OF EGGS, IMPORTED INTO THE UNITED KINGDOM IN EACH YEAR FROM 1888 TO 1893.

	1888	1889	1890
	£	£	£
Poultry . . .	403,197	472,686	497,858
Eggs . . .	3,077,109	3,122,813	3,428,802
	3,480,306	3,595,499	3,926,660

	1891	1892	1893
	£	£	£
Poultry . . .	456,979	583,430	578,959
Eggs . . .	3,505,522	3,794,718	3,875,639
	3,962,501	4,378,148	4,454,598

[1] See on this point the concluding remarks (pp. 126–131) of the paper by Sir John Lawes and Sir Henry Gilbert on the *Home Produce, Imports, &c., of Wheat* (Journal, Vol. IV., 3rd Series, Part I., 1893). With reference, for example, to our imports of dairy produce, they say (p. 127): "In fact, to produce the increased amounts of butter and cheese supposed would require several million acres of grass land, necessarily displacing some other produce, involving increased importation of something else to compensate the loss; and it would also require increased importation of food-stuffs for the cows."

As examples of profitable industries, which might be advantageously extended in many rural districts and usefully introduced into others, some account is given in the following pages of the duck-fattening business on the one hand, and of the rearing and feeding of fowls on the other. A few notes on the results of certain experiments in poultry feeding are added.

The Duck-fattening Industry.

In the neighbourhood of Leighton Buzzard, on the borders of the counties of Bedford and Buckingham, one of the leading industries is the rearing and fattening of ducks. The business was formerly localised more in the direction of Aylesbury, but of late years it has extended towards Leighton Buzzard, which has become a convenient centre from which to acquire a knowledge of the essential features of an occupation that is no doubt capable of profitable pursuit in other parts of the country. As will subsequently be seen, one of the chief points in favour of an extension of the industry is that it may be entered upon with very little capital, though as a set-off against this it should be observed that it is an employment which, to be followed successfully, demands a special exercise of patience and perseverance, as well as unflagging attention, on the part of those who devote themselves to it.

The general principle underlying the business as it is carried on in the Leighton Buzzard district is that the breeding of the ducks is undertaken by people who are quite distinct from those engaged in the work of rearing and fattening the young birds. The eggs, in fact, are bought up from anybody—farmers, cottagers, and others—who may keep ducks and drakes. Whilst, therefore, the production of eggs is undertaken by many people, the hatching of the eggs and the rearing and fattening of the young ducks are in the hands of comparatively few persons, and it is these latter who may be regarded as specially engaged in the industry now under notice. Various methods are followed in the purchase of eggs. In some cases a duck-keeper contracts to deliver all his eggs to one purchaser at prices agreed upon. In other cases the duck-fattener buys eggs where and when he can, and makes the best bargain possible for himself. Whatever system be followed the result is that the people who have breeding ducks find a regular market for eggs amongst the fatteners, and these latter obtain their supplies from a considerable range of country. Hence, although the actual work of rearing and fattening may be in comparatively few hands, the interest in the business is widespread, from the fact that it embraces all the people who produce ducks' eggs for sale. At the beginning of the hatching season—when the inducement to put ducklings on the market early is a strong one—a set of 13 eggs may command up to 6*s*. or 7*s*., and in extreme cases as much as 1*s*. each is sometimes given at Christmas time for fertile eggs. As the laying season advances, and eggs become more abundant, the price declines to ordinary market rates, but as the produce of these eggs cannot be ready for sale till ducklings are plentiful and cheap, the return is correspondingly less. Another factor that operates against the duck-fattener at the opening of the season is the difficulty at the outset of obtaining hens for setting purposes. Artificial incubation does not appear to be practised, and in the depth of winter as high a price as 4*s*. may be given for a clucking hen to hatch out eggs; as the spring advances the price declines till it finally falls to about 1*s*. 9*d*. Any kind of hen will answer the purpose.

It is convenient and economical to set several hens simultaneously, so that when, on about the tenth day, the eggs are examined and the infertile ones are taken away, each hen may be given a full complement of eggs, and one or two hens which will thus be left without any may be put on a new nest of eggs. The energy of the hens in the work of incubation is thus economised, whilst the infertile eggs are boiled and chopped up, shells included, as food for the ducklings during the first week of their active life. The period of incubation of ducks' eggs is, as is well known, 28 days. The Aylesbury duck is the variety exclusively bred in the district.

Inasmuch as the principal object in view is to get the ducklings fat for sale by the time they are eight or nine weeks old, the management from the moment the young birds emerge from the shell is directed solely to this end. For the first week after hatching the ducklings remain with the hen, their food during this period consisting of boiled egg and of toast soaked in water—of the latter they are specially fond. This food may be continued for a few days after the hen has been taken away, but it is gradually replaced by boiled rice. Only good qualities of rice—Rangoon or stained Japan, such as will become gelatinous in boiling—are used, the price being about 10*s*. per cwt. Later on, barley-meal and toppings (or sharps) are introduced into the diet, and at five weeks old the ducklings are put upon fattening food, an important constituent of which is greaves or tallow scrap—sometimes called scrap-cake—which is the refuse from tallow-chandlers' factories, and costs about 14*s*. per cwt, A mess of rice, barley-meal, toppings, and greaves boiled up together, with some chopped and boiled stinging-nettles added for blood-cooling purposes, usually constitutes the food upon which the ducklings are fattened. In large establishments the carcass of a horse or sheep cut up and boiled as required in a copper out of doors affords useful fattening food which may be given in place of, or as supplementary to, the greaves. The ducklings are fed three times a day—at 7.30 A.M., 12.30 P.M., and 4.30 P.M.

As to the proportion of birds produced from eggs set, at the beginning of the season it is about 8 out of 13, but the number increases as the season advances and the eggs can be more certainly relied upon as fertile. Of the birds hatched out, a rearer in a large way of business finds he markets about 85 per cent. as fat ducklings. Much depends, however, upon the attention given to the young birds immediately after they are hatched; trouble and care bestowed at this time upon weak birds is often amply repaid. A painstaking rearer will pick out the delicate young birds and give them personal superintendence in the kitchen for a few days, till they are strong enough to be again placed with the more sturdy nestlings.

The equipment of a "duck farm" is simple in the extreme. One or two low dry wooden sheds, each with a "run" in front, are sufficient. The classification of the ducklings is determined by age. They are, accordingly, divided into "flocks," of one week old, two weeks old, and other ages. At a week old a flock of Aylesbury ducklings is an exceedingly pretty sight. Each bird is a little ball of yellow fluffy down, furnished with a bill of delicate heliotrope colour. The youngsters are very nimble and keep together as they run up and down or across their limited range, uttering continually the plaintive call which falls upon the ear almost like a plea for protection. As age advances, the feathers turn white, and the bills grow paler. Very commonly the run is littered with straw, upon which the little creatures will peacefully nestle on a drowsy sunny afternoon. As an example of economy in small things it may be noted that the straw is periodically gathered up, shaken out elsewhere to dry and sweeten, and then strewn again upon the run or under the shed. In one case where a large shed is used for the ducklings the straw is taken out daily and the mud floor swept, sprinkled with a weak solution of carbolic acid, and dusted with lime, before the straw is put back again. Great care has to be exercised in keeping the ducklings healthy, and cleanliness is necessarily a first consideration. In the spring of the present year a duck-rearer near Tring lost 1,000 ducklings, and attributes their untimely death to a species of louse—caught from the brood hens, he opines—fastening on the back of the neck.

It will be understood that the young birds destined to be killed as ducklings are never allowed to roam at large, nor do they go on the water, the object being to reduce the wear and tear of muscular tissue to a minimum, so that as much as possible of the food may be utilised in adding to the weight of flesh upon the bird. As the ducklings are never kept for breeding purposes this somewhat unnatural mode of life can have no ill-effects of an hereditary nature. Such water as the ducklings are allowed access to is supplied to them in small troughs or shallow vessels, and they use it for bathing and drinking purposes. The duck-rearers are very particular as to the kind of grit which is given in the drinking water. It is found that the local gravel, which is free of clay, will not "bind," and material for this purpose is therefore obtained from Long Marston, near Tring, at 1*s*. 6*d*. a load. As the birds are always kept in confinement, it is essential to health that they should be provided with efficient means of triturating their food.

Where a large number of birds of the same age are kept together, it is usual, except when they come to the front to feed, to partition them off into small "flocks" of about 100 birds each. This is easily done by means of planks about one foot wide, set on edge, so as to divide up the ground space into a number of rectangular areas. The object of this is to prevent the birds from overcrowding, and possibly killing the weaker ones by overlying. As the birds return from feeding they are successively partitioned off as fast as a sufficient number enter the shed. When the birds get larger with advancing age it is found expedient to confine fewer in each pen—say, two dozen or so.

A somewhat frequent malady of the ducklings is that known as "soft bill," which may possibly be induced by high feeding. But this can hardly be the case when the bill is so soft that the young bird cannot break its way out of the shell. The evil would then seem to be, in some way, inherited, and too close inter-breeding of the parent birds suggests itself as the cause. Inquiry in the neighbourhood elicited the fact that in some cases the same drake may be kept in use as long as four years. Change of blood would, therefore, seem to be imperatively called for; but as a rule the egg-producers, who are scattered through the district, seem indifferent to the most elementary principles underlying the art of breeding, and are perhaps quite ignorant of them.

The number of ducklings that can be reared on a very limited area of ground is surprising, and in some cases the small garden attached to a cottage is all the space that is available. In one shed, visited in April, there were thirteen pens, constructed as already described, each containing about 100 birds, so that when they were let out for feeding a little army of 1,300 ducklings came into view. In another place nearly 300 hens were sitting simultaneously, the hatching boxes being arranged in horizontal tiers, one above the other. On quite a small place belonging to a cottager, the number of fat ducklings sent off in the season of 1893 reached a total of nearly 1,900. Another rearer, on a somewhat larger scale, plucks about 6,000 birds in the year. At a still larger establishment, in connexion with a farm of 160 acres, the number of fat ducklings sent to market in 1893 was 10,000.

The controlling feature of the whole industry is, in effect, furnished by the consumer. The game season in this country may be regarded as extending from August to January, and the object of the duck-fatteners is to supply the market with birds during the alternating six months from February to July. To put fat ducklings of eight or nine weeks old upon the market early in February involves setting the hen upon the eggs in November, at a time when eggs are scarce and clucking hens are difficult to obtain. Hence the fat ducklings that come first into the market, just at the close of the game season, command a high price, but the quotations steadily diminish till they reach a minimum in July, when the supply of ducklings is abundant. The following may be taken as representing the price of ducklings per couple in the Metropolitan market at the times stated: February, 16*s.*; March, 14*s.*; April, 12*s.*; May, 8*s.*; June, 6*s.* to 7*s.*; July, 5*s.* to 6*s.* It is seen, then, that the ducklings decline in value from 7*s.* or 8*s.* apiece at the beginning of the season to about 2*s.* 6*d.* or 3*s.* at its close. The average weight of the birds at the Metropolitan Market is 7½ lb., dressing to 5 lb. per pair.

As the season for marketing the ducklings ends in August, it follows that the fatteners have three or four idle months before the commencement of the next hatching season. During this resting period the sheds are thoroughly cleaned and whitewashed, and the ground on which the ducklings are reared is sweetened and rendered fit for the next season's operations. The interval between one season and another is therefore very useful, for it not only gives the fatteners a rest, but it permits of so thorough an overhauling of the premises as cannot be otherwise than conducive to the health of the birds.

An important feature of the business is that those engaged in it practically clear out the whole of their stock every year. The turn-over is thus rapid, and as a very small capital would suffice to enter upon the industry on a moderate scale there does not seem, on the face of it, to be any reason why it should not be profitably extended to other districts. It is to be noted that around Leighton Buzzard nobody seems to depend upon it exclusively as a source of livelihood, as all who are engaged in the business have also some other occupation. Much of the work, perhaps most of it, can very well be left to women and girls; the care of delicate young birds newly hatched, the preparation of the food, and the regular feeding of the ducklings do not involve heavy labour, and may well be entrusted to the female members of the household. Constant care, unwearying attention, scrupulous observance of details, and the maintenance of a healthy condition of the birds—these on the one hand, and a due development of the commercial instinct on the other, seem to be the factors necessary to command success.

The disposal of the hens that have been used for hatching, the killing, plucking, and packing of the ducklings for market, and the sale of the ducklings' feathers are amongst the minor details of the business. The railway carriage to London for a package containing from four to a dozen ducklings is about 1*s.* 2*d.*, and it is estimated that the charge upon each bird for carriage and commission is about 3*d.* If the price of fat ducklings in June be taken as fairly representing the average for the season, this would come to about 3*s.* 3*d.* per bird all round. The gross return from a small business which marketed 1,000 birds in the course of the season would thus amount to 162*l.* 10*s.*, especially if the return from feathers and worn-out hens be included. Deducting from this all charges for rent, food, plant, brood hens, and other contingent expenses, there should be left a fair margin to recoup the members of the duck-fattener's family for their services, and to induce them to persevere in the business. From the fact that a considerable number of people are engaged in the industry, it may reasonably be inferred that it is lucrative, whilst the circumstance that it can be easily and conveniently dropped if desired at the end of any season is in reality another argument in favour of its extension.

The Fowl-fattening Industry.

In certain districts of Sussex and Surrey much attention has long been given to the rearing and fattening of chickens, especially in the neighbourhoods of Heathfield and Uckfield. At one of the largest establishments as many as 6,000 chickens may be undergoing the fattening process at one time; at the other extreme is the small farmer or cottager who does not attempt to fatten more than a few dozen birds. The chickens are readily bought up from the breeders by higglers, who sometimes pay up to 3*s.* 6*d.* or 4*s.* in the spring months for well-grown birds nine or ten weeks old; moreover, the regular senders of dead poultry to market understand the mode of preparation after killing, a point of the highest importance when the birds are exposed for retail sale. Inasmuch as the demand for chickens far exceeds the supply, there should certainly be room for a profitable extension of this minor industry. The system of fattening is nowhere carried out on more enlightened principles than at Iville Farm, Baynards, near Horsham, belonging to Mr. C. E. Brooke, Master of the Poulterers' Company, so that a description of the methods there pursued may be regarded as illustrative of the general features of the business.

The operations at Iville Farm are conducted on an area of about fifteen acres of poor grass land, which, however, is fairly dry. Here on a spring day a large number of hatching boxes or coops may be seen, arranged at regular intervals upon the ground, and each containing a hen, either sitting on eggs or with young chickens which she has hatched out. The coops are shifted daily to the extent of their own width, so that there may be a continuous succession of fresh sweet soil and that the fouling of the ground may be avoided. Each hen is taken out of her box for from fifteen to thirty minutes daily, according to weather, and is fastened by a string to a small peg on the ground in front; this is the opportunity allowed her for exercise. The hatching season lasts from October to May inclusive, thus extending over a period of eight months. Artificial as well as natural methods of incubation are employed, the former more particularly in the winter months, when as many as five incubators may be in operation at the same time. In the rearing of the young birds also both artificial and natural methods are resorted to, the chickens being brought up under a brooder in the former case, and left to the care of the hen in the latter.

For the first twenty-four hours after emerging from the egg the young birds get no food, neither are they tortured by the nostrum of forcing a peppercorn down the throat or by tearing off the hard scale at the end of the beak. During the first week their diet consists chiefly of Spratt's chicken food, with which is mixed hard-boiled eggs chopped up with their shells; these are the eggs which have proved to be infertile and have been removed from beneath the hens or the incubators. The chickens are next put on a more varied diet consisting of a mixture of barley meal and Spratt's food in the morning, boiled rice with oatmeal or bone meal at mid-day, and wheat in the evening. At ages varying from four to seven months the young birds are sent into the fattening house, after three weeks in which place they are ready for killing. The house is a rectangular apartment, kept sweet and clean by whitewash and other means, and lighted from the roof only. All round the interior the fatting boxes or coops are arranged side by side in horizontal tiers, one over another, and when the house is full it contains 632 birds. The cages or coops are made of wood and have vertical bars in front; each cage is large enough to permit its inmate to turn round, but no more. As each bird has a cage to itself there is no loss of muscle or of energy, such as might arise were the birds placed in a common pen, in which disagreements might constantly occur.

There are two stages of feeding in the fattening house. For the first week the food—a thick mixture of ground oats and water—is delivered from a wooden spoon into a trough which extends along in front of the cages. Each bird gets a spoonful, which it devours by thrusting its head between the bars of its cage. For the remaining two weeks the birds are fed exclusively by cramming, and on a richer diet. The food in this final period consists of a mixture of barley meal, ground oats, and skim milk, to which is added the best beef and mutton fat obtainable, the proportion of fat being increased day by day. The cramming operation is easily effected. The cramming machine containing its soft mess is wheeled along in front of the coops. To feed a bird the attendant takes it out of its coop by its wings, and passes the fingers of his left hand beneath the bird's crop. With his right hand he directs the end of a flexible tube coming from the reservoir of the machine through the fowl's mouth into its crop. With his right foot he presses the treadle of the machine, and thereby drives a mass of food into the crop, judging by his left hand when this cavity is sufficiently filled, and regulating the pressure on the treadle accordingly. A careless attendant, or a beginner, might burst the bird's crop by over-distension, but an experienced man is capable of feeding 100 birds from the machine in the space of about twenty minutes. All the birds in the cramming house are fed twice a day, at 7 A.M. and 4.30 P.M. A small quantity of ground oyster shell is added to the food of the birds in the cramming house to promote digestion. As soon as the morning or evening meal has been administered, the blinds of the skylights are drawn down and the birds are left in quiet and semi-darkness to digest the food they have received and to acquire an appetite for the next meal. The isolation of the birds is no doubt conducive to contentment, and results in a quiet disposition of the avian mind which cannot be other than favourable to the rapid laying on of flesh. Old or quarrelsome fowls which it is desired to get rid of are rapidly fattened and sold for making soup.

About 5,000 fowls are turned out from this establishment in a year. The total probably includes, however, some hundreds of very young chickens—*petits poussins*, as they are called in France—about a month old. These rapidly-fattened chickens fetch from 1*s*. 6*d*. to 2*s*. in April and May, and furnish a choice dish for which the demand is an increasing one.

The increase in weight appears to be very rapid in the earlier stages of cramming, as may be seen from the following details of nine birds which Mr. Brooke exhibited at the Dairy Show in 1893:—

	Days	Total increase lb.	oz.	Average increase per bird lb.	oz.
Sept. 11 to 21 . . .	10	13	7¾	1	8
Sept. 21 to 28 . . .	7	5	5¼		9½
Sept. 28 to Oct. 9 . . .	10	2	12¾		5
	27	21	10	2	6½

At 21 days, or three weeks—the usual time of fattening—the average gain amounted to 2 lb. 3 oz. per bird.

As to the best kind of poultry stock for flesh-producing purposes, Mr. Brooke is loud in his praises of the Dorking. "The Plymouth Rock, too, is a splendid bird, though very leggy and bony. Houdans—which as table fowls are as highly esteemed in France as are Dorkings in England—have also attracted the attention of our fanciers; and old English game birds, which at one period seemed likely to become extinct, are also increasing in popularity. Indian game, which has had to live down the prejudice originally excited against it on account of the colour of its flesh when cooked, is now a favourite. After all, both in flavour and in colour, it most closely resembles the pheasant."

The fowl, however, which Mr. Brooke recommends as "the very best for table purposes" is the cross between the Indian Game and the Dorking. It is quite hardy, it stands caponising thoroughly well, and it is believed that its more general introduction would exercise a beneficial influence in our barn-yards. His experience has convinced him that the finest cross-breds available for table purposes are the Indian Game-Dorkings; "they give so much breast, and the flesh is so full." At the

Birmingham Show, November, 1893, Mr. Brooke exhibited two pairs of cross-bred pullets, from an Indian Game cock and a Dorking hen ; the one pair weighed 14 lb. 1½ oz., and the other pair 13 lb. 7 oz.

Mr. Brooke's successful experience imparts a special value to his general hints to poultry breeders, which he gives as follows :—

Farmers and others cannot pay too much attention to the details of housing and feeding, and this should be varied according to the season of the year and the temperature. Only on these conditions can the birds thrive and become a source of profit. We change our stock every second year, it being an acknowledged fact that where the stock is left for three or four years—or indefinitely, as too often happens—the bird deteriorates in size. One frequently finds a man keeping four or five hens and one cockerel with them for the period just mentioned, and the breed naturally degenerates. One authority, who has been delivering a series of lectures in Essex, was surprised to find the people of that county exceedingly retrograde in the selection of their stock, more especially as they are fairly successful in bringing up strong hardy birds for table purposes. In eighteen farmyards out of twenty in Essex one can find, he affirms, the greatest mongrels possible, and when fresh blood is introduced it is only a cross-bred male bird. In some districts hundreds of pullets hatched at the end of February, March, and April had not laid an egg up to the middle of November. Where a pure bred cock is turned down in a farmyard, say in November, the pullets usually in a few weeks begin laying, when eggs are most in request, as soon as the birds are between six and seven months old, and some even before that age. It is not necessary for farmers and those who merely want eggs and table birds to choose pure breeds for stock: they simply require a separate pure-bred male bird every year for fresh blood. Whilst in the Dedham district the authority whom I have cited called upon Colonel Argozy, who keeps about six silver-pencilled Hamburghs in a small stable-yard with nothing but gravel to run on; and it was noticed that this gentleman was getting more eggs from those six birds than were many of the poultry-keepers round about with twelve or fifteen mongrels. At one place there were 160 fowls, old and young, which produced about four eggs per week. When he asked the farmer's wife why she did not clear off the old hens, she replied, characteristically, "because they are such good sitters in the spring." It is ridiculous to keep a lot of old hens through the winter with the chances of their laying a few eggs in March and April, and then bringing up a brood of chickens; and yet hundreds of people do this. If they kept young hens or pullets they might get eggs all through the autumn and winter.

As regards feeding, I would be sparing at first, accustoming the birds very gradually to the assimiliation of their food. In the early morning, during the very cold spring weather, we give the fowls hot meal, mixed to a proper consistency and put upon small boards in front of them in the pens. It should be removed if the fowls do not want it, and their appetite will then return. At no time should they have sour food; and all stale victuals should be taken from the trough. In the middle of the day we give them wheat; and the last thing at night a little maize, but only in a sufficient quantity so that they can pick everything up. We keep them by the dozen or so in large pens, and change them from one pen to another every three weeks. After changing the pens, generally about three or four times a year, we lime the grass, an operation that sweetens the ground. I highly approve of the movable house for laying hens. The idea is an excellent and practical one. The shelter is by no means cumbersome; two boys can move it, and this may be done daily on to fresh ground.

The dust-bath is another great feature in the pen. Everyone who has seen the delight with which hens scratch about the dust in a country lane can appreciate the importance of providing them with at least a box of ashes, or with dry earth and a sprinkling of sulphur in it. As regards grit, oyster-shells ground fine will be useful, and in that form are greatly appreciated by the fowls; it may even be mixed with the food. I should prefer flint if I could pulverise it. Oyster-shells, however, are more manageable, and are sufficiently plentiful. When the fowls are very eager for food we begin the cramming.

Finally, where the production of eggs is found to be more remunerative than the rearing of table chickens, it will be advantageous to keep varieties that are non-incubating, as in that case the continuous production of eggs is not interfered with by the hens becoming broody and losing time in sitting. And the very best laying fowls are unquestionably the white Leghorn and the black Minorca. The same careful and judicious treatment, however, is in their case necessary to ensure the best results.

Experiments in Poultry Feeding.

In an experiment extending over a period of six months at the New York Experimental Station, it was found that each laying hen of the smaller breeds daily consumed an average of 2·56 ounces of food (mostly maize meal and wheat); birds of the larger breeds ate 3·6 ounces each. At the same station the weight of water-free food required to produce one ounce increase on cockerels and capons was found to be 11·35 ounces. Each fowl produced about 43 pounds of manure in a year, of which two-thirds was moisture.

At the Maine Experimental Station the gain made by 24 cockerels in 32 days was 20½ pounds, valued at 10*s*. The food consumed was 94 pounds of maize and 12½ pounds of meat scrap and blood, the whole costing 6*s*.

In another experiment hens which were allowed access to coarsely-ground oyster-shells laid more eggs than hens which received ground glass. The egg-shells of the birds eating oyster-shells were also heavier. When oyster-shells were used a pound of eggs was produced for every 3·95 pounds of water-free food. The quantity of ground glass consumed was large, and made up between a fourth and a third of the water-free food. Hens which were allowed as much tallow as they would readily consume with their usual food exhibited no symptoms of injury to health, but were later in moulting than those which ate a less quantity of fat.

An investigation into the cost of food for growing chickens conducted at the New York Station showed that, with skim milk at 1*s*. per 100 pounds (say 1*s*. per 10 gallons), a mixture of maize meal, bran, middlings, and linseed meal at 4*l.* per ton, green clover at 8*s.* per ton, and meat scraps at 1¼*d.* per pound, it cost approximately 2¾*d.* for each pound of gain made by growing chickens. At 10½ weeks old these chickens averaged 2·4 pounds in weight.

At the same station, when home-made incubators and brooders were used for chickens and ducks, white Plymouth Rock chicks at 12 weeks old averaged 1·7 pound apiece, whilst Pekin ducks, also reared in a brooder, at the same age weighed nearly 4 pounds.

Conclusion.

A point of cardinal importance, upon which in the preceding pages insistence has been laid in the case both of duck-rearing and of fowl-rearing, is the maintenance of a vigorous young male bird where breeding is the object in view. If this be not attended to the number of infertile eggs is likely to cause annoyance and loss. Another point is the commercial advantage arising from securing the early market, at a time when prices are at their best. A well-sustained effort in this direction brings a substantial reward, for it is the means of raising very considerably the amount of the season's earnings. There is nothing new in this point, for more than 170 years ago Defoe recognised the commercial value of "live chickens in the dear seasons." His remarks,[1] at the end of which these words occur, are, however, of so much interest that they will bear quoting:—

> I cannot omit, however little it may seem, that this county of Suffolk is particularly famous for furnishing the City of London and all the counties round with turkeys, and that it is thought there are more turkeys bred in this county and the part of Norfolk that adjoins to it than in all the rest of England, especially for sale, though this may be reckoned, as I say above, but a trifling thing to take notice of in these remarks; yet, as I have hinted, I shall observe how London is in general supplied with all its provisions from the whole body of the nation, and how every part of the island is engaged in some degree or other of that supply. On this account I could not omit it, nor will it be found so inconsiderable an article as some may imagine, if this be true, which I received an account of from a person living on the place, viz., that they have counted three hundred droves of turkeys (for they drive them all in droves on foot) pass in one season over Stratford Bridge on the River Stour, which parts Suffolk from Essex, about six miles from Colchester, on the road from Ipswich to London. These droves, as they say, generally contain from three hundred to a thousand each drove; so that one may suppose them to contain five hundred one with another, which is one hundred and fifty thousand in all; and yet this is one of the least passages, the numbers which travel by Newmarket Heath and the open country and the forest, and also the numbers that come by Sudbury and Clare being many more.

[1] *Tour through the Eastern Counties of England*, 1722. By Daniel Defoe.

For the further supplies of the markets of London with poultry, of which these countries (*sic*) particularly abound, they have within these few years found it practicable to make the geese travel on foot too, as well as the turkeys, and a prodigious number are brought up to London in droves from the farthest parts of Norfolk; even from the fen country about Lynn, Downham, Wisbech, and the Washes; as also from all the east side of Norfolk and Suffolk, of whom it is very frequent now to meet droves with a thousand, sometimes two thousand in a drove. They begin to drive them generally in August, by which time the harvest is almost over, and the geese may feed in the stubbles as they go. Thus they hold on to the end of October, when the roads begin to be too stiff and deep for their broad feet and short legs to march in.

Besides these methods of driving these creatures on foot, they have of late also invented a new method of carriage, being carts formed on purpose, with four stories or stages to put the creatures in one above another, by which invention one cart will carry a very great number; and for the smoother going they drive with two horses abreast, like a coach, so quartering the road for the ease of the gentry that thus ride. Changing horses, they travel night and day, so that they bring the fowls seventy, eighty, or one hundred miles in two days and one night. The horses in this new-fashioned voiture go two abreast, as above, but no perch below, as in a coach, but they are fastened together by a piece of wood lying crosswise upon their necks, by which they are kept even and together, and the driver sits on the top of the cart like as in the public carriages for the army, &c.

In this manner they hurry away the creatures alive, and infinite numbers are thus carried to London every year. This method is also particular for the carrying young turkeys or turkey poults in their season, which are valuable, and yield a good price at market; as also for live chickens in the dear seasons, of all which a very great number are brought in this manner to London, and more prodigiously out of this country than any other part of England, which is the reason of my speaking of it here.

Nothing has been said as to poultry-farming, nor is it intended to advocate a business which has so often resulted in failure. Mr. Brooke has contrasted clearly enough the bright promise which these ventures hold out at the beginning with the disasters which usually follow. "The fowls cease to lay, they require a great deal of feeding, and finally they begin to die off by the score. Croup and other diseases have seized them, owing to the foulness of the soil, and in a few months Mr. Tegetmeier has to record the failure of another poultry farm." On the other hand, a few fowls, or if the available ground is sufficiently large, some dozens of them—not so numerous but that their houses and haunts may be kept scrupulously clean—may be made a source of profit. It is fowl-keeping on this modest scale that pays, and it is from poultry-farmers in this humble way of business that the higglers obtain the millions of eggs which are sent into this country from the small peasant farmers of France and Holland.

W. Fream.

12 Hanover Square, W.

Official Reports.

REPORT OF THE COUNCIL

TO THE

FIFTY-FIFTH ANNIVERSARY GENERAL MEETING OF GOVERNORS AND MEMBERS OF THE SOCIETY

HELD IN THE HALL OF THE ROYAL MEDICAL AND CHIRURGICAL SOCIETY,

20 *Hanover Square*, *W.*

ON TUESDAY, MAY 22, 1894,

The DUKE of DEVONSHIRE, K.G. (President), in the Chair.

THE Council have to report the following changes in the list of Governors and Members during the year which has elapsed since the last Anniversary Meeting in May 1893:—Two new Governors and 622 Members have joined the Society, 5 Members have been reinstated under Bye-Law 12, and 18 Members have qualified as Governors; whilst the deaths of 1 Honorary Member, 2 Annual Governors, 10 Life Governors, 52 Life Members, and 138 Annual Members have been reported. A total of 22 Members have been struck off the books under Bye-Law 10, owing to absence of addresses; 67 under Bye-Law 11, for arrears of subscriptions; and 228 have resigned.

2. The Council greatly regret to have to report the loss of the Rt. Hon. Sir Harry Verney, Bart., the "Father" of the Society, who died on February 12 last at the patriarchal age of 92. Sir Harry Verney was the last survivor of those who met together at the Freemasons' Tavern on May 9, 1838, to found the English Agricultural Society, and he was a Member of the original Committee. Up to the time of his death he continued to manifest the keenest interest in all matters relating to the Society and to agriculture generally.

3. Through the lamented death, under circumstances of peculiar painfulness, of Mr. George Mander Allender, the Council have lost an active and valued colleague. Mr. Allender had been a member of the Council since 1881, and his practical mind and business acumen were always of great value in the deliberations of the various Committees on which he served.

4. Amongst other Governors and Members whose loss by death the Society has had to deplore since the beginning of the present year are:—The Earl of Bective, the Earl of Lindsay, the Earl of Lovelace (a Foundation Life Governor), Viscount Somerton, Lord

Clonbrock, Lord Crewe, Lord Tweedmouth, Sir G. D. Fitzgerald, Bart., Mr. James Atkinson, of Winderwath, Penrith, Mr. Hugh Aylmer, of West Dereham Abbey (a Member of the Council from 1875 to 1889), Mr. George Burt, of Swanage, Mr. J. S. Corbett, of Cogan Pill, Cardiff, Gen. A. Fytche, C.S.I., Mr. William Greaves, of Bakewell (a Foundation Life Governor), Mr. John Hick, of Mytton Hall, Mr. J. D. Morton, of Tunbridge Wells (a member since 1842), Col. W. F. Newdigate, Mr. George Rea, of Wooler, Mr. G. M. Sexton, of Ipswich, the Rt. Hon. E. Stanhope, M.P., and Mr. James Theobald, M.P.

5. To fill the vacancy caused by Mr. Allender's decease, the Earl of Jersey, of Middleton Park, Bicester, has been re-elected to the seat upon the Council which he vacated during his tenure of the Governorship of New South Wales.

6. The Council have elected Professor G. D. Liveing, M.A., F.R.S., of Cambridge, an Honorary Member of the Society, in recognition of his distinguished services to agriculture.

7. These and other changes bring the total number of Governors and Members now on the Register to 11,218, divided as follows :

21	Foundation Life Governors (Members elected before the granting of the Charter on March 26, 1840) ;
73	Governors paying an annual subscription of 5*l.* ;
92	Life Governors ;
7,212	Members paying an annual subscription of 1*l.* ;
3,705	Life Members ;
93	Life Members by Examination ;
22	Honorary Members.
11,218	Total number of Governors and Members ;

or a net increase of 92 Members during the year.

8. The accounts for the year 1893 have been examined and certified by the Auditors and Accountants of the Society, and are published in the current number of the Journal. The final results of the working of the year are that, after writing off the customary percentages for depreciation, and discharging all the preliminary expenses connected with the acquisition of Harewood House, the Society's assets amounted at December 31, 1893, to 38,279*l.* 14*s.* 7*d.*, as against 36,858*l.* 18*s.* 3*d.* at the end of 1892.

9. The structural alterations to Harewood House are now practically completed, and it is hoped that the Society will be able to enter upon the occupation of its new premises shortly after the Cambridge Meeting. Meanwhile, the internal fittings and the furnishing of the house are being proceeded with. An underlease of the Society's present house, 12 Hanover Square, has been granted to the Shire Horse Society, who will sublet portions of the house to other kindred agricultural organisations.

10. The Council have the pleasure to report that a number of

ancient works on Agriculture have recently been presented by various donors to the Society's Library, which with similar works purchased at favourable opportunities by the Society itself, and those previously in the Library, will help to form a very valuable collection of classical agricultural literature. In view of the increased bookshelf accommodation available in the new house, the Council will feel greatly indebted to any Governors and Members who, upon inspection of their Libraries, may find themselves in a position to present to the Society any works upon Agriculture that it may not already possess. Amongst the recent additions to the Library is a complete set of the "Memoirs of the Rothamsted Experiments," presented by the Board of Agriculture.

11. The preparations for the forthcoming Country Meeting at Cambridge next month are well advanced. The Meeting will be held on Midsummer Common, an open space of 64 acres near the centre of the town. As the Council have already reported, it became necessary, in view of the fact that the area of the Show-yard could not be extended, to impose some limitations on the entries both of implements and stock; and the 13,402 feet of shedding applied for in the former department will monopolise, with the 1864 entries of horses, cattle and sheep, and the entries in the other departments, the whole of the space available for the purpose. For the same reason, the Council were obliged to close the list of entries of live stock on May 1—the last day of entry at ordinary rates—and to decline all post entries, in accordance with the intimation printed in the Prize Sheet and on all the certificates of entry. They have, however, passed a new regulation allowing an exhibitor who has already made an entry of horses, cattle or sheep in a particular class to withdraw the entry of such animal, and to substitute for it, up to Thursday, May 31, the entry of another animal in the same class, on payment of an extra fee. This regulation, besides being, it is hoped, a considerable convenience to exhibitors, will have the additional advantage of reducing the number of empty stalls and pens in the Showyard.

12. In the Implement Department, the number of feet of shedding (exclusive of open ground space) actually allotted is 13,402 feet in 442 stands, as against 13,018 feet in 408 stands at Chester last year, and 12,511 feet in 411 stands at Warwick in 1892. Notwithstanding the limitation of the maximum space allowed to an exhibitor to 100 feet (instead of 150 feet), and the fact that a number of applications had necessarily to be declined, the Implement Department will still be the largest of any Meeting in the last fifteen years, except the Jubilee Meeting at Windsor in 1889.

13. For the reasons stated in another paragraph (23), the Council have felt it necessary to decline all the entries of Pigs which were tendered: but, even under these circumstances, and the final closing of the lists at an earlier date than usual, there are still 1864 entries in the Live Stock Department, or more than at Warwick in 1892, Plymouth in 1890, Newcastle in 1887, and Norwich in 1886, where horses, cattle, sheep, and pigs were all exhibited, and the limitations as to entries were less than at present. There will be 617 horses at Cambridge, as compared with 509 at Chester last year; 659 cattle as compared with 759; and 588 sheep as compared with 631. In addition, there will be 705 entries of poultry, 162 of butter, 72 of cheese, 74 of cider, 10 of jams and preserved fruits, and 220 of hives, honey, &c.

14. The trials of the twenty-four oil engines which have been entered for the prizes offered by the Society will take place in the Showyard in the week preceding the Meeting, commencing on Monday, June 18. The trials of churns (24 entries) will commence on Wednesday, June 20; of sheep-dipping apparatus (6 entries) on Friday, June 22; and of spraying machines (17 entries) on Saturday, June 23. The inspection by the Judges of the 116 "New Implements" entered for the Society's Silver Medals will commence on Thursday, June 21.

15. The Implement Yard and the Dairy will be opened to Members of the Society and the public on Saturday, June 23, when the charge for admission to non-members will be 2*s.* 6*d.* The judging will take place in all classes on Monday, June 25, when the charge for admission will be 5*s.* On Tuesday and Wednesday the charge for admission will be 2*s.* 6*d.* each day; and on the last two days, Thursday and Friday, it will be 1*s.* each day.

16. Forty-four candidates have entered for the competitions of Butter-makers for the Society's Prizes and Certificates, to take place in the Showyard, from Tuesday, the 26th, to Friday, the 29th June. Twenty-six shoeing-smiths practising in the Society's District A will compete for the Prizes offered for shoeing Roadsters and Agricultural Horses.

17. In their last report the Council referred to the receipt of an invitation from the authorities of Darlington for the holding at that place of the Country Meeting of 1895. The Committee of Inspection having since reported favourably of the site and other accommodation offered for the purposes of the Meeting, and a deputation representing the town and neighbourhood having had an interview with the Council on the subject, it has been resolved that next year's Country Meeting shall be held at Darlington.

18. In connexion with the Meeting of 1895, the Council have already resolved to offer for competition prizes for hay-making and clover-making machines in two classes, as follows:—

	First Prize	Second Prize
Class 1.—Hay-making machines	20*l.*	10*l.*
Class 2.—Clover-making machines	20*l.*	10*l.*

The last date for receiving entries for these prizes will be on

Monday, April 1, 1895, which is also the date for the closing of the ordinary implement entries.

19. In accordance with the scheme of rotation of districts as revised in 1892, the Country Meeting of 1896 will be held in District C, which consists of the counties of Derby, Leicester, Lincoln, Northampton, Nottingham, and Rutland.

20. To fill vacancies that have occurred, the Council have appointed Mr. Lewis P. Rees, M.R.C.V.S., of Brecon, and Mr. Charles Morgan, M.R.C.V.S., of Carmarthen, as the Society's Provincial Veterinary Surgeons for the counties of Brecon and Carmarthen respectively. The Examiners on the Diseases of Animals of the Farm other than the Horse, in the examinations for the diploma of the Royal College of Veterinary Surgeons held last year, have reported that the following gentlemen attained the greatest distinction:—1. Mr. H. T. SAWYER, Veterinary-Lieutenant, A.V.D., care of Veterinary-Colonel Lambert, C.B., 5 King Street, Westminster, S.W. 2. Mr. E. T. THORBURN, Morton House, Frome, Somerset. The Society's Silver Medal for Proficiency in Cattle Pathology has therefore been bestowed upon Lieutenant Sawyer, and the Bronze Medal upon Mr. Thorburn.

21. The retirement, after nearly thirty years of active service, of Professor Brown from his position as Chief of the Veterinary Department of the Board of Agriculture, affords the Council an opportunity of placing upon record their high sense of the value of his past efforts in the extirpation of the contagious diseases of animals, and of the conspicuous services which he has rendered to the Society, both in his professional capacity and as a contributor to the Journal. The Council are glad to state that the Society will continue to have the advantage of Professor Brown's co-operation and assistance.

22. In the Report for 1893, reference was made to the steps which had been taken to bring under the notice of the President of the Board of Agriculture the subject of epizootic abortion among cows. A reply has been received to the effect that while admitting the importance of an inquiry into the nature and causes of the disease, the Government regret that the present state of the public finances does not permit the granting of moneys for the purpose. Under these circumstances, it appeared to the Council desirable that they should at once appoint a Special Committee of Inquiry to collect evidence upon the subject, and to report as to the advisability of experiments with breeding animals being undertaken by the Society itself. Schedules of questions have been extensively circulated, and some important evidence has been taken from stockowners and veterinarians. A leaflet has also been distributed among stockowners, recommending the adoption of Professor Nocard's system of antiseptic treatment, which was described in the article on

Abortion in Part IV. of the Journal for 1891. The Special Committee is still engaged upon the inquiry.

23. In November last the Board of Agriculture commenced the work of extirpating swine-fever under the provisions of the Swine-Fever Act of 1893. The measures adopted have led to the detection of a large number of centres of disease which had hitherto been concealed, and it has been found necessary to order the slaughter of swine which were affected with the disease, or had been in some ways exposed to infection, at the rate of a thousand per week. In view of the fact that swine-fever continues to be as prevalent as ever, the Council have felt bound to give practical support to the measures adopted by the Board of Agriculture for the extirpation of the disease by excluding all pigs from their Show-yard at Cambridge. It is hoped that, through the measures taken in the general interests of agriculturists, swine-fever, if not totally eradicated, may speedily be reduced to insignificant proportions, when it may become possible for the present irksome restrictions to be relaxed.

24. Reports of outbreaks of anthrax have been more numerous than during the preceding year, but judging from the considerable proportion of cases of suspected anthrax which were sent to the laboratory of the Royal Veterinary College, and proved on examination not to be anthrax, there is reason to conclude that the reports have been in excess of the actual outbreaks. The scarcity of food during the past dry season led to the consumption of various indigestible, and even poisonous plants, and it is most probable that many of the deaths from this cause were attributed to anthrax. There is no doubt, however, that the disease has increased in the last two or three years. But it is a noticeable fact that during 1893, in 567 outbreaks of anthrax there were only 1,294 animals attacked, a little over two for each outbreak. Cases of diseases of the digestive organs in cattle from the presence of microscopic worms have been numerous during the past year, and there have also been serious losses in some districts among foals from the ravages of a minute strongle, the young of the *Strongylus tetracanthus*.

25. Investigations have been continued in the pathological laboratory at the Royal Veterinary College, under the Society's annual grant, on the subject of ringworm in calves, with particular reference to the life history of the fungus which is the cause of the disease. Protective inoculation for anthrax has received special attention, with the view to test its safety and efficacy. Some time will be occupied in the necessary experiments. The results at present justify the statement that the average losses among inoculated animals are less than one per cent., but from time to time the loss has reached five and even ten per cent. without there being any detectable cause to account for the mortality. Further experiments with mallein and tuberculin have added to the previous evidence of the value of these agents for the detection of glanders and tuberculosis in cases where there are no symptoms present to indicate either disease.

26. A considerably larger number of applications have this season been made to the Consulting Botanist. The undesirable practice of purchasing mixtures for laying down to grass, without specifying the seeds of which they are to be composed, is increasing. The quality and feeding value of foreign hay, needed to supply the deficiencies of the home produce, have been determined in several cases.

27. Inquiries have been continued in reference to the disease in turnips known as "finger and toe." The evidence so far obtained points to the presence of the disease on one field of a farm and its absence on another field of the same farm as not being associated with any difference in the actual soil-constituents of the fields, but that one or the other may be affected according as the fungus may find its way on to it. But it seems also to be shown that where fields are affected the soil is always poor in lime, and that on soils possessing abundant lime the disease is not known. Experiments are now in progress to ascertain if any application of manures or chemical substances will prevent the fungus taking a hold on the soil, or will destroy it when once present.

28. The passing of the Fertilisers and Feeding Stuffs Act of 1893 does not appear as yet to have made any material difference to the analytical work carried on by the Society on behalf of its members. This may to some extent be due to the short time the Act has been in operation, but it is also more than likely that members of the Society find the procedure to be followed in submitting examples to the Consulting Chemist simpler and practically quite as effective as that necessitated by the Act, with its attendant regulations and precautions. From December 1, 1893, to April 30, 1894, the number of samples sent by members for analysis has been 642, as against 688 during the corresponding period of last year.

29. The passing of the Fertilisers and Feeding Stuffs Act has, however, had one good effect, which has been abundantly brought out in the correspondence sent to the Consulting Chemist, viz., the obligation it imposes to give an invoice, which, in the case at least of fertilisers, must also state their essential fertilising ingredients. Experience has, however, shown that there are numerous ways of "contracting out" of the Act, or of vitiating its intent, and the giving of an invoice or even a guarantee does not necessarily imply that money's worth is being obtained. Hence it is believed that there will be quite as much need as before for the vigilance of the Chemical Committee in suppressing and exposing adulteration, and for the assistance of the Consulting Chemist in advising members as to their purchases. There is reason to think that the order forms recently issued by the Society are made use of to a considerable extent by members, and that the instructions given in relation to the working of the Fertilisers and Feeding Stuffs Act have been found of considerable benefit. In consequence of the approaching transfer of the Society's offices, a re-arrangement of the Chemical Department has been under consideration, and will shortly be carried into effect. Under the new arrangement it is hoped that more time may be devoted to original researches than has hitherto been possible.

30. As usual during the winter season, feeding experiments have been carried out at the Woburn Experimental Farm. Those upon sheep-feeding have been concluded, and point to the economy of feeding sheep with a moderate diet for a longer period in preference to more rapid feeding with large quantities of cake and corn, and also to the value of hay as an addition to a diet for sheep. The experiments on fattening bullocks have shown that the place of roots cannot be taken by straw-chaff to which linseed oil has been added, and that for fattening bullocks linseed oil is not a desirable article of food.

31. The insects with regard to which the advice of the Zoologist has been most frequently sought during the winter season belong to the weevil tribe. The vine weevil, the turnip gall weevil, and, of late, the pea and clover weevil (*Sitones*) have been the subjects of complaint. The Zoologist has devoted considerable attention to the investigation of substances likely to prove useful as insecticides. He has also instituted, upon the spot, a careful inquiry as to the methods which have proved most efficacious in dealing with the beetle so destructive to mustard crops in the fen district.

32. Sir John Thorold and Mr. Charles Whitehead have been re-elected as the Society's representatives upon the Lawes Agricultural Trust for a further period of five years.

33. Thirty-two candidates entered and 28 actually competed in the Society's Senior Examinations, held from the 8th to the 12th of this month. The answers of the candidates are now under consideration, and the results will be announced as soon as possible. The Council have resolved to discontinue after the present year the award of free Life Memberships to the winners of First Class Certificates in these Examinations.

By Order of the Council,

ERNEST CLARKE,

Secretary.

REPORT OF THE SPECIAL COMMITTEE ON ABORTION IN CATTLE.

THE Special Committee appointed by the Council to inquire into the subject of Abortion in Cattle[1] beg to report that, immediately on their appointment, instructions were given for the issue of circular letters, (1) to the Society's Provincial Veterinary Surgeons in each county, and (2) to a large number of owners of live stock, asking for statistics and information respecting their experience in connexion with this disorder, and in reply to these a considerable body of valuable information was received.

2. The Committee met for the first time to take evidence on Monday, March 5, 1894, and took further evidence on Monday, April 2, and Monday, April 30. In the course of their sittings, they examined the following ten witnesses, including stockowners whose herds had suffered from abortion, and veterinary surgeons who had had experience in dealing with the disease, viz.—

1. MR. CLEMENT STEPHENSON, F.R.C.V.S., Newcastle-on-Tyne.
2. MR. JAMES PETER, Agent to Lord Fitzhardinge, of Berkeley Castle.
3. MR. FRANK BOOTH, M.R.C.V.S., of Abergele (the Society's Provincial Veterinary Surgeon for Carnarvon and Denbigh).
4. MR. JOHN DENCHFIELD, Burston House, Aylesbury (stock-owner).
5. PROFESSOR McFADYEAN, M.B., B.Sc., F.R.S.E., Dean of the Royal Veterinary College.
6. DR. SIMS WOODHEAD, M.D., F.R.S.E., Director of the Laboratories of the Conjoint Board of the Royal Colleges of Physicians and Surgeons.
7. MR. ROBERT HICKES, F.R.C.V.S., Market Weighton.
8. PROFESSOR PENBERTHY, F.R.C.V.S., Royal Veterinary College.
9. PROFESSOR J. WORTLEY AXE, M.R.C.V.S.
10. COL. CURTIS HAYWARD, Quedgeley, Gloucester.

---

[1] *Extract from the Proceedings of the Council, Wednesday, February 7, 1894.*—The Report of the Veterinary Committee having been received and adopted, it was resolved, on the recommendation of the Committee, to appoint a Special Committee to inquire into the subject of Abortion in Cattle, such Committee to be empowered to collect evidence from stock-breeders and from veterinary surgeons, both by the issue of circulars of inquiry, and by the calling of witnesses, and to be instructed to report as to the advisability of experiments with breeding animals being undertaken by the Society. Agreeably with the recommendation of the Veterinary Committee, the Special Committee was constituted of Sir John Thorold, the Hon. C. T. Parker, Sir Nigel Kingscote, Col. Curtis Hayward, Mr. Garrett Taylor, Professors Brown, Axe, and McFadyean, and Dr. Sims Woodhead, with power to add to their number. [Mr. Clement Stephenson, F.R.C.V.S., added to the Committee, March 5, 1894.]

History of Abortion.

3. That the disease of abortion in some form was known to the ancients is apparent from the references which are made to a "cast calf" in Exodus, and in the Book of Job.[1]

Abortion is defined to be a premature expulsion of the embryo or fœtus before development has advanced to a sufficient extent to render the animal capable of living when separated from the mother.

In an article on Abortion, in the Second Volume, Third Series, Part 4, of the Society's Journal (1891), the periods of viability in different animals are given in the following table :—

Animal	Period of gestation	Viability at
Foal	11–12 months	10 months
Calf	9–10 ,,	7 ,,
Lamb and kid . .	5 ,,	4 ,,
Pig	4 ,,	3 ,,
Puppy . . .	9 weeks	7 weeks
Kitten . . .	55 days	45 days
Rabbit . . .	25 ,,	20 ,,

4. There appears to be evidence that abortion is more common in the domesticated races than among wild animals. In an article written for the Society's Journal by Mr. Barlow in 1851, it is said, "From various inquiries which have been made, and from the statements of travellers and other persons competent to speak on the subject, it seems that among the vast herds of wild cattle inhabiting large tracts of country in the Old and New Worlds, abortion is unknown."[2]

One of the earliest writers, Clater, speaks, in 1786, of abortion as one of the curses of the breeder, and refers to some of its common causes. He also remarks on the fact that the disease sometimes assumes an epizootic character.

Youatt, writing in 1834, remarks on the susceptibility of cows above that of other animals on the farm. He also refers to common causes of abortion, such as climatic changes, certain kinds of food, and excitement ; and he gives the history of a case occurring in France, in which the whole circumstances suggested that the affection was of a contagious character.

Monsieur Bouley, writing, in 1863, in his *Dictionary of Veterinary Medicine*, refers to abortion beginning with the introduction of a new cow. He also notes various common causes, and among these he mentions imitation, by which he means to imply that when abortion takes place in a herd, a number of pregnant cows will quickly follow the example of the first. He also points out that when abortion takes place, cows in a herd become

[1] Job xxi. 10.

[2] *R.A.S.E. Journal*, Vol. XII., Part 1, 1st Series, 1851, p. 64.

extremely excited, running round the fœtus, and occasionally becoming what he describes as "frantic." These facts are well known to breeders at the present day.

5. Dr. George Fleming, in his work on Veterinary Obstetrics, published in 1878, quotes the observations of different Continental experts, and remarks that Zündel found that if septic bacteria are introduced into the vagina, abortion follows. Ten years later, Monsieur Nocard expressed his opinion that the disease was of a distinctly contagious character. Professor Axe, in 1885, refers to the theory of contagion, which he looks upon as insufficiently sustained by the evidence. He also gives an account in the Society's Journal for 1885 of an extensive outbreak of abortion amongst ewes in Lincolnshire;[1] and he considers the practice of feeding pregnant cows exclusively on unripe or watery roots, and especially on unwholesome, filth-laden "shells," as among the principal causes of the disease; but he adds to these causes, "the pain induced by protracted foot-rot, exposure to cold wind, and continuous heavy rains, and the exertion necessary to take the animals through the deep and sticky ground."

Mr. Clement Stephenson, F.R.C.V.S., in an article in the Society's Journal in 1885, attaches considerable importance to sympathy, and also refers to other known causes.[2]

Dr. Johnson, of Kirkby Overblow, in Yorkshire, writing in the Society's Journal in 1886,[3] advances a series of arguments, based on his own observations, in favour of the presumption that the disease arises from the consumption of ergoted grasses; but he also remarks that the belief in the infectious nature of abortion is universal.

6. In the Transactions of the Highland and Agricultural Society of Scotland for 1887 and 1889, there is a report from Dr. Sims Woodhead, Professor McFadyean, and Dr. A. P. Aitken, who conducted an inquiry into the subject in Edinburgh in 1887, commencing by sending out a circular letter of questions for the purpose of obtaining information. The inquiry proved that the disease was then prevalent throughout the length and breadth of Scotland, and there appears to be an opinion that it is yearly becoming more common.

Results of Committee's Inquiries.

7. The information obtained by the Committee leads to the conclusion that abortion is also extensively prevalent in the greater part of England and Wales; and from correspondence which has taken place, it is certain that it exists in several parts of Ireland, notably in the counties of Limerick and Cork, but chiefly in the latter county. An investigation of this district is being made by Mr. Prentice, the Veterinary Travelling Inspector attached to the Veterinary Department in Dublin.

---

[1] *R.A.S.E. Journal*, Vol. XXI., Part 1, 2nd Series, 1885, pp. 199-206.
[2] *Ibid.*, Vol. XXI, Part 2, 2nd Series, 1885 p. 499.
[3] *Ibid.*, Vol. XXII., Part 2, 2nd Series, 1886, p. 462.

8. From the evidence given by several witnesses, it is evident that the idea of the disease being generally contagious and infectious is very widely spread. One witness was of opinion that *any* case of abortion, arising from any cause, was likely to become the centre of fresh outbreaks.

9. On the subject of causes which would produce abortion there was a very considerable difference of opinion; but the majority of the witnesses seemed to think that it might be caused by offensive odours, food in bad condition, especially in a putrid state, by the consumption of highly contaminated sewage water, by fright, and also from sympathy; and it was generally agreed that the occurrence of a single case in a herd was likely to be followed by others. Other witnesses held the view that no importance whatever was to be attached to feeding, or the drinking of contaminated sewage water, and some announced their conviction that none of the alleged common causes exercised any material influence in the production of the disease.

10. In reference to the geographical and geological distribution of the affection the majority of the witnesses had nothing whatever to say; but the whole of the evidence appears to point to the conclusion that neither of these conditions is materially concerned in the development of the disease. One witness, however, alleged, as the result of his inquiries, that abortion was unknown, or extremely rare, in the hilly districts in Wales; the same thing cannot be stated with regard to Scotland.

11. Questions as to the influence exercised by particular bulls were asked of most of the witnesses; and some of them were of opinion that, from the want of potency in the male, abortion very frequently occurred, apparently as the result of imperfect impregnation of the ovum. It was also considered by most of the witnesses that the use of a bull which had served a cow shortly after abortion was extremely dangerous. There were, however, several cases related in which this had occurred without any ill result following.

12. The effect of domestication was also a subject of inquiry; and in answer to questions, some witnesses considered that well-bred animals and those who were placed under highly artificial conditions were more liable to suffer than those which lived in a more natural state. This view, however, was combated by several others.

13. Two or three witnesses gave evidence to the effect that the disease generally dies out without treatment in from two to four years. It may, however, be remarked that in a very large proportion of cases this satisfactory result does not occur.

14. As to the disposal of cows after abortion, a number of witnesses stated their belief that it was very difficult to get them to settle to service. It was also alleged that it was desirable under any circumstances to allow several periods of œstrum to pass over before service again took place. Some witnesses went so far as to advise that several months should be allowed to elapse after the occurrence of abortion before the animal was again used for breeding. It was

universally agreed that it was undesirable to use them for this purpose shortly after abortion, and it was admitted generally that the safe course is to feed the animal for the butcher.

15. Most of the witnesses, in answer to the question as to the importance of proving whether or not the disease is contagious, expressed their belief that it was extremely desirable that the matter should be set at rest.

16. The information which was elicited from the witnesses, and also from the replies to the circular letter of questions, suggests that very little is being done by way of preventive treatment. Three or four stockowners stated that they had tried the method of disinfection by the use of bi-chloride of mercury, three of them with success; but the evidence generally suggests that the most ordinary sanitary precautions, even the obvious one of destroying or burying the aborted fœtus, are frequently neglected.

Summary of Evidence.

17. From the whole of the evidence which has come before the Committee, it is certain that abortion of the epizootic form is exceedingly prevalent in this kingdom, and that it occasions very serious losses—in fact, that it is, as Clater asserted more than a hundred years ago, one of the curses of the breeder; and it would appear that for some years past it has been on the increase. It is also clear that in the country generally it is accepted very much in the light of a curse for which there is no remedy, and stockowners in general do not take any steps for its prevention.

18. The theory of contagion is almost universally accepted; and it may be allowed that the theory fits in most accurately with the observed facts. But, on the other hand, it must be affirmed that there is no proof that the disease is one of the true contagia. This question could only be settled by a series of experiments, which must be carried over a considerable period and would necessarily be costly.

19. In the majority of cases no cause for an outbreak of abortion can be traced; it is only in occasional instances that the evidence appears to point to the introduction of a fresh cow, which is first attacked, or to the use of a particular bull, or to some accidental circumstances of the kind to which reference has already been made.

20. As to the influence which is exercised by domestication it is difficult to express any positive opinion; but there appears to be no doubt that the most highly cultivated breeds and those that are placed in the most artificial conditions have less of the resistant power which is expressed by the word "stamina" than those which are placed under more natural conditions. On the other hand, it is alleged with perfect truth that abortion often occurs in animals which are left to shift for themselves, and are, in short, the subjects of neglect and unsanitary treatment.

Recommendations.

21. So far as the inquiry has extended, the Committee believe that they are justified in making the following recommendations :—

I. For practical purposes, and with a view to the adoption of the necessary precautions, the disease should be deemed to be contagious.

II. For the purposes of prevention, strict sanitary precautions, including habitual cleansing and disinfection of places where breeding cows are kept, should be insisted on, and particular attention should be paid to the character of the food and the water with which the animals are supplied.

III. The treatment by the aid of antiseptics of cows which have aborted is certainly to be recommended ; and the evidence which has been already furnished in favour of the use of a solution of bichloride of mercury, as described in the leaflet already issued (see page liv) appears to the Committee to justify the advocacy of its general employment in every case where the disease presents itself in a herd. It may be advisable to state that, in view of its poisonous nature, it is necessary to guard against any injurious consequences arising to pigs or poultry from the careless disposal of the sweepings from the sheds in which this disinfectant has been used.

IV. On the question of experiments for the purpose of proving whether or not the disease is of a contagious character, the Committee do not feel justified in advising the Society to expend a large sum of money in this direction. At the same time, it is impossible not to realise that a decision on this point is a matter of very considerable importance ; and the Committee recommend that an additional sum of 200*l*. be placed at the disposal of the Veterinary Committee for the purpose of further scientific investigations into the causes of abortion in cattle.

J. H. Thorold,
Chairman.

June 4th, 1894.

ANBURY, CLUB-ROOT, OR FINGER AND TOE IN TURNIPS.[1]

The Occurrence of the Disease in its relation to the Constituents of the Soil.

It has long been known that on light sandy land Turnips are frequently liable to the disease known as "finger and toe," and that the presence of the disease is often concurrent with the absence of a sufficiency of lime, on which account a dressing of lime or chalk has frequently proved, on such lands, an effectual cure. The late Dr. Voelcker conducted in the year 1859 an inquiry into this subject, examining different soils, and analysing the diseased roots and the excrescences from them. The results went to show what has been stated, viz. that lime-deficient soils are those most prone to produce "finger and toe," and that liming is a general, though not universal, cure, while, as compared with sound turnips, the diseased ones contained more nitrogen and more mineral matter. An inquiry of a more extended nature having been set on foot by the Royal Agricultural Society of England, it fell to me to make further examinations of soils from different districts, with the view of ascertaining whether further information could be obtained as to those constituents of the soil the presence or absence of which would account for the prevalence of the disease. At the same time the Consulting Botanist of the Society was charged with the work of direct inquiry into the behaviour of the particular fungus producing the disease, when brought into contact with lime and other bodies believed to be effectual in preventing its spread. It was considered desirable that, as the investigation, so far as the soil-constituents were concerned, tended in one direction, the results should be now summarised.

I may here say, in explanation, that while the botanical view is, that the presence in the land, or the importation on to it, in some way or other, of the fungus is sufficient to determine its spread, I was, on my part, somewhat hopeful that an examination of different soils would lead to establishing more definitely which of them were liable to be affected, and which, if any, might be considered "disease-proof," and that I might indicate the constituents which determined the liability to disease, as well as the quantities of these constituents which ought to be present to insure immunity from disease.

In the course of the inquiry I noted that in some cases it was stated, in answer to questions directed to this end, that on one and the same farm there existed fields that were recognised as being *always* liable to disease, and others that were *never* subject to it. I hoped that by selecting typical examples and by analysing the soil of these fields I might be able to bring out some clear differences in their composition which might account for the appearances noted.

[1] An illustrated article on this subject by W. Carruthers, F.R.S., appeared in the Journal, Vol. IV. 3rd series, Part II., 1894, pp. 334–339.

I give here instances which will illustrate the result of my investigation.

1. On a farm in the occupation of Mr. W. H. Glossop, of Babworth, near Retford, was a field, the whole of it having been treated alike, but on one part of which the turnips were perfectly sound, while on another part they were badly attacked by "finger and toe." I selected this as a typical example, believing that analysis would possibly bring out a decided difference in the composition of the soil from the respective parts. The analyses, however, came out as follows :—

	I Soil not affected	II Soil affected
[1] Organic matter and water of combination	3·35	3·10
Oxide of iron and alumina	2·46	2·84
Lime	·10	·28
Alkalies, &c.	·47	·36
Insoluble silicates and sand . . .	93·62	93·42
	100·00	100·00
[1] containing nitrogen	·108	·116

It will be noted that the two soils were very similar in composition, and that both of them contained very little lime; indeed, there was a marked deficiency. But, while this was so, the soil affected by disease had even more lime than that which was not subject, and it could therefore not be concluded that the larger proportion of lime (this itself being small) had anything to do with the presence or absence of disease.

2. In a second instance, from the farm of Mr. James Thomas, North Otterington, Northallerton, it was reported that there were five fields liable to the disease, and four others not liable. At my request Mr. Thomas kindly sent me samples taken from fields typical of the two different appearances. These I analysed, and obtained the following results :—

	Soil not liable to disease	Soil liable to disease
[1] Organic matter and water of combination	3·21	3·49
Oxide of iron and alumina	3·63	3·84
[2] Lime	·32	·29
Alkalies, magnesia, &c.	1·17	1·46
Insoluble silicates and sand . . .	91·67	90·92
	100·00	100·00
[1] containing nitrogen	·095	·114
[2] equal to carbonate of lime . . .	·58	·52

Both the above soils are decidedly deficient in lime, but though it is true that the one "liable" contains less lime than the "affected" soil, yet the difference between the amounts contained is not sufficient to constitute any practical difference between the two. Nor yet are there any other points brought out by the analyses which would justify the conclusion being drawn that the presence of a certain constituent of the soil in a greater or less degree determined its proneness to or immunity from disease. I was forced to conclude that the liability of the one land as compared with the other must be dependent, not upon the soil, but upon the actual presence of the fungus in the one case, and its absence in the other. A striking proof of the correctness of this assertion was brought out in the correspondence which followed. On neither of the fields the soil of which was analysed had any lime been applied for at least 25 years. But it appeared that Mr. Thomas had carted on to the field now considered "liable to disease" farmyard manure made by cattle to which turnips attacked by "finger and toe" had been fed, he being then unaware that it was possible to convey in this way the fungus from one field to another. There is little doubt that the disease had been spread through this means, and that the reason for the existence of "finger and toe" on one field and not on the other was not any difference in the composition of the soils of the respective fields, but the fact that the fungus producing the disease had been conveyed to one field and not to the other. Had it been similarly imported on to the soil considered "not liable to attack" there is little doubt that it would have spread there similarly, this soil also being very poor in lime.

The foregoing and other cases which I inquired into led me to the conclusion that in the case of *soils deficient in lime* it could not be established that the alleged liability to, or immunity from, disease was traceable to the chemical constituents of the soils, or to the proportions in which they existed, but that one or the other soil may be equally liable, and that, where immunity from disease is reported, it is only because the fungus has not as yet been conveyed to the land.

Having accounted thus for the reported differences between certain fields on the same farm, I turned next to a comparison of the soils of farms where the disease appeared to be unknown, and those where it was a constant source of loss. From analyses which I have made of different soils I select the following:—

	Soils not liable to "finger and toe"				Soils liable to "finger and toe"		
	I	II	III	IV	V	VI	VII
[1] Organic matter and water of combination	13·01	6·09	9·05	8·82	5·13	8·08	11·10
Oxide of iron .	1·94	3·16	3·49	2·49	1·53	1·96	·72
Alumina . .	1·93	1·80	2·66	1·47	1·22	1·05	1·15
Lime . . .	1·44	2·05	1·62	7·46	·18	·10	·29
Magnesia . .	·31	·39	1·32	·86	·64	·18	·22
Potash . .	·14	·20	·39	·28	·11	·11	·06
Soda . . .	·31	·27	·72	1·86	·24	·12	·74
Phosphoric acid .	·18	·24	·25	·25	·14	·23	·22
Sulphuric acid .	·10	·07	·09	·05	·07	·06	·07
Insoluble silicates and sand	80·64	85·73	80·41	76·46	90·74	88·11	85·43
	100·00	100·00	100·00	100·00	100·00	100·00	100·00
[1] containing nitrogen	·409	·171	·283	·32	·196	·232	·322

	Soils not liable to "finger and toe"			Soils liable	
	VIII	IX	X	XI	XII
[1] Organic matter and water of combination	5·58	7·22	7·48	10·50	7·72
Oxide of iron and alumina .	2·77	7·97	5·66	3·75	3·94
Carbonate of lime . .	·87	8·63	·78	·11	·31
Alkalies, &c. . . .	·79	9·59	·50	·37	2·11
Insoluble silicates and sand	89·99	66·59	85·58	85·27	85·92
	100·00	100·00	100·00	100·00	100·00
[1] containing nitrogen . .	—	·109	·243	·332	·298

If these analyses are compared, it will be seen that the only strongly marked points of difference, as between soils liable to disease and those not liable, are in the relative proportions of lime contained, and, to a lesser extent, in the potash. The latter may possibly have something to do with the question ; but this is not made clear by the analyses, the ·14 per cent. of potash in No. I being practically the same as the ·11 per cent. in Nos. V and VI. But the differences in the amounts of lime contained in the soils of either class are very striking, and clearly point to this feature of the presence or absence of sufficient lime being intimately associated with the freedom from, or liability to, disease.

All the soils on which "finger and toe" never occurs are those which an agricultural chemist would describe as containing sufficient lime ; all those which are subject to disease are those recognised as being lime-deficient. As regards the actual percentage of lime required, it would appear that the presence of ·75 per cent. of carbonate of lime is enough to constitute a soil "disease-proof," if indeed such a condition of soil can exist ; while less than one-half per cent. of carbonate of lime would seem insufficient to ward off the attacks of the fungus.

In saying this I am aware that it has not yet been shown that the fungus cannot thrive in a soil which contains three-quarters of one per cent., or even more, of carbonate of lime ; but the analyses I have set out show that none of the soils which are reported to be unaffected by disease have less lime than the first-named percentage, and there is strong ground for concluding that in this lies the determining factor. For this reason I am of opinion that further inquiry into this subject should take the form of ascertaining whether it is possible to infect with the fungus land that is *rich* in lime, or whether the presence in the soil of lime in sufficiency has a destructive or retarding effect upon the vitality and spread of the fungus.

J. Augustus Voelcker.

12 Hanover Square, W.

QUARTERLY REPORT OF THE CHEMICAL COMMITTEE.

June, 1894.

1. Mr. George Adams, Royal Prize Farm, Faringdon, Berks, sent on March 19, 1894, a sample taken from a bulk of 30 cwt. of what had been invoiced to him as follows :—

Jan. 3, 1894. $29\frac{3}{4}$ cwt. R. Meal 3*s.*=4*l.* 9*s.* 3*d.*

and which he stated had been sent to him as "Rice Meal." The vendor was Mr. W. H. Davis, miller, Lechlade.

After receiving the meal, Mr. Adams found that his cattle would not eat it, and he therefore sent a sample for analysis to Dr. Voelcker.

The report was as follows :—

	March 22, 1894.	
Moisture	12·53	100·00
Oil	1·40	
[1] Albuminous compounds (flesh-forming matters)	4·94	
Starch, digestible fibre, &c.	28·95	
Woody fibre (cellulose)	33·52	
[2] Mineral matter (ash)	18·66	
[1] containing nitrogen	·79	
[2] including silica	14·67	

This is not rice meal, but the ground husks, or shudes, of rice—a material of very small feeding value. Rice meal has only about 5 per cent. of woody fibre; this material has $33\frac{1}{2}$ per cent.

The following case illustrates the importance of requiring an *explicit* guarantee in the purchase of cakes :—

2. Mr. W. J. Millen, of Bluecoat, Goudhurst, Kent, sent on March 29, on behalf of Mr. E. Hussey, Scotney Castle, Lamberhurst, a sample of 3 tons of what he had purchased as "Djeffkin's Russian Oil Cake," at 8*l.* per ton delivered, less $2\frac{1}{2}$ per cent. discount. Attached to the invoice was the following statement :—

Conditions of Sale of Fertilisers and Feeding Stuffs.

Foreign Cakes.

American, Russian, and all imported cakes and feeding stuffs guaranteed of the usual good and merchantable quality of the brand or description stated, but exact composition unknown.

Dr. Voelcker's report was as follows :—

	April 6, 1894.	
Moisture	12·86	100·00
Oil	9·64	
[1] Albuminous compounds (flesh-forming matters) .	26·19	
Mucilage, sugar, and digestible fibre . . .	36·54	
Woody fibre (cellulose)	8·34	
[2] Mineral matter (ash)	6·43	
[1] containing nitrogen	4·19	
[2] including sand	1·69	

An impure cake containing much weed seed and starchy matters.

---

3. Lieut.-Col. Milligan, of Caldwell Hall, Burton-on-Trent, forwarded for analysis, on April 20, a sample of what he had purchased as "Blood and Bone Manure," and which cost 6*l.* per ton delivered. The vendors were Messrs. E. Dean & Sons, Gibbons Street, Ashton New Road, Bradford, near Manchester.

Messrs. Dean & Sons, in their circular, quoted, under the heading of "Blood and Bone Manure," two different manures, one at 5*l.* per ton, and the other, which was stated to be "specially prepared, of extra quality," at 6*l.* per ton. The latter was recommended in a letter from the vendors, they enclosing the following certificate relating to it :—

Chemical Laboratory, Gibbons Street, Bradford, Manchester.

Harry Grimshaw, F.C.S., late Demonstrator in Chemistry,
Owens College, Manchester, Mem. Lit. & Phil. Soc., Manchester.

Below please find results of our analysis of the sample of manure which you handed to me :—

Moisture	20·09	100·00
Organic matter	39·25	
Sulphate of lime	8·14	
Alkaline salts	1·13	
Mineral matter	31·39	
containing nitrogen equal to ammonia . . .	5·032 per cent	
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 at 30*s.* ,,	12	4	2
Phosphoric acid . . .	8·06 at 40*l.* ,,	322	8	0
Alkaline salts . . .	1·14 at 2*l.* ,,	2	5	2
Ammonia	5·03 at 80*l.* ,,	402	8	0
	100	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.—
I am, yours faithfully, H. Grimshaw.

Dr. Voelcker's report on the sample sent him by Col. Milligan was as follows :—

April 26, 1894.

Moisture	24·85	100·00
[1] Organic matter	20·94	
Phosphate of lime	7·49	
Carbonate of lime, oxide of iron, &c.	28·66	
Sand	18·06	
[1] containing nitrogen (total)	2·97	
equal to ammonia	3·61	

An extravagant price to pay. The manure is a comparatively poor one, and, if the price is for cash, I call it just about twice too dear.

On receipt of this report, Col. Milligan complained to the vendors of the quality, and received the following reply from them :—

May 2, 1894.

DEAR SIR,—In reply to yours to hand this morning we beg to say we sent on April 10 last one ton bone manure at 6*l.* per ton and one ton at 5*l.* per ton. The query is, Out of which quality was the sample sent for analysis to Mr. J. A. Voelcker ? We fail to understand analysis arrived at by this gentleman, as it differs from that of ours. We beg to say ours of that at 6*l.* per ton was taken from bulk heap of manure from which it was bagged—that is, the 6*l.* per ton. In explanation we may say that the sample you have sent may not have been properly and thoroughly blended with bulk lot, which is often likely to occur if the men are a little careless in the mixing. Then, again, every ton of manure we send out for root crops contains 2 cwt. of sulphate of ammonia added before bagged up, value of which is 13*l.* 12*s.* 6*d.* per ton. This Mr. Voelcker would not, we presume, analyse to its value, as in the case also of nitrate of soda, and the prepared raw bones of which our manure contains large proportions, sometimes fails in parts or portions of arriving at a correct analysis. I shall see Mr. Ashmull to-morrow (Thursday) afternoon at Burton, and will then give a further explanation to him of the difficulties of making a careful investigation of the qualities, the test of which is best seen in the application and the results. No single case has yet been known of a failure. The results hitherto have been highly satisfactory, and I think I may with safety say this has been so in your experience of its use, for we have now supplied you a few seasons with it. I shall not ask for payment until you have been satisfied with the results. In your case I dare venture on the above terms, on principle.—I remain, dear Sir, yours truly, (for) E. DEAN & SONS, HUGH DEAN.

Col. Milligan replied :—

89 Sloane Street, S.W.: May 7, 1894.

Messrs. Dean & Son.

SIRS,—In reply to yours of 2nd inst. I hear from my bailiff that there is no doubt about the sample sent to Dr. Voelcker being taken from the 6*l.* per ton lot of "Blood and Bone" manure, and also that it was taken according to the rules laid down. A duplicate sample is in his possession, which you can have to be analysed by the County Council analyst, or if you are not satisfied that the sample has been properly taken, come over to Caldwell next week, or send a representative, and take a fresh sample in my presence. Dr. Voelcker, whom I saw on Saturday, states that he has determined the whole of the ammonia in whatever form present.

I would point out to you that you have contravened the Fertilisers and Feeding Stuffs Act, 1893, by not giving on your invoice a guarantee of analysis. It seems to me it is a matter to bring before the County Council. In your letter you mention that the men may be a little careless in the mixing. I do not know whether you allude to your men at the works or my men. As regards results it would be hard to say whether they were owing to the general fertility of the land, the season, or your manure, so I cannot go by that. What we farmers want is proper value for our money.

I am at above address till Monday, 14th inst.—Yours faithfully,

C. Milligan.

The vendors accepted Col. Milligan's offer to resample. This was done on May 15 in the presence of both parties, samples of both the 5*l.* and the 6*l.* per ton manures being taken.

One of the samples of the 5*l.* per ton manure was sent to Dr. Voelcker, who reported upon it as follows :—

	May 22, 1894.	
Moisture	24·04	100·00
[1] Organic matter	19·71	
Phosphate of lime	6·63	
Carbonate of lime, oxide of iron, &c.	30·47	
Sand	19·15	
[1] containing nitrogen	2·77	
equal to ammonia	3·35	

This is nearly as good as the 6*l.* per ton manure; there is hardly 5*s.* a ton difference between them. Both manures are ruinously dear.

Col. Milligan paid the account and closed the transaction.

The following are two instances of worthless manures sold at comparatively extravagant prices :—

4. Mr. W. S. Burton, of Childrey Manor, Wantage, Berks, sent on April 28 a sample of what had been sold to him as "Blood Manure," at 20*s.* per ton.

Dr. Voelcker's report was as follows :—

	May 7, 1894.	
Moisture	15·71	100·00
[1] Organic matter	5·69	
Phosphate of lime	1·26	
Oxide of iron, carbonate of lime, &c.	22·63	
Sand	54·71	
[1] containing nitrogen	·43	
equal to ammonia	·52	

This is not "Blood Manure" at all, though called so. It is a material of very slight manurial value, and is not worth 5*s.* a ton.

Mr. Burton then wrote :—

Childrey Manor, Wantage: May 26, 1894.

Dear Dr. Voelcker,—Thanks for your kind letter. On due investigation I find that the vendor of the Manure had no intention to deceive.

He is not a scientific man, and unfortunately mixed some refuse lime with the manure some months ago, thinking this would render it fit for drilling.

Doubtless the lime has dissipated the ammonia &c.

He has relieved me from my purchase, so the matter need not be pursued further.—Yours faithfully, W. SCHOOLCROFT BURTON.

Dr. Voelcker replied :—

May 30, 1894.

DEAR MR. BURTON,—I have examined the sample of manure further, and have no hesitation in saying that the explanation given by the vendor is not the real one. The sample contains no caustic lime at all, nor anything that would drive the ammonia off, had it ever been present. What the sample does contain is brick-dust, grit, earth, &c., with which it has been adulterated.—Yours faithfully, J. AUGUSTUS VOELCKER.

5. Mr. H. Hedges, of Sunbury, Middlesex, sent, on May 2, a sample of manure which was offered to him at 3*l*. per ton.

The report on this was as follows :—

May 14, 1894.

Moisture	8·25	100·00
[1] Organic matter	14·60	
Phosphate of lime	·55	
Carbonate of lime, &c.	21·50	
Sand	55·10	
[1] containing nitrogen	·58	
equal to ammonia	·70	

A very poor material, and hardly worth the name of manure. It would be dear at 10*s*. a ton.

Mr. Hedges did not make any purchase.

The following is an instance of gross adulteration of nitrate of soda :—

6. Mr. Henry Davies, of Goldby's Farm, Astley, Nuneaton, sent on May 5 for analysis a sample of what he stated had been sold to him as "95 per cent. pure Nitrate of Soda," the price being 11*l*. 10*s*. per ton delivered, payment within one month.

On the invoice being sent, it read :—

	Nitrogen Min.	Nitrogen Max.	Tons		£	*s*.		£	*s*.	*d*.
Nitrate of Soda	13	14 %	2	@	11	10	per ton	23	0	0

Dr. Voelcker's report on this sample was as follows :—

May 14, 1894.

Moisture	2·64	100·00
Chloride of sodium (common salt)	25·74	
Other impurities	·79	
Pure nitrate of soda	70·83	

An impure sample containing over 25 per cent. of common salt. The price asked is high for even the very best quality of nitrate of soda.

It may be pointed out that a sample of the quality represented by the foregoing analysis would contain 11·66 per cent. of nitrogen only, while "95 per cent. pure" nitrate would have at least 15·6 per cent. of nitrogen.

The merchants then wrote :—

May 21, 1894.

Mr. Henry Davies, Goldby's Farm, near Nuneaton.

Dear Sir,—With reference to your favour of the 16th inst., we beg to point out that the nitrate of soda was invoiced to you as containing the nitrogen which your analysis shows it to hold. We therefore fail to see where the cause of complaint lays. Our agent was not authorised to offer it as pure, nor did we state it to be such, and the price must have shown you that it could not possibly have been so, and you should not, if you had so expected it, have taken delivery after receiving the invoice.

We are quite within our legal rights in refusing to make you any allowance, but being desirous of retaining your custom should be glad to hear what allowance you expect, and we will endeavour to meet you.—Yours truly, * * * *

Dr. Voelcker pointed out to Mr. Davies that he had only received 11·66 per cent. of nitrogen, and not even that (13 per cent.) stated on the invoice ; and he also showed that the price, instead of being low, as the merchants indicated, was the full price of the best quality of nitrate of soda.

On May 30 the vendors wrote :—

May 30, 1894.

Mr. Henry Davies, Astley.

Dear Sir,—In reply to yours of 24th inst., we have considered the matter thoroughly, and in order to avoid all unpleasantness we now make you the offer, without prejudice, of 25*s*. per ton reduction, payment of account to be made forthwith.—Yours truly, * * * *

The following case is an instance of a manure containing *boiled* bones being sold as "Dissolved Bones."

7. Mr. H. C. Gardner, of Ombersley, Droitwich, forwarded on behalf of Mr. T. Amphlett, of Acton Hall, Stourport, Worcestershire, for analysis, on May 8, a sample of what was sold as "Dissolved Bones." The vendors were Messrs J. P. Harvey & Co., Kidderminster. On receipt of the invoice it read :—

	£	*s.*	*d.*
3 tons Diss. Bones at 6*l*. 10*s*. 0*d*.	19	10	0
1 ton Diss. Bones	7	0	0
	26	10	0

Artificially compounded :

Ammonia	2 to 3 per cent.
Phosphates	30 to 35 „

Minimum guaranteed.

Dr. Voelcker's report on the sample was as follows :—

	May 18, 1894	
Moisture	11·31	
[1] Organic matter and water of combination	29·77	
Monobasic phosphate of lime	8·61	
Equal to tribasic phosphate of lime (bone phosphate) rendered soluble by acid	(13·49)	100·00
Insoluble phosphates	26·39	
Sulphate of lime, alkaline salts, &c.	22·47	
Insoluble siliceous matter	1·45	
[1] containing nitrogen	1·79	
equal to ammonia	2·18	

This is not pure dissolved bones, not being made of *raw* bone and acid only. The price is too high for this quality.

The vendors maintained that they had given what had been guaranteed, and that the manure was entirely bone and acid. Dr. Voelcker, however, showed Mr. Amphlett that the real point was whether the manure was one that ought to have been described as "Dissolved Bones," and whether it was made, as is understood in the trade dissolved bones *should* be, from *raw* bone and acid only, and not with *boiled* bone as well. Dissolved bones thus, properly made, should contain over 3 per cent. of ammonia ; and this the farmer has a right to expect when paying such a price as that in question here, and not to be supplied with *boiled* bone giving less ammonia than *raw* bone would.

The following case shows the risk run in buying feeding meals without any guarantee :—

8. Mr. C. Wilkinson, The Lodge Farm, Dudmaston, Bridgnorth, sent for analysis, on May 14, a sample of what was sent him in response to an order for "Bran," the price being 5*l.* per ton. No particular guarantee was asked for.

Dr. Voelcker's report on the sample was—

	May 19, 1894.	
Moisture	11·83	
Oil	3·89	
[1] Albuminous compounds (flesh-forming matters)	14·01	100·00
Starch, digestible fibre, &c.	56·19	
Woody fibre (cellulose)	9·39	
Mineral matter (ash)	4·69	
[1] containing nitrogen	2·24	

This is not genuine wheat bran, but contains also a quantity of ground barley, as also oats and some maize. It is a coarse and not nice sample, not being in good condition—there are some maggots in it.

The vendors made an allowance of 10*s.* per ton.

The following cases exemplify direct contraventions of the Fertilisers and Feeding Stuffs Act as regards the sale, under the name of "Linseed-cake," of impure cakes which have no right to be described as "Linseed-cake":—

9. Mr. R. F. Gubbin, of Wyddial Bury, Buntingford, Herts, forwarded, on April 30, a sample of 2 tons of what he had purchased as "Russian Linseed-cake," at 7*l*. 12*s*. 6*d*. per ton delivered.

Mr. Gubbin stated that the vendors assured him that the cake was pure. After sending a sample for analysis to Dr. Voelcker, the following report was received:—

May 2, 1894.

Moisture	12·98	100·00
Oil	9·75	
[1] Albuminous compounds (flesh-forming matters)	29·69	
Mucilage, sugar, and digestible fibre	33·74	
Woody fibre (cellulose)	7·65	
[2] Mineral matter (ash)	6·19	
[1] containing nitrogen	4·75	
[2] including sand	1·09	

A cake adulterated to a considerable extent with spurry and other weed seeds.

On receipt of the invoice it read as follows:—

April 23, 1894.

R. F. Gubbin, Wyddial Bury.

		£	s.	d.
April 3, 1894.	2 tons 1 cwt. 15 lb. Rus. Lin. Cake at 7*l*. 12*s*. 6*d*.	15	14	0

Subsequently the vendors wrote:—

April 27, 1894.

Dear Sir,—Your letter to hand *re* Linseed Cake. We beg to say we do not guarantee the purity of any cake we sell. We do the best we can to supply the purest cake on the market, and, as far as our knowledge goes, what you had only contains its *natural* admixture. . . . We are, yours truly,

* * * *

Mr. Gubbin then gave the vendors an opportunity of taking a fresh sample; but this they did not avail themselves of. On the parties meeting at Hertford later on, the vendors stated that the broker declined to admit the impurity of the cake or to give any compensation.

---

10. Mr. J. Drewitt, of Patching, Worthing, sent for analysis, on May 15, a sample of Russian linseed-cake which he had purchased with a guarantee of 16 per cent. of oil, the price being 7*l*. 15*s*. per ton delivered to nearest station. Four tons had been purchased altogether.

Dr. Voelcker's report was as follows:—

May 22, 1894.

Moisture	13·87	100·00
Oil	11·38	
[1] Albuminous compounds (flesh-forming matters)	28·75	
Mucilage, sugar, and digestible fibre	31·91	
Woody fibre (cellulose)	8·85	
Mineral matter (ash)	5·24	
[1] containing nitrogen	4·60	

Not only has this cake considerably less oil than it is stated to contain, but it is a very impure cake, containing a large quantity of foreign weed seeds and starchy impurities. *Polygonum* and spurry are the chief weed seeds. Such a cake ought not to be sold under the name Linseed-cake, and if you have bought it for this I would advise you to send it back.

In reply to inquiries, Mr. Drewitt said that he knew the vendor to be an honourable man who did not know the cake to be impure, but had sold it relying on the wholesale merchant in London.

Nitrate of Soda.

The Committee think it desirable to call attention to the changes which have taken place in the methods of sale and the quality of Nitrate of Soda since the introduction of the Fertilisers and Feeding Stuffs Act.

Previous to this time, it was the exception for any sample sold to a farmer by a respectable merchant to analyse below "95 per cent. purity." Everyone knew what "95 per cent. pure" meant in the case of nitrate of soda, and this quality was, as stated, the minimum one generally met with. The introduction of the Fertilisers and Feeding Stuffs Act has, however, caused the well-understood and recognised term "95 per cent. pure" to be replaced wholly, or in part, by a statement of the percentage of *nitrogen* which the sample shall *at least* contain. The farmer has no idea how much nitrogen there ought to be in what he always knew as "95 per cent. pure," and, as illustrated in case No. 6 quoted in this report, it is to be feared that he is often misled by the representations given him.

The percentage of nitrogen in "95 per cent. pure" nitrate of soda should be 15·6.

It is also noticeable that the quality of Nitrate of Soda has very markedly deteriorated of late. It is rather the exception now to meet with a sample that analyses "95 per cent.," and the greater number now yield only about 93 per cent. of pure Nitrate of Soda.

EMLYN,
Chairman

June 5, 1894.

REPORT OF THE EDUCATION COMMITTEE ON THE RESULTS OF THE SENIOR EXAMINATION, 1894.

The Committee have to report that thirty-two candidates entered, and twenty-eight actually competed, at the Society's Senior Examinations which took place from the 8th to the 12th of May last, and that of these twenty-eight competitors, fifteen have satisfied the Examiners.

2. The following ten candidates, placed in order of merit, have gained first-class certificates. In view of the fact that candidates 5 and 6 are practically equal in merit, the Committee recommend that Life Memberships be granted to both, as well as to the winners of the money prizes offered by the Society for the first four candidates.

1. John Dronsfield Whittaker, Royal Agricultural College, Cirencester. *First Prize of* 25*l. and Life Membership of the Society.*
2. Alexander Clark Welch, 5 West Newington Place, Edinburgh. *Second Prize of* 15*l. and Life Membership of the Society.*
3. Charles J. R. Tipper, The Agricultural College, Aspatria. *Third Prize of* 10*l. and Life Membership of the Society.*
4. Herbert Simpson Daine, Woolfall Hall Farm, Huyton, Liverpool. *Fourth Prize of* 5*l. and Life Membership of the Society.*
5. John Waugh Paterson, 14 Brunstane Road, Portobello, N.B. *Life Membership of the Society.*
6. Grosvenor Berry, Fairseat, Wrotham, Kent. *Life Membership of the Society.*
7. Joseph Terrence de La Mothe, The Agricultural College, Aspatria.
8. Albert A. Dixon, The Agricultural College, Aspatria.
9. Alfred George Scorer, Abercorn Lodge, Upper Hamilton Terrace, N.W.
10. George Lloyd Pain, Woodhay, Silverdale, Carnforth.

3. The following candidates, having passed in Agriculture and in three of the four other compulsory subjects, are entitled to second-class certificates:—

11. Frederick Victor Dutton, University College of North Wales, Bangor.

12. Richard Henry Evans, Llecheiddior Mill, Garn, R.S.O., Carnarvon.

13. Alexander George Gibson, University College of Wales, Aberystwyth.

14. William George Rumbold, 22 Great George Street, Westminster, S.W.

15. Thomas Whiting, University College of Wales, Aberystwyth.

4. Of the compulsory subjects, there were three failures in Agriculture, ten in Chemistry, eight in Book-keeping, ten in Land Surveying, and twelve in Agricultural Engineering. Of the optional subjects, there were ten failures in Botany, one failure in Geology, nine failures in Anatomy, and twelve in Agricultural Entomology.

5. The Examiner in Agriculture (Mr. A. F. Milton Druce) reports as follows: "The farming experience of the twenty-eight candidates who presented themselves widely differed, as the places whence they had gained their knowledge ranged from Scotland and Wales to the southern counties. The answers were satisfactory with regard to the culture of grass, cost, and dairying. A great difference was expressed in the written papers on the outlay for the root crop, but in most cases the candidates when questioned showed sufficient knowledge to justify the marks gained. Poultry-keeping had evidently been a matter of much consideration to many of the candidates. The students who had been engaged in practical work were much more ready with their answers for the *vivâ voce* examination than those who had not had the advantage of such experience.'

6. The Examiner in General Chemistry (Professor Liveing, F.R.S.) reports that the work in this subject was, on the whole, well done. Eight out of twenty-eight candidates obtained 70 per cent. or upwards of the marks, and the candidates generally showed more knowledge and more intelligent acquaintance with the principles of Chemistry than had usually been shown in previous years. The Examiner in Agricultural Chemistry (Dr. J. Augustus Voelcker, B.Sc.) considers the results of the Examination very satisfactory, four papers being of marked excellence. Dr. Voelcker adds: "Of the six questions, the one least well answered was that referring to continuous corn-growing. Several candidates omitted it altogether. There was a decided disinclination to set out analyses (as required) illustrating the differences of composition of root crops, and in no single case was this done satisfactorily. The question on the utilisation of sewage was almost universally well answered, and the replies to that on the 'ripening of cheese' were much better than I had expected."

7. The Examiner in Book-keeping (Mr. Ernest Clarke) reports : "On the whole, the results of the Examination in Book-keeping are disappointing. Of twenty-eight papers sent in, only four were done really well. Considering that the paper set was by no means a difficult one, and that ample time was given for its working, the answers are by no means satisfactory ; and it is to be feared that sufficient attention is not given, either by teachers or students, to this subject, which is one of cardinal importance in the profession of Land Agent, to which many of the candidates for the Society's examination aspire.'

8. The Examiner in Mensuration and Land Surveying (Mr. G. H. Leane, F.S.I.) reports "an improvement in the quality of the work compared with that of last year, though there remains much to be desired, especially in that branch relating to the survey of small estates, of which very few seem to realise the importance."

9. The Examiner in Agricultural Engineering (Dr. W. Anderson, F.R.S.) reports that "the papers written this year do not call for much remark beyond the one I have so often made, as to the indifferent powers of sketching. Of the twenty-eight students who presented themselves for examination, only one candidate produced presentable drawings. The answers to Questions 13 and 14 were, for the most part, very meagre, and not such as might have been expected."

10. In the optional subjects, the Examiner in Botany (Mr. W. Carruthers, F.R.S.) reports that the papers have a larger proportion of poor answers than he has ever had before. The Examiner in Geology (Professor Rupert Jones, F.R.S.) reports that "the results are very satisfactory. Of the twenty-three candidates all but one obtained half the marks or more, eleven obtained two-thirds of the maximum of marks or more, and of these one obtained quite full marks." The Examiner in Anatomy and Animal Physiology (Professor J. B. Simonds) reports that the results are not so satisfactory on the whole as could be wished. The Examiner in Agricultural Entomology (Mr. Cecil Warburton, M.A.) reports that "the answers in this subject are by no means up to the level of those of last year. No fewer than twelve candidates have failed to obtain 50 per cent., and not more than three or four papers are distinctly good. Great ignorance was displayed with regard to the 'gout fly,' which did such widespread damage in 1893. The question on clover weevils was only attempted by two candidates."

11. On the whole, the general standard of success attained by the candidates is not so high as last year ; and the observations of some of the Examiners appear to indicate that unequal attention is given by the candidates to the several subjects which form part of the Examination.

12. The following Table gives the marks assigned by the Examiners to the work done by each candidate in the several subjects :—

Name of Candidate [The names of those winning First-class Certificates are printed in capitals.]	Age of Candidate	Agriculture, *max.* 300	Chemistry, *max.* 200	Book-keeping, *max.* 200	Land Surveying, *max.* 200	Agrl. Engineering, *max.* 200	*a.* Botany, *max.* 100	*a.* Geology, *max.* 100	*a.* Anatomy, *max.* 100	*a.* Agrl. Entomology, *max.* 100	Total Marks *max.* 1,500	Result
*BERRY, G. . .	24	172	167	185	100	100	85	86	80	68	1,043	6th
+ . . .	18	193	+	+	+	+	—	60	+	—	+	+
+ . . .	19	165	+	+	+	+	—	—	—	+	+	+
+ . . .	44	169	+	120	+	159	+	63	+	+	+	+
+ . . .	30	192	136	+	+	+	51	50	—	+	+	+
+ . . .	20	+	+	100	101	102	+	—	60	+	+	+
+ . . .	33	179	100	100	+	+	63	63	50	50	+	+
*DAINE, H. S. . .	37	245	157	135	165	160	74	92	50	90	1,168	4th
†DIXON, A. A. . .	22	172	133	105	100	125	65	83	55	50	888	8th
‡Dutton, F. V. . .	29	167	157	120	+	160	76	86	60	77	903	11th
+ . . .	29	180	124	+	145	+	62	59	+	+	+	+
‡Evans, R. H. . .	23	166	128	100	163	+	51	64	+	+	672	12th
‡Gibson, A. G. . .	18	162	115	110	103	+	52	—	55	59	656	13th
+ . . .	18	+	+	+	+	+	+	—	+	+	+	+
+ . . .	19	+	109	+	+	+	+	50	—	+	+	+
+ . . .	31	165	+	+	105	+	+	71	+	50	+	+
†MOTHE, J. T. de La.	19	173	128	140	152	104	62	82	75	50	966	7th
+ . . .	24	160	+	+	101	+	+	50	+	+	+	+
†PAIN, G. L. . .	22	163	114	120	151	125	+	65	+	+	738	10th
*PATERSON, J. W. .	25	177	158	100	143	150	64	98	80	77	1,047	5th
+ . . .	20	190	+	105	+	100	+	+	—	+	+	+
‡Rumbold, W. G. .	30	180	+	100	135	134	—	51	—	—	600	14th
†SCORER, A. G. .	27	183	108	130	196	117	+	75	—	65	874	9th
*TIPPER, C. J. R. .	22	195	178	200	124	159	74	94	90	58	1,172	3rd
+ . . .	24	205	+	110	100	+	—	81	—	68	+	+
*WELCH, A. C. .	24	220	145	200	174	162	68	94	60	85	1,208	2nd
‡Whiting, T. . .	18	200	100	115	+	127	+	—	+	+	542	15th
*WHITTAKER, J. D.	28	256	172	170	186	175	70	100	80	85	1,294	1st

REMARKS.

* First-class certificate and life membership.
† First-class certificate.
‡ Second-class certificate.

a Optional subjects.
— Did not attempt.
\+ Failed.

MORETON,
Chairman.

June 5, 1894.

EXAMINATION IN AGRICULTURE.

MAXIMUM NUMBER OF MARKS FOR THIS SUBJECT, INCLUDING THE *VIVA VOCE*, 300. PASS NUMBER, 150.

Tuesday, May 8th, from 2 p.m. till 5 p.m.

1. In selecting a farm of 400 acres, at least one-third grass, for occupation at the present time, give your ideas as to the capital you would require; what would guide you in your choice as to situation, soil, rent; how you would propose to pay the amount due for the first half-year; the sum you would allow for labour; the cost of the Live and Dead Stock, in detail; and briefly the

items and probable amounts under each head of receipts and expenditure for the financial year.

2. The prices of agricultural produce being now so low, state what improvements you consider could be introduced as to the management of such a farm so as to lessen expenses without injuring the land.

3. What would be the average yield, weight, and value, per acre, at present prices, of the various crops of corn, hay, and straw, on such a holding (*Question No.* 1)?

4. State in full the cultivations and cost per acre for Mangel Wurzel, Turnips, and Swedes, taking the land as clean, after a crop of wheat, till the time the roots are ready to harvest or feed-off, and their fair value.

5. What would be the cost (in detail) per quarter for threshing, winnowing, and delivering corn five miles? Given—

4	Ricks	Wheat	containing say	85 qrs.	in all
8	,,	Barley	,, ,,	320 ,,	,,
3	,,	Oats	,, ,,	180 ,,	,,
2	,,	Beans	,, ,,	40 ,,	,,

6. The crop of hay and straw being so deficient last year, give some of the lessons taught in economy, naming the substitutes used in the place of hay and straw, and the approximate extra cost (if any) for the tenant.

7. Describe, as to putting down land to 2, 3, and 4 years ley, the different varieties, quantities, and cost of such grass and clover seeds per acre for each term, specifying and taking into consideration the peculiarities of any particular soil, the cultivation, and mode of management.

8. What profits would you expect per head, per annum, and in full, how derived, from a herd of forty dairy cows, to sell the milk near a town, the rent of the land being 60*s.* per acre?

9. Give a list of the different breeds of English sheep, making two classes with regard to wool, their respective merits as to butcher's value, any particular breeds, as best adapted for certain soils, and full details of the breed with which you are best acquainted.

In selecting a ram, state the chief points which you deem essential for improving your ewe and feeding flock.

10. Give your ideas in full as to keeping poultry in fields, in movable houses.

EXAMINATION IN CHEMISTRY.

MAXIMUM NUMBER OF MARKS, 200. PASS NUMBER, 100.

PART A. GENERAL CHEMISTRY.

Thursday, May 10, *from* 10 *a.m. till* 1 *p.m.*

1. Give a brief account of the occurrence of nitrogen, combined and uncombined, in nature. How can nitrogen be distinguished from carbon dioxide, and from hydrochloric acid gas? How could you prove the presence nitrogen in albumen?

2. Atmospheric air is said to be a mixture of gases, while nitric oxide and sulphur di-oxide are said to be compounds; state the reasons for the distinction. How is atmospheric air affected by (1) the burning in it of a fire, (2) the fall of rain through it?

3. Calculate the weight of nitrogen in one cwt. of each of the following substances: Chili saltpetre, common saltpetre, ammonium sulphate, sal-ammoniac. ($N : O : Cl : Na : K = 14 : 16 : 35{\cdot}5 : 23 : 39.$)

4. How is bleaching powder made? How can it be made to yield chlorine? Explain its chemical action with a solution of (1) sulphurous acid, (2) ferrous sulphate.

5. How do cast iron, wrought iron, and steel differ in chemical composition? Mention the chief methods in use for protecting iron from rust, and explain the principle on which each of them depends.

6. Explain how to detect each of the following substances when it is present in a solution: copper, mercury, zinc, barium, silica.

7. Of the common compounds of lead which are soluble, more or less, and which are quite insoluble in water? Explain the action of litharge on an oil, such as palm oil, or olive oil.

8. What is an antiseptic? Show, by examples, that most antiseptics belong to one of two classes, either mineral poisons or reducing agents.

9. State the relation between cane sugar and grape sugar. How can starch be converted into sugar, and alcohol into acetic acid? State the nature of the chemical change in each case.

10. State the chemical composition of each of the following substances, and give an account of its chief chemical properties: urea, ether, phenol, oil of turpentine.

EXAMINATION IN CHEMISTRY.

MAXIMUM NUMBER OF MARKS, 200. PASS NUMBER, 100.

PART B. AGRICULTURAL CHEMISTRY.

Friday, May 11th, from 10 *a.m. till* 1 *p.m.*

1. Show by typical analyses the differences of chemical composition between White Turnips, Swedes, and Mangels. Name the constituents upon which the value of the roots as feeding materials chiefly depends, and what circumstances may modify the relative proportions of these constituents.

2. Suppose a farmer about to purchase for use on his land (*a*) nitrate of soda, (*b*) bone-meal, (*c*) basic slag, (*d*) mineral superphosphate, (*e*) kainit, (*f*) dissolved bones, what ought he to stipulate for in each case when giving his order? Give your reasons for this.

3. What are the chief impediments to the utilisation of sewage as a manurial source? Describe any method of obtaining it in a portable form; and, when so obtained, on what class of land and for what purposes is it best utilised?

4. State anything you know as to the class of land most liable to "finger and toe," and say whether there is anything to lead to the belief that the prevalence or absence of the disease has any relation to the constituents of the soil; also, what influence any particular kind of manuring may possibly exercise upon the spread of disease.

5. Describe the chief characteristics of what is known generally as "Prout's system" of continuous corn-growing. On what class of land, and under what conditions, is it most likely to be successful? What modifications of it has it been found necessary to introduce?

6. What is the "ripening" of cheese? Under what conditions does it proceed best, and what are the principal changes that take place during the process?

EXAMINATION IN BOOK-KEEPING.

MAXIMUM NUMBER OF MARKS, 200. PASS NUMBER, 100.

Thursday, May 10th, from 2 *p.m. till* 5 *p.m.*

To lessen the number of entries in the ledger, the single heading "Live Stock" may comprise all the animals except horses; single entries may also be used for "Rent, Rates, Taxes, and Insurance," for "Seeds, Manures, and Foods Purchased," for "Tradesmen's Bills and Petty Cash," and for "Corn, Hay, and Straw."

Journalise the following transactions; post them into a ledger make out a Balance Sheet and a Profit and Loss Account.

Robert Brown rents a farm at 250*l.* a year.

On Sept. 29, 1892, his assets were:—

		£	s.	d.
Cash at Bank		210	0	0
Petty Cash		13	5	0
Horses	valued at	180	0	0
Sheep	,,	460	0	0
Dairy Stock	,,	380	0	0
Pigs	,,	33	0	0
Poultry	,,	6	0	0
Hay and Straw	,,	245	0	0
Corn	,,	525	0	0
Seeds and Manures	,,	94	0	0
Oil cake	,,	57	10	0
Growing Crops and Tillages	,,	570	0	0
Implements, taken at cost price, less 10 per cent. per annum for depreciation		310	0	0

His liabilities were:—

	£	s.	d.
To Landlord	125	0	0
,, Bankers, loan at 4 per cent.	400	0	0
,, Implement-makers for implements included in the above valuation	75	4	0

During the year he draws cheques for:—

	£	s.	d.
Horses	40	0	0
Cattle	170	0	0
Pigs	25	0	0
Sheep	175	0	0
Seeds	15	0	0
Manures	33	0	0
Implements	14	0	0
Tradesmen's Bills	37	0	0
House Expenses	174	0	0
Wages	447	0	0
Food Purchased	73	0	0
Rent	140	0	0
Rates and Taxes	43	0	0
Petty Cash	24	17	6

He sells to his landlord 20 tons of Hay at 5*l.* 5*s.*, and receives notice in June that 25 per cent. of his rent is remitted for the current year.

He sells to his implement-makers 40 sheep at 39*s.*

He sells to Smith 45 sheep at 42*s.*, and accepts in part payment 5 cows worth 16*l.* each, the balance remaining due.

He receives and pays into the Bank for:—

	£	s.	d.
Horses sold	57	10	0
Cattle ,,	146	0	0
Sheep ,,	380	0	0
Pigs and Poultry	44	0	0
Dairy Produce	284	13	0
Corn	615	0	0
Wool	123	0	0

These receipts enable him on the 25th of March to repay the loan from the Bankers.

On Sept. 29, 1893, he owes to tradesmen 65*l.* 12*s*

His valuations are:—

	£	s.	d.
Cattle and Dairy Stock	430	0	0
Sheep	530	0	0
Horses	160	0	0
Pigs and Poultry	37	0	0
Corn	450	0	0
Hay and Straw	175	0	0
Growing Crops and Tillages . . .	525	0	0
Seeds and Manures	160	0	0
Petty Cash in Hand	9	0	0

He values his Implements at cost price, less 10 per cent. per annum for depreciation.

EXAMINATION IN MENSURATION AND LAND SURVEYING.

MAXIMUM NUMBER OF MARKS, 200. PASS NUMBER, 100.

Wednesday, May 9th, from 10 a.m. till 1 p.m.

1. On the plan given on page 4 of this paper[1] draw in pencil the chain lines you would run to enable you to make and plot a complete survey without the aid of angular instruments.

NOTE.—*The Candidate must not spend more than fifteen minutes over this question.*

2. Compute the area of the inclosure given upon page 2,[1] using the ordinary plotting scale for this purpose, and giving the result in acres, roods, and perches. Scale, $\frac{1}{2500}$.

3. From the field notes given upon page 3[1] lay down the survey lines, and plot the details to a scale of 2 chains to an inch.

NOTE.—*The Candidate must not spend more than forty minutes over this question.*

4. Make up the level book on page 2,[1] filling in the rises, falls, and reduced levels (heights above base).

5. Plot the section in the last question to a scale of 2 chains to an inch horizontal, and 20 feet to an inch vertical.

6. What area in statute acres will equal $14_a\ 3_r\ 20_p$? customary acres, where the rod or perch in use is 24 feet in length?

7. In the process of a Survey it is necessary to obtain the distance of a point (C) inaccessible by ordinary chaining. A base line A B is measured, and the following angles are taken to C from points A and B with a theodolite:—

$$C A B = 38° 10'$$
$$C B A = 56° 20'$$

The length of A B is 43 chains 25 links.

Give lengths of C A and C B.

8. The Reduced level of a certain mark (A) is 45·25 feet. By means of a theodolite set over it—the axis of the telescope being 4 feet above it—the angle of elevation to another mark (B) was found to be 3° 14′. The distance A to B had been previously found by trigonometry to be 83 chains.

Give the Reduced level of the mark (B) without taking into consideration Curvature and Refraction.

9. Give the amount for Curvature and Refraction in the foregoing example, and state whether it will be an addition to or subtraction from the answer.

---

[1] Not here reproduced.

EXAMINATION IN AGRICULTURAL ENGINEERING.

MAXIMUM NUMBER OF MARKS, 200. PASS NUMBER, 100.

Tuesday, May 8th, from 10 *a.m. till* 1 *p.m.*

N.B.—Not more than half the questions should be attempted.

1. Explain the arrangement of a pair of two-sheave blocks and calculate the mechanical advantage gained in lifting weights.
2. What is meant by the term "Energy" in mechanics, and how is it measured?
3. Explain how it is that water on the earth does not set into solid ice throughout its bulk in severe frosts, and show why, when it does set, the melting, in warm weather, goes on very slowly.
4. Describe the various means by which heat is diffused or communicated from one place to another or from one substance to another.
5. What is the reason why air requires more heat to raise its temperature a given number of degrees when at constant pressure than when at constant volume?
6. Describe the construction of the barometer, and explain its use in the ordinary transactions of life.
7. What are the resistances to be overcome by water flowing through a pipe, and how are these resistances usually measured?
8. Sketch an ordinary water-wheel taking its water about the level of its axis.
9. How is the efficiency of a steam boiler ascertained, and what does "coefficient of efficiency" mean?
10. Sketch an ordinary slide valve of a steam-engine, and explain the distribution of steam during one revolution of the crank shaft.
11. Describe the difference between a non-condensing steam-engine and a condensing engine, and state what is meant by "surface condenser."
12. Describe the action of a petroleum engine in which the combustion of the oil takes place in the engine.
13. Describe one of the methods of applying steam power to the cultivation of land.
14. Describe the mechanical appliances in use in cutting and securing a hay crop.
15. Sketch a chaff or straw cutter and describe its mode of action.
16. Sketch and describe a centrifugal cream separator.
17. Describe the means by which the power of a water-wheel or steam engine is transmitted to a number of machines.
18. Describe a form of light railway such as is suitable for farm work.

EXAMINATION IN BOTANY.

MAXIMUM NUMBER OF MARKS, 100. PASS NUMBER, 50.

Friday, May 11th, from 2 *p.m. till* 4 *p.m.*

Seven questions at st must be answered.

1. What is protoplasm, and what functions does it perform in the plant?
2. Describe the elements of a vascular bundle in the stem of a grass.
3. How do plants receive, use, and part with water, oxygen, and carbonic acid gas?
4. What is an achene, a siliqua, a legume, and a drupe? Give examples of each.

5. What methods would you adopt to obtain new varieties in cultivated plants?

6. Explain the different conditions under which seeds fail to germinate.

7. Specify the seven best plants for—(*a*) permanent, and (*b*) temporary pasture, and give reasons for your selections.

8. Give the name of the organism which causes "Club-root," "Finger and toe," or "Anbury." Describe its life-history, and state what steps you would take to get rid of it.

9. Give the characteristics of the Natural Order *Gramineæ*, and describe the flower of a British species.

10. Name and describe in systematic order the plants marked A and B.

EXAMINATION IN GEOLOGY.

MAXIMUM NUMBER OF MARKS, 100. PASS NUMBER, 50.

Saturday, May 12th, from 10 a.m. till 1 p.m.

1. Name and describe some of the most common of the Rock-forming Minerals, and the Rocks or Strata of which they are constituents.

2. Describe, and illustrate with diagrams, the *dip* and *strike* of Strata and show how the physical features of a country are influenced thereby.

3. What are Metamorphic Rocks? Why are they so called? Where are they chiefly met with? Describe the geological position of some in particular.

4. Give a Tabular List of *either* (1) the Upper Silurian,—*or* (2) the Cretaceous Formations, together with some of their most important Fossils.

5. Describe the origin and constitution of the chief kinds of Limestone, with remarks on the aspect, character, locality, and uses of those you mention.

6. Give reasons, on geological grounds, why some parts of England are respectively good for (1) pastoral, or (2) arable farming; or (3) for the manufacturing industries.

7. Write a brief account of the chief *alluvial* lands on the coasts of England,—their extent, origin, and capabilities for farming or other purposes.

8. Make a sketch-map or plan of the geological structure of any district you are acquainted with; and show how you would mark *dips, strikes, faults, lodes* or *metalliferous veins*, and *glacial striæ* by signs; and by what colours you would indicate the *different kinds of rocks*.

9. Describe (with diagrams) the geological structure and physical features of one of the large Counties in the British Isles; and give some notes on its economic products.

10. By what Fossils would you be able to recognize the exposure or occurrence of the Lias, the Oxford Clay, the Gault, and the London Clay respectively?

11. Which are the best Building-stones found in the British Isles? State where they are found, and for what purposes they are specially used.

12. Name and describe *four* of the Specimens on the Table before you.

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 cause why the head of an animal is maintained more or less in a horizontal position, independently of the various movements to which it is subjected by the bending, &c. of the neck.

2. Describe the dentition of a four years old horse, a three years old ox, a two years old sheep and a year old pig, so far as the incisor teeth and tusks indicate.

3. Name the principal glands which secrete the saliva, and describe its action on the food during mastication.

4. In the act of deglutition, say where involuntary action commences and where it ends.

5. One of the animals of the farm does not possess a gall bladder: say which it is. The heart, as the central organ of circulation, possesses four cavities: describe the two which exist in connexion with the systemic circulation.

6. State the names, in regular order, which are given to different sections of the intestinal canal, commencing at the stomach, and say from which of them the nutritive portions of the food are chiefly absorbed.

7. Suppose portions of the Rumen, Reticulum, Omasum and Abomasum of an ox were cut from each viscus, how would you recognise each?

8. Name the several divisions of the vertebral column, and give the relative number existing in the horse and ox.

9. State the number of the so-called true ribs of the horse and ox, and describe the difference which exists in their connexion with the Sternum.

10. Name the animal of the farm whose kidneys are lobulated, and explain the cause why the urine on being expelled from the bladder does not pass backwards into the tubes by which it entered.

11. Name the period of pregnancy, either in weeks or days, in the mare, cow, ewe, and sow, and describe the position of the fœtus in natural labour, and the average time occupied in parturition by each animal.

12. By what means is the birth of a fœtus effected, and in what respect do the so-called throes differ from ordinary muscular contractions?

EXAMINATION IN AGRICULTURAL ENTOMOLOGY.

MAXIMUM NUMBER OF MARKS, 100. PASS NUMBER, 50.

Friday, May 11th, from 4 p.m. till 5 p.m.

Candidates will not be required to answer more than FIVE of the questions on this paper. The replies are to be as short as possible, and where the candidate is not acquainted with the scientific name of an insect, the generally received English name will be accepted.

1. Name the parts of which an insect's body is composed, and describe its method of breathing.

2. Describe the appearance of a Sawfly and of its larva, and give an example of sawfly infestation.

3. What are the signs of the presence of "Gout-fly" (*Chlorops tæniopus*) in barley, and what precautions are calculated to prevent the recurrence of the pest?

4. Describe the larva of the "Crane-fly," or "Daddy-long-legs" (*Tipula oleracea*), mentioning the nature of its injury and the remedies applicable to it.

5. Give an account of any weevils which affect clover, and suggest methods of treatment.

6. Write what you know of the Bot-fly which infests sheep (*Œstrus ovis*).

7. What are "Surface caterpillars" or "Cut-worms"? Mention the principal crops attacked, the nature of the injury, and the treatment you would adopt.

8. Give an account of the life-history of the Cockchafer (*Melolontha vulgaris*).

Notes, Communications, and Reviews.

SEWAGE DISPOSAL AND RIVERS POLLUTION.

A PAPER read before the Surveyors' Institution by Mr. R. F. Grantham[1] conveniently summarises for us the present position of the chronic question of sewage disposal. Taken with the discussion elicited at an adjourned meeting, it enables us to glance at what has been and is being done, in those places where the need has become most pressing, towards a tolerable, if not a final, solution of a great difficulty. During the few years that have elapsed since the last epidemic of papers and discussions on the subject little knowledge of real or startling novelty has been acquired and no revolutionary modes of treatment have been introduced. There has nevertheless been a certain steady working out in practice of rival theories and recommendations, rendering possible a better adaptation of means to ends and a more correct prevision of success or failure in any given case than we formerly possessed. By a rough process of trial and error, repeated here and there as necessity compelled, certain data have been accumulated which may be utilised by the less wooden of the sanitary and municipal boards in their endeavours to extricate themselves from the dilemma in which they are often placed between the mandates of the Local Government Board on the one hand, and the advice of scientific experts on the other.

There is something to be proud of, and something to inspire a less pleasurable feeling, in reviewing our national contribution to the perfecting of sanitation. Cleanliness and decency are valued, certainly, not less in Great Britain than in other countries, and we can look with more equanimity on the probable result of a cholera invasion than perhaps any other European nation. In spite of the sometimes amazing local opposition,[2] and the difficulties that often

---

[1] *Recent Experience in Sewage Filtration considered in relation to River Pollution*. Trans. Surv. Inst., Vol. XXV., Parts 12, 13, 1893.

[2] "In the smaller towns and villages," Mr Grantham tells us, "the proposal for any scheme of sewerage, and sometimes of waterworks, is too frequently and successfully met with the strongest objections by the inhabitants. It is not long ago (in a town I had to do with where the death rate was high, where in former years cholera had raged, and where the people visibly suffered in health from the pollution at their doors) that at the Government inquiry into

beset the application of pressure from headquarters, all but the smallest towns and villages have made some struggle to achieve a pure water supply and to dispose of their filth innocuously. In respect of the amount of money expended in these efforts, too, we probably need not fear comparison with our rivals, but if we ask ourselves how much of this money has been wisely expended, and how much direct useful knowledge we have obtained by the expenditure, we have little reason for self-gratulation. Expensive evidence has been taken again and again before Royal Commissions, and expensive battles have been fought between chemists and engineers, lawyers *pro* and *con.*, local boards and aggrieved individuals, municipalities and the central government and the conservancy boards. How much has been expended either by the Local Government Board or by Municipalities and Local Boards in direct, unbiassed, scientific experiment? To take a concrete example, the Metropolitan Board of Works has spent, and was spending down to the time of its dissolution, vast sums in connexion with the question. Can we trace any scrap of scientific knowledge of sewage treatment to its initiative? True, that its doings are often quoted in discussions like the one we are reviewing, but only to spice the narrative with a nuisance big enough to strike the imagination by its millions of tons, or a bill for disinfectants running into many hundreds of thousands of pounds; certainly not as an example to be followed, or as a source of accurate, well-ascertained, and exhaustive information. Yet it is not too much to say that the metropolitan authorities might, by systematic experiments *ad hoc*, carried on by competent persons under their own control (not by chartering scientific *advice* at haphazard), have long ago completely solved the problem of sewage *purification* and be at the present moment discharging a clear and sweet effluent into the Thames. Even failing this they might have abandoned the attempt and addressed themselves with success to the alternative of excluding the sewage from the river altogether and removing it to a distance for disposal.

We cannot wonder, then, that the author has to go far afield for examples of carefully conducted experiments throwing new light on the question, or that the most instructive citations are the experiments of the Massachusetts State Board of Health on sewage filtration, and the successful working of the Berlin sewage farms. A detailed account of these farms was given by Mr. Roechling in a paper read in 1892 before the Institution of Civil Engineers. One of the speakers, after remarking that London,[1] with its five millions

---

a proposed scheme of sewerage, the strongest opposition was offered by a large majority of the townspeople, headed by the vicar and supported by the principal doctor. The scheme, however, has been carried out, and the opening of the old house-drains and cesspools revealed a frightful state of things. Long lengths of pipes choked full of deposit, and cesspools within three or four feet of the back doors, brimful of the foulest sewage, nearly level with the surface of the ground, abounded all through the town."

[1] Of course this applies only to the Metropolitan District. Some of the suburban boards (notably Wimbledon) have led the van of intelligent land treatment.

of people, had not a single acre experimented upon for sewage purification, was corrected by the statement that Mr. Crimp (late of Wimbledon) has now under the London County Council just laid out *one acre* for the purpose; we are also told that experiments on the filtering process of different materials are now being carried out for the London County Council. These are, at any rate, signs of awakening, and with a few lines stating the present position of the Metropolitan area we may pass on to review what is being done elsewhere.

A partially successful though costly remedy for the filthy condition of the Thames, which had literally become intolerable, has been found by a rough clarification of the sewage at the outfalls at Barking and Crossness by chemical precipitation. To each gallon is added about 4 grains of lime and 1 grain of sulphate of iron, which produce a rapid settlement of the grosser suspended matters in the form of slime or sludge. From 2 to 2½ million tons of this sludge are scraped off the settling tanks, pumped into barges, and sent out to sea annually, and to that extent the effluent discharged into the river is of course purified. The quantity of chemicals used is the *minimum* that will produce anything like clarification when the sewage happens to be of the quality experimented on by those who prescribed the dose. Less would not clarify, more would mean more cost and more sludge. But, alas! sewage is not always of this ideal quality, and so it is to be feared the clarification is often very incomplete. To render the effluent more presentable it is therefore dosed with a little of what is practically Condy's Disinfecting Fluid (manganate of soda and sulphuric acid are the materials actually used) before discharge into the river; this, too, is a very costly business, and the success again very partial, a small fraction only of the putrefiable matter being destroyed by the disinfectant, and the disinfection, therefore, merely temporary. The net result is that there is some improvement in the condition of the river at the outfalls, though the mass of impure effluent discharged into it still pollutes to a very undesirable extent, especially during such a season as the summer of last year. A significant remark was made by Mr. Cooper—"that the effluent of the London sewage into the river Thames should be much more largely diluted, he thought, was quite impossible. The water supply was, he thought, something like one-third of the amount of water coming down the river in dry seasons." Unless, therefore, the metropolitan authorities can deal successfully with their enormous effluent from the sludge tanks by filtration through soil, sand, or prepared purifying material, there is much justification for those who hold that ultimately the sewage of London will have to be removed bodily to the Mapplin Sands or some more suitable distant spot.

Towards the possibility of purifying by filtration the partially clarified effluent on the scale required for the enormous output of London little attention has hitherto been directed, and until recently no experiments worthy of the name seem to have been made.

For the Metropolitan Board of Works had fallen into the hands of the advocates of purification by chemical precipitation, and between these and the advocates of some form of irrigation or filtration through land—broadly speaking, between the chemists whose services might be required to advise on chemical treatment, and the engineers who find their account in laying out sewage farms and filtration areas—has long raged a bitter though highly unreasonable warfare—profitable, no doubt, to the combatants, but certainly hampering to the progress of sanitation. The unreason is now beginning to be felt on both sides, for the process of trial and error above alluded to has shown that the rival recommendations are not so much antagonistic as supplementary. On both sides similar extravagant expectations have been held out, which time has shown to be illusory. The advocates of irrigation claimed that the application of excretory matter to land was the natural and only perfect method of rendering it harmless, and therefore the only way of preventing the pollution of our rivers ; that the throwing away into the sea of the fertilising ingredients of millions of acres was a shameful waste ; and that by the restoration of these to the land a profit could, and ought to be, obtained. Even on this question of waste there is a *pro* and *con*. For experts interested in the sale of artificial manures were not long in discovering that, although too much sewage in our rivers may kill fish, the fish at sea have claims on our bounty, and that sludge or sewage carried out to sea is literally bread cast on the waters, returning to us after many days !

The position taken by the chemists was that irrigation could never be made to pay ; that in addition it was often a nuisance or a failure ; and that by chemical precipitation alone an effluent could be procured sufficiently pure for discharge into any river, whilst the hope was held out that by the sale of the precipitated sludge sufficient of the manurial value of the sewage might be recovered to render chemical treatment the least costly method of dealing with sewage.

Experience, now considerable, of both methods has left neither position intact, whilst allowing some truth to each. Filtration of sewage through soil, when that operation can be secured, has, indeed, held its ground as the most perfect means of purification. No precipitant, or combination of chemical nostrums, has been successful in securing as sweet and pure an effluent as that which has really passed through the pores of the soil. And there are many instances, especially in the case of small towns in agricultural districts, where simple broad irrigation,[1] intelligently managed, has proved both adequate and economical. Where a large acreage of suitable land, otherwise worthless, can be secured, it has even proved a financial success on a large scale. As a case we may quote Dantzig, with a daily sewage flow of over $3\frac{1}{4}$ million gallons per 24 hours, disposed of on "dune sand" :—

[1] Better with a preliminary screening through a layer of very coarse material.

The sewage from Dantzig has been utilised by irrigation on what was originally useless sandy land on the coast, the subsoil water rising to within 5 feet of the surface. The sewage liquid, when applied to the land, forces out any air from it in bubbles, and then sinks rapidly into the subsoil, leaving on the surface and in the pores of the soil both the suspended and a portion of the dissolved matters. The land, originally let at 4½*d.* per acre, was subsequently leased to a contractor for 30 years at a rental of 1*l.* 11*s.* 6*d.* per acre. The whole affair, I am informed, has technically, financially, and otherwise proved a complete success. The depth of *humus* or vegetable soil has been increased, by the continued irrigation. The quantity of sewage applied is equal to about 5,500 gallons per acre per day. Analyses of the effluent water showed that it came within the standard requirement laid down by the Rivers Pollution Commissioners.[1]

The checks to the universal spread of broad irrigation have, however, been serious, though of simple character. In some places there is no land suitable for sewage filtration, in others the sewage is not suitable to be placed upon the land. Some land, actually used for sewage farms, will take only 2,000 gallons per acre per day,[2] and does not deal effectually with this, whilst some few lands will purify easily 5,500 gallons as at Dantzig, and in England the gravelly soil of the Rugby Sewage Farm is made to take over 6,000 gallons, and the free soil of Croydon over 11,500 gallons. By the combination of intermittent filtration with irrigation, that is by laying out a portion of the land as filtration areas, the quantity of sewage that can be dealt with is still more extended, and this is the plan now generally adopted in the most successful sewage farms. In this way at Kendal the farm takes an average of 37,500 gallons per acre daily, and at Forfar (17 acres irrigation, 7 intermittent filtration) an average of 20,000 to 25,000 gallons per acre. When the filtration areas are used alone, as is often the case for weeks together, they will take 70,000 gallons to the acre. The provision of filtration areas as adjuncts to land intended for irrigation is a positive advantage, too, from the farming point of view; for one of the main difficulties in sewage farming is the necessity of dealing with the regular daily and nightly flow, whether the land and the crops require it or not. Intermittence is one of the conditions of success in the day-by-day application of sewage to land, whilst it is obvious that land for cropping can deal with much larger quantities in the spring and summer than in the winter, and that there are periods—for example, when the land is frost-bound—when it is desirable to keep the sewage off altogether, since the only result of applying it would be for it to run off the surface unpurified.

On the filtration areas frost is seldom an impediment to treatment, the large quantity of (comparatively) warm sewage with which they are constantly flooded effectually preventing the ground from becoming frost-bound. At Leeds "about two years ago an attempt was made by flooding one of the areas to make a skating-

[1] *Min. Proceed. Inst. C.E.*, Vol. XLIV.

[2] This is equivalent to about seventy persons per acre.

rink of it; the next morning, although a hard frost had prevailed meantime, the sewage had all disappeared into the land." The objection to filtration areas that they must necessarily be unremunerative, since they are dosed with far too much sewage to allow of growing profitable crops, has become less serious since the idea of making a profit out of the application of sewage to land is in many places an impossible one and is now everywhere recognised as secondary to that of securing efficient purification. Moreover, as we see, the small acreage devoted to filtration on a properly planned sewage farm is an actual advantage to the farming. It is true that near most towns it is impossible to get sufficient land at an ordinary agricultural price to permit of the *profitable* application of sewage, but for all that there are situations and circumstances where sewage *utilisation* is not the dream of a bygone generation, as it is now the fashion generally to term it. The instance of Dantzig, already given, when sufficient waste land at a waste price was obtainable, is a case in point; but a more instructive one is that of the Berlin sewage farms as described by Mr. Roechling (*loc. cit.*). Here we have the sewage of a metropolitan population, not too favourably situated for the purpose, treated with success from a sanitary and *even from a financial* point of view, by the intelligent and thoroughly organised distribution over a sufficient acreage of land, comprised in several farms, under a combined system of irrigation and intermittent filtration. The following abstract description of these farms given by Mr. Roechling in the course of the discussion may be quoted *in extenso* :—

The city of Berlin had now a population of $1\frac{3}{4}$ million, and was situated in the sandy plains of North Germany, on either side of the Spree. The flow of the river was sluggish and it was held up by one or two locks. The Spree did not carry more water, in periods of great drought, than about 450 cubic feet per second. It was at first intended to collect the sewage of Berlin at one pumping-station, and to treat it there chemically; but this plan had been given up, and the sewage of Berlin was now pumped from twelve different pumping-stations within the boundaries of the town on to farms north and south of Berlin, from 6 to 12 miles distant from the heart of the city. The total area of the farms stood, on March 31, 1890, at 18,790 acres, of which 11,016 were under sewage treatment, the rest being farmed agriculturally until it was required for the sewage of the town. The total daily flow of sewage amounted now to over 30 million gallons.

The subsoil of the farms was chiefly sand, with a preponderance of loamy sand and sandy loam in places, especially on the northern farms. The effluent from the farms went into small ditches, which emptied into small streams, not bigger in places than from 10 to 12 feet across. The effluent from the northern farm came back to Berlin, whereas the effluents from the southern farms discharged into the Havel at Potsdam, several miles below Berlin. When the nature of the streams that took the effluent was considered, viz., their sluggish flow, their small area in cross section (almost too small in places to carry both the sewage and the ordinary discharge), and their much-obstructed and very tortuous course, it would be admitted that the Berlin sewage farms were placed at a great disadvantage in this respect, and that there was every chance that an effluent not perfectly purified would set up secondary decomposition.

The farms were situated in the midst of the surrounding populous villages, and the money spent upon them amounted, on March 31, 1890, to 1,173,648*l*. At first a good many complaints were raised by the adjoining owners against the sewage farms, and several Royal Commissions were appointed to inquire into their condition. As a result of these inquiries the Town Council of Berlin adopted very stringent regulations for the management of the farms, and for the sewaging of each field in particular. Gradually the complaints about the farms ceased, and now adjoining owners were anxious to sewage their own land or to hire portions of the sewaged land from the Corporation. The Berlin authorities rightly laid great stress upon a most careful systematic sewaging of the land, as, without it, the results from the farms, both commercially and from a sanitary point of view, must be mere matters of chance. They had now quite an army of thoroughly trained sewage men, which enabled them to cope most successfully with sewage irrigation upon a scale that was at present without a parallel.

As to the financial results obtained from the farms, he might say that the profit of management, expressed as the rate of interest on capital outlay, amounted to a little more than $2\frac{3}{4}$ per cent. in the year ending March 31, 1891, and this, it would be admitted, was a very fair interest in these days.

Concerning the degree of purification attained on the farms, he might point out that, though they had absorbed over 350 millions of tons of sewage since they were first laid out, they had turned out a most excellent effluent, in which only from about 5 to 10 per cent. of the dissolved organic pollution present in the raw sewage remained. These results had not been obtained from a few isolated analyses made now and then, but from about three hundred analyses regularly carried out during the last ten years or more. He knew of no chemical treatment that was able to show such good results for so long a period.

A good deal had been said against sewage farms on account of the unhealthy conditions of life they were apt to produce, but that such was not the case on the Berlin farms was evident from a careful perusal of the mortality figures observed on them. He would only mention that, though a severe epidemic of typhoid fever was raging in the eastern and northern portions of the city at the commencement of 1888, yet no case of this fever was reported from the farms throughout the year. The authorities had now established four convalescent homes, with 286 beds in all, on the farms, which were supplied with water from wells sunk on the spot, and were doing excellent work.

Much of the success obtained at Berlin is confessedly due to skilled management and thorough organisation of the labourers employed, the farms being cut up into small areas to which the sewage is applied in the most carefully planned and systematic manner. But it is evident that what has been done there can be done elsewhere, if only the like conditions are observed.

Coming to those cases where sewage in its crude state is unsuitable for application to land, it is here that previous chemical treatment becomes a valuable auxiliary. The sewage of some towns, *e.g.* Wolverhampton, contains iron and sometimes compounds absolutely injurious to vegetation. In other towns, especially where the sewage is concentrated, it forms a slimy impervious deposit on the soil, similar to *papier-mâché*, which soon prevents filtration altogether. True that this can sometimes be overcome by periodically allowing the deposit to dry, and breaking up the surface with tillage implements; but it is evident that much of the filtering power of the land must be lost on every occasion before matters arrive at this pass. Previous clarification of the sewage by addition of a few grains of lime per gallon before running it into settling-tanks removes injurious iron compounds if present, and produces a rapid settlement of slimy suspended matter, giving in both cases an effluent eminently adapted for application to land. On the other hand, it introduces the new question of *sludge disposal*, which, however, is not the bugbear it used to be, the difficulty being now overcome in several ways, and with greatest ease where there is land attached to the sewage works. In London, where there is no land, and the quantity of sludge produced is so enormous, they as yet see no alternative for treating the bulk to carrying out to sea in a fleet of steam barges. At Wimbledon, Wolverhampton, and very many other places, the sludge is filter-pressed into semi-dry cakes, which are sold at a nominal figure or given away to farmers who will cart them away as manure. At Birmingham it is pumped up into wooden conduits and conveyed to a porous section of the sewage farm, where the liquid portion speedily drains away, leaving the sludge in a condition to be dug into the ground. At each of these three towns, and many others, the clarified effluent from the liming tanks is employed to irrigate an adequate area of land, with satisfactory results as regards purification, and this has always seemed to the writer the correct way to employ effluents from precipitation processes. It must be remembered that little of the manurial value of the sewage is removed in the sludge, and that the application of the effluent to the growth of crops, considered in itself and apart from the rest of the treatment, is a paying process.

Of course the claim has been, and is still, made by the anti-irrigation enthusiasts that chemical precipitation is of itself a sufficient purification, avoiding the necessity for land altogether, and producing an effluent fit for discharge into any stream. In practice this is seldom realised. The use of lime alone produces an unsatisfactory effluent, and to obtain a decent one it is in most cases necessary to supplement the lime with a little sulphate of iron, sulphate of alumina, or other chemical or patent nostrum. By such means a fair effluent may be obtained with trial quantities of sewage experimented on in the laboratory, but it is difficult to produce a good effluent day after day at the sewage works when the changing quality of the sewage is not watched over by a skilled chemist ready to proportion the precipitants to the actual charge to be dealt with. This at any rate may be said, that whatever the quality of effluent produced by chemical precipitation, it is *infinitely* inferior in point of purity to the effluent from simple lime precipitation *after* the latter has been filtered through soil or similar purifying material; whilst there can be no doubt that by a combination of precipitation with soil filtration a perfectly satisfactory effluent *can always* be obtained. There are, indeed, two cases where chemical precipitation by itself may still be the best procedure. As a stopgap, or a means of partial purification *faute* *de mieux*, when land or filter beds are not available, as is the present case with London, it is no doubt defensible; and in the very different case where the river itself into which the effluent is discharged is already used for irrigating watermeadows on its banks, it may be the best course to adopt. But there is now a pretty general agreement, even amongst the advocates of chemical treatment, that its proper function is as an adjunct to irrigation or filtration.

Dr. Dupré himself, who, in conjunction with Mr. Dibdin, prescribed the proportions of chemicals used to precipitate the London sewage, admits in this discussion that "no such chemical treatment would do more than clarify the sewage by removing the suspended matter, but would leave the matters in solution almost unaffected," and that by the system followed in London "the effluent produced was not such as could with safety be discharged into a relatively small river."

This being so, it is interesting to glance at the prospect of advance in the direction of exalting the purifying power of soil or other filtering material.

"Actual practice shows that quantities varying from 2,000 to 6,000 gallons per acre per day have generally been applied to sewage irrigation farms, and from 10,000 gallons to 60,000 gallons to farms laid out for irrigation combined with intermittent filtration where crops are cultivated." The well-known laboratory experiments of Dr. Frankland, which led to the practice of intermittent downward filtration, showed that volumes of 43,000, 74,000, and 96,000 gallons per acre per day could be filtered through filters packed with six feet of porous *surface* soil, with complete purification. Although this estimate of Dr. Frankland's led to much disappointment when it was first attempted to put intermittent filtration into practice, from the fact that the conditions obtainable were not such as existed in his experimental filters, it appears from the statement of Mr. Bailey Denton that when the soil is exceptionally favourable, as at Abingdon and Forfar, a near approach to these maximum figures has actually been obtained. At Abingdon, for example, the soil of which he regards as ideally favourable, it appears that although they have 27½ acres for irrigation and 6 for intermittent filtration, 3 only of the latter are sufficient to purify the whole sewage of the town (6,500 people), which gives an ordinary dry-weather flow of 67,000 gallons to the acre.

The experimental filters constructed by the Massachusetts Board of Health[1] are in some cases of nearly double this efficiency, and throw more light on the requisite conditions. These filters were 17 feet in diameter and 6 feet deep. The best result was obtained with 5 feet of coarse clean sand, which filtered at the rate of 102,000 gallons per acre per day; extremely fine sand filtered only 34,000 gallons, and garden soil only 8,600. The necessity of air spaces is thus clearly indicated, and is forcibly pointed out by the result

[1] Massachusetts State Board of Health, 19th and 22nd Annual Reports.

obtained when the filtering material was 5 feet of gravel and stones *as large as beans*. "For nine months sewage pumped directly from the city sewer was applied nine times a day for six days in the week, in quantity equivalent to 81,400 gallons per acre per day. Here we find that 98·6 per cent. of the organic matter is removed by being burned and converted into nitrates, and more than 99 per cent. of the bacteria that were in the sewage were killed." Even the rate of 126,000 gallons per acre per day was successfully maintained for three months, and the stones remained as clean as they were a year before. Only after two years' working did the effluent become foul, when it was found that the air in the interstices had become impure from the amount of organic matter which had been retained. A layer of sand on the surface would perhaps have prevented this. The upper surface only of the sand filters became clogged after four years' working.

Now sewage is a difficult material to filter, and some descriptions will not filter at all. That such results as are recorded above have been obtained with crude or slightly strained sewage is therefore very encouraging. When it comes to filtering an *effluent* from a precipitation tank, of course vastly greater rates of filtration can be secured. We are told, for example, that a daily flow of 2½ million gallons of sewage is treated at Mortlake by precipitation, and the effluent filtered through 1½ acre only of filter beds composed of layers of gravel, sand, and carbon, the surface being covered with a thin layer of earth sown with grass (=1·6 million gallons per acre per day). This is about the ordinary rate of filtration of the London Water Companies' filter beds. The rate claimed for some patent filtering materials is even twice as great as this, when used upon an effluent resulting from the use of a patent precipitant.

The amount of *purification* by destruction of dissolved organic matter effected by filtration through porous materials was measured in the case of the Massachusetts experiments by the quantity of organic nitrogen that had disappeared by conversion into nitrate. Now, although this process of nitrification may not be an exact measure of the whole process of purification, it is doubtless a very important part of it. We know about it that it is effected by the agency of living organisms, that these are found in *surface* soil only, or, as in the case of the Massachusetts filters, they doubtless attach themselves to the surfaces of all the filtering particles which have *free access to air* during the intervals of filtration. Hence the supreme importance of porosity, and even coarseness, in the filter, and of *intermittence* in filtration. This seems to us to have a direct bearing on a remark of Dr. Dupré, who considers that turning a sewage effluent into a river is something like filtering it through land, or, to quote more exactly :—

Here he might point out a very common mistake made by advocates of sewage-farming, namely, the comparison of the effluent from the farm with the effluent from the chemical precipitation works. The river into which the latter effluent was discharged must, in a measure, be looked upon as taking the place of the sewage farm, and he maintained that if the river was suitable it did its work as effectively and with far less nuisance than the ordinary sewage farm. The whole surface of the river Thames, from Barking to the Nore, was about equal to the smallest sewage farm proposed for London.

Granting that rivers do purify sewage, as indeed must be the case on even a superficial view of the question, it is still, to our mind, a grave mistake to compare the purifying *power* of a river area with that of an equal area of land, as is here done. If the nitrifying power is to be taken as a criterion, the writer can say from his own experiments that the difference between the nitrifying power of surface soil and that of river water is so great that it is hard to compare them at all; and the reason is obvious, the nitrifying organisms being immensely more abundant on the soil particles, all freely aerated, than in the body of the water, aerated to an extremely limited extent. Beside this the nitrifying organisms at any rate form a layer which has a great habit of *sticking fast to surfaces.*

We have dealt with sewage treatment at such a length that we have little space left to touch upon the kindred question of rivers pollution except in so far as it is implied in what has been already said. With the advances above described in securing clean effluents, and the prospect of further advances as efficient filtration is put into practice, there is not the difficulty there formerly was in setting up a standard of purity which may stand some chance of becoming an actuality when rivers are merely subject to ordinary polluting agencies. Rivers so unfortunately situated as the Irwell ought of course to be judged by a different standard. The standards recommended some years ago by the Rivers Pollution Commissioners have been a dead letter, because absurdly stringent and absurdly inelastic. What seems to be a suggestion in the right direction arising from the discussion under review is that suitable standards should be established for *each river* by local bodies empowered to do so. Mr. Grantham suggests that committees of the County Councils should conduct experiments to establish such standards for streams within their boundaries, and should systematically examine all effluents. Mr. Willis Bund replies to this that two or more County Councils concerned with one river might set up different standards, and moreover the Councils themselves are in some cases responsible for pollution. He thinks that a Conservancy Board for each river basin is necessary, though these might possibly be constituted by joint committees of the County Councils concerned.

J. M. H. Munro.

Riverside, Churchfields, Salisbury.

THE TEWFIKIEH COLLEGE OF AGRICULTURE, EGYPT.

It may be of interest to record what has been lately done by England to promote the agricultural prosperity of Egypt, and to spread the knowledge of practical and scientific agriculture in a country which is at present under the tutelage and protection of England.

The Tewfikieh College of Agriculture at Ghizeh, near Cairo, was founded in 1890 by a Government grant of 4,000*l.*, and Mr. Williamson Wallace was appointed Director. Attached to it is a farm of 300 acres which formed part of the grounds and dependencies of one of the palaces of the late Khedive, Ismail Pasha, the principal building being at present utilised as an archæological museum. The accommodation provided is well adapted for the purpose, and consists of a quadrangular arrangement of lecture rooms, laboratory, and lodgings for the sixty-six students.

The students are taken from the sons of native proprietors, small and large. The land is much subdivided, and there are, as a matter of fact, very few large proprietors, except the Government, who hold the "Daira" lands under public administration.

The course of instruction extends over four years, of which the first is mainly devoted to the learning of English. The progress of the students in English has been satisfactory, and has been facilitated by the fact that many of the students have already learnt French. After a year the lectures, which have at first to be translated from English into Arabic, are understood, either wholly or the greater part of them, by the students.

Subjects embraced in the Four Years' Course of the Tewfikieh College of Agriculture.

1. Agriculture.
2. General Chemistry.
3. Practical Chemistry.
4. Agricultural Chemistry.
5. Botany.
6. Geology.
7. Veterinary Hygiene.
8. Gardening.
9. Entomology.
10. Land Surveying.
11. Practical Gardening.
12. Practical Agriculture and the Arabic and English languages.

The course detailed in the foregoing table extends over four sessional years, and is so framed that the scientific instruction is virtually completed before any considerable amount of practical or manual work is undertaken. Daily visits, however, are paid to the farm by the students, so that they know thoroughly what are the operations which later on they will have to perform for themselves.

The College now receives a grant of about 5,000*l.* annually from the Government, and the students pay a fee of 25*l.* a year for their board and clothing. The College has only received about 1,000*l.* to start the farm, but has made and saved about 1,000*l.* a year, the profits of careful farming.

The sessional year begins in October and ends in June, when the inundations commence.

Rotation of Crops.—A great revolution in the agriculture of Egypt was made by Mehemet Ali (1805–1849), when the production of the land was increased, and the character of the crops was changed by keeping the Nile within its banks, and substituting irrigation for the flooding of the Nile, which was previously the normal state, and under which conditions only winter crops could be secured after the inundations had receded.

The Principal of the College, Mr. Williamson Wallace, to whom I am indebted for the information relating to the farm, has given me the following memorandum about the rotation of crops :—

"The rotation of crops in Egypt is a three-course rotation, and is as follows :—*First Year.* Cotton sown in March and gathered in October and November. Clover and beans, sown in October and November, cut four times during winter and finished in May, followed in the *second year* by a catch crop of maize, sown in July and reaped after ninety or one hundred days (generally no catch crop is taken on large estates, but the land is left fallow in preparation for the following wheat crop). *Third Year.* Barley or wheat, sown in November and reaped in the beginning of May, followed by a catch crop of maize sown in July. When maize is not taken as a catch crop in this year clover is sown in November, and the clover root taken up after one cutting when preparing the land in February for the following cotton crop. This is the rotation of the Delta where the land is not inundated by the Nile. In Upper Egypt, that is south of Cairo, the greater part of the country is subject to the Nile flood, the water being drained off in November, and wheat, beans, clover, or barley sown immediately. Here only one crop is got in the season, and a two-course rotation more or less irregularly followed, namely, beans or clover one year, followed by barley or wheat the next year. Sugar cane is grown in Upper Egypt upon lands which are not inundated, and takes the place of cotton in the rotation, standing two years in the land and being preceded by fallow and followed by clover. Lucerne has been cultivated in Egypt and Arabia as far back as there is any information on the subject ; a patch of it is useful where cows are kept, but it is unprofitable as a permanent crop on a large scale."

The Director was the first to introduce good fresh butter on the Cairo market, for which there is a ready sale at about 2*s.* a pound among the European population. Dairy schools are now being organised in the country districts.

The stock on the farm consisted, at the time of my visit in February, 1894, of the native cows, which have a strong resemblance to the Channel Islands cattle, and seem to have been at some remote period crossed with them, although they are at present rather larger than the Jersey breed. The Director has, I think wisely, secured a good Guernsey bull, which will improve the milking properties of the native cattle. There are also the buffaloes, which give rich milk but not in large quantity. All the ploughing is done by bullocks. There seems an opening for the introduction of Shorthorn bulls who would thrive in the climate and improve the beef-producing qualities of the cows.

There were on the farm some native sheep, a long-legged breed with perhaps some cross of the Merino. They are now using a

Shropshire ram with the native ewes, which were running on the clover-root, and had some fine lambs in January.

The water used on the farm for irrigation is pumped up by an engine from the Nile, and the fuel consists of the dried maize stalks. The clover is generally cut four times in the cold season after being irrigated in succession.

Seed and Manurial Experiments.—The principal English grasses and clovers have been introduced, together with turnips, mangel wurzel, several varieties of Italian wheat, Californian, Smyrnian, and Algerian barleys, Bedford onions, and English varieties of potatoes, the last named being subsequently shipped as 'new' to the London market early in the spring, and sold at remunerative prices. Eight varieties of Egyptian cotton were grown, and the results carefully investigated. A new variety has lately been introduced which promises to increase the production of cotton both in quantity and purity of colour. Native wheats were top-dressed with poudrette and artificial manures, whilst nitrogenous, phosphatic, and potassic manures were applied to the cotton crop.

These experiments have not been costly, being carried out on small plots; sulphate of ammonia has been tried on the corn crops without any corresponding improvement. There seems to be sufficient nitrogen and lime for the wheat crops in the Nile mud, which constitutes the soil of the farm.

With regard to the labour on the farm, the work is done by labourers, whose families have allotments and small patches where they grow garden produce mainly. The workmen are thus kept close at hand. Some land is let at about 6*l.* or 7*l.* per acre. This is above the general average, which is from 3*l.* to 5*l.* per acre in the country districts away from Cairo.

The grounds around the College also comprise the old gardens of the palace of Ghizeh, with fine orange and lemon trees. The produce of these sells at as much as 25*l.* an acre, to be gathered by the natives, who co-operate together and purchase the crops, which they watch till they are ripe for sale, otherwise they would be robbed. The same is done with the sugar canes and the other crops, which are worth up to 20*l.* an acre gross. The cost of cultivating, taxes, and water-rent is high, up to 2*l.* 10*s.* an acre for the two latter items.

Implements and Machinery.—The plough used is an English one, double, so that the workmen can plough either way without turning, as it is important for irrigation that the furrows should be even and level. Another native plough with long wooden share follows and works the ground after the first one, to a depth of about fifteen or seventeen inches.

European ploughs, harrows, rollers, scythes, and smaller farm implements have been imported, and are in use upon the farm. The grain crop was threshed by an improved machine ; the first reaper-and-binder worked in Egypt cut the grain crop in 1891. A grass mower was for the first time used to cut the clover crop. Silage was successfully made, and the most improved utensils and accessories for butter-making have been introduced. An oil engine and flour mills are worked for exhibition and profit.

The College has received from the leading English implement makers, as presents, the following :—A reaper-and-binder, a reaping machine, a grass mower and other machinery, seeds from a leading seedsman, and manures for experiments. This shows an appreciation of the importance to English trade of the experiments now carried on at the farm.

The forced labour, or *corvée*, of the Egyptian Fellahin has been abolished, and the country is now prosperous. Sugar factories with European machinery, generally French, have been established, at which a large number of labourers are employed, and it is said that for the first time the peasants have money in hand to pay their taxes without mortgaging their standing crops. There is therefore an opening for the introduction of English machinery into the country, which will be facilitated when the students at the Agricultural College return to their own homes and spread the knowledge of an improved system of agriculture among their neighbours.

EGERTON OF TATTON.

Tatton Park, Knutsford, Cheshire.

AWARDS UNDER THE AGRICULTURAL HOLDINGS ACT.

In these days, when so much discussion is taking place about the operation of the Agricultural Holdings Act, and when suggestions are being made for its amendment in many different quarters, it seems desirable to call attention to the case of Farquharson *v.* Morgan,[1] which tends to show that an amendment of the Act is desirable in the direction of allowing moneys awarded to an outgoing tenant for tillages and such-like matters under lease, agreement, or custom of the country, and moneys awarded for compensation under the Act, to be the subject of one valuation and award, and to be recoverable in one lump sum from the County Court, which is not the case as the law now stands.

The facts in the case were, so far as material, as follows :—

By a lease dated November 29, 1888, Farquharson let a farm to Morgan from year to year. The lease provided that, on the determination of the tenancy, the tenant should be entitled to allowances and compensation in respect of various matters which are not the subject of compensation under the Agricultural Holdings Act, to be ascertained upon the basis provided by that Act ; and it was agreed by the lease that the clauses of the Act relating

---

[1] Reported in the first volume of the Law Reports for 1894, Queen's Bench Division, p. 552.

to procedure, and contained in Sections 7 to 28 (both inclusive) of it, should apply as well to any claim for allowance or compensation to be made under the lease as to any claim under the Act.

The tenancy was determined on March 25, 1891. The tenant gave the landlord due notice of his intention to claim compensation for matters which were the subject of compensation under the lease, but the notice did not include any matters the subject of compensation under the Act. The landlord gave the tenant a counter notice of claim under the Act. The parties appointed referees in the ordinary course, and the referees an umpire. The referees being unable to agree, the umpire made an award, by which he awarded a lump sum of 92*l.* 12*s.* 9*d.* to be paid by the landlord to the tenant, as the balance due to the latter after allowing the amount due to the former.

In due time afterwards, the tenant applied to the County Court to enforce payment of the award under Section 24 of the Act, which enacts that, "when any money agreed or awarded for compensation is not paid within 14 days after the time when it is agreed or awarded to be paid, it shall be recoverable upon order made by the judge of the County Court, as money ordered by a County Court under its ordinary jurisdiction to be paid is recoverable." Upon such application, the landlord took objection to the form of the award, because it awarded a lump sum generally for compensation, and did not specify particulars as required by Section 19 of the Act. He did not upon that occasion take any objection to the jurisdiction of the County Court. By consent of both parties, the award was remitted to the umpire in order that he might amend it in conformity with Section 19. This the umpire did, and, as amended, the award showed that it included compensation to the tenant for matters which were the subject of compensation under the lease, but not under the Act. The landlord appealed against the amended award on the ground, amongst several others, that compensation had been awarded for certain improvements, acts, and things in respect of which the tenant was not entitled to compensation under the Act; the County Court judge, however, dismissed the appeal because the landlord's notice of appeal against the award was not given within the time (7 days after the delivery of the award) prescribed by the Act, but he stated a special case for the judgment of the High Court of Justice. Upon that case coming on for hearing, it was ordered, by consent of the parties, that the matter of the appeal should be remitted to the County Court judge to be re-heard upon its merits. So the case went back to the County Court judge, who affirmed the award, and made an order for the payment of the amount awarded.

Thereupon the landlord applied to the Queen's Bench Division of the High Court for a writ to prohibit the County Court from proceeding upon the order that it had made, on the ground that Section 24 of the Act did not give the County Court judge any authority to enforce the award. The Divisional Court refused to order the writ to issue, and the landlord appealed to the Court of Appeal. The case was heard on January 15 in the present year by Lord Halsbury (Ex-Lord-Chancellor), and the Lords Justices Lopes and Davey, who took time to consider their judgment until the 15th of the February following, when they reluctantly gave it in favour of the landlord.

"In this case," said Lord Halsbury, "with every disposition to decline to interfere with the proceedings in the County Court on the ground that, if it is possible for a person to render himself incapable of applying for a prohibition in such a case as this, the appellant has done so, I feel nevertheless constrained to decide that the writ must issue to prohibit further proceedings on the order of the County Court, so far as it is applicable to that portion of the award which is in respect of matters outside the Agricultural Holdings Act. It has been long settled that, where an objection to the jurisdiction of an inferior Court appears on the face of the proceedings, it is immaterial by what means and by whom the Court is informed of such objection. The Court must protect the prerogative of the Crown and the due course of the administration of justice by prohibiting the inferior Court from proceeding in matters as to which it is apparent that it has no jurisdiction. Looking to what appears on the face of the award in this case, and applying to that the provisions of the Agricultural Holdings Act and the power of enforcing awards given by that Act, I think it is impossible to doubt that there is that on the face of the proceedings which shows that the judge, in granting execution under the provisions of that Act, was acting beyond his jurisdiction. The Act specifies the matters which are to be the subject of compensation under it, and it appears on the face of the award that there are matters included in the compensation awarded which are outside the provisions of the Act. Section 24 of the Act provides in substance that a sum awarded as compensation under the Act may be recovered on the order of the County Court judge as money recovered by an ordinary County Court judgment. It is apparent that in applying that Section to subject-matters which are not included in the provisions of the Act, the County Court was exceeding its jurisdiction. Under these circumstances, reluctant as I am to aid the appellant in this case, I am unable to resist the conclusion that the writ ought to issue. Considering the course of the litigation, I think the appellant ought not to have any costs of the proceedings except in this Court where he has succeeded."

And so Lopes, L. J. "The award on the face of it discloses a want of jurisdiction. It contains and deals with matters which are not the subject of the Agricultural Holdings Act, matters outside that Act, and which cannot be enforced under the 24th Section. In such circumstances, most reluctantly I am compelled to hold that the writ of prohibition must issue."

And Davey, L. J. in a similar strain :—

"The jurisdiction of the County Court in the matter is statutory, and is conferred by the Agricultural Holdings Act.

"It is obvious that Section 24 of the Act only applies to money agreed or awarded to be paid in respect of matters within the Act, and gives no jurisdiction over awards as to other matters made pursuant to a contractual submission or with the consent of the parties. Indeed, it was not and could not be denied that as far forth as the award related to matters outside the Act, the County Court judge had no jurisdiction to enforce the award, and the applicant was *primâ facie* entitled to the prohibition. But it was argued that the granting of a prohibition is discretionary, and that the applicant was estopped or precluded by his conduct from claiming a prohibition." And after considering this argument at length and deciding against it, the learned Lord Justice concluded his judgment thus: "Although I think the applicant is not precluded from asking for a prohibition, yet he is doing so in breach of his contract, and I think there should be no costs in the Court below; but the appellant should have the costs of the appeal."

Two points may clearly be deduced from this case. First, that notwithstanding that Section 21 of the Act enacts that "a submission or award shall not be made a rule of any Court, or be removable by any process into any Court, and an award shall not be questioned or otherwise than as provided by the Act," and that Section 22 enacts that "the decision of the County Court on appeal shall be final, save that the judge shall, at the request of either party, state a special case on a question of law for the judgment of the High Court of Justice, and the decision of the High Court shall be final"; yet references under the Act may be made the subjects of appeal to the Court of Appeal, and apparently even to the House of Lords. Secondly, that notwithstanding the contract of the parties, there should be separate awards for compensation payable under lease agreement or custom, and for compensation payable under the Act. The latter point may easily be amended, but it does not seem so easy to prevent the proverbial "coach-and-four" being driven through the appeal sections.

S. B. L. Druce.

9 Old Square, Lincoln's Inn, W.C.

OVERHANGING TREES.

In the last number of the Journal (Pt. I., Vol. V. 3rd Series, p. 173) I reported two cases relating to this subject which had been decided by Courts of First Instance. In the first the plaintiff obtained damages for the loss of a colt, the death of which was alleged to have been caused by eating the defendant's yew bushes; in the second the defendant was held to be liable in damages for having cut some branches off the plaintiff's trees, which overhung the defendant's premises, without having given previous notice to the plaintiff. Both these cases have been reversed on appeal since the note was written, and it is deemed right to insert a further note of that fact, in order that no incorrect conclusions of law may be disseminated through the Journal.

The first case was reversed partly on the ground that there was no evidence that the colt had eaten the defendant's yew bushes, and partly that if it had eaten them it could not have done so without going on to the defendant's land, which it had no right to do, there being no liability on the part of the defendant to repair the fence, so as to prevent the colt from going on to his land.

The second case was reversed on the ground that a landowner is entitled to cut off the branches of his neighbour's trees which overhang his land, however long they have been there, and that he is not bound to give his neighbour notice of his intention to cut them unless he has to go on the neighbour's land for the purpose.

S. B. L. DRUCE.

9 Old Square, Lincoln's Inn, W.C.

METAYAGE AND ITS APPLICABILITY TO ENGLAND.[1]

AT a time when the suggestion is again made that some kind of produce rents might be advantageous to agriculture in the United Kingdom, it may be useful to inquire into the nature of *métayage*, its advantages and drawbacks, in the country nearest home. With reference to this system Thorold Rogers says in his *Political Economy* (p. 166) : "The tenant pays a fixed quantity in money or produce for the use of his farm, generally using the landlord's stock and seed. This kind of tenancy is called *métayer* in France . . . Such a tenancy prevailed in England for about sixty years." This view of *métayage*, however, is hardly to be defended. It is not a fixed *quantity* either of money or produce which is paid by the tenant, but a fixed *quotity* of produce, or its equivalent in money if so agreed. And the essence of the contract lies rather in joint enterprise than in joint capital. If agricultural contracts of this kind have never been known in England, we cannot be surprised at there not being an English name for them.[2] By a loose extension of

---

[1] Abstract of a paper on "Métayage in Western France," by Henry Higgs in the *Economic Journal*, Vol. IV., No. 13, 1894.

[2] As the name occurs in several English dictionaries it may perhaps be regarded as anglicised. The following references are quoted from the *Century Dictionary* :—

Métayage : the cultivation of land on shares ; the métayer system of agriculture.

Métayage : that is to say, a kind of temporary partnership or joint venture, in which the proprietor supplies the land and the seed, and the peasants do all the work with their own horses and implements.—D. M. WALLACE, *Russia*, p. 519.

Métayer [M.L. *medietarius*, one who tills land for half the produce] : a popular language a small farm in France is still sometimes called a *métairie*, even though the tenant uses no movable capital other than his own, and his rent is fixed on the English system. But it must be remembered that before the Revolution farmers were nearly synonymous with *métayers*,—five-sixths of the whole land of the kingdom according to Turgot, seven-eighths according to Arthur Young, being held under *métayage*, though the latter writer states almost simultaneously (*Travels in France*, i. 399, 407) that one-third of the land of the kingdom is in the hands of peasant proprietors.

From the thirteenth century the system continued in France with great persistence until the end of the last century. The Revolution, by confiscating the land of the clergy, and selling the estates of those who had been driven out of the country, or out of the world, brought about a large immediate increase of small proprietors and a diminution in the number of *métayers*. Thus in 1832 M. de Gasparin estimated that more than half the soil was under *métayage* ; in 1842 M. de Chateauvieux put the proportion at one-third ; whilst in 1860 M. de Lavergne thought the number of *métayers* about equal to that of the farmers. It appears that a reaction has set in during the present generation, and in spite of some checks *métayage* is believed to be now gaining in favour. In the *Statistique agricole*, published in 1886, figures of which the following are the equivalents are given relative to land under cultivation in 1882 :—

		Acres		Acres	
	4,324,917 holdings averaging	11·07	=	47,868,820	cultivated by their owners.
	347,858 *métairies* ,,	32·21	=	11,212,125	,, ,,
	749,559 farms on hire ,,	29·49	=	22,114,201	,, ,,
Total	5,422,334 holdings			81,195,146	

The system of *métayage* predominates especially in the centre and south of France, and in Mayenne in the west, where during the agricultural crisis farmers have become *métayers* almost without exception. Broadly speaking, the *métayer* provides the labour and

cultivator who tills a farm or piece of ground for the owner on condition of receiving a share of the produce, generally a half, the owner usually furnishing the whole or a part of the stock, tools, &c. This system of cultivation, called *métayage*, or the *métayer system*, prevails in the central and southern parts of France and in most of Italy, and is practised to a considerable extent in the Southern United States.

The principle of the *métayer* system is that the labourer or peasant makes his engagement directly with the landowner, and pays, not a fixed rent, either in money or in kind, but a certain proportion of the produce, or rather of what remains of the produce after deducting what is considered necessary to keep up the stock. The proportion is usually, as the name imports, one-half, but in several districts in Italy it is two-thirds. Respecting the supply of stock, the custom varies from place to place ; in some places the landlord furnishes the whole, in others half, in others some particular part ; as, for instance, the cattle and seed, the labourer providing the implements.—J. S. Mill, *Political Econ.*, II. viii. § 1.

The *métayer* has less motive to exertion than the peasant proprietor, since only half the fruits of his industry, instead of the whole, are his own.—*Ibid.* II. viii. § 2.

It may be added that both *métayage* and *métayer* occur in the *Stanford Dictionary of Anglicised Words and Phrases*.—Ed.

implements, the landlord the immovables (land, buildings, &c.), and both parties share equally in the provision of stock and the partition of the produce, while the responsibility of management is mutual—the discretion of the landlord, in case of dispute, being exercised in some matters, and that of the *métayer* in others. On a few farms of superior quality the landlord's share is higher (*e.g.* two-thirds), while on some inferior farms he receives only one-third,—such exceptional cases, however, need not be considered. The details of each contract of *métayage* vary according to the district, and are regulated for the most part by local custom—a sort of "custom of the country"—as minutely codified in a *Recueil des Usages ruraux de l'Arrondissement.* This little code, issued by authority, may be bought for a few sous in the local shops, and its contents are accurately known by the *métayers* themselves. They provide for almost every conceivable question which can arise affecting the joint or several liability of the parties, prescribe certain limits to the mode of cultivation, fix the approximate dates of successive agricultural operations, the rotation of crops, the quantity of manures, &c., and assume throughout the active co-operation of intelligence and goodwill on both sides. A lease, after the usual recitals, embodies any special stipulation which is agreed upon, and refers for the rest to the customs as defined in the *Recueil.* The little pamphlet of thirty-two pages duodecimo, now in use at Laval, was drawn up in 1858 by a commission appointed by the prefect of Mayenne in 1855. The commission was aided by the agricultural society of Laval, the justices of the peace, notaries, solicitors, and experts; and its labours are little more than a re-statement of customs already of hoary antiquity, applicable as well to farms at money-rents as to *métayer*-farms. The *Recueil* is judicially recognised as an accurate statement of local custom, but it has no binding force so far as the lease expressly provides to the contrary. Where no special provision is made, the parties are presumed to have agreed to be bound by custom.

Métayage then is, in effect, an agricultural partnership. The fact that it is, on occasion, a loss-sharing as well as a profit-sharing [1] enterprise relieves it of one criticism frequently directed against this form of co-operation. In other respects it may claim the merits, and is open to the objections, common to profit-sharing in general. An argument used by Adam Smith and most of those who have followed him is that it could never be to the interest of *métayers* to put their own capital into the land, "because the landlord, who laid out nothing, was to get one-half of whatever it produced. The tithe, which is but a tenth of the produce, is found to be a very great hindrance to improvement. A tax, therefore, which amounted to one-half, must have been an effectual bar to it." But Adam Smith expressly states that he is referring to a *métayer* who, "having no stock of his own," cultivated 'only by means of

[1] See the paper on *Profit-sharing in Agriculture*, by Albert Grey, in this Journal, 3rd Series, Vol. II., 1891, pp. 771–793.—Ed.

what the landlord advanced to him." Such an argument has no bearing upon tenures which require the parties to advance capital in equal shares. At present the *métayer* has no difficulty in persuading his landlord to share in the purchase of additional stock. The *métayer*, less able to sustain a loss, is the more cautious of the two, and when he has persuaded himself that such an outlay would be remunerative, there is rarely any need for the landlord to hesitate about embarking capital with his own little venture.

On the other hand, the *métayer* is said to be more disposed than the ordinary farmer to the adoption of improvements. The example of a landlord farming his own land has comparatively little local influence. He is credited with ability to indulge his fancy in experiments, and his neighbours have little opportunity of judging whether or not his "improvements" pay. But if he lets his land to a *métayer*, any reclamation of the soil, draining, levelling, &c., must still be done at his own charges under the eyes of his tenant; and he is often spirited enough to introduce improvements in cattle, manures, implements, &c., by the persuasion of experiment, at his own expense when he is not otherwise able to convince the tenant of their advantages. The gradual extension of the use of lime and the crossing of cattle with Shorthorns in the department of Mayenne are attributed to the example of the *métayers*, influenced by the precepts and experiments of their landlords, and followed slowly by farmers at money-rents when the success of the changes had been established beyond a doubt.

Since the establishment of the Republic in France, the public service has to a great extent been a closed career to the old aristocracy, which has taken refuge in its landed property, and brought to the service of *métayers* a knowledge of agriculture, chemistry, and scientific farming of the greatest value. The necessity of keeping accounts on both sides amply repays the trouble which it involves, and the *métayer* is fortunate in having at his side a moneyed partner without whose help certain improvements are strangled. With reference to this point it is recalled that Thorold Rogers in his *Economic Interpretation of History* (p. 171) says:—"When landlord cultivation ceased, marling was abandoned, it was too costly for the risk, and sheep-breeding suffered at least some deterioration."

The honesty of the *métayers* is admitted to be irreproachable. Probity is, indeed, part of their capital, and any breach of it would be fatal to their position and to their prospects of finding another farm. It is sometimes argued, that having regard to the *métayer's* personal consumption, and to the payment of half his produce in kind, his margin of saleable produce is so small that he cannot gain much by a rise of prices, and is likely to become indifferent and sleepy as a cultivator. There is no danger of this kind where prices are stationary or declining; and even when prices rise, an increase in the product is almost entirely pure profit, of which a half is a sufficiently powerful inducement to vigorous industry, while the farmer is liable to have his rent raised, and thus gains little more—perhaps even less—than the *métayer*.

Compared with the farmer, the *métayer* has more stability of income, and is better able to weather such a currency crisis as that of the last quarter of the present century. He profits by the intelligence and resources of his landlord, with whom his personal relations generally place him on excellent terms, and these aids to his small capital permit of a higher type of farming than is possible to the farmer or the peasant proprietor who has no such collaborator. Though he is less independent than either the farmer or the peasant proprietor, he is generally more comfortable than the little owner, who is liable to yield to a narrow and sordid parsimony under the temptation of rounding off his plot of ground, and even to starve such land as he has in the endeavour to buy more.

To what extent the introduction of *métayage* into England might prove successful is a question for consideration. We are accustomed to larger farms and to tenants of larger capital, and with these a landlord-partner might be a source more of irritation than of advantage. The English owner would dislike the bother of supervision and the uncertainty of his income, whilst the English tenant would resent "interference" in his management of the farm. Possibly, too, the English soil and climate might oppose difficulties unknown to the cultivators of France and Italy, whilst, finally, the social constitution of our country might raise a further obstacle. The French law of succession, which has accustomed peasants to divide property frequently among themselves, smooths the way to the division of their produce with the landlord, an operation which might not be so easily effected where it is less familiar. If, however, the farmers of England should continue to suffer as heavily as they have done in the last few years, and the owners of land, failing tenants, should employ bailiffs and stimulate their interests by making their remuneration vary with the profits, we should not be far removed from the contract of *métayage*. Produce rents would be another step in the same direction.

Rigid as *métayer* tenure may at first sight seem to be, it is susceptible of considerable elasticity. The *usages ruraux* of Laval differ in several respects from those of its adjoining *arrondissement* of Château-Gontier ; the landlord may at each new contract adjust such details as who is to pay the taxes, or may vary the size of the farm, the amount and the shares of capital supplied, or the quantity of labour required. On the whole there appears to be a balance of advantage in favour of *métayage*, so far as small farms and small capitals are concerned. It is conceivable, though nothing points to such a course as probable, that *métayage* might supply a bridge between the tenants of small holdings and a new class of yeomen in this country.

ROMNEY MARSH SHEEP.

Bred on exposed marshes, and generally grazed upon short and poor feed in its first year, the Romney Marsh Sheep may be said to present a result to be expected after many years of the survival of the fittest. Of a hardy and strong constitution, it will live and thrive even upon the poorest lands without any artificial feeding or assistance. Nevertheless, upon the best pasture, or when aided by extra feeding, there is no breed which more readily responds, owing to its natural kindliness and quick-fatting disposition. It may not be out of place to briefly describe the sheep-grazing district, in the counties of Kent and Sussex, known as Romney Marsh, which, for drainage and sea-defence purposes, is divided into various "levels," viz., Romney Marsh, Walland Marsh, Denge Marsh, Broomhill, and East Guldeford, comprising an area of about 42,000 acres of pasture land, with a further considerable acreage of adjacent marshes extending inland and of similar character.

The Marsh may be regarded as a peninsula, terminating in its southern extremity at Dungeness Point, and having a seaboard of several miles upon the east and west; while a low range of hills bounds it upon the north and north-east.

Probably no more exposed and bleak country can be imagined. In some parts miles may be traversed without seeing tree or hedge. Severe winds from the east, or gales from the west, sweep across it with full unchecked force from the sea; and, in a hot and dry season, such as we experienced in 1893, there is no shade or shelter from the burning glare of the sun.

The fields are divided from each other by post and rail fences or by water fences called "ditches" and "sewers" (for drainage purposes).

The quality of the land in the district, which, regarded geologically, is a recent reclamation from the sea, varies very considerably. On the one hand there are parts which, from a rich alluvial deposit, have become pasture of the highest quality, while on the other, and closely adjoining, or intermixed, are many acres of the poorest land—hard, stiff, and unkindly clay, or sand and shingle sparsely covered with vegetation, and only barely sustaining stock in the most favourable seasons.

In these circumstances it may well be understood that the sheep "bred of the soil" must be of the most hardy and thrifty nature, and such qualities may be pre-eminently claimed for the Romney Marsh breed.

No sheep are better proof against the diseases which from time to time play such havoc and devastation among our flocks. Although none can be said to stand sound against, for example, attacks of liver fluke (or rot), throat worm, or foot rot, under favourable conditions for the development of these diseases, yet the Romney Marsh sheep will be the last to succumb and is the most likely to withstand them.

The system of the Romney Marsh grazier with regard to his lambs is disadvantageous to early development. It is a loss to himself and generally unprofitable.

It is not practicable to winter the lambs upon any large scale in Romney Marsh. They are usually placed in August or September in the uplands of Kent and other adjoining counties at keep until the spring. The general manner of this wintering is wasteful. Thousands of lambs are sent away, often full of flesh and condition, to simply subsist on such feed as the keepers may find them. Heavy losses are frequently sustained owing to mismanagement and unsuitable feed. The result of a bad wintering naturally hinders the growth, and is visible in all further stages of the animal.

The lambing down of the ewes on the Marsh usually begins in April. Shearing commences in June, and it is the practice to shear the lambs.

It should be mentioned that sheep kept entirely upon the uplands of the county of Kent, and principally upon artificial food, are of a larger size, coarser, and with more bone. They are generally called "Kents," as distinguished from the Romney Marsh breed. While originating from the Marsh sheep, it is possible that a strain of the Lincoln has at some period been introduced into their breeding.

It is difficult for the writer, himself a breeder, to describe the shape and form which best represent the Romney Marsh breed, for each breeder would seem to have his own ideal.

Old Dr. Price, who wrote a most interesting book upon sheep-grazing in Romney Marsh in 1809, gives twelve points of a good sheep. Among these are a good head, a short neck, a deep and wide breast, a good leg, and width over the shoulders. Perhaps the last named is the most important quality to obtain. Given this, and a straight back, all other desirable points usually follow.

Sheep of this breed are held in much esteem by the butcher, and neat weights commonly make as high a price per stone as the highest quality Downs.

The mutton is usually the best obtainable from May to October, and during that period the markets in Kent and Sussex, and also the London market, are very largely supplied with it.

One of the most important matters of study is the quantity and quality of the wool. It may be described as of heavy weight, with a long, full, and decided staple. Very great improvement in the direction of a good and even fleece has been made in recent years by careful selection, the object kept in view being to increase the wool of best quality and to lessen the amount of the breech and coarser parts.

The result both as to quality and weight of wool from Romney Marsh sheep kept in New Zealand, and in other countries, under more satisfactory climatic conditions than here, has, to the knowledge of the writer, been most satisfactory and profitable.

As an example of sheep grazed in the usual way in Romney Marsh he may instance, in one separately kept growth of wool from

1,000 head, consisting of tegs, ewes bringing up their lambs, and fatting sheep, in the dry and trying year of 1893, an average weight of 8 lb. per sheep, the wool being washed on the sheep.

The Romney Marsh sheep seem well adapted to cross with other breeds. The result of crossing with the Merino shows that the extra weight and long staple are secured, while the wool assimilates to the fineness of texture of that highly valued breed.

In this country, too, the ewes are frequently purchased from the Marsh graziers and crossed with Shropshire, Hampshire Down, or Southdown rams, for the purpose of breeding early lambs for fatting, with excellent results.

To recapitulate what has been stated—the result of years of careful selection, combined with the varied conditions of feed, and roughness of climate, of its native home in the Marsh, have now produced a breed which stands first for hardiness and healthiness, with good kindly disposition, and heavy even wool.

There can, indeed, be but little doubt that the Romney Marsh sheep is rapidly attaining a favourable and well-deserved recognition both at home and abroad.

ARTHUR FINN.

Westbroke, Lydd, Kent.

BACTERIA, THEIR NATURE AND FUNCTION.[1]

A WELL-KNOWN English writer a short time ago informed the public that Professor von Pettenkofer, the distinguished veteran in sanitary science in Munich, expressed the opinion that "the atmospheric envelope of this globe is at present in a bacillophil humour.' Expressions such as these have been repeatedly used in one form or another, some more, some less witty; the intention being, of course, to convey an exaggerated impression of the frame of mind of over-zealous enthusiasts. By such expressions more or less distinguished speakers and writers have been enabled to exhibit the smartness of their phraseology. Thus one distinguished professor relieved the anxiety of his students by the jocular observation that idleness and laziness will probably be found to be due to a specific bacillus, while another no less profound writer enunciated that crime and inebriety are probably due to bacilli. With regard to the distribution of bacteria, as well as with regard to their action, we meet with statements which are almost made humorous by smartness of exaggeration. Under the cover of the title "Science Notes," one of the London papers offered to its readers for breakfast the following palatable dish :—"In a grain of butter you have 47,250,000

[1] The substance of a lecture delivered at the London Institution by E. Klein, M.D., F.R.S.

microbes; when you eat a slice of bread and butter you therefore must swallow as many microbes as there are people in Europe." Here it ought to be stated that a grain of solid matter of *London sewage* contains only a small fraction of this number of microbes. But, leaving these silly exaggerations and these grotesque sayings to their authors for further improvement, it is nevertheless well established that a considerable number of phenomena in nature are intimately associated with bacterial life. The world of bacteria is comparable to an unseen flora which, in variety of character, of activity, and importance in the economy of nature, compares with the visible flora, and in its extension and area of distribution is as great as, in some respects greater than, that of the visible vegetable and animal kingdom. Though unperceived by the unaided eye, this bacterial world forces itself, by its multifarious activity, continually on our attention; it comes into prominence by the vast effects, the slow but far-reaching results, which it produces on man, animal, and plant, for good and for evil, in life and in death. Some of these actions I propose to notice, and it will be seen that while there are bacteria whose actions are undesired and not conducive to the well-being of man or animals, there are others which are of the greatest service both to them and to plants, and are an essential and integral part in the economy of nature.

Structure and Life-history of Bacteria.

I have spoken of the bacterial world as of an unseen flora; I mean by this a part of the vegetable kingdom not perceived by the unaided eye, though, nevertheless, it is easily brought to perception, by a variety of means. The individuals that constitute the bacterial world are, in fact, of such extremely minute size that only by the aid of the microscope can they be seen, their size being often less than $\frac{1}{25000}$ or $\frac{1}{30000}$ part of an inch, rarely more than $\frac{1}{3000}$ part of an inch. They are spoken of as having the character of plants, because the elements, like those of a plant, are invested in a sheath of cellulose, within which is contained the essential part, the living protoplasm, the bacterial individuals being in fact comparable to unicellular plants, in which, however, no definite cell nucleus has been hitherto demonstrated. It ought, however, to be mentioned that various observers have attempted to show, and, by complex methods of staining, have succeeded in showing, in some bacterial species the existence of parts which resemble, and which are considered as comparable to, the nucleus forming an integral part of the typical vegetable cell.

In speaking of bacteria as of plants there are other than morphological characters which guide us in this designation; bacteria resemble plants in this essential, that they possess the power to build up, out of simple organic compounds, the most complex substances, such as the protoplasm of their own bodies. There are known not a few bacterial species which grow and multiply, *i.e.* which build up their highly complex nitrogenous (albuminous) substances at the expense of relatively simple nitrogenous bodies, such as ammonium tartrate, urea and allied substances, or which can do this even by the absorption of free nitrogen of the air. Other species require for their growth and multiplication nitrogenous substances as complex as the animal body itself, and, like this latter, are capable of breaking them up into simpler combinations. Pathogenic (*i.e.* disease-producing) bacteria and many of the species concerned in the decomposition and putrefaction of albuminous substances belong to this group.

All bacteria multiply by division; hence their name, Schizomycetes, or fission fungi, the typical process of multiplication consisting in the enlargement of an individual, and its subsequent splitting into two by fission, at the conclusion of which process two new individuals are the result, each of them capable of enlarging and again dividing in the same way into two, and so on. But it can be easily shown by comparative observations, and examination of suitably prepared specimens of artificial cultures of the different species, that not seldom the process of multiplication does not follow this line.

I was able to show at this stage a lantern slide of a microscopic specimen of one of those species which, owing to the spherical or nearly spherical form of the elements, is called a Coccus, or Micrococcus; and, owing to the manner of growth in clusters and continuous masses, is called a Staphylococcus; this microscopic specimen was obtained by the method of making "impression preparations"; that is to say, by means of a thin glass pressed on to a recent, *i.e.* a *young* colony or colonies growing on the surface of a solid medium, an exact impression is obtained of the growth, and a good and correct insight is obtained into the manner in which the colony enlarges, and the way in which the individuals constituting the colony grow and multiply. This photographic representation shows that there are a good many individuals many times (4–10 times) as large as others, that some of these large elements are uniform, while others show just the indication of a transverse fissure by which the large element is dividing; still others show two fissures at right angles, by which the big element becomes divided into four smaller ones. But it is seen also that the majority of the cocci are only minute dots, some in pairs, others in clusters, the former looking like two demi-lunes separated by a straight clear line; in fact, this latter appearance denotes the typical manner in which one coccus, having first enlarged a little, divides into two small elements. But the presence of the huge elements mentioned above tells us also that one coccus may go on growing to a very large size without dividing, and, having reached this huge diameter, then commences to divide, first into two, then into four, eight, and sixteen individuals of the typical size.

A second specimen shown was an impression preparation of a recent colony of another species (*Bacillus coli*), the individuals of which are rod-shaped or cylindrical, and are what are called typical bacilli. Here the great majority of the individuals are of cylindrical shape, and of a fairly uniform size; a few only are shorter, and arranged in the form of a dumb-bell, indicating that one of the longer individuals has by fission split up into two smaller individuals. But a glance at a third impression preparation, of which was shown a photograph (Proteus), demonstrates that while there are a few chains of cylindrical bacilli, indicating successive division of the individuals and the new offsprings remaining joined end to end—thus constituting what is spoken of as a Leptothrix—there are other threads in the colony which either show a division into cylindrical elements only imperfectly or not at all, appearing uniform and unsegmented threads; where the segmentation is imperfect the individuals are of very various lengths, some not longer than those typical bacilli in the first-mentioned chains, others three and more times as long. These appearances indicate that the multiplication of the bacilli does not always take place in that typical manner in which it is generally represented; viz. one individual elongates a little, then splits up into two short individuals; but a bacillus may go on elongating till it reaches the manifold length of the typical rods, and, having reached this great length, then segments off into a great number of cylindrical rods. This mode of multiplication can be made out not only in these impression preparations, but can be actually observed in the fresh condition under suitable conditions, *e.g.* on the warm stage of the microscope.

That this mode of growth appertains not only to cocci and bacilli, but also to the third morphological group of bacteria, viz. the Vibrios, or Spirilla, is ascertained by the fact that often one vibrio, *i.e.* a more or less curved rod-shaped individual or a comma-shaped bacillus, grows into a uniform homogeneous spiral or wavy thread, which is capable of splitting up into a number, *i.e.* a chain of comma-shaped vibrios.

We have then the typical mode of division by which one individual, a Coccus, or Bacillus, or Vibrio, as the case may be, slightly enlarges, and then by fission divides into two; or an individual continues to grow to abnormal size or length, and then splits up into a series of individuals of the typical size; this latter mode of multiplication implies a deficiency of fission for the time being, and is not, as far as can be made out, due to any abnormal conditions affecting the growth, for in many species this occurs in recent and active colonies under conditions which in all other respects must be pronounced as favourable for growth and multiplication.

Another interesting appearance, shown by some species of bacteria, is generally ascribed to degeneration or involution, *i.e.* the bacteria assume peculiar abnormal shapes stated to be due to abnormal influences, insufficient or unfavourable soil, unfavourable temperature, &c., &c.; but while it is true that such influences do produce abnormal shapes, disintegration, &c., there are certain changes in shape that are observed in some species of bacteria while growing under perfectly favourable conditions and with the normal rapidity, and which are anything but degenerating.

A recent colony of the *Bacillus anthracis*, like the photograph which was next shown, growing on nutritive gelatine, is made up of twisted and convoluted threads of cylindrical rods, which threads are seen to shoot out and to extend like filaments from the margin of the colony. Instead, however, of these filaments being made up of the typical cylindrical rods, the former consist of relatively huge spindle-shaped or spherical masses many times the diameter of the typical rods. The threads of this colony are perfectly active, and are growing with vigour and in perfectly normal circumstances as regards soil, temperature, and all other known conditions. As a matter of fact, a few days later, as comparative specimens show, all threads may be, and as a rule are, again of the typical aspect, *i.e.* uniform threads and chains of rod-shaped elements.

Another photograph shown was from a colony of the bacillus of diphtheria. Here also we notice the appearances already mentioned of the anthrax bacilli, viz. shorter or longer filaments, in which some of the elements show a conspicuous enlargement ; pear-shaped, spherical, or club-shaped. Such forms are not involution forms : they occur in vigorous and actively growing young colonies.

A still further illustration, and one of great importance, was shown by a photograph illustrating a similar change of the tubercle bacilli. This change has now been confirmed by several independent observers. The typical tubercle bacilli of human or bovine tubercle and of early cultivations are cylindrical rods. In cultivations of long duration but still actively growing we notice forms which are more filamentous, and, as in the present illustrations, are branched filaments with club-shaped enlargements.

From all this the conclusion is justified that in all these cases of bacilli the typical cylindrical bacilli show occasionally an indication that reminds one of forms belonging to the higher or mycelial fungi, in which the growing filaments remain unsegmented and become thickened and even branched. These thickened, branched, and club-shaped forms of the bacilli would correspond to an atavism, and would recall a probable former fungoid phase in the evolutional history of these bacilli.

The next point to which I wish to direct attention is the rapidity with which multiplication of the bacteria takes place. This differs according to the amount and nature of the nutriment or soil on which they grow, and to the temperature. While some bacteria multiply even at lower temperatures at a great rate, others do so only at higher temperatures. But in order to convey an idea of the power and the rate of multiplication I may mention the following : Direct observations show that the rate at which bacteria divide at a temperature of 64° F. varies from eighteen minutes to thirty minutes or a little longer, and at higher temperatures correspondingly faster. A tube of nutrient broth was inoculated with a trace of the growth of a staphylococcus (*Staphylococcus pyogenes aureus*), the number of cocci introduced into the tube having been previously determined to be 8 per cubic centimetre. The tube was then kept at 99° F. ; in the first twenty-four hours the cocci had multiplied to 640,000 per cubic centimetre ; in the second twenty-four hours to 248 millions per cubic centimetre, and in the third twenty-four hours to 1,184 millions per cubic centimetre. (1 cubic centimetre =·061 cubic inch.)

A point of interest is the motility exhibited by certain bacteria. In some species most, in others comparatively few, individuals show active locomotion, spinning round and darting to and fro; in many other species no motility is observed. In the motile species it is known that this motility is due to the presence and active motion of cilia or flagella, and these have been seen and photographed in former years in some of the larger forms, but only within recent years has it been possible, by means of new methods (Löffler), to actually demonstrate in the smallest forms these flagella, and here the remarkable facts have been shown that while some possess only one flagellum at one end, in other species the bacillus possesses a bundle of them, or is covered with the flagella on its whole surface. Photographs were shown of the flagella, one possessing two flagella at one end (*Spirillum volutans*), the other (cholera bacillus) one at one end, and the third (typhoid bacillus) covered with quite a number of flagella.

A not less interesting point is the formation of spores: the only trustworthily ascertained mode of spore formation is that which is called endospores; a bacillus at a certain phase develops in its protoplasm a minute glistening granule; this increases in size and becomes oval, while the rest of the substance of the bacillus becomes pale, swells up, and gradually degenerates and disappears, leaving the fully formed oval bright spore free. These spores offer great resistance to temperature, chemical obnoxious substances, drying, &c., so that even after long periods and various adventures, when again brought under proper and suitable conditions, they are capable of germinating into the bacilli. These then grow and divide, and continue to do so, producing new crops. Non-sporing bacteria are for this reason more liable to succumb in the struggle for existence, although many species of non-sporing bacilli have such a vast power of multiplication and are so little selective in their requirements that they manage to keep their crops perpetually going; some notorious putrefactive cocci and bacilli belong to this class. Having now mentioned the essential features in the morphology of bacteria, I proceed to give a short summary of some of the most important activities which bacteria exhibit.

Bacteria causing Decomposition of Albumin.

Foremost in importance and vastness of result is the action which certain species of bacteria have on albuminous matter, an action which is termed *putrefactive decomposition of albumin*, animal or vegetable. All organic matter when deprived of life is resolved into similar compounds, is broken up into lower nitrogenous principles, like leucin, tyrosin, indol, phenol, &c., of which the ultimate products are ammonia, nitrites, and nitrates. The plant, it may be said in a general way, builds up albuminous matter from nitrates. This albuminous matter it is which forms the protoplasm of its cells, this albuminous matter it is which serves as nitrogenous food for animals; these again supplying the food for other animals and man. In the living body of these the albuminous matter becomes broken up, yielding nitrogenous principles like urea and allied substances, which again, after further oxidation in the soil and in water, serve to supply nitrates to the plant. Also, the bodies of animals and plants after death form a large stock from which by a long chain of processes, induced and sustained by micro-organisms, lower nitrogenous compounds, and ultimately ammonia and nitrates, are produced, from which the living plants principally draw their nitrogen.

From this it is evident that the vegetable kingdom is dependent for its nitrogen chiefly on processes by which from the albumin of dead organic matter, by the activity of micro-organisms, in the first place lower nitrogenous principles and ultimately ammonia, and in the second place, also by micro-organisms, nitrites and nitrates are formed. Now, the micro-organisms which are capable of producing the first series of decompositions of dead albuminous matter form, so to speak, the first army of attack; it is this army which, while multiplying at the expense of albumin, decomposes it, and thereby is instrumental in changing it into lower nitrogenous principles, such as leucin, tyrosin, indol, and ammonia. Amongst the large number of species of putrefactive bacteria I will describe two only, which by their wide distribution may be considered as playing a very important part in this decomposition of albumin. The first is the species known as *Proteus vulgaris*, the second is the *Bacillus coli*.

(*a*) *Proteus vulgaris.*—This species is the common putrefactive organism; it is almost invariably present in dead and decaying albuminous matter; it is the organism which in dead animals and man plays the principal part in the destruction and resolution of the body; it is present in the cavity of the normal intestine; it is found in connexion with effete and dead matter occurring in the body in health and disease; it has a wide distribution in nature, and is present wherever organic matter happens to be in a state of putrescence; it is liable to pass from this and to be transmitted to other putrescible matter by air currents, by dust, by water, by human contact or otherwise, and then to set up in this new organic matter the same state of putrescence. The same applies to the *Bacillus coli*, which has also a very wide distribution, and which is in most instances associated with putrefaction and decomposition of albuminous matter; it is a normal inhabitant of the human and animal intestine, and from here often passes into the soil, water, and air.

These two species of organisms may be considered, then, as being of great importance in the destruction and resolution of putrescible matter—in short, of dead albuminous matter. Both these species are motile bacilli.

Proteus vulgaris, as its name implies, presents itself in forms so varied, that it is at first sight difficult to recognise them as belonging to one and the same species: coccus forms, short ovals, short and long cylinders, homogeneous long threads, and even spiral forms. But by artificial cultivation by exact methods they can be shown to belong to one and the same species; and it can also be shown that under particular conditions of cultivation the bacillus almost invariably shows itself as cylindrical and thread-like forms; whereas under other conditions it assumes the character of cocci and ovals. Photographs which were shown gave an exact representation of these cylindrical and thread-like forms observed in early gelatine plate cultures; later on, when the growth has proceeded for some days, and the gelatine has almost entirely become liquefied, the majority of the individuals are very short—either coccus-like or short ovals.

It is on account of this unstable or protean character of its form that Hauser gave it the name of Proteus, and being the common microbe of putrid decomposition, he called it *Proteus vulgaris.*

This organism, as a first and important action, peptonises albumin and liquefies and peptonises gelatine; then this peptone is decomposed, yielding, amongst other substances, leucin, tyrosin, indol, skatol, phenol, and, further, ammonia.

(*b*) *Bacillus coli.*—The normal inhabitant of the intestine of man and animals is another powerful albumin-decomposing microbe, but, unlike the proteus, it decomposes albumin without first converting it into peptone; it therefore does not liquefy gelatine like the proteus; it rapidly decomposes albumin, forming indol and allied bodies, and even ammonia.

Bacteria causing Ammoniacal Fermentation of Urea.

In connexion with these true putrefactive bacteria I must mention a group of bacteria which, though not strictly connected with decomposition of albuminous matter, play an important part, inasmuch as their action supplements that of the former, the group in question consisting of species which can change urea and allied substances into ammonium carbonate. This action is generally and justly considered of the nature of a ferment or hydrating action, like that of other organised ferments to be presently described. But we mention this group here because by changing urea into ammonium carbonate it prepares, in one sense, the way for the action of certain other bacteria which, by oxidising ammonia into nitrites and nitrates, are the direct food-providers for the vegetable kingdom. Urea and allied substances, as stated above, are the last products of albuminous metabolism in man and animals, and therefore form an integral part of the material destined for the soil in which the plants of our gardens and fields live and thrive. I showed at this stage one of the species of this group—for there are several—the *Micrococcus ureæ*; this is a coccus growing as a white staphylococcus, and forming connected masses in the natural or artificial culture media; it does not liquefy gelatine, and grows extremely rapidly at higher temperatures.

Photographs give an idea of the character of this organism in plate-, in streak- and stab-culture, and in microscopic specimens ; in these latter it is noticed that neither in size, nor arrangement, nor mode of division does this microbe show anything that would distinguish it from other species of staphylococcus ; its action on urea is its chief distinguishing character, as it is capable of converting it into ammonium carbonate.

At present it is well established that nitrogenous principles like indol, phenol, and ammonia are produced during the decomposition of albumin by proteus, *Bacillus coli*, and other putrefactive bacteria ; and, further, that substances, as indol, phenol, and the like, are, by the activity of certain other bacteria not yet sufficiently investigated, converted into ammonia. We have now traced the decomposition of albumin down to ammonia, and in this condition it is subjected in the soil to the action of the *nitrifying bacteria*—that is, bacteria which oxidise ammonia and convert it into nitrites and ultimately into nitrates ; these bacteria complete then the series of processes by which the nitrogen ultimately returns from where it started. It started as nitrates in the soil surrounding the roots of plants, and as nitrates it ultimately again finds itself in the soil ; first it had been used by the plant in order to build up its albumin, then as vegetable albumin it represents the food of animals ; in these it serves to build up the protoplasm of the animal body, from which it passes as food for carnivorous animals. The albumin of animals or plants becomes decomposed by putrefactive bacteria, the ultimate product of this, ammonia, becoming converted by the nitrifying bacteria of the soil into nitrites, and finally into nitrates. "From earth to earth" expresses the beginning and end of this wonderful migration and change !

Nitrifying Bacteria.

Schlœsing and Müntz were the first to show that the conversion of ammonia into nitrates in the soil is most probably caused by micro-organisms, but not till the researches of Warington, Winogradski, and P. Frankland were these micro-organisms isolated and more carefully experimented with. Warington, and particularly Winogradski, have shown that there are two species of bacteria which play an important part in these processes, one species converting ammonia into nitrites, the other converting these finally into nitrates. Some lantern slides of Winogradski were here exhibited, in which these two species are well shown ; the slides are of preparations of artificial cultivations, in which Winogradski has been extremely successful. These two species (the nitrous and the nitric organism) are minute rod-shaped or oval bacteria ; when in the act of dividing, they form short dumb-bells ; the nitrous organism is larger than the nitric, but both show forms which possess cilia, and which therefore are possessed of motility. Winogradski has by artificial cultivations obtained both these species in large quantities, and on testing them on liquids of suitable composition, found that the one is capable of converting ammonia into nitrites, the other these latter into nitrates. There can then be no doubt that the problem of the manufacture on a large scale of these nitrifying microbes, so important for agriculture, must be considered as solved.

Bacteria of Leguminosæ.

I have next to bring to notice a group of organisms which, like the former, are of interest and importance to the vegetable kingdom, at any rate to one portion of it, viz. the plants belonging to the natural order Leguminosæ.

Hellriegel and Wilfarth had shown that the excess of nitrogen in the Leguminosæ is obtained from the atmosphere by the instrumentality of bacteria in the soil around the roots of the leguminous plants ; that these bacteria " fix " the free nitrogen contained in the soil, derived, of course, from the atmosphere ; and that, if the soil be sterilised, by which the bacteria are killed, no fixation of nitrogen can take place, and the growth of the leguminous plant remains appreciably attenuated. The roots of leguminous plants growing in the ordinary soil are known to possess numbers of nodular growths. These nodules have been thoroughly investigated by a large number of observers, and their importance in the process of fixing the nitrogen, and in the proper development of the plant, has been satisfactorily worked out ; foremost amongst these stand the investigations of Marshall Ward, of Sir John Lawes and Sir Henry Gilbert, of Beyerinck, Prazmowski, Nobbe, and Frank. Beyerinck, then Prazmowski, and particularly Nobbe, have shown that the nodules on the roots owe their origin to the growth in the tissues of the root of certain bacteria, and it is these bacteria which are instrumental in fixing the free nitrogen. These bacteria represent well-defined species, and, as Nobbe has shown, differ for the different Leguminosæ.

Photographs were shown to illustrate the distribution, in the tissue of the nodules on the roots of lupines, of particular species of bacteria, then the character of these bacteria under cultivations, and their aspect and size in microscopic specimens. This species of bacilli is composed of motile cylindrical rods, which, cultivated in gelatine, liquefy this, and produce in the liquefied gelatine a peculiar greenish fluorescent colouring ; on agar they also produce this colouring. The nature of the young colonies in plate cultivation, their manner of spreading and swarming, are well shown in such photographs.

Chromogenic and Phosphorescent Bacteria.

The remarkable species of what are termed chromogenic bacteria have the power to produce pigments, either pigments which become dissolved in the medium in which these bacteria grow, or which remain limited to the substance of the bacteria themselves. Species of bacteria there are which produce pigments of scarlet, red, orange, yellow, yellow-green, green, greenish-blue, blue, violet, or pink colour. The nature of these pigments and the meaning and object of their formation are still shrouded in a good deal of mystery, though Erdmann and Schrötter showed long ago that many points of similarity exist between some of these pigments and certain aniline colours. *Bacillus prodigiosus* is the more common of the chromogenic bacteria, being occasionally present in water and in air. The pigment is soluble in alcohol, though only to a limited degree.

I can only make a brief reference to another remarkable group of bacteria, which comprises several species, all having the power to produce luminosity of themselves and the medium in which they grow. These phosphorescent bacteria have been long known (Pflüger) to be concerned in the production of the phosphorescent condition of decomposing sea fish, but within recent times Ludwig, Fischer, Katz, and particularly Beyerinck, have studied more in detail the conditions under which these bacteria grow, and have identified and cultivated several species. Dr. Beyerinck has sent me one species of these phosphorescent bacteria, the elements of which are short oval rods, often dumb-bells; they grow in fish broth, and when the growth becomes conspicuous to the unaided eye it is luminous when viewed in the dark. Some cultures were exhibited which, when placed in the dark, showed a beautiful phosphorescent appearance. The phosphorescence is more or less limited to the surface layer, that is the one in contact with the oxygen of the air; in the depth it is absent, but when shaking the flask the phosphorescence appears also in the depth.

Fermentation.

I have mentioned, in connexion with a previous group, bacterial species which have the power by hydration to change urea into ammonium carbonate—a change which is called a fermentative action. Changes similar to these are caused by micro-organisms in many processes playing an important part in industries. Amongst these changes I may mention one in particular, the souring of milk. There are a good many others, the viscous or mannite fermentation, the butyric fermentation, the indigo fermentation, the dextran fermentation, the acetic acid fermentation, and others; but we must confine ourselves to the description of one, viz. the common *Bacterium lactis*. It is a minute oval bacterium, which multiplies with great rapidity, and which, introduced into milk, turns this sour in 12 to 24 hours at the ordinary temperature; when sterile milk is inoculated with this bacterium and kept in a warm place at a temperature of 60° to 65° F., the milk is found solid and curdled before 20 or 24 hours are over, and in this curdled milk large numbers of the *Bacterium lactis* are present either as dumb-bell ovals or as short chains. When a needle is dipped first into such curdled milk and then into normal milk, the same coagulation with the same appearances takes place in the latter. When a plate cultivation of such milk is made it is seen that a large number of colonies, all of the same character, are developed, which colonies are made up of the *Bacterium lactis*; through however numerous generations this organism is cultivated in artificial cultivations—it grows well on nutritive gelatine to which whey or only lactic sugar has been added —if it is then transferred to fresh milk, it always produces this souring and curdling; that is to say, it changes lactic sugar into lactic acid, and as this is being formed it coagulates and precipitates the casein of the milk. With a trace of milk that has gone naturally sour—that is to say, to which the *Bacterium lactis* has found entrance, and in which by its multiplication it has produced curdling, any amount of normal milk can be successively turned sour and curdled.

Bacterium lactis is not by any means a rare organism; it is widely distributed, and can at any moment, in dairies and other places, through impurities of the utensils, by dust, &c., find access to milk, which would soon succumb to its attacks. When, for instance, in dairies or in one or another locality, the milk has a frequent tendency to turn sour, this means that the *Bacterium lactis* has taken firm footing in such a locality. It is well known that only extreme measures of cleanliness, thorough boiling of all utensils and vessels, cleaning of walls and floors, can banish or reduce it. In this the analogy with an epidemic of an infectious disease is obvious. Just as in an epidemic, every susceptible individual to which the contagium has had access becomes smitten by infection, and just as in an epidemic the contagium of the disease, being of wide distribution, and having taken a firm hold of the locality, attacks an increasing number of individuals, and thus causes the epidemic—so also in the case of the *Bacterium lactis*: when this has taken a firm hold of, and has acquired a great distribution in, any locality, any sample of milk (*i.e.* susceptible individual) may take the infection, either by coming in contact, directly or indirectly, with a trace of the milk already infected, *e.g.* by being placed in vessels in which infected milk has been kept previously, or becoming infected through dust charged with *Bacterium lactis*, or coming in contact with water poured from a vessel in which traces of the microbes were still left. All this finds its complete analogy in the case of an epidemic infectious disease. The fermentative processes due to microbic activity, and playing an important part in industries (alcoholic and other fermentations), illustrate in a very striking manner some of the essential features observed in the nature, in the production, and in the spread of infectious diseases in man and animals. The fermentative processes, thoroughly established as being due to microbic activity by the researches of Pasteur, were by Pasteur, and others after him, used as illustrations of the way in which infectious disorders in man and animals arise, and it was exactly these considerations which led Pasteur to his brilliant studies of these diseases, the results of which studies have been of such signal service in sanitary science in general, and in the prevention of infectious diseases in particular.

In the fermentative processes studied by Pasteur and others it was shown that each specific fermentative process is due to the growth and multiplication of a specific microbe. Just the same is the case with the infectious diseases—when from a substance which is in the process of fermentation, a trace containing the particular microbe is introduced into fresh fermentable substance, this latter undergoes the same fermentation; further, it is shown that, however great the number of accidental non-specific bacteria which may be introduced at the same time, unless that particular bacterium be present amongst them, the specific fermentative change does not ensue. The same is the case with infectious diseases: the number of non-specific bacteria in water, dust, air, various common articles of food, &c., is sometimes great, but no amount of these would set up any of the infectious diseases, like cholera or typhoid fever, tetanus or diphtheria; in order to do so there must be amongst them the particular microbe of cholera or typhoid fever, &c. Again in each fermentative process the substance which is to undergo the fermentation must be susceptible of the particular fermentation: a substance that contains sugar can undergo the alcoholic fermentation, a substance that contains alcohol can undergo the acetic acid fermentation, &c. The same is the case in the infectious diseases: an individual must be susceptible to the disease, though it is not quite clearly established what the meaning of this is. Further, just as in the fermentative process the susceptibility of the substance alone is not sufficient, is only a preliminary condition, the actual infection with the specific microbe being the essential, so also in the infectious disease: in order that a susceptible individual should become the subject of the disease, it is essential that the specific microbe should be present and should find entrance into this susceptible individual. Just as little as a particular condition of the atmosphere, of temperature, &c., is capable of producing the souring of milk, so also a particular atmospheric or telluric condition, season, or other external circumstances alone cannot produce an infectious disease. What is wanted in the first place is the presence of the *Bacterium lactis* in the one, the specific pathogenic microbe in the other; atmospheric or telluric conditions may and do favour the more rapid multiplication and dissemination of the *Bacterium lactis* or other specific microbes, but without the presence of the specific microbes these processes could not take place. "Thunder in the air" could not turn the milk sour, could not make meat tainted, could not turn beer or wine sour, without the presence of the specific microbes, which by their presence and multiplication produce those undesired changes in these substances; the particular condition of the air could and would increase their rate of multiplication and distribution, and therefore increase the chances of infection of these substances, and consequently a more conspicuous manifestation of the effects of the activity of those microbes, but it could not produce the microbes themselves.

Pathogenic Bacteria.

The different pathogenic bacteria connected with and causing the different infectious diseases have, then, the power of growing and multiplying within the infected individual and, through the different poisonous substances—toxins—which they therein produce, of causing the changes which characterise the particular disease.

Photographs of a variety of such pathogenic bacteria serve to show that both as regards the manner of distribution of these bacteria in the tissues of the infected individuals, as also in their morphological and biological characters in artificial cultures, most of them are sufficiently distinguished from one another and from other non-pathogenic bacteria. In considering the general action of pathogenic bacteria we find that they may be arranged in two groups :—

a. Such as are entirely, so far as our knowledge at present goes, dependent on the living body of man or animals. These are *endogenic* bacteria or true parasites, for they do not appear to lead an existence independent of the living body. When, therefore, infection by them takes place, it is effected by direct transference from an infected individual to a new one; this is so in small-pox, in vaccinia, and in hydrophobia.

b. A second group comprises those which are capable, besides a parasitic life, *i.e.* growing and multiplying within the animal body, of leading also an existence independent of the animal body : that is to say, they, like many other non-pathogenic bacteria, are capable of thriving in suitable materials in the outside world; such are anthrax and fowl cholera, Asiatic cholera and typhoid fever, tetanus and diphtheria, and others. But also amongst these some can lead such an *ectogenic* life comparatively easily, while others do so only in a restricted sense. While, for instance, anthrax, tetanus, typhoid fever can lead such ectogenic life easily, *i.e.* growing and multiplying outside the animal body, others, like tubercle and glanders, do so only to a very small extent. The former are obviously the more dangerous to man and animals, on account of their more ready distribution, than the latter, of which the ectogenic existence is considerably restricted by various conditions, *e.g.* they require higher temperatures to grow at, and they require a much more specialised nutritive medium than is generally attainable by them.

Many and wonderful are the results which have been obtained within a comparatively short recent period by a large number of workers as regards the identification of many of the pathogenic bacteria, their habits of life, their mode of spread and infection ; the way in which their action can be attenuated, their effects weakened, and such weakened cultures used for protective inoculations ;—the brilliant results achieved by Pasteur and many others in these protective and curative inoculations against anthrax, against fowl cholera, against tubercle, against hydrophobia, against tetanus, and other diseases.

E. Klein,

St. Bartholomew's Hospital, London.

PUBLICATIONS OF INTEREST TO AGRICULTURISTS.

I.—CROSS-FERTILISATION OF PEARS.[1]

A POSTSCRIPT to the paper on Cross-fertilisation of Cereals (Journal, Vol. IV. 3rd series, Part IV. 1893, p. 701) indicated some important results from experiments in cross-fertilisation of pears. The detailed account of these experiments has since been issued from the Department of Agriculture, Washington. The results obtained deserve a longer notice than was given to them in the note referred to, because of their practical bearing on fruit culture.

A poor crop of pears is often due to causes over which the cultivator has control. Care has to be taken that the trees are in a healthy and vigorous condition. This is necessary not only for the quality but also for the quantity of the fruit. In a weak or diseased tree fewer blossoms set, and those that do set do not produce full sized fruits. The character of the tree also must be observed, and when that is not satisfactory the tree should be removed. Sometimes a vigorous tree has a tendency to produce only leaf-bearing branches; this can be stopped by severe pruning. The causes of a poor crop are, however, generally beyond the control of the cultivator. A small proportion only of the blossoms on a tree produce fruit. In a cluster of flowers usually one develops into a fruit, the others fall off early. Even before the blossom has disappeared a large number have fallen to the ground, and within a week or two some of those that have shown signs of setting also drop off. This is a natural operation, which prevents the tree bearing more fruits than it is able to perfect. Wet weather at the time when the anthers are fully ripe and have discharged their pollen grains prevents fertilisation. In such weather the bees and other insects, which are the agents in carrying the pollen grains to the stigma, are not about. Then a heavy shower will wash off all the free pollen grains and carry them to the ground. A decrease in the temperature also is very destructive to the young fruit. A few degrees of frost may kill the tender growing seed, and a little more severe frost may fatally injure the pistil.

The experiments of Mr. M. B. Waite show that there are conditions, hitherto scarcely suspected, which seriously affect the crops, and which are completely within the control of the cultivator.

Mr. Galloway, the Chief of the Division of Vegetable Pathology in the United States Department of Agriculture, resolved to make some investigations into the influence of insects in producing

[1] *The Pollination of Pear Flowers.* By MERTON B. WAITE. Pp. 86, with 12 Plates and other Illustrations. U.S. Department of Agriculture: Washington, 1894.

"the fire" or twig blight of the pear, and put the matter into the hands of Mr. Waite. The disease was prevented wherever the blossoms were effectually guarded against the visits of insects. It was clear that the bacteria causing this blight were carried by the insects from flower to flower. But it was observed as a result of the experiments that the exclusion of the insects from the flowers prevented the blossoms from setting their fruit. This suggested an inquiry into the conditions under which fertilisation took place, and experiments having this in view were instituted, in the spring of 1892, which have shed a new light on an important cause of unfruitfulness in pears and apples which had not hitherto been suspected by practical fruit-growers.

The method of proceeding was to cover the flowers while they were yet in bud with bags of paper, cheese cloth, or nets. The paper bags excluded insects and pollen, the cheese cloth bags were nearly as efficient, while the meshes of the net, being about ten to the inch, permitted the entrance of pollen grains if they were carried from tree to tree by the wind.

To determine the effects of the pollen from different flowers, it was necessary to prevent the pollen produced by the flower experimented on from falling on the stigma. This was done by cutting away with a pair of fine scissors the calyx, corolla, and stamens from the flower bud just before opening. Examination of the vertical section of the flower of a pear shows that this can easily be done. The calyx, corolla, and stamens spring from the edge of a cup, while the styles rise, at some distance from them, through the centre of the cup. A careful cutting away of the cup below the rim, where the different organs are given off, leaves the pistil uninjured. All the other flowers in the cluster were removed. A sufficient number of flowers being thus prepared, pollen was applied by the hand to the stigmas from (1) the same flower, (2) a flower from another part of the same branch, (3) a flower from another tree of the same variety, and (4) a flower of another variety. One of the experiment stations was in a large orchard, containing about 22,000 standard William pear-trees (called in America Bartletts). Not a single William blossom set fruit with pollen from a William flower, no matter where the pollen was obtained from, while a large proportion of the flowers crossed with other varieties did. The results were practically the same in the other experimental stations, except that some varieties were sufficiently influenced by their own pollen to produce fruit, though in all the cases the fruits were smaller and the seeds small and barren. The William is nearly, or quite, self-sterile, and so also are the following twenty-one other varieties which were experimented upon :—Anjou, Boussock, Clairgeau, Clapp's Favourite, Columbia, De la Chène, Doyenne Sieulle, Easter, Gansel's Bergamotte, Grey Doyenne, Howell, Jones, Lawrence, Louise Bonne de Jersey, Mount Vernon, Pound, Sheldon, Souvenir du Congrès, Superfin, Wilder (Col.) Winter Nelis. A smaller number of varieties have been observed to be able more or less to fertilise themselves. These are : Angoulême, Box, Brockworth, Buffum, Diel, Doyenne d'Alençon, Flemish Beauty, Heathcote, Kieffer, Le Conte, Manning's Elizabeth, Sechel, Tyson, White Doyenne.

The failure to secure fertilisation by pollen from other plants of the same variety is of the greatest importance to cultivators. Yet it is only the confirmation of the more or less self-sterility of the flowers borne by an individual plant, seeing that all the separate portions of a cultivated variety, on whatever stock they are grown, are portions of a single tree. Thus the trees of William pear growing in Britain, on the Continent, in America, the Cape and Australia, are all parts of the original William tree. By budding or grafting the tree has been immensely multiplied, but it has never been reproduced from seed. Each separate fragment, though supported on an independent stock, retains all the peculiarities of the original plant. In operating, then, with the pollen from the flower of any William tree, we are using only the pollen of a different, though now independent, branch of one tree.

The large orchard of William pears where some of the experiments were carried on had been planted some seventeen or eighteen years. A portion of the site had been a small orchard of different varieties, which had been very productive. So the proprietor, to secure a valuable orchard, grubbed up the old orchard and planted 22,000 William trees. He has never been able to get a full crop from them. One year the orchard yielded 4,000 boxes of three pecks each, being an average of three-fifths of a peck per tree. Similar trees twelve years old ordinarily yield four or five times that quantity under favourable conditions. In 1891 the crop was only 1,200 boxes, and in 1892 it was less than 100 boxes. In the orchard three trees of different varieties had been by mistake planted among the Williams; two were Clapp's Favourite and the other a Buffum. In the neighbourhood of these three trees the Williams were very productive, bearing down the branches to the ground with the weight of fruit. His previous experiments led Mr. Waite to believe that this limited and local abundance was caused by cross-fertilisation from the other trees, and this view was fully confirmed by all his subsequent experiments.

Another interesting result of these investigations of Mr. Waite is that the fruits which have hitherto been described and figured, and been generally known as the type pears of a particular variety, are not pure bred but crosses. The fruits obtained in the few cases where self-fertilisation was effective were remarkably uniform among themselves, but they were smaller and different in form from the general crop on the tree; the seeds enclosed in the fruits were small and imperfectly developed, and being without embryos were incapable of germinating. On the other hand, the qualities of the fruit in these self-fertilised cases were constant: they were more juicy and more delicate in flavour than the general crop. In a vigorous, full-bearing tree of William pears one or two, or perhaps three, of these smaller self-fertilised pears may be found. In future these small pears must be studied as representing the pure type of the variety, while the modifications in the general crop must be traced to the influence of the neighbouring varieties. There is here abundant scope for the cultivator to secure, by proper selection, such parents in an apple or pear orchard (for what is true of the pear is true also of the apple) as will give the best qualities to his produce. Taking the one property of weight as an indication of what may be done, it was found that the average pear of a self-fertilised William weighed 100 grams, while the pollen of an Easter applied to the William gave an average fruit of 167 grams, of an Angoulême 133 grams, of an Anjou 116 grams, of Clapp's Favourite 114 grams, and of a White Doyenne only 89 grams.

The practical conclusions from these interesting experiments are : 1. Plant mixed orchards, or at least avoid planting solid blocks of one variety. 2. Where blossoms fail to produce fruit for a series of years in large blocks of trees of one variety, it is most probable that the failure is due to want of cross-fertilisation. 3. And as bees and other insects are the agents for the transportation of pollen, it is desirable to see that there are sufficient bees in the neighbourhood, or within two or three miles, to visit the blossoms. When feasible, sheltered situations should be selected to encourage the visits of insects.

William Carruthers.

44 Central Hill, Norwood, S.E.

II.—HAWKS AND OWLS.[1]

This publication, which is an official bulletin on the Hawks and Owls of the United States in their relation to Agriculture, is no mere pamphlet, but a handsome volume of some two hundred pages, illustrated by twenty-six original coloured plates. It presents the results of a laborious scientific investigation extending over several years, and the keynote of the bulletin is struck in the letter of transmittal, where we read :—

> The statements herein contained respecting the food of the various hawks and owls are based on the critical examination, by scientific experts, of the actual contents of about 2,700 stomachs of these birds, and consequently may be fairly regarded as a truthful showing of the normal food of each species. The results prove that a class of birds commonly looked upon as enemies to the farmer, and indiscriminately destroyed whenever occasion offers, really rank among his best friends, and with few exceptions should be preserved, and encouraged to take up their abode in the neighbourhood of his home.

Seventy-three species of rapacious birds are dealt with, and these are divided, on economic grounds, into four classes :—(*a*) Those wholly beneficial or harmless ; (*b*) those chiefly beneficial ; (*c*) those in which the beneficial and harmful qualities balance ; (*d*) those positively harmful.

---

[1] *The Hawks and Owls of the United States in their Relation to Agriculture.* By A. K. Fisher, M.D. Published by the U.S. Department of Agriculture: 1893.

The second class is found to contain the greater number of species, and, what is more important, most of the best known and most commonly occurring species are included in it.

Only six species fall into the category of the positively harmful birds. Three of these are so rare that their depredations may be neglected; one exercises its rapacity on fish, and two alone are to be regarded as absolute foes to the farmer. Neither of these, we may remark, are English birds.

Dr. Fisher pathetically laments the impossibility of any clear division of rapacious birds into two groups, the beneficial and the injurious. Such a division, besides possessing the charm of simplicity, would afford the practical agriculturist a clear and unequivocal guide to action on the appearance of any bird.

So simple a classification, however, is obviously quite out of the question. Not only may the same bird both benefit and injure us by its general habits, feeding, perhaps, impartially on mice and poultry, but there are cases, like that of the rook, where a bird is a serious nuisance for a brief period, and a valuable ally during the remainder of the year. Clearly the only method by which a true conclusion can be arrived at is an accurate determination of the habits and a careful weighing of the pros and cons in the case of each species, and it is the masterly application of this method which entitles the publication under notice to rank as a valuable contribution to American agricultural science.

We say advisedly *American* agricultural science. Beyond the general conclusion that all the owls and most of the hawks are friends and not foes, this book, though highly interesting, possesses little practical value for the English farmer on account of the fact that most of the species dealt with are unknown in this country.

Only six of the birds under notice are to be recognised as true British species, and of these the owls alone possess any economic importance. In the United States, as in England, the barn owl and the long- and short-eared owls are found to feed almost exclusively on injurious rodents, such as mice and voles. Indeed no good reason is given for denying them a place in the first class of entirely beneficial rapacious birds.

The two members of the hawk tribe which possess the greatest interest for the British farmer are not included in the American list. These are, of course, the sparrow-hawk and the kestrel. The former, though it preys to some extent upon mice and insects, commits serious havoc among game and poultry, and there is little doubt that the harm it does in this direction considerably exceeds the benefits it otherwise confers, and the farmer is justified in regarding it as an enemy.

With the kestrel the reverse is the case. It will certainly take game, but only when exceedingly young and helpless, while, throughout the remainder of the year, the benefit it confers by the wholesale destruction of mice and beetles is incalculable. English wild birds in their relation to agriculture have, however, been already treated in this Journal, and we may refer those interested in the subject to the accurate and comprehensive articles by Mr. Archibald which appeared in Part IV. of Vol. III., 3rd series, 1892, and in the current volume of the Journal (Part I., 1894, p. 60).

The Report on the plague of field-voles[1] in Scotland issued by the Board of Agriculture last year also deals with the economic value of the kestrel, the sparrow-hawk and the owls.

To return to the American publication, the twenty-six coloured plates deserve a special word of commendation. The drawings are evidently original, being in no sense a reproduction of Audubon's figures, and, to judge from the few species familiar to us, they are remarkably faithful portraits, and add greatly to the value of the bulletin. The department recognised so clearly the importance of ample and faithful illustration of a work intended for the use of practical men that the publication was considerably delayed in order that satisfactory plates might be prepared.

The figures are of course reduced, but their relation to the size of the actual birds is indicated on each plate. This plan is no doubt the best, though such awkward ratios as $\frac{2}{7}$ and $\frac{2}{5}$ might surely have been avoided without much difficulty. Absolute measurements of length and "extent" are calculated to mislead rather than to enlighten the uninitiated. Twenty-two inches across the wings would probably suggest to the average mind a bird of much larger dimensions than the familiar sparrow-hawk.

CECIL WARBURTON.

Zoological Laboratory, Cambridge.

THE GEOLOGICAL SURVEY OF ENGLAND AND WALES.[2]

THE general scope of the work of the Geological Survey has been made the subject of a paper in the current volume of the Journal (Part I., pp. 140–162). As, however, the work of the Survey is continuously progressing, and as many of the results are of direct interest to agriculturists, the following extracts are made from the latest published report of the Director-General.

Drift Survey.—In the early maps published by the Survey, superficial deposits were generally left unrepresented. The importance of these deposits in questions of agriculture, drainage, water-supply, and public health having at length been recognised, it was determined that in future they should be traced and shown upon the maps. As at first they were inadequately understood by geologists, the mapping of them could not be made wholly satisfactory and complete. But as they came to be more thoroughly studied and

[1] Reviewed in the Journal, Vol. IV. 3rd series, Part II., 1893, p. 421.

[2] Excerpts from the Annual Report for 1892 of the Director-General of the Geological Survey. From the Fortieth Report of the Science and Art Department, published in 1893.

more carefully traced, they have been represented with increasing fulness and accuracy upon the maps. It has been thought desirable to revise and complete the earlier drift surveys in the north of England, and to extend these surveys over the other parts of the country where they have not previously been made. This renewed examination of the ground is carried on upon maps of the scale of six inches to the mile, and advantage is taken of it to check, and where needful to correct, the already published mapping of the older geological formations underneath.

As the Geological Survey advanced into the eastern counties of England, the importance of the drift deposits became increasingly manifest. Over large districts, indeed, it was impossible satisfactorily to delineate on maps the structure and boundaries of the formations underlying the drifts which spread as a deep cover above them. For such areas drift maps only could be issued.

It was not until the original survey of the whole of England and Wales had been completed that the systematic re-survey of the drifts was begun on the six-inch scale, over those areas not previously re-surveyed for this purpose. In the south-east of England, where the work is under the charge of Mr. Whitaker, it has extended from Huntingdonshire across the counties of Bedford, Hertford, Buckingham, Oxford, Berks, Wilts, Hants, and the south of Sussex.

Among the more important or interesting observations made by the officers in the course of these operations, the following may be referred to. Fresh information has been obtained as to the form of the land-surface on which the oldest parts of the drift deposits were laid down. A few years ago Mr. Whitaker described some deep channels excavated in the Chalk, and subsequently filled with Boulder Clay, in the long valley running south from Saffron Waldron. The River Cam now drains the northern part of this old valley, the River Stort the southern part. Mr. Cameron has recently noted a similar old channel, 100 feet deep and filled with drift, near Walkern in Hertfordshire.

In regard to the Boulder Clay itself, the mapping recently carried on by Mr. C. Fox-Strangways in East and Central Leicestershire, so far as it has gone, confirms the previous observations of Mr. Deeley in the Trent Valley by tending to show that this deposit may be grouped into three fairly well-marked divisions, separated by sand, gravel, or brickearth. The oldest Boulder Clay seems to have come from the west ; the "Chalky Boulder Clay," which is the division most largely developed in this area, arrived from the east. This Chalky Boulder Clay is well known for the occasional great size of the transported masses which it contains. Mr. Fox-Strangways has recently noted one of exceptionally large dimensions to the north-west of Melton. It is a mass of Lincolnshire Oolite, at least 300 yards long and 100 yards broad ; but it may extend beneath the Boulder Clay to a further distance. Quarries have been opened in this mass, at one place to a depth of 15 feet. Again, in the Boulder Clay of Huntingdonshire, Mr. Cameron has observed an erratic of flinty Chalk, of such large dimensions that the village of

Catworth has been built on it, and it extends also over a considerable area of the surrounding land.

While alluding to the older drifts of the South of England, I may refer to the fact that the recent extension of the Geological Survey into South Wales, for the revision of the coalfield, has enabled us to begin the systematic examination of the superficial deposits of that region, which up to the present time are almost unknown. Mr. A. Strahan has found true ice-striated rock-surfaces and undoubted Boulder Clay, indicating a southward movement of the ice, together with abundant deposits of sands and gravels which are probably the most southerly examples of true eskers or kames in this country.

Much attention has been given by the officers of the Survey to the mapping of the high-lying or plateau-gravels in the Isle of Wight. Much of this island, as well as of the low grounds of Hampshire, has been shown to have been formerly overspread by these deposits; but they exist now only in widely separated patches, which, lying high above the modern valleys, serve to mark the great denudation undergone by the island. A more recent set of river gravels, distributed along the existing valleys, has obviously been derived from the waste of the plateau-gravels. By the encroachment of the sea the valley of the West Yar has been cut across, so that the valley-gravels now form a capping to the sea cliff. In the Weymouth district Mr. Strahan has recently mapped some interesting tracts of high-level gravels, which have been deeply denuded, and from which possibly the materials of the famous Chesil Beach may have been in part derived.

The mapping of the southern portions of Sussex by Mr. Clement Reid has brought to light several novel and important facts in regard to the condition of that part of England during the Ice Age. He has discovered that a deposit with glacially striated erratics lies there beneath certain clays full of the remains of temperate animals and plants, whilst above these clays comes another deposit produced apparently under arctic conditions.

Tertiary.—The re-examination of the Tertiary areas to the west of London for the Drift Survey has shown the general accuracy of the old mapping, though the boundary lines have been occasionally improved. In Hampshire and the Isle of Wight more extensive alterations have been necessary. Thus, the Hamstead Beds, in place of occupying mere isolated patches on the high ground, as was believed when the original map was prepared, are now known to cover a large area. This was proved by Mr. Reid, chiefly by the use of portable boring-rods, such as had for some time previously been employed by the Belgian Geological Survey. These tools have also proved of great service in some recent work in the Eastern Counties. Certain small outliers on the Chalk of Hampshire, shown as Eocene on the old map, have now been placed among the drifts, and have been mapped as "Clay-with-flints." Probably here, as is often the case in parts of the London Basin, the so-called "Clay-with-flints" is in great part rearranged Eocene material.

The occurrence of lenticular masses of pebbles at the top of the Reading Beds has been noted in the Hampshire Basin. These possibly represent the Blackheath Beds of the London Basin. The Bagshot Pebble-beds have also been detected over a fairly large area in the Hampshire Basin.

In West Sussex, Mr. Reid has improved the mapping of the Tertiary tracts. Although the strata are much covered with drift, well-sections and other data have enabled him to carry the Eocene formations over a considerably larger area than is shown on the old map, and also to ascertain in the district the nature and importance of the folds and other disturbances which traverse the Secondary rocks of the South of England. The westward extension of these structural features has been traced by Mr. Whitaker through the Southampton district, where Bagshot Sand and London Clay have sometimes been thus brought up within areas hitherto believed to lie upon Bracklesham Beds. In Sussex these folds trend east and west, but in Hampshire they turn towards the north-west.

Cretaceous.—On the older one-inch maps the Chalk was shown as one mass, no attempt being made to indicate its subdivisions. Indeed, no such subdivisions were formerly recognised, save a general grouping into Chalk-with-flints and Chalk-without-flints. Sometimes the lowest portion was separately referred to as Chalk Marl. In later surveys, however, advantage has been taken of the opportunity of tracing on the ground the subdivisions that can now be mapped. These are as follows :—

Upper Chalk.
Chalk Rock.
Middle Chalk, with Melbourne Rock (at the base).
Lower Chalk, with Totternhoe Stone.
Chalk Marl.

The Totternhoe Stone was mapped by Mr. Whitaker many years ago along a part of the northern side of the London Basin ; he also first recognised the "Chalk Rock," but only of late years have these geological horizons been represented on the maps.

The subdivisions of the Chalk, as above described, are less marked in the western areas. Along the northern outcrop, Totternhoe Stone dies out in Berkshire, the Chalk Rock and Melbourne Rock continuing into Dorset and Devon. Along the southern outcrop, the Totternhoe Stone does not exist; and the other rock-beds have not been recognised west of the neighbourhood of Dorchester.

The separation of the thick mass of Chalk into so many distinct subdivisions has both an economic and a scientific interest. By revealing the actual structure of the Chalk and the outcrops of its several members the new mapping renders essential service in questions of water-supply. It likewise indicates the undulations into which, in consequence of subterranean disturbances, the Chalk has been thrown. These undulations, though often too gentle to be safely inferred from surface exposures, are apparent when the outcrops of the several subdivisions of the Chalk are continuously traced.

In the Chalk area of Hampshire, Mr. Hawkins, by mapping out these horizons, has proved the general accuracy of the interpretation of the structure of that region given by Dr. Barrois. The uprise at Winchester is well marked, Lower Chalk being there brought to the surface. The folds traversing the Chalk in the western part of the Hampshire Basin, though more strongly marked than those of the London Basin, can only be satisfactorily made out by mapping the subdivisions of the Chalk. Some of the ruptures attendant on the plication of the rocks, so marked in Dorsetshire, are prolonged even into Sussex, and have been detected by Mr. Reid as far east as Eastbourne, where on the foreshore the Cretaceous strata are repeated by faults and overthrusts.

It seems not impossible that the detailed and accurate mapping of the disturbances in the Chalk may ultimately give a clue to the depths of the underlying Palæozoic rocks, a question of the utmost practical importance in regard to the tracing of coal-bearing deposits beneath the South of England.

In 1891 phosphatic Chalk, closely resembling that which is commercially worked in the North of France and in Belgium, was noticed for the first time in this country by Mr. Strahan. The bed is exposed in a Chalk-pit at Taplow, but at present has not been detected elsewhere.

The relations of the Gault and Upper Greensand have long been a matter of uncertainty. Mr. Bristow, the late Senior Director, believed that the two were really one formation, one being locally developed at the expense of the other. Mr. Godwin-Austen regarded the Upper Greensand as a shore-deposit, in part contemporaneous with the Gault of deeper waters. Other geologists have expressed similar views. These opinions have received support from our recent Surveys. The upper part of the Gault becomes more sandy to the west, and was there mapped as Upper Greensand, the clay coloured as Gault in Wiltshire representing only about the lower third part of the Gault of Folkestone. This clay becomes so thin to the west that it cannot be separately mapped.

Mr. Jukes-Browne makes three divisions of the Gault and Upper Greensand Series, which are now found to constitute really one formation :—

3. Greensands and Sandstone, and Chert-beds (Zone of *Pecten asper*).
2. Buff Sands, Malmstones, and Silty Marls; the last representing the Upper Gault (Zone of *Ammonites rostratus*).
1. Lower Gault Clays (Zone of *Ammonites lautus and Amm. interruptus*).

The Chert-beds of Wiltshire and Devonshire are local developments in the Zone of *Pecten asper*. They are not found in Dorset; but they attain importance in the Isle of Wight, and were there separately mapped by Mr. Strahan.

In the neighbourhood of Devizes the subdivisions of the Upper Greensand are well marked. The lower one, or "Malmstone," contains, especially in the lower part, colloid silica in the form of small round globules and sponge spicules, sometimes to the extent of from 40 to 50 per cent. of the stone. The upper division, about 70 feet thick near Devizes, consists of green and grey sands. As these are irregular in thickness, thin out rapidly to the north, and extend as a band in a nearly east and west direction, they may represent an ancient sand-bank. The persistence of the Malmstone over a very wide extent of the Upper Greensand of England is a noteworthy fact.

A revived industry of some interest on the borders of Bedfordshire and Buckinghamshire is the extraction of fuller's earth from the Lower Greensand. This deposit is now worked by mincs on the flanks of the escarpment. Mr. Cameron has frequently visited these mines, and has described them in papers read before the British Association and elsewhere.

Jurassic.—Some of the most important recent additions to our knowledge of the structure of the Jurassic and Cretaceous rocks of the South of England have been made by Mr. Strahan in his re-examination of Dorsetshire for the Drift Survey. The area known as the Isle of Purbeck has long had a peculiar geological interest, not only from the fact that the Portland and Purbeck rocks there reach their maximum development, but also from its structure. It is traversed by an extremely sharp and faulted monoclinal fold, a continuation of the Isle of Wight monocline, from which, however, it differs in being accompanied by inversion of the strata and much overthrust faulting. This structure may, in fact, be regarded as an intermediate stage between a simple monocline and a complete overthrust. The deeply indented coast affords unusual facilities for examining the effect of the movement. The old one-inch map, on account of the smallness of the scale, gave merely a diagrammatic view of the structure of the "island." In the re-survey on the six-inch scale both the faults and the subdivisions of the strata have been traced with a detail that was before impossible. In the Isle of Purbeck the principal additions to the map consist in the tracing of the subdivisions of the Cretaceous system. The Lower Greensand, which is so well developed in the Isle of Wight, was known to exist in the Isle of Purbcck also, but its limits had never been determined. It has now been separated from the Wealden group, with which it was formerly confused, and it has been traccd westward until it finally thins away, while at the same time the Wealden Shales, which form the uppermost subdivision of the Wealden group in the Isle of Wight, have been traced through the Isle of Purbeck as far westward as they extend.

During the mapping of the Lower Greensand, some interesting evidence as to its relation with the overlying Gault came to light. This evidence tends to confirm the conclusions formed during the re-mapping of the Isle of Wight, for the break at the base of the Gault, which was there only suspected, becomes so much more pronounced westwards as to suggest that the base of the Cretaceous system might have been more suitably drawn at the bottom of the Gault than at the bottom of the Wealden group, which is inseparably connected with the Purbeck Beds. Moreover, a conglomerate which forms the base of the Gault seems to correspond to the Carstone of the Isle of Wight, which has again been correlated with the Folkestone Beds. The suggestion, therefore, made long ago, that a portion of the Folkestone Beds should be included in the Upper Cretaceous group receives support. In the Weymouth peninsula the principal alterations relate to the mapping of the subdivisions of the Chalk as far westward as they are recognisable, and in the tracing of subdivisions of the Corallian rocks which are locally developed near Weymouth. The numerous faults of the area have also been followed with a minuteness of detail which was impossible on the old one-inch map. An interesting result has been obtained from this work. The faults and foldings of the strata, though nearly all agreeing in direction, were found to have been formed at two different periods, the one set affecting the Oolitic rocks, but passing under the Upper Cretaceous strata without disturbing them, the other breaking through both Oolitic and Cretaceous rocks alike. The older movements took place between the deposition of the Upper and Lower Cretaceous strata, while the later set were obviously contemporaneous with the Isle of Wight and Isle of Purbeck monoclines, which are believed to be of Miocene age. In more than one case faults of the later age cross obliquely the older lines of fracture, producing a complication which could only be worked out on the large-scale map. The break at the base of the Gault mentioned above seems to have been due to the faulting and upheaving of the rocks during the first of these periods of disturbance. It becomes here a most pronounced unconformability, and the Gault, with a thin conglomerate at its base, passes over the edges of the Wealden, Purbeck, and Kimmeridgian rocks in rapid succession.

In the country around Bedford important changes have been made in the maps. The Oxford Clay is now known to cover a large area of Great Oolite to the north-west of Bedford. In the original survey this clay seems to have been taken as part of the Boulder Clay by which it is generally covered, the underlying Kellaways Sands having been also taken as drift. But the detailed mapping of the drifts of the district has enabled Mr. Cameron to make the correction. Another improvement in the map is the mapping of the Cornbrash over areas where it was formerly supposed to be absent. This bed has now been ascertained to have a continuous range from the coast of Dorsetshire to Yorkshire. A smaller but not unimportant alteration relates to the exposures of clay beneath the Great Oolite near Olney. These were formerly considered to be Lias; but Mr. H. B. Woodward has now shown that, although Upper Lias is present at no great depth, the strata laid bare at the surface are the Upper Estuarine Clays of the Great Oolite series.

Triassic.—Advantage has been taken of the prosecution of the Drift Survey across the salt districts of Cheshire and Staffordshire to obtain much additional information regarding the Triassic rocks, especially with reference to their industrial aspects. Mr. C. E. de Rance has collected 208 sections of the salt-deposits at Northwich, Middlewich, Winsford and Lawton. He has likewise reduced some mining plans of salt-workings and placed their details in the six-inch maps, and has further collected tables of the levels of the brines at various periods, reducing these levels to ordnance datum, and thus showing the height of the upper and lower rock-salt surfaces.

Carboniferous.—It is in the re-examination of the great coal-field of South Wales that the chief recent operations of the Survey in the Carboniferous system have lain. Sufficient progress has now been made to show of how much practical value a detailed survey of this coalfield will prove to be. Mr. Strahan, who has had charge of this work, soon ascertained that, while the great thickness and uniformity of character of the widespread "Pennant Grit" makes it difficult to obtain indications of the geological structure over large tracts of ground, the position of a certain coal-seam known as the "Mynyddislwyn vein" affords an excellent horizon from which the lie of the other strata can be followed in great detail. He has accordingly devoted special attention to tracing the outcrop of this seam and the trend of the numerous faults which have been met with in working it. He has had occasion to examine a large series of plans of old workings, and to reduce from these the necessary data upon the six-inch ordnance maps. When these maps are completed, with all the available detailed information, they will probably afford a sufficient and accurate guide to the depth and dip of the various coal-seams over a large part of the area. The information thus worked out, combined with a precise geological mapping of the ground, will prevent the waste of large sums of money in seeking for coal, by showing exactly the limits within which the seams may be looked for and the depths at which they may be expected.

Devonian.—The maps of Devon and Cornwall were the first on which the Geological Survey began its operations. The region which they represent, besides the importance of its mineral industries, is one of great geological complication, which could not be properly worked out on maps of so small a scale as one inch to a mile and so inaccurate in their topography. Moreover, at the time when these maps were made, geological science was far from being so well equipped as it now is for attacking such problems as are presented by the rocks of the South-west of England. It has long been recognised, therefore, that a total re-survey of that region was needed; but the state of progress of the survey of other parts of the country has hitherto prevented this work from being undertaken on an adequate scale. But as the eventual re-survey, which must sooner or later be carried out, will be greatly facilitated by an accurate determination of the stratigraphical horizons of the Devonian rocks, and a detailed mapping of these in some one district, Mr. Ussher has been employed in conducting these operations in the south of Devonshire. By a sedulous scrutiny of the ground he has been enabled to detect the presence of organic remains previously unnoticed, and by their aid to distinguish and trace the three great divisions of the Devonian system over the district between Newton Abbott and Plymouth.

Water Supply.—During 1892 a Royal Commission was appointed to consider the question of the water supply of London. Having been nominated one of the Commissioners Sir Archibald Geikie considered it desirable that every assistance to the inquiry which it was in the power of the Geological Survey to render should be given. As so much of the value of the investigation would depend upon the accuracy of the geological information laid before the Commission, he placed at its disposal the published maps of the Survey and such unpublished data as might be of service. Two maps of the region embraced by the inquiry were supplied from the Survey office, viz.: one of the entire Thames Basin, showing the nature and distribution of the superficial deposits over the Chalk and Tertiary areas; and one of the Chalk areas within that basin, indicating the tract of bare Chalk, the districts covered with more or less pervious accumulations which allow the rain to sink through them into the Chalk, and the districts where the Chalk is covered with impervious deposits which throw the rain off upon the surrounding ground. The areas of these impervious deposits are further distinguished according as they throw the drainage away from or into the Chalk.

At the request of the Commission, Messrs. Whitaker and Topley, who have an intimate knowledge of the geology of the London Basin, made a careful examination of the Chalk area of the east of Kent, with special reference to the possibility of obtaining an additional supply of water from that district for London. The data obtained by them have been laid before the Commission and will appear in its report.

Applications for Information.—During the year numerous inquiries were made at the office of the Survey, 28 Jermyn Street, London, S.W., respecting Agriculture, Water Supply, Building Materials, and allied subjects, and were duly attended to.

THE SPRING OF 1894.

Regarded from an agricultural standpoint, the weather of last spring was distinctly disappointing, for while the earlier part of the period was, as a rule, fine, warm, and dry, the latter part was characterised by excessive rains, and, what was even worse, by persistent low temperatures. The natural progress of the season from winter cold to summer warmth was, in fact, to a large extent reversed, the weather at the close of the spring being more in keeping with the beginning of March than with the end of May.

During the first half of March the country experienced a continuance of the stormy showery conditions which prevailed throughout the greater part of last winter, and by the middle of the month the farmer was beginning to long for dry weather, in order that he might get on with the ordinary spring work. The wish was soon gratified, a complete absence of rain being reported over nearly the whole of the United Kingdom during the closing fortnight in the month. In some localities the drought continued much longer, and early in April fears were expressed that the spring of 1894 might prove as disastrous to the agriculturist as that of 1893. A gradual break-up in the weather was, however, in progress ; and although for a week or two the showers were very partial, and in many places very slight, the entire country was at length visited by a fairly copious rainfall. By the end of April the general outlook was, in fact, unusually favourable, and had the following month proved equally kind, there can be little doubt that the harvest prospects for 1894 would have been phenomenally good. The proverbial caprices of an English May were, however, displayed this year in a more than ordinary degree, the weather being changeable in the extreme, with heavy rains in most places, and with unusually low temperatures, especially during the latter half of the month. Occasional frosts in May are common enough, but it is not often that the country experiences such a spell of cold as that which prevailed between the 19th and 25th of the month, when sharp frost occurred almost nightly in some of our central districts. Still later on, viz., between the 28th and 30th, another touch of severe cold visited the midland counties, the disastrous effect of so much inclement weather being now very apparent, especially in orchards and market gardens, where an immense amount of damage was occasioned. At the close of the quarter the great desiderata appeared to be, firstly and above all, an abundance of warm sunshine, and secondly, with the hay harvest in view, an early cessation of the heavy rains. The leading features in the weather of the entire spring are shown in the Table on p. 396, which gives for various parts of the country a summary of the conditions relating to each of the principal meteorological elements.

Temperature.—We find that over the country generally, the mean readings were above the average in seven out of the first eight weeks of the quarter, and either equal to or below the normal in the five remaining weeks. Taking the season as a whole, the mean of all the day readings was in most districts about two degrees above the average, but in the midland counties it was as much as two and a half degrees in excess. The mean of all the night readings was a trifle below the average in the north-eastern counties, and very little above it in the midlands or the south-western counties ; elsewhere, however, there was a considerable excess. The mean of the day and night readings combined was, upon the whole, about a degree and a half above the average, the excess ranging from a little under a degree in the north-eastern counties to very nearly two degrees in the southern counties and in the Channel Islands. The maximum readings for the quarter, given in the first column of the Table, were registered in nearly all cases during the second week in April, when the thermometer exceeded 70° in all districts excepting the Channel Islands, and exceeded 75° in the eastern, midland and southern counties. In May the only districts in which

Temperature, Rainfall, *and* **Bright Sunshine** *experienced over* **England** *and* **Wales** *during the thirteen weeks ended June* 2, 1894.

(*The Spring Season.*)

Districts	TEMPERATURE							
	Highest observed	Lowest observed	Day temperatures		Night temperatures		Day and night temperatures combined	
			Mean	Difference from average	Mean	Difference from average	Mean	Difference from average
	°	°	°	°	°	°	°	°
North-eastern counties . .	72	25	52·6	+2·0	38·6	−0·1	45·6	+0·9
Eastern counties . . .	77	24	55·7	+2·1	39·2	+1·0	47·5	+1·6
Midland " . . .	76	22	56·5	+2·5	38·2	+0·4	47·4	+1·5
Southern " . . .	76	27	56·4	+2·0	42·1	+1·7	49·3	+1·9
North-western counties, including North Wales .	73	27	54·6	+1·9	41·0	+1·1	47·8	+1·5
South-western counties, including South Wales .	71	25	55·4	+2·3	41·7	+0·1	48·6	+1·2
Channel Islands . . .	69	34	55·5	+2·0	46·0	+1·7	50·8	+1·9

Districts	RAINFALL				BRIGHT SUNSHINE			
	Days with rain		Total fall		Duration		Percentage of possible amount	
	Number	Difference from average	Amount	Difference from average	Hours recorded	Difference from average	Percentage	Difference from average percentage
			ins.	ins.				
North-eastern counties .	51	+ 6	5·1	−0·5	482	+86	38	+ 7
Eastern counties . .	46	+ 1	5·7	+0·4	506	+23	40	+ 4
Midland "	43	0	5·2	−1·2	478	+55	38	+ 6
Southern "	41	− 1	5·0	−0·5	550	+44	44	+ 9
North-western counties, including North Wales	49	+ 5	6·9	+0·6	466	+62	37	+ 4
South-western counties, including South Wales	47	+ 1	7·7	0	588	+65	47	+ 8
Channel Islands . . .	49	− 1	6·6	+0·3	618	+23	50	+13

NOTE.—The above Table is compiled from information given in the Weekly Weather Report of the Meteorological Office. The averages employed are:—For Temperature, the records made during the twenty years, 1871–90; for Rainy Days, the values for the thirteen years, 1878–90; for total Rainfall, those for the twenty-five years, 1866–90; and for Bright Sunshine, those for the ten years, 1881–90.

the thermometer exceeded 70° were the eastern and southern; in the north-east and north-west of England the thermometer did not exceed 65°, and in the last-mentioned district it did not even reach that point. The minimum temperatures, given in the second column of the Table, were recorded on various dates in March, but readings very slightly higher were observed during the week ending May 26. In the screen the thermometer at the latter advanced season of the year fell to 26° in the midlands, to 27° in the south-western counties, and to 29° in all other districts excepting the Channel Islands. On the surface of the ground the frost was of course more severe, the lowest points reached by exposed thermometers being 18° at Worksop, 19° at Stoke-on-Trent, and 23° at Loughborough.

Rainfall.—The rainfall over the country generally was very irregularly distributed throughout the quarter, but upon the whole it was short of the average during the earlier half of the period, and in excess during the latter half. The total amount for the season did not differ much from the normal, excepting in the midland counties, where there was a deficiency of about 19 per cent. In the eastern and north-western counties and in the Channel Islands there was for the entire quarter a slight excess, while in the north-eastern and southern counties there was an equally slight deficit. The number of days with rain also agreed fairly well with the average, excepting in the north-eastern and north-western counties, where the falls were more frequent than usual. The absolute drought which set in over the country generally about the middle of March continued in many places for three weeks or more, and in several isolated portions of our eastern, central, and southern counties it lasted for as many as 25 or 26 days. In some few places situated in the same districts a partial drought prevailed for upwards of six weeks. Snow or sleet fell at many of the western and northern stations between May 19 and 22.

Bright Sunshine was largely in excess of the average in March and the early part of April, but for the remainder of the quarter it was almost continuously deficient, the only sunny week being that ending with May 26. Taking the season as a whole, there was a decided excess, the finest district of all being the north-eastern counties, where the sun shone upon an average for nearly an hour per day in excess of the usual duration. In the southern counties the daily excess did not amount to quite half an hour, while in the Channel Islands it was little more than a quarter of an hour.

OUR IMPORTS OF HAY.

A NOTEWORTHY result of the disastrous drought which prevailed over most of England in the summer of 1893 has been the enormous increase in our imports of hay consequent on the meagre crop of the home-grown product. To such an extent have the imports gone up that for the past year particulars have been supplied, month by month, to the Board of Trade by Her Majesty's Customs, showing the quantities and sources of the hay sent across the seas into the United Kingdom. Even in the first six months of 1893, at a time when the fate of the English hay crop was still undecided, indications were not lacking that hay was arriving at our ports to an extent heretofore unequalled. Thus our imports for the first half of 1893 reached a total of 62,766 tons, which slightly exceeds the total

TABLE I.—*Imports of Hay into the United Kingdom, showing the Contributory Countries.*

Country	Five months ended May 31		Twelve months ended December 31	
	1894	1893	1893	1892
	Tons	Tons	Tons	Tons
Russia, North	25,061	—	26,839	2
Russia, South	997	—	855	—
Sweden	—	142	235	121
Norway	2,236	434	1,674	2,225
Denmark	3,391	1,930	4,252	2,291
Germany	1,675	652	2,188	4,290
Holland	7,895	8,385	28,332	19,403
Belgium	1,753	110	3,436	90
France	1,969	628	1,234	3,526
Portugal	—	—	61	—
Spain	39	—	144	—
Italy	125	—	—	—
Canary Islands	—	—	1	—
Malta	—	—	9	—
Turkey, European	490	—	216	—
Turkey, Asiatic	542	—	4	—
Algeria	190	730	731	3,274
Cape of Good Hope	1	—	—	—
Bombay	—	—	69	—
South Australia	—	—	9	—
New Zealand	22	—	40	—
Canada	9,860	3,091	63,175	13,120
Newfoundland	23	—	206	—
United States, Atlantic	108,369	34,013	101,132	11,588
Chili	3,310	—	3,614	346
Argentine Republic	583	3,606	24,594	961
Total	168,531	53,721	263,050	61,237

of 61,237 tons, representing the whole import for the year 1892. In the second half of last year the quantity imported reached 200,284 tons, which is rather more than three times the quantity which was brought in during the first half of the year. At the time of writing the figures denoting our imports during the current year are available only down to the end of May; that is, for the first five months of 1894. But they do not indicate any falling-off in the imports, notwithstanding that the prospects of the English hay crop are now vastly superior to what they were a year ago. Taking five-sixths of the import of the latter half of 1893, we get a total of 166,904 tons, as representing the average for five months, whereas during the first five months of 1894 we have imported 168,531 tons, so that there is really a slight increase in the rate of importation during the current year, so far as it has gone. A more striking view of the subject is obtained by comparing the 168,531 tons imported within the first five months of the present year with the 263,050 tons which represent the whole of the import in 1893. The former number is 64 per cent. of the latter; in other words, we have imported for the first five months of 1894 about two-thirds as much hay as was landed on our shores in the entire twelve months of 1893.

Table I. has been constructed to show the imports of hay, and their sources, during the seventeen months which ended with May 31, 1894. The imports in 1893 are compared with those for 1892, and

TABLE II.—*Imports of Hay into the United Kingdom, showing the Contributory Continents.*

Continents	Five months ended May 31		Twelve months ended December 31	
	1894	1893	1893	1892
	Tons	Tons	Tons	Tons
Europe	45,631	12,281	69,475	31,948
Asia	542	—	73	—
Africa	191	730	732	3,274
North America	118,252	37,104	164,513	24,708
South America	3,893	3,606	28,208	1,307
Australasia	22	—	49	—
Total	168,531	53,721	263,050	61,237

the imports in the first five months of 1894 with those for the corresponding months of 1893. The fact that the United States of America has sent us 108,369 tons in the first five months of this year, as against 101,132 tons in the whole of last year, shows what efforts she is making to retain and strengthen a trade which so recently as 1892 was represented by only 11,588 tons. As compared with 1892 she last year increased her export to us nearly nine-fold, whilst in the first five months of 1894 she has sent us nearly ten times as much as she did in the twelve months of 1892. Canada is not holding her ground so well, but she sent us five times as much hay in 1893 as in 1892, and it is worth noting that Canada alone sent to our ports in 1893 more than the total quantity of hay we took from all sources in 1892. Holland, which was first on the list in 1892, gave precedence to the United States and Canada in 1893, and in the current year up to May 31 she further yields place to Russia.

A continental grouping of the sources of our hay imports, such as is set forth in Table II., brings out some interesting results.

Thus in 1892 just one-half of our imports were of European origin, whilst North America contributed only 40 per cent. In 1893, on the other hand, North America accounted for over 62 per cent., the European tribute being but 26 per cent. ; so that, whilst the former continent sent us about two-thirds of our total import, Europe did not make up more than about one-fourth. For the first five months of the present year the disparity is still more pronounced ; for, whilst the North American supply has risen to 70 per cent. of the total import, the proportion from European countries remains practically stationary at 27 per cent. The fact, no doubt, is that several European countries have like ourselves been in want of hay, owing to the ill effects of last year's drought.

Lastly, an inquiry into the gross monthly imports gives the

TABLE III.—*Monthly Imports of Hay into the United Kingdom.*

	Twelve months ended December 31	
	1893 Tons	1892 Tons
Five months, January to May	53,721	21,607
June	9,045	4,459
July	18,636	3,614
August	38,416	2,497
September	35,948	4,723
October	28,923	7,412
November	41,047	7,740
December	37,314	9,185
Total	263,050	61,237

	Five months ended May 31	
	1894 Tons	1893 Tons
January	31,967	8,368
February	26,745	9,248
March	41,132	12,474
April	35,560	13,394
May	33,127	10,237
Total	168,531	53,721

results recorded in Table III. As a matter of fact, the importation never reached a monthly total of 10,000 tons till March, 1893. During the twelve months extending from June, 1893, to May, 1894, the highest monthly import was that of March, 1894 ; but the 41,132 tons in that month are closely approached by the 41,047 tons in November, 1893. It cannot be argued that the import for May, 1894, shows any effective decline, for it is greater than the import in any of the months of June, July, October, January, and February. Within the last twelve months our total imports of hay from all sources for the year ended May 31, 1894, amounted to 377,860 tons. The produce of hay in the year 1893, from both temporary and permanent grass land, in England and Wales, was estimated at the low total of 3,830,405 tons. Hence it would appear that our imports of hay in the year ended May 31, 1894, were equivalent to nearly one-tenth of last year's hay crop in England and Wales.

The figures which have been given possess an intrinsic interest, but it is not exclusively for this reason that they have been quoted. English farmers know only too well that, when the lines have once been laid, there is little difficulty experienced in continuing to transport along them any kind of foreign produce into this country. Now that the growers beyond the seas have learnt the possibilities of expansion in the hay trade, they will certainly make an effort, not only to retain the position they have already acquired, but to strengthen their interest in our market. In a Free-trade country like Great Britain the only way to meet this threatened invasion of foreign hay is to increase the home output to such a degree that the prices will tend to check rather than to encourage a further development in foreign imports. The season is yet young enough to permit of our farmers increasing their reserves of hay to a greater extent than, perhaps, they had intended. If, then, a return to moderate prices should cause the foreign hay trade to shrink back within its old limits, the lessened price of home-grown hay would bring with it its own compensation, for its greater quantity would enable farmers to feed hay largely to their stock, and thus to effect a substantial reduction in the corn and cake bill. On the other hand, it is not unreasonable to anticipate that, unless the foreign hay trade should receive some such check as has been suggested, it must continue to grow in volume, until the produce of grass lands beyond the seas is poured into this country as regularly and as persistently as the grain from the wheatfields of North America and Argentina, of Russia and India.

W. Fream.

12 Hanover Square, W.

RECENT AGRICULTURAL INVENTIONS

The subjects of Applications for Patents from March 12 to June 9, 1894.

N.B.—Where the Invention is a communication from abroad, the name of the Inventor is shown in italics, between parentheses, after the name of the applicant.

Agricultural Machinery and Implements, &c.

No. of Application. Year 1894.	Name of Applicant.	Title of Invention.
5382	Turner, H. E.	Cultivators, &c.
5485	Cashmore, T. J. and anr.	Chaffcutter, &c.
5545	Blackstone, E. C.	Root-cutters.
5900	Thornton, J. and anr.	Steaming wheat, &c.
5983	Fleming, H. B.	Elevating hay, &c.

No. of Application. Year 1894.	Name of Applicant.	Title of Invention.
6344	Radford, A. L. .	Mowing machines.
6373	Poschmann, T. .	Preventing straw coiling up on a threshing drum.
6461	McGregor, A. .	Grain-binding harvesters.
6666	McGeoch, J. A. .	Mould boards for ploughs.
6667	„ „ .	Combination implement for cultivating the soil.
6668	„ „ .	Harrows.
6773	Perkins & Jaffs .	Appliances for sowing seeds.
6865	Lee, J. W. . .	Feed device of chaffcutters.
6980	Ransome, J. E. .	Ploughs.
7015	Thompson, D. J. .	Reaping machine.
7095	Cunliffe, W. .	Scraper for wheat-cleaning machines.
7107	Thomson, J. .	Turnip topping, &c., machine.
7193	Disturnal, T. J.	Reducing oats to meal.
7204	Roberts, J. .	Potato digger and picker.
7279	Anderson, W. .	Manure distributing machine.
7291	Thompson, W. P. (*Lanz, Germany*) . .	Threshing machines.
7546	Bamford, S. B. .	Machines for slicing turnips.
7677	Ballach, A. .	Adjustable coulter for seed drills.
7866	Howard & Gibbs	Horse rakes.
7927	Paine, E. G. .	Mowers and reapers.
8180	Thompson, W. P. (*Unterslip and anr.*)	Ploughs.
8275	Lewin, T. . .	Self-binding harvester.
8279	Walker, W. .	Double-horse hoe.
8294	Newton, A. . .	Digging forks.
8626	Robert, E. . .	Ploughs.
8709	Kirkby, F. . .	Horse-hoe blade.
8710	„ „ . .	Plough coulters.
8718	Bentall, E. E. .	Disc machines for preparing roots for cattle.
8797	Almont & Stevens	Grain evener for self-binding harvesters.
8844	Doyle & Farrell	Turnip, &c., sowing machines.
9320	Oldershaw, S. .	Hand appliance for cutting grass, &c.
9497	Wilson, W. . .	Chaff-cutters.
9720	Sargeant, T. C. .	Drill and distributor.
9841	Ford, J. . .	Sheaf looser and feeder for threshing machines.
9912	Parke, W. . .	Hay-press.
9966	Kessler, A. . .	Potato digging machine.
10005	Paxton, R. . .	Drill rollers for turnip-sowing barrows.
10050	Garfitt, C. . .	Beaters for threshing machines.
10051	Crawley, J. .	Potato hoe.
10190	Howard & Bousfield	Hay-presses.
10608	Backhouse, J. .	Ploughs.
10859	Komnick and another .	Threshing machines.
10877	Russell, G. . .	Manure and seed drill.
10969	Holyoak, J. E. .	Drill coulters.
10977	Gregory, W. .	Hand banking plough.

Stable Utensils and Fittings—Horse-shoes, &c.

No. of Application. Year 1894.	Name of Applicant.	Title of Invention.
5185	HARRIS, W. J.	Horse clippers.
5343	EARL POULETT	Roughing horse-shoes.
5385	METCALFE, F. R.	Horse-shoes.
5486	HARRISON, A.	Frost cogs for horse-shoes.
5502	OSWALD, W.	Saddles, collars, &c.
5665	Von PREU and anr.	Horse-shoes.
5885	METCALFE, F. R.	Horse-shoes.
5907	DEWSBURY, J. and anr.	Safety stirrup.
6189	POPPE, C.	Horse-collars.
6307	LEWIS, J.	Horse-shoes.
6392	KIRK, H.	Bridles.
6399	WILSON, G.	Holding bits.
6414	CLOKE, T. and anr.	Horse-shoe.
6464	ATKINSON, C. & others	Horse-collars.
6546	PALMER, J. (*Touch, Burmah*)	Bits.
7103	CARRINGTON, H.	Safety stirrups.
7186	SMALL, J.	Horse-shoes.
7293	MANIFOLD, W. A.	Horse-shoes.
7314	DELANEY, J.	Nosebags.
7513	HOLCOMBE, E.	Safety stirrup.
7625	POWELL, A. & others	Collar or saddle.
7747	EVERALL, D.	Safety stirrup.
7898	PLATT, J. E.	Horse-shoes.
7957	FRIEDL, A.	Bridle bits.
7997	JONES, T. N. & others	Horse-shoes.
8030	LECLERCQ, L.	Safety saddle bars.
8211	WITHERS, T. G. and S.	Stirrups.
8415	AUSTIN, W. J.	Bridles.
8756	STENSLOFF, W.	Instantaneously detaching shying horses from vehicles.
8846	PHIPPS, J. L.	Collar for carrying the electric light on harness.
8995	SUMNER, J.	Bits.
9005	ROYLE, T.	Horse-shoes.
9117	TREES, J. and others	Riding saddles.
9335	VERRIER, A. B.	Pneumatic horse-collar.
9339	KIRKMAN, W. T.	Appliance to prevent horses in shafts running away.
9508, 9861	ROWLAND, T.	Apparatus for supplying feed to horses.
9929	HUGHES, E.	Harness and fastenings for liberating fallen horses.
10164	RALPH, J.	Horse-collars.
10574	CHIPPERFIELD, S. E.	Anti-slipping appliance for horse-shoes.
10686	The COCKSHUTT PLOW Co. LD.	Horse-shoes.

No. of Application. Year 1894.	Name of Applicant.	Title of Invention.
10755	De Horsey, E.	Horse-shoes.
10864	Yule, J. S.	Safety spring halter chain.
11153	Rowland, T.	Supplying feed to horses.

Carts and Carriages.

6637	Widdall, E.	Adjusting seats of dog carts, &c.
7014	Morton, J.	Hay bogies.
10532	Carter, J. & S.	Wheels of wagons and carts.
12213	Thompson, W. P. (*Heer, Germany*)	Cart or wagon.

Dairy Utensils, &c.

6063	McCarthy, J.	Butter box.
6076	Rawlingson, J.	Receptacle for straining milk and separating cream.
7195	Barton, W.	Butter churns.
7328	Bradford, T.	Diaphragm for churns.
7428	Wright, S. H.	Producing butter.
7612	Grainger, R.	Aërating milk.
7824	Dunkley, E. T.	Self-acting air valve and eyelet for churns.
8711	King, H.	Milk can.
8780	Freeth, F. H.	Railway milk cans.
9077	Vincent, W.	Butter churns.
10455	Duncan, J. H. and others	Butter churns.
10633	Swarbrick, G.	Butter press.
10944, 10945	Salenius, E. G. N.	Cream separators.
11006	Hampson, W.	Billets for pillar reins.
11047	Wright, S. H.	Producing butter.

Poultry and Game, &c., Appliances.

5882	Mann, S.	Incubators.
6457	Morant, G. F.	Pens for poultry, &c.
7055	Markham, E.	Preserving eggs.
7203	Woodfield, V.	Poultry markers.
10553	Green, J. G., & Blum, J.	Incubator and rearer.

Miscellaneous.

5360	Ward, H. E. & others	Clippers for animals.
10323	Denison, J. H.	Feed trough for cattle.
10350	Kraatz, R.	Drinking troughs for cattle.
10499	Lanaway, E. & H.	Honey extracters.
10787	Hole, G. W.	Queen trap, or swarm arrester for beehives.
10826	Hayward, C. P.	Marking cattle.
10848	Stempel, L.	Drying onions and tomatoes.

Numbers of Specifications relating to the above subjects published since March 10, 1894.[1]

Specifications of 1893.

5527, 5863, 1308, 1697, 3783, 4340, 4816, 5671, 6166, 7079, 7321, 7511, 7522, 7524, 7542, 7547, 7725, 8044, 8070, 8193, 8587, 8627, 8738, 8858, 9103, 9187, 9215, 9645, 9852, 10010, 10372, 10806, 11030, 11031, 11093, 11216, 11260, 11293, 11415, 11447, 11507, 11698, 11804, 11829, 12861, 13704, 14194, 14734, 15161, 15942, 16453, 18142, 18712, 19507, 21898, 22799 23361, 23801, 24420.

Specifications of 1894.

194, 492, 1032, 1825, 1978, 2012, 2093, 2846, 4165, 4951, 5343, 5882, 5907, 6373.

STATISTICS AFFECTING BRITISH AGRICULTURAL INTERESTS.

AGRICULTURAL PRODUCE STATISTICS, 1893.

THE official report on the Crops of 1893 was issued by the Board of Agriculture on April 27, 1894, under the usual title of "Agricultural Produce Statistics." The extraordinary nature of last year's harvest, and the disasters which befell the great majority of farmers in that part of England lying south of the valley of the Trent, are abundantly reflected in Major Craigie's report, which is prefixed to the tables, and from which the subjoined details are extracted. The summary table presented on pp. 416–17 is compiled partly from the Agricultural Produce Statistics, and partly from the previously issued Agricultural Returns.

TOTALS FOR THE UNITED KINGDOM.

To enable a general statement to be prepared for the United Kingdom—exclusive of the Isle of Man and Channel Islands, where statistics of this nature are not collected—particulars of the yield of the Irish crops have been included.

In dealing with the aggregate results obtained by combining the available data, it must be remembered that these totals fail in some respects to indicate the characteristics of the season of 1893, which perhaps more than any recent year was distinguished by a striking variety of local experience. Throughout Ireland, with the exception of a section of the country in the South-East, the year proved a productive one, while Scotland and some of the more northerly English counties similarly escaped the more serious effects of the prolonged

[1] Copies (price 8*d.* each) may be obtained at the Patent Office (Sale and Store Branch), 38 Cursitor Street, London, E.C.

drought, which not only told disastrously on the Hay harvest, but also largely reduced the yield of the cereals of the year. The higher yields of the more fortunate parts of the United Kingdom thus to some extent counteracted the unusual losses of the Central and Southern counties.

Even thus qualified, however, the general figures for the United Kingdom indicate a marked deficiency in four out of the five cereal crops reported on, while the Hay crop, from both permanent and temporary grass, has been reduced to an extent never before recorded in these returns. In Grain crops, as compared with 1892, we have grown less Barley by 14 per cent., less Wheat by 16 per cent., less Beans by 31 per cent., and less Peas by 5 per cent. The estimated produce of Wheat stands below the total for the preceding year by as much as 1,233,000 quarters. This is mainly in consequence of the smaller area under the crop; but the further loss of nearly 1,400,000 quarters of Barley must be wholly ascribed to an inferior yield, as the acreage was slightly greater than in 1892. Against these losses a total increase of only 50,000 quarters of Oats, on a largely increased area, is a relatively small set off.

Grain Crops in the United Kingdom.—The estimates of the total native production of Wheat, Barley, Oats, Beans, and Peas in the United Kingdom as a whole, reckoned in quarters, compare as shown in Table I. for each of the last three years, placing these five crops in the order of their relative magnitude.

Table I.—*Total produce of Corn Crops in the United Kingdom.*

Crops	1891	1892	1893
	Quarters	Quarters	Quarters
Oats . . .	20,809,000	21,023,000	21,074,000
Barley . . .	9,944,000	9,617,000	8,218,000
Wheat . . .	9,343,000	7,597,000	6,364,000
Beans . . .	1,337,000	882,000	608,000
Peas . . .	722,000	629,000	595,000

Such a table brings out the contrast with the harvest of 1891 as well as of 1892, and indicates that nearly 3,000,000 fewer quarters of Wheat were grown in 1893 than were produced two years previously.

These figures also strikingly emphasize the fact that with an extending area in England, and an area always largely preponderating in Scotland and Ireland, the Oat crop bulks more largely than all the other four Corn crops collectively in any estimate of the total Corn production of the United Kingdom. And it may be added that even if, as has been sometimes estimated, no more than one-half of the Oats grown come into the category of saleable produce, the value of that half at the prices current in March, 1894, exceeds the entire value of the Wheat crop of the year.

The mean yields per acre of the grain crops for the United

Kingdom in 1893 are shown in the table on pp. 416–17 to have been, in the case of Wheat, 26·08 bushels; of Barley, 29·30; and of Beans, 19·61. These are quite the lowest figures returned in the decade for which returns exist. In the case of Peas the yield of 22·61 bushels was the lowest with the exception of 1885, when only 18·78 bushels were secured, while but for a large Irish return, and a Scottish crop over average by more than 5 per cent., the Oat crop of 1893 would have occupied a similar position of inferiority.

Other Crops in the United Kingdom.—Turning to other forms of produce, the aggregate totals of Potatoes, Roots, and Hay in the United Kingdom in the past three years may be contrasted as in Table II., in tons.

TABLE II.—*Total produce of Potatoes, Roots, and Hay in the United Kingdom.*

Crops	1891	1892	1893
	Tons	Tons	Tons
Potatoes	6,090,000	5,634,000	6,541,000
Turnips	29,742,000	31,419,000	31,110,000
Mangel	7,558,000	7,428,000	5,225,000
Hay from clover, &c.	4,278,000	4,015,000	3,167,000
Hay from permanent pasture	8,393,000	7,501,000	5,915,000

The abundant Potato crop of the season is here apparent, the average yield being only once before reached, and the total outturn estimated at 16 per cent. above the figures for 1892. In the case of Turnips the produce is slightly below the previous year's crop, but above that of 1891. Mangel, however, shows a diminution of 30 per cent., a serious loss considering the value of the crop in a season when fodder and feeding stuffs are scarce. But attention will be mainly attracted to the conspicuous failure of the Hay crop. The average production of both kinds of Hay in the United Kingdom in a normal season may be taken as roughly 13,000,000 tons—whereof about one-third is raised in Ireland. Every one of the last three seasons has, however, shown under average results, and the total produce for 1893 is estimated at little over 9,000,000 tons. Since practically one half of this, or 4,483,000 tons, was the produce of Irish fields, it follows that the reduction in the area mown, and the scanty crops secured last season, left the growers of Hay on this side of St. George's Channel with not much over half of their accustomed supply of fodder. Even with the aid of the fair Irish crop, the total estimate of Hay of all sorts shown by the above table to have been obtained in the United Kingdom stands at a level nearly 2,500,000 tons below the crop of 1892, and 3,500,000 tons below that of the previous year, while it falls short of an ordinary average crop by about 4,000,000 tons.

Map of England and Wales (and part of Scotland), showing the divisions and also the subdivisions into which the counties of England have been grouped.

Yield of Crops in Great Britain.

Confining attention to the statistics collected of the yield of the various crops in Great Britain alone, and disregarding the element introduced by the Irish figures, we are met by an almost unbroken series of under-average yields, the production of Wheat in the year 1893 standing at only 25·95 bushels per acre, the yield for Barley being 28·69 bushels, for Oats 35·59 bushels, for Beans 19·39 bushels, for Peas 22·61 bushels, for Turnips 13·30 tons, for Mangel 12·84 tons, for Hops 7·21 cwt., for Clover Hay 18·74 cwt., and for Permanent Meadow Hay only 12·56 cwt., or less than half a crop. Potatoes alone show an average yield.

Comparisons with Previous Harvests.—Perhaps the relation of these figures to the records of previous years in some of the more important crops may be most conveniently shown by Table III., wherein the normal yield for Great Britain, according to the local estimates obtained in 1885 and 1886, and shown in the heading of the several columns, is represented by the figure "100," and the proportion of the estimated yield per acre of each year, from 1884 to 1893 inclusive, to this ordinary average is shown accordingly.

Table III.—*Relative Yields of Crops in Great Britain, 1884–1893.*

Years	Wheat	Barley	Oats	Potatoes	Hay (Clover, &c.)	Hay (Permanent Pasture)
	Estimated ordinary average, 28·80 bushels per acre	Estimated ordinary average, 34·02 bushels per acre	Estimated ordinary average, 39·04 bushels per acre	Estimated ordinary average, 6·11 tons per acre	Estimated ordinary average, 29·34 cwt. per acre	Estimated ordinary average, 25·56 cwt. per acre
1884	104	100	96	108	—	—
1885	109	103	94	95	—	—
1886	93	95	97	94	100	102
1887	111	92	89	104	93	81
1888	97	97	95	85	96	110
1889	104	93	101	101	114	114
1890	107	103	106	87	104	104
1891	109	100	99	94	97	92
1892	92	102	99	95	87	75
1893	90	84	91	108	64	49

Neither Wheat nor Barley, it therefore appears, has ever before shown so small a yield as in 1893 since these returns were collected, and the yield of Oats only on one occasion. Potatoes have only once before been as good a crop, while Hay of both kinds has, as anticipated, shown an enormous diminution from the normal standard.

The Yield of Wheat in Great Britain.—Taking some of the estimated results of the year's harvest in detail, Wheat in Great Britain was grown on a surface less by a seventh than in 1892; and the mean yield per acre being also less, though only by half a bushel, than in the bad harvest of that year, the gross total outturn was smaller than the crop of 1892 by nearly a sixth part. As already shown, the yield per acre of the Wheat crop in Great Britain was practically 10 per cent. short of the accepted standard. But it must be noted that the quality was in numerous instances unusually high, and in one or two cases weights of 65 lb. and even 67 lb. per bushel were reported.

So far as the reduced total produce follows from the diminished area devoted to wheat growing, the comments offered on the acreage returns explain sufficiently the local effect of the changes thus arising. But the mean Wheat yield per acre on the area still left under this cereal in 1893 covers such varied local results as to invite closer inquiry. Compared with the standard ordinary average, accepted since 1885 as a point for comparison, although the English yield taken by itself was last year more than 3 bushels per acre short on the whole, yet in York, Durham, Northumberland, and in Scotland, an excess of 3 to 4 bushels per acre over the average was recorded. In Cambridge, Essex, Middlesex, Kent, Surrey, and Sussex, on the other hand, the yield was 8 to 9 bushels under average, and in Hampshire over 6½ bushels short. These figures represent reductions of from 24 to 30 per cent. They doubtless indicate the chief sufferers from the meteorological conditions of the year, and help to explain the large declines of 13 per cent. in yield in the first and 17½ per cent. in the second produce divisions which are shown in Table IV., and in the map on p. 408, while they afford a strong contrast with the over-average yield of 10½ per cent. reported from the Northern and North-Western counties of the fourth division.

The yield of Wheat in 1893 varied indeed so greatly in certain groups of counties that it may be worth while to make a further analysis of the general results in still narrower areas by breaking up the four divisions of England shown in Table IV. into the eight subdivisions which were referred to in the report on the produce returns of 1891.

In Table IV. it is made clear that the greatest reduction in the yield per acre of last season's Wheat crop occurred in the five South-Eastern counties lying south of the Thames, forming the first part of the second division, with a decline of nearly 25 per cent. from the standard. The first section of the first or Eastern division—which is usually the area of highest Wheat yield, and is distinguished as the district where this cereal still retains an exceptional share of the cultivated area—comes next in order of diminished yield, with a reduction of 21 per cent.; the third largest decline being in the counties of the extreme South-West; while the whole Northern division returned an over-average crop, which was best in the counties nearest the Scottish Border.

TABLE IV.—*Produce of Wheat in the Subdivisions of England in* 1893.

Divisions of England		Estimated total produce, 1893	Estimated yield per acre, 1893	Ordinary average (as estimated in 1885)	1893 Deficiency (−) or increase (+) on estimated ordinary average	1893 Percentage of decrease (−) or increase (+)
		Bushels	Bushels	Bushels	Bushels	Per cent.
Division No. 1 *	Part (*a*)	10,783,964	24·37	30·80	−6·43	−20·9
	Part (*b*)	11,506,858	30·21	31·45	−1·24	− 4·0
Division No. 2 †	Part (*a*)	5,455,301	22·69	30·20	−7·51	−24·9
	Part (*b*)	5,809,038	26·10	28·76	−2·66	− 9·2
Division No. 3 ‡	Part (*a*)	5,433,897	25·02	26·39	−1·37	− 5·2
	Part (*b*)	3,138,804	21·70	24·36	−2·66	−10·9
Division No. 4 §	Part (*a*)	2,445,780	28·37	24·94	+3·43	+13·7
	Part (*b*)	1,855,765	28·84	27·15	+1·69	+ 6·2

*Division I. Containing (*a*) six eastern and (*b*) three north-eastern counties	†Division II. Containing (*a*) five south-eastern and (*b*) nine east-midland counties	‡Division III. Containing (*a*) six west-midland and (*b*) four south-western counties	§Division IV. Containing (*a*) four northern and (*b*) six north-western counties
(*a*) Cambridge Suffolk Essex Herts Beds Hunts	(*a*) Kent Surrey Sussex Hants Berks	(*a*) Shropshire Worcester Hereford Gloucester Wilts Monmouth	(*a*) Northumberland Durham York, N.R. York, W.R.
(*b*) Norfolk Lincoln York, E.R.	(*b*) Notts Leicester Rutland Northampton Warwick Oxford Bucks Middlesex London	(*b*) Somerset Dorset Devon Cornwall	(*b*) Cumberland Westmorland Lancashire Cheshire Derby Stafford

The Yield of Barley in Great Britain.—Turning to the Barley crop of 1893, the differences are shown in Table V. to have been most marked in the groups of counties wherein the Wheat crop suffered most. In the South-Eastern group of Kent, Surrey, Sussex, Hants, and Berks, the Barley yield per acre was reduced by upwards of 36 per cent. below the normal figure. In the six Eastern counties forming the first part of the division No. 1, the mean decline has been 30½ per cent., while in the South-West, again, from Dorset to Cornwall, a mean reduction of nearly 29 per cent. is reported. In three English counties, Middlesex, Surrey, and Cornwall, where the normal yield ranges from 32 to over 39 bushels per acre, the Barley yield of 1893 is returned as under 20 bushels per acre.

TABLE V.—*Produce of Barley in the Subdivisions of England in* 1893.

Divisions of England		Estimated total produce, 1893	Estimated yield per acre, 1893	Ordinary average (as estimated in 1885)	1893 Deficiency (−) or increase (+) on estimated ordinary average	1893 Percentage of decrease (−) or increase (+)
		Bushels	Bushels	Bushels	Bushels	Per cent.
Division No. 1.	Part (*a*)	9,554,220	24·91	35·87	−10·96	−30·5
	Part (*b*)	14,801,335	31·28	35·57	− 4·29	−12·0
Division No. 2.	Part (*a*)	3,273,527	22·79	35·79	−13·00	−36·3
	Part (*b*)	5,565,458	27·23	34·37	− 7·14	−20·8
Division No. 3.	Part (*a*)	4,691,719	27·56	31·14	− 3·58	−11·5
	Part (*b*)	3,265,689	22·09	30 97	− 8·88	−28·7
Division No. 4.	Part (*a*)	6,610,416	35 23	33·04	+ 2·19	+ 6·6
	Part (*b*)	1,270,344	31·01	32·40	− 1·39	− 4·3

Not till we reach the Northern group does the crop appear to have escaped the loss of yield due to the drought of 1893; and, indeed, Barley is returned as an under-average crop even in two counties, Derby and Stafford, included in this division. In Scotland the Barley crop was more than 4½ per cent. over average, but in Wales nearly 10 per cent. under average. Nor was the loss measured by the number of bushels threshed the only damage sustained, for except where the Barley was sown early, when some good samples were obtained in various districts, the irregular germination of the crop in very many English counties severely affected the quality and value of the produce.

The Yield of Oats in Great Britain.—The Oat crop of 1893, deprived of the moisture requisite to its growth in three-fourths of England, fell also considerably below an average yield. Scotland, however, furnishes a third of the acreage carrying Oats in Great Britain, while it has only a little more than a tenth of the acreage under Barley, and there the benefit of a remarkably early harvest enabled an over-average crop to be secured. This caused the mean reduction of the yield per acre of Oats in Great Britain to stand at a smaller figure than that of Barley, the total decline of 8·8 per cent. below the standard yield being the result of a drop of nearly twice this ratio, or 16·7 per cent., in the English counties, and one of 4·7 per cent. in Wales, checked by an increased yield of 5·3 per cent. in North Britain.

In the three produce divisions of England which have suffered in the case of the other cereals, the average loss in Oats is very considerable. In five of the six smaller groups or subdivisions compared in the preceding paragraphs, and collectively making up the injuriously affected section of the country, a yield of from 4½ to 18 bushels short of the standard has been recorded. As before, the five counties of the South-East—Kent, Surrey, Sussex, Hants, and Berks—have the unpleasant pre-eminence of being collectively the greatest sufferers, with a yield reduced from a standard of 46 bushels per acre to one of 28 bushels, or very little more than three-fifths of an ordinary crop; the report from Sussex is the worst of the five, the average Oat crop in that county being only a single bushel above 3 quarters to the acre, while in ordinary seasons little short of 6 quarters per acre are looked for.

After the South-Eastern counties, some of the Eastern group have been next worst off. Cambridge, which usually boasts the largest Oat yield of any English county, with a normal outturn reckoned in 1885 at over 8 quarters to the acre, reports in 1893 a crop of less than 5 quarters, while the whole of Part (*a*) of this division returns only two-thirds of a normal harvest. Here also, in the case both of Oats and of other cereals, instances of the crops being cut green to make up for deficient fodder are reported.

The fluctuations shown in 1893 in the yield of Oats in each of the eight subdivisions of England may be traced in Table VI.

TABLE VI.—*Produce of Oats in the Subdivisions of England in* 1893.

Divisions of England		Estimated total produce, 1893	Estimated yield per acre, 1893	Ordinary average (as estimated in 1885)	1893: Deficiency (−) or increase (+) on estimated ordinary average	1893: Percentage of decrease (−) or increase (+)
		Bushels	Bushels	Bushels	Bushels	Per cent.
Division No. 1	Part (*a*)	6,980,940	32·80	50·43	−17·63	−35·0
	Part (*b*)	12,347,591	43·61	50·16	− 6·55	−13·0
Division No. 2	Part (*a*)	7,052,277	27·80	45·80	−18·00	−39·3
	Part (*b*)	5,908,312	31·35	40·39	− 9·04	−22·4
Division No. 3	Part (*a*)	5,684,820	32·75	37·28	− 4·53	−12·1
	Part (*b*)	6,489,842	27·15	34·92	− 7·77	−22·3
Division No. 4	Part (*a*)	10,850,671	41·91	38·46	+ 3·45	+ 9·0
	Part (*b*)	11,849,981	38·88	39·46	− 0·58	− 1·5

In Wales, where Oats are grown on a not inconsiderable area, the average decline is only a bushel and a half below the standard; but an exceptional loss occurs in three counties—Carmarthen, Carnarvon and Pembroke. In the last of these, indeed, the deficit appears as nearly 16 bushels below the standard, and may be traced to the special suffering of this county from the drought which is indicated by the rainfall records of the year. While the Scottish Oat crop, as above noticed, has been on the whole over average one or two counties have there also come short, as in the case of Sutherland and Orkney, and to a smaller extent in Perth and Dumfries. Some special damage of a different origin occurred in the South of Scotland by the gale of August 21, whereby quantities of from 2 to 6 bushels per acre were said to have been shaken out.

The Yield of Potatoes in Great Britain.—The one crop of the past season which was very generally good was Potatoes, the mean yield per acre for Great Britain coming out half a ton or nearly 8 per cent. above the standard of 1885, and $13\frac{1}{2}$ per cent. over the yield of 1892. No doubt in the case of individual counties, possibly where the original estimates were placed rather high, the yield of 1893 fell a little short. But, on the other hand, Potato crops exceeding 9 tons to the acre were reported for Gloucester and Derby, for Merioneth and Clackmannan. The estimated average for England in 1893 is 6·64 tons per acre. It is 6·63 tons in Wales, and 6·42 tons in Scotland. The English average does not appear to have been exceeded for any year since these returns have been collected, while only once, in 1887, has the Welsh average been slightly higher, and only twice, in 1887 and 1889, has the Scotch average stood at a larger figure. The absence of disease was very generally reported, and the excellence of the crop was a common matter of remark. From Aberdeen, Stirling, and Dumfries mention was, however, made of a varying degree of disease among the early varieties affecting from an eighth to a third of these crops.

The Yield of Turnips in Great Britain.—The Turnip crop of 1893 seems to have been about 13 per cent. below the standard of $15\frac{1}{4}$ tons to an acre, estimated as a normal crop in 1885. Since, however, this figure is one which has never been reached for Great Britain as a whole in any of the years for which produce statistics are forthcoming, it is possible that the average of $13\frac{1}{4}$ tons in 1893, although less than last year's estimate, does not represent so inferior a yield as was at one time expected, and, looking farther back, it is considerably better than the crops of 1888, 1887, or 1885.

The English Turnip crop stands much below the Welsh or the Scotch, showing only 12 tons to the acre, against 15 tons and $16\frac{1}{2}$ tons respectively in these countries. Moreover, the yield in the English counties is marked by an extreme variety of range from under 8 tons to the acre in Bedford and less than 9 tons in Cambridge, Buckingham, Essex, Hertford, Middlesex, and Berkshire, to 17 to 20 tons in Chester, Westmorland, Derby, Northumberland, and Lancaster. An estimate of 23 tons is given in Cumberland, and in one Welsh county, Brecon, while no less than seven Scottish counties return Turnip crops of over 20 tons to the acre.

The Yield of Mangel in Great Britain.—Although Mangel is grown in every county of England and Wales, it is a relatively unimportant crop in the northern counties, while its extent and value are considerable in many of the more southerly districts in which the drought of 1893 was severely felt. The reduction in the yield in the past season is, therefore, not surprising, and must have pressed with special severity on particular areas. The mean yield per acre in England has dropped from 19·89 tons to 12·74 tons. In Essex the return appears to have been less than 6 tons to the acre —not one-third of an ordinary crop. In Hertfordshire, Berkshire, and Middlesex less than 9 tons to the acre were reported, and in Buckinghamshire $9\frac{1}{2}$ tons. The county of Dorset, which has the highest standard yield, shows less than 10 tons, in place of 26·6 tons to the acre in the season of 1892.

The Yield of Hay in Great Britain.—The most serious of the several disasters of the past year has lain in the failure, already adverted to, of so unusual a proportion of the Hay crop. This has affected a very wide and important section of the area of Great Britain, and the loss extends to both forms of Hay, whether from Permanent or Temporary Grasses. The estimated average production of Hay of all kinds in an ordinary season in Great Britain exceeds 8,600,000 tons, but according to the reports furnished, only 1,918,000 tons were cut from clover and rotation grasses, while a total of 2,681,000 tons from permanent meadow was all that had been secured last summer.

Besides the reduced area which the agricultural returns showed to have been reserved for Hay in Great Britain under the peculiar circumstances of the season, the yield per acre on this diminished surface was in the case of Permanent Grasses less than half the customary estimate, and the reduction in the yield of the Clover and seed Hay exceeded one-third. In Hay from Permanent Meadow, the deficit per acre, compared with the normal yield, reached 14 cwt. in England, nearly 7 cwt. in Wales, while even in Scotland an estimated loss of 3 cwt. to the acre is reported. The Clover, Sainfoin, and Rotation Grasses cut were likewise about 3 cwt. short in Scotland. They were not much under 9 cwt. short in Wales, and nearly 13 cwt. deficient in England. In some cases where, contrary to the usual practice, second cuttings were obtained after rain had come, the estimated yield was only reached by including these. More usually it is reported that the urgent need of grass for grazing purposes led to there being little attempt to supplement the scanty first crop of Hay by a second cutting, while frequent instances are reported where no cutting at all took place until the autumn. Not a single county in England, and only two in Wales and eight in Scotland, returned over average yields per acre, but the different extent of the loss in the various counties was as striking as in the Grain crops. In Clover Hay the English average—16·67 cwt. per acre in place of 29·39—included seven counties where less than 10 cwt. was obtained. Bedford showed 8·63 cwt. only as against a standard crop of 38·02 cwt., Surrey 8·16 cwt. only against one of 26·64 cwt., while the Berkshire and Buckinghamshire totals for the year scarcely rose above 9 cwt. to the acre, and Dorset, Gloucester, and Oxford also returned an average of less than half a ton, while in 11 other English counties less than half a crop was secured.

In ordinary seasons Lancaster returns one of the heaviest Clover Hay crops, but even here the yield was reduced to 32·58 cwt. per

Estimated Total Produce and Yield per Acre of the Principal Crops, Cattle, Sheep, and Pigs, in the United

[From the Agricultural Returns and

Crops	England						Wales					
	Acreage, 'thousands' (000) omitted		Produce of crops, 'thousands' (000) omitted		Average yield per acre		Acreage, 'thousands' (000) omitted		Produce of crops, 'thousands' (000) omitted		Average yield per acre	
	1892	1893	1892	1893	1892	1893	1892	1893	1892	1893	1892	1893
CORN CROPS :—	Acres	Acres	Bush.	Bush.	Bush.	Bush.	Acres	Acres	Bush.	Bush.	Bush.	Bush.
Wheat	2,103	1,799	55,107	46,429	26·20	25·81	55	55	1,319	1,205	23·86	22·09
Barley including Bere	1,710	1,752	59,511	49,033	34·81	27·99	115	112	3,351	2,803	29·26	25·06
Oats	1,765	1,914	73,266	67,164	41·50	35·08	233	241	7,977	7,452	34·18	30·94
Rye	39	47	—	—	—	—	1	1	—	—	—	—
Beans	295	229	6,390	4,257	21·70	18·58	2	2	44	35	28·34	21·11
Peas	192	208	4,966	4,705	25·91	22·64	1	1	25	20	19·73	16·16
TOTAL CORN CROPS	6,104	5,949	—	—	—	—	407	412	—	—	—	—
GREEN CROPS :—			Tons	Tons	Tons	Tons			Tons	Tons	Tons	Tons
Potatoes	350	356	2,085	2,362	5·96	6·64	37	35	207	232	5·66	6·63
Turnips and Swedes	1,390	1,424	19,122	17,206	13·76	12·08	71	71	1,138	1,072	16·04	15·02
Mangel	352	339	6,520	4,313	18·52	12·74	8	7	142	123	17·97	16·38
Cabbage, Kohl-rabi, and Rape	142	146	—	—	—	—	2	2	—	—	—	—
Vetches or Tares	184	161	—	—	—	—	2	2	—	—	—	—
Other Green Crops	92	102	—	—	—	—	1	1	—	—	—	—
TOTAL GREEN CROPS	2,510	2,528	—	—	—	—	121	118	—	—	—	—
OTHER CROPS, GRASS, &c. :—												
Clover and artificial grasses and permanent pasture	10,348	10,700	—	—	—	—	1,650	1,649	—	—	—	—
Ditto for hay	5,409	5,103	Cwt. 111,178	Cwt. 68,730	—	—	671	667	Cwt. 12,069	Cwt. 7,878	—	—
Flax	1	1	—	—	—	—	—	—	—	—	—	—
Hops	56	58	413	415	Cwt. 7·35	Cwt. 7·21	—	—	—	—	—	—
Small Fruit[3]	57	60	—	—	—	—	1	1	—	—	—	—
TOTAL OTHER CROPS	15,871	15,923	—	—	—	—	2,322	2,317	—	—	—	—

Live Stock	Year 1892	Year 1893	Year 1892	Year 1893
	Actual No.	Actual No.	Actual No.	Actual No.
Horses	1,169,146	1,173,809	148,827	147,344
Cattle	4,968,590	4,744,059	754,467	738,608
Sheep	17,993,756	16,805,280	3,197,501	3,101,890
Pigs	1,828,542	1,793,456	197,302	200,676

NOTE.—The produce of Corn Crops for Ireland, originally returned in weight, has been converted into *bushels*, at the rate of 60 *lb.* to the bushel of Wheat; 50 *lb.* to the bushel of Barley; 39 *lb.* to the bushel of Oats; and 60 *lb.* to the bushel of Beans and Peas.

and also the Acreage under other Crops and Grass, and Numbers of Horses, Kingdom in the Years 1892 *and* 1893.

the Agricultural Produce Statistics.]

Scotland						Ireland						United Kingdom					
Acreage, 'thousands' (000) omitted		Produce of crops, 'thousands' (000) omitted		Average yield per acre		Acreage, 'thousands' (000) omitted		Produce of crops, 'thousands' (000) omitted		Average yield per acre		Acreage, 'thousands' (000) omitted		Produce of crops, 'thousands' (000) omitted		Average yield per acre	
392	1893	1892	1893	1892	1893	1892	1893	1892	1893	1892	1893	1892	1893	1892	1893	1892	1893
cres	Acres	Bush.	Bush.	Bush.	Bush.	Acres	Acres	Bush.	Bush.	Bush.	Bush.	Acres	Acres	Bush.	Bush.	Bush.	Bush.
62	44	2,135	1,613	34·66	36·58	75	55	2,214	1,666	29·36	30·28	2,295	1,953	60,775	50,913	26·48	26·08
213	212	7,623	7,700	35·84	36·38	176	169	6,455	6,211	36·76	36·76	2,212	2,244	76,939	65,746	34·78	29·30
999	1,017	35,052	38,270	35·10	37·65	1,226	1,248	51,886	55,701	42·31	44·62	4,224	4,420	168,181	168,588	39·82	38·14
8	7	—	—	—	—	13	13	—	—	—	—	61	70	—	—	—	—
15	14	470	454	31·23	32·48	4	3	149	118	37·51	35·85	315	248	7,054	4,863	22·38	19·61
1	1	27	25	22·66	24·79	½	⅓	11	6	24·97	19·68	195	210	5,028	4,756	25·85	22·61
298	1,295	—	—	—	—	1,494½	1,488⅓	—	—	—	—	9,302	9,145	—	—	—	—
		Tons	Tons	Tons	Tons			Tons	Tons	Tons	Tons			Tons	Tons	Tons	Tons
139	137	757	882	5·44	6·42	740	724	2,585	3,064	3·49	4·23	1,265	1,252	5,634	6,541	4·45	5·23
176	480	7,088	7,984	14·88	16·64	300	303	4,071	4,848	13·55	16·01	2,238	2,278	31,419	31,110	14·04	13·66
1	1	19	21	14·77	20·95	[1] 52	[1] 47	[1] 747	[1] 769	[1] 14·49	[1] 16·35	413	394	7,428	5,225	17·99	13·26
7	8	—	—	—	—	[2] 48	[2] 47	—	—	—	—	199	203	—	—	—	—
12	12	—	—	—	—	5	5	—	—	—	—	204	181	—	—	—	—
2	2	—	—	—	—	30	28	—	—	—	—	128	135	—	—	—	—
37	640	—	—	—	—	1,175	1,154	—	—	—	—	4,447	4,443	—	—	—	—
07	2,396	—	—	—	—	10,251	10,309	—	—	—	—	24,716	25,112	—	—	—	—
45	547	Cwt. 17,059	Cwt. 15,368	—	—	2,143	2,167	Cwt. 90,025	Cwt. 89,666	—	—	8,768	8,485	Cwt. 230,330	Cwt. 181,642	—	—
	—	—	—	—	—	71	67	—	—	—	—	72	69	—	—	—	—
	—	—	—	—	—	—	—	—	—	—	—	56	58	413	415	Cwt. 7·35	Cwt. 7·21
5	5	—	—	—	—	—	—	—	—	—	—	*63	*66	—	—	—	—
57	2,948	—	—	—	—	12,466	12,543	—	—	—	—	33,675	33,810	—	—	—	—

Year 1892	Year 1893	Year 1892	Year 1893	Year 1892	Year 1893
Actual No. 200,109	Actual No. 203,374	Actual No. 539,788	Actual No. 545,180	Actual No. 2,067,549	Actual No. 2,079,587
1,221,726	1,218,009	4,531,025	4,464,026	11,519,417	11,207,551
7,543,447	7,373,164	4,827,702	4,421,593	33,642,808	31,774,824
112,015	119,398	1,115,888	1,152,365	3,265,898	3,278,030

Including Beetroot.
Excluding Ireland.
* Cabbage and rape only.
* Gooseberries, strawberries, currants, and other small fruit.

acre in place of 42·05 cwt. In Durham 27·73 cwt. out of 31·43 was secured, and the average crops of the other Northern counties —Northumberland, Cumberland, and Westmorland—with those of the considerable Hay areas of Chester and the West Riding, ranged from 24 cwt. to 31 cwt. even in the past summer. But in other counties where the area of Rotation Hay is large the yields have been very small. Thus the yield of Norfolk was 15·36 cwt., and that of Hampshire was 11·69 cwt. only. In Wales the county of Pembroke again stands out as the greatest sufferer with a Clover Hay crop of 7·33 cwt. as against a normal yield of 25·73 cwt. The Scotch Hay crop of this class is nowhere put below 16·41 cwt., which is the yield shown for Inverness. It is small, however, also in Orkney, Shetland, and Caithness, but on the other hand the estimate exceeds two tons to the acre in Edinburgh and Renfrew, and is very nearly as large in Lanark.

Table VII.—*The produce of Hay in* 1893 *and* 1892.

Divisions	1893	1892	Decrease	Decrease per cent.
	Cwt.	Cwt.	Cwt.	Per cent.
Great Britain . .	91,976,022	140,305,061	48,329,039	34·45
England . . .	68,729,702	111,177,871	42,448,169	38·18
Wales . . .	7,878,402	12,068,687	4,190,285	34·72
Scotland . . .	15,367,918	17,058,503	1,690,585	9·91
England in Divisions:				
Division 1 (a) .	5,213,795	10,790,061	5,576,266	51·68
Division 1 (b) .	5,797,542	11,267,566	5,470,024	48·55
Division 2 (a) .	5,162,573	9,957,887	4,795,314	48·16
Division 2 (b) .	5,535,578	11,523,102	5,987,524	51·96
Division 3 (a) .	7,600,494	12,129,426	4,528,932	37·34
Division 3 (b) .	5,514,940	9,054,700	3,539,760	39·09
Division 4 (a) .	14,264,900	18,388,382	4,123,482	22·42
Division 4 (b) .	19,639,880	28,066,747	8,426,867	30·02

The record of Hay cut from Permanent Grass is very poor in England. The English mean estimate gives only 12 cwt. in place of an ordinary 26 cwt. per acre, but this includes some remarkable returns which credit Kent with only 4·33 cwt. per acre, as against a normal crop estimated at 25·52 cwt., Bedford with 4·38 cwt. out of a customary crop of 24·43 cwt., Rutland with 4·64 cwt. out of 24·67 cwt., and Surrey 4·97 cwt. out of 25·02 cwt., while through a belt of counties including Berkshire, Buckingham, Oxford, Gloucester, and Somerset, with Warwick and Worcester, a yield of less than 7 cwt. per acre is reported. Pembroke is again the only Welsh county equally low. In Scotland, the Permanent Meadow Hay is returned as from 9 to 12 cwt. over average in Stirlingshire and Dumbarton, but little over half a crop in Dumfriesshire, and two-thirds in other Border counties. The estimate supplied shows but little more than a seventh of a crop in Orkney.

Adding together the gross estimated produce of both kinds of Hay in the past season, it may be interesting to compare, as in Table VII., the general results of the year with those recorded for 1892, itself a year of under average production. If we contrast the aggregate Hay crop of the leading geographical divisions of Great Britain and of the eight groups of English counties previously tabulated in respect of their cereal crops, it is possible to see what percentage of loss has resulted from the diminished acreage and reduced yields of the year, and where it fell most heavily.

The aggregate Hay harvest for Great Britain was, it is seen, not two-thirds of the 1892 crop, but in England not much more than three-fifths was obtained, while in Scotland the loss was 10 per cent. only. Again, throughout the two divisions forming the Eastern half of England, the production of Hay in 1893 is just about half that of the same district in 1892. In the third division of South-Western and West Midland Counties the proportion of loss is 37 to 39 per cent. In the six North-Western counties the loss is just 30 per cent., but in the other section of this division—that is, in Yorkshire, Durham, and Northumberland—not much over one-fifth of the crop was lost.

The Hay Crop in Europe.—In France the failure of hay was conspicuous, especially in the central departments, and a deficit of something like 15,000,000 tons has been suggested. Complaints were numerous of the impossibility of maintaining the cattle on the scanty pastures and the small hay crops secured, and, as with ourselves, the driving of half-fed stock into the markets led to much depreciation of values. Various expedients in the use of novel fodder plants were resorted to, and the anxiety of the French Government was shown by official inquiries made abroad as to the probable sources whence foreign supplies might be sought, while the import duties on fodder were suspended until the end of the year. The total imports into France are said to have increased from 21,000 tons to 159,000 tons in the year.

In Germany severe losses in certain districts were experienced, especially near the Rhine, and after July 4 the export of hay was forbidden, as well as that of fresh and dried fodder plants and chopped straw. The final official reports put the clover and lucerne hay crop for the German Empire, as a whole, at 21 per cent. under the previous year's yield, and $24\frac{1}{2}$ per cent. under average, the permanent meadow hay being 22 and 23 per cent. respectively under the same estimates.

In Austria-Hungary the consequences of the drought induced the Government to take similar measures of precaution, and exports of hay, oil-cakes, straw, and chaff were prohibited, although on the Hungarian side of the dual empire, where the hay harvest was not so seriously affected, this step was somewhat unfavourably regarded. In Italy considerable apprehension was felt early in the season at the reduced hay crop consequent on the drought then experienced, and the official reports transmitted from Rome indicated an extensive loss of pasturage in the neighbourhood of the capital.

In Switzerland also, the shortness of the hay crop gave rise to some apprehension, and proposals for a large import of hay from America were reported as under consideration. In the Netherlands, except in the water-meadow districts, the drought was severely felt, and the scarcity of fodder formed the subject of discussion in the Legislature owing to the extensive purchases of Dutch hay from the more favoured provinces for export to other countries at comparatively high prices.

On the other hand, in south-eastern Europe a large hay crop in Roumania enabled French and German buyers to make purchases there. The southern provinces of Russia likewise enjoyed a plentiful hay harvest, and the Russian hay crop was generally a good one, although some damage from rain in certain districts was reported. That Empire, however, as a whole, profited as an exporter of fodder to meet the wants of some other European countries.

The Hay Crop in America.—Outside of Europe, also, considerable supplies were available, and an important Transatlantic trade in hay resulted. Although drought was felt in some of the States of the American Union during the summer, and complaints were forthcoming of the loss of pasturage in the autumn in the South, the November estimates of the hay yield for the country, as a whole, were above those of 1892, the bulk of the yield being much increased by the greater proportion of the alfafa or lucerne crop now included in the estimates. It may be noted, however, that while the official return of the surface under hay in America approximates 50,000,000 acres, some importation of hay into the States has been annually recorded of late, exceeding in the aggregate the exports of this form of agricultural produce. It is probable that the circumstances of the past summer will have materially altered the position in this respect, as our record of imports here from the United States indicated an extraordinary increase in the twelve months ended December 31, 1893, over the previous year's arrivals, and a total receipt from this source alone of over 100,000 tons.

In Canada, whence the United States draw a portion of their imports of hay, the yield of 1893, judging from the Ontario Returns, was over average by more than a third of a ton to the acre; and in the year up to December last Canada is credited with 63,000 tons of the hay imported into the United Kingdom, while reports transmitted to the Board of Agriculture during the summer appear to indicate that some part of the nominal American exports was made up of hay from across the Canadian frontier which had been brought down to and shipped at Boston or other ports.

JOURNAL

OF THE

ROYAL AGRICULTURAL SOCIETY OF ENGLAND.

THE CAMBRIDGE MEETING, 1894.

THE holding of this year's Country Meeting at the ancient University town of Cambridge is an event which, by its associations, carries us back to the earliest days of the Royal Agricultural Society of England. The first Show which the national society ever brought together was that at Oxford in 1839; the second was that at Cambridge in 1840. Between the dates of these two Meetings the Society—known originally as the English Agricultural Society—received (March 26, 1840) its Charter of Incorporation as the Royal Agricultural Society of England, so that in a sense the Meeting at Cambridge, fifty-four years ago, may be looked back upon as the first Show held by the Society as at present constituted. Oxford was revisited in 1870, but the long interval just mentioned has been allowed to elapse between the first and second visits to the rival seat of learning. The incidents of the first two Country Meetings of the Society have been so fully dealt with by the Secretary in this volume of the Journal (Part II., pp. 205–234) that any further comparison between the first and second Meetings at Cambridge —in 1840 and 1894—is rendered unnecessary. Subjoined are a few details as to the seven Meetings which have been held in the Eastern Counties.

Year	Place of meeting	President	Entries of live stock	Entries of implements	Persons paying for admission
1840	Cambridge	The Duke of Richmond	337	115	no record
1849	Norwich	Earl of Chichester	624	1,882	,,
1856	Chelmsford	Lord Portman	752	2,702	32,982
1867	Bury St. Edmunds	Mr. H. S. Thompson	719	4,804	61,837
1874	Bedford	Mr. Edward Holland	1,527	5,931	71,989
1886	Norwich	H.R.H. The Prince of Wales	1,823	4,656	104,909
1894	Cambridge	The Duke of Devonshire	1,861	6,031	111,658

The Show-Ground.

Contrary to what is often of necessity the case, a site was found for the Show within the limits of the town. The place selected was an open area of sixty-four acres extending between the grounds of Jesus College and the banks of the river Cam. As may be seen from the plan on the opposite page, the Surveyor had an awkwardly shaped piece of ground to deal with. The main features of the arrangement were made dependent on a public road—Victoria Avenue—which the municipal authorities temporarily closed to traffic. Passing into the Showyard at the chief entrance the visitor found that the display of implements was grouped on the right-hand side of this road, whilst all the live stock were collected on the left-hand side. A much-appreciated innovation, due to the Honorary Director, was the placing of finger-posts at the junctions of the main avenues. The locomotion of visitors was further facilitated by the display, at suitable conspicuous places, of large coloured plans of the Showyard.

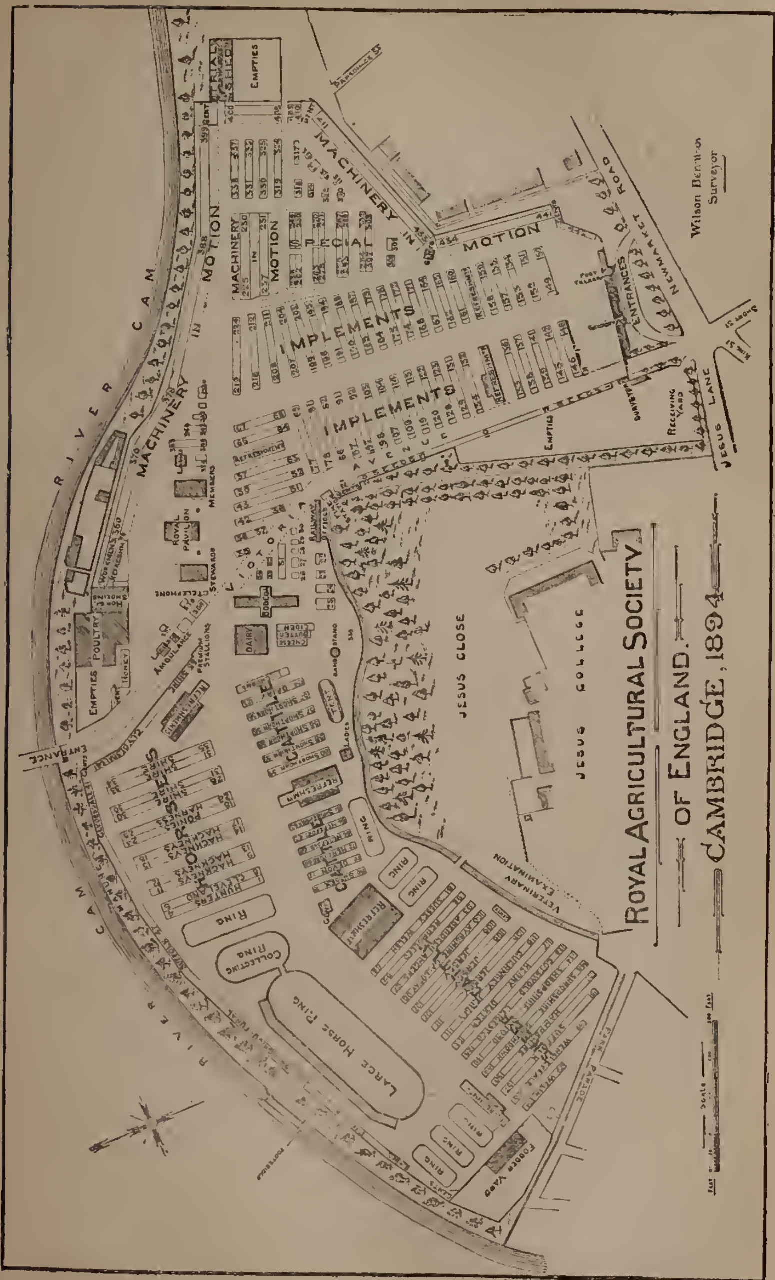
Entries.

The entries of live stock at Cambridge were made under new conditions, which render it impossible to institute any fair comparisons between the numbers of entries this year and those in previous years. After 1890 the entries of live stock by an individual exhibitor were restricted to three in any one class, and for the Cambridge Meeting the number was reduced to two. On account, moreover, of the prevalence of swine fever, the Council on May 2, 1894, decided[1] that no entries of pigs should be accepted, and accordingly this section of the Show was entirely suspended. Notwithstanding these drawbacks, the total entries of stock, as will be seen from the table on p. 424, exceeded those at Warwick in 1892, and at Plymouth in 1890. This was largely due to the capital entry of horses, which has only been surpassed twice in the last ten years, namely, at Windsor in 1889, and at Doncaster in 1891.

The Implement Yard was remarkably well filled, the total extent of shedding being, with the exception of the Jubilee Meeting at Windsor, the largest of the last ten years.

---

[1] See this Volume of the Journal (Part II.), Appendix, p. lxi.


ROYAL AGRICULTURAL SOCIETY
OF ENGLAND.
CAMBRIDGE, 1894
RIVER CAM
MACHINERY IN MOTION
SPECIAL MACHINERY IN MOTION
IMPLEMENTS
EMPTIES
TRIAL SHED
POULTRY
ROYAL PAVILION
DAIRY
JESUS CLOSE
JESUS COLLEGE
NEWMARKET ROAD
ENTRANCES
JESUS LANE
RECEIVING YARD
VETERINARY EXAMINATION
LARGE HORSE RING
COLLECTING RING
RING
FODDER YARD
Surveyor

Number of Entries at the last Ten Country Meetings (1885–1894).

Number of animals entered	Cambridge, 1894	Chester, 1893	Warwick, 1892	Doncaster, 1891	Plymouth, 1890	Windsor, 1889	Nottingham, 1888	Newcastle, 1887	Norwich, 1886	Preston, 1885
Horses . .	617	509	419	717	333	996	546	500	493	438
Cattle . .	659	759	607	669	642	1,644	644	626	681	539
Sheep . .	588	631	600	649	571	1,109	537	513	446	433
Pigs . . .	—	162	202	205	223	265	148	194	203	203
Total . .	1,684	2,061	1,858	2,240	1,769	4,014	1,875	1,833	1,823	1,613
Poultry . .	705	836	835	789	695	861	343	405	191	325
Produce . .	538	957	433	425	456	1,202	441	347	274	385

Shedding in Implement Yard (in feet) [exclusive of open-ground space]	Cambridge, 1894	Chester, 1893	Warwick, 1892	Doncaster, 1891	Plymouth, 1890	Windsor, 1889	Nottingham, 1888	Newcastle, 1887	Norwich, 1886	Preston, 1885
	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.
Ordinary . .	8,435	8,610	8,241	8,343	6,117	10,378	7,253	5,508	7,155	8,417
Machinery in motion .	2,539	2,211	2,151	2,106	1,291	2,496	1,607	1,125	2,017	2,063
Special shedding (including seeds, models, &c.)	2,128	2,197	2,119	2,024	1,670	2,728	1,883	1,581	1,640	1,520
Total . .	13,102	13,018	12,511	12,473	9,078	15,602	10,743	8,217	10,812	12,000

The Show.

In accordance with the usual custom, the Implement Yard only was open to the public on Saturday, June 23. From Monday till Friday, June 25 to 29, the entire Showyard was open daily.

The Meeting was favoured throughout by fine weather. The Saturday was a bright, breezy day, and though on Monday morning rain seemed probable, none fell. That day and the next were dry, but were associated with clouded skies. The last three days, however, left nothing to be desired in the way of Showyard weather, brilliant sunshine and pleasant breezes prevailing throughout the Wednesday, Thursday, and Friday. It fortunately happened that, after a long spell of broken weather in May and June, this delightful change was as welcome to farmers in all parts of the country as it was to those who had the success of the Cambridge Meeting most closely at heart.

Divine Service was held on Sunday morning in the large tent, and was attended by the grooms, herdsmen, shepherds and others in charge of live stock, as well as by a large number of Members of Council, including the President and the President-elect. The service, which was choral, was conducted by the Rev. J. E. L. Dickson, vicar of St. Andrew-the-Less, Barnwell, and the sermon was preached by the Bishop of Ely (the Right Rev. Lord Alwyne Compton, D.D.), who took as his text (St. Luke xii. 6–7): "Are not five sparrows sold for two farthings, and not one of them is forgotten before God? But even the very hairs of your head are all numbered. Fear not, therefore: ye are of more value than many sparrows." After the benediction the National Anthem was sung, the news of the birth of a son to His Royal Highness the Duke of York having reached the Showyard whilst the service was being held.

On Monday morning, at 8·30, the Stewards and Judges of live stock met in the large tent, and were briefly addressed as to the nature and extent of their duties by the Hon. Cecil T. Parker, Honorary Director of the Show. At 9 o'clock judging commenced in all sections, and the awards in the whole of the live-stock classes were posted up before the Show closed for the day.

The Prince of Wales honoured the Show with his presence on Tuesday, and remained on the ground for most of the day, spending the night at the Lodge of Trinity College, in the great hall of which a banquet in honour of His Royal Highness was given in the evening. The General Meeting of Governors and Members of the Royal Agricultural Society, held on Tuesday, filled the large tent to overflowing. The Duke of Devonshire, K.G., President of the Society, took the chair, and was supported by the Prince of Wales, Sir J. H. Thorold, Bart. (President-elect), nearly the whole of the Members of Council, and by several noblemen and gentlemen representing the University and the Cambridge Local Committee. From the report of this Meeting, given in the Appendix (p. xc.), it will be seen how great was the appreciation of the efforts which had been made by the Municipal Body, the Local Committee, and the townsmen generally to promote the success of the Society's visit to Cambridge. On this and the remaining days of the Show the band of the King's Dragoon Guards played selections of music, the programme of which was printed in the Catalogue.

On Wednesday afternoon the Duke of York, who in the morning had received the degree of LL.D. from the University of Cambridge, visited the Show, and witnessed the horse parade in the great ring, besides inspecting various other sections of the Exhibition. It is interesting to record that His Royal Highness appeared at this Meeting for the first time as an exhibitor at the Society's Shows, and obtained several awards in the Red Polled cattle classes.

As Cambridge is not the centre of a thickly populated district, a large attendance of paying visitors could hardly be looked for. The result, however, far exceeded anticipations, and the total number of close upon 112,000 people who passed the turnstiles must be regarded as exceedingly satisfactory. The remarkable attendance of 63,981 people on Thursday, the first of the one shilling days, has only been twice exceeded during the last decade. Nearly 200 excursion trains emptied themselves into the town of Cambridge on that day. Though this large influx of visitors must be primarily attributed to the beautiful weather, due acknowledgment should be made of the successful efforts of the town authorities in providing on Wednesday and Thursday evenings magnificent displays of fireworks. These, given in College grounds, the beautiful surroundings of which enhanced the brilliancy of the spectacle, were greatly enjoyed by large crowds of spectators.

Number of Paying Visitors at the last Ten Country Meetings (1885–1894).

Day of Show	Cambridge, 1894	Chester, 1893	Warwick, 1892	Doncaster, 1891	Plymouth, 1890	Windsor, 1889	Nottingham, 1888	Newcastle, 1887	Norwich, 1886	Preston, 1885
Implement day (2*s*. 6*d*.)	260	299	266	314	194	493	1,826	1,209	148	394
1st day (Mon. 5*s*.) . .	1,879	2,397	3,570	2,681	1,234	6,223	1,671	1,097	625	3,557
2nd day (Tues. 2*s*. 6*d*.)	13,152	20,959	16,598	12,331	10,008	18,809	11,103	11,331	8,074	21,713
3rd day (Wed. 2*s*. 6*d*.)	17,890	19,034	15,779	18,530	39,308[1]	24,690	9,057	12,020	10,894	19,318
4th day (Thurs. 1*s*.) .	63,981	59,555	36,448	57,580	32,371	32,965	88,832	77,410	42,774	34,302
5th day (Fri. 1*s*.) . .	14,496	13,664	23,801	20,034	14,026	44,493	35,438	24,305	42,394	14,908
Total . .	111,658	115,908	96,462	111,500	97,141	155,707[2]	147,927	127,372	104,909	94,192

[1] Wednesday was a one shilling day at Plymouth. [2] Including 28,034 on the sixth day (Sat. 1*s*.).

The Society and the University.

No record of the Cambridge Meeting would be complete without an appreciative reference to the cordial and fraternal spirit with which the Royal Agricultural Society was welcomed by the ancient and illustrious University of Cambridge. Several of the Colleges threw open their doors with that generous hospitality which, from mediæval times, is one of their most treasured heritages. The happy coincidence that the President of the Society was also the Chancellor of the University furnished the strongest possible link between the renowned seat of learning and the national society whose migrations, after the wanderings of over half a century, had at length brought it back to the scene of its earliest triumphs. The University authorities resolved that the second visit of the Society to Cambridge should not pass without some official recognition on their part of the work which the Society has done—and is doing—to promote the interests and to extend our knowledge of the first of human industries.

What more graceful form could this recognition take than the enrolment upon its records of the names of those whom the University knew that the Society itself would delight to honour? Accordingly, it was resolved by a Grace of the Senate to confer the following Honorary Degrees:—that of LL.D. upon His Royal Highness the Duke of York, the Duke of Richmond and Gordon, Earl Cathcart, Sir John Thorold, Colonel Sir Nigel Kingscote, and Mr. Albert Pell; that of D.Sc. upon Sir John Lawes and Sir Henry Gilbert; and that of M.A. upon Mr. Ernest Clarke and Dr. J. Augustus Voelcker.[1] The ceremony took place in the Senate House on the beautiful morning of Wednesday, June 27, in the presence of a brilliant assembly. The Duke of Devonshire, Chancellor of the University, presided, and seated on his Grace's right were their Royal Highnesses the Prince of Wales, attired in his robes as LL.D. of the University, the Princess of Wales, and the Princesses Victoria and Maud of Wales. The honorary graduates were loudly cheered as, one by one, they were presented by the Public Orator to the Chancellor, and admitted by the latter to their respective degrees.

The following is the text of the Latin orations delivered by the Public Orator, Dr. Sandys, Fellow and Tutor of St. John's College, through whose kindness an English translation is given of each.

Address of Welcome to the Society.

Dignissime domine, domine Cancellarie; Principes illustrissimi; ceterique omnes quotquot hodie adestis:

Principis nostri, plusquam semel Praesidis sui, auspicio, Cancellarii nostri sub praesidio, Regiam agricolarum Anglicorum societatem Cantabrigiam denuo invisentem Academiae totius nomine iubemus salvere. Ipso Tullio auctore novimus, primum nihil Xenophonti tam regale visum esse quam studium agri colendi; deinde hominum generi universo culturam agrorum esse salutarem; denique omnium rerum ex quibus aliquid adquiratur, nihil esse agri cultura melius, nihil dulcius, nihil homine dignius. Salvete

[1] Honorary Degrees were upon the same occasion conferred upon Mr. Alexander Peckover, the newly appointed Lord-Lieutenant of Cambridgeshire (LL.D.), and upon Professor Mendeleeff, the distinguished Russian chemist (D.Sc.)

igitur studii tam praeclari professores, qui in agris colendis scientiam cum usu et experientia coniunctam profitemini. Vos, segetis laetae in expectatione, telluris gremio semina creditis; nos, non minore cum spe, iuventutis nostrae in mentibus doctrinae germina inserere conamur. Vos, in agrorum cultura scientiae lumen per Angliae rura late diffunditis; nos, inter Academiae nostrae numina, etiam ipsi Cereri locum nuper seposuimus. Et vestra et nostra commoda sunt aliquatenus communia; vestrae artes dum vigent, etiam nosmet ipsi prospera fortuna utimur, florent praediorum nostrorum reditus, florent Collegia nostra, floret tota Universitas. Nihil igitur auspicatius hodie precari possumus quam ut, vestrae societatis auxilio, patriae totius ad fructum, civium omnium in usum, telluris munera divina indies ampliora vobis reddantur; utque nostrum quoque in populum universum descendant benedictiones illae antiquae:—*benedictus tu in civitate et benedictus in agro; benedictus fructus terrae tuae fructusque iumentorum tuorum; benedicti greges armentorum tuorum oviumque tuarum.*

Atque haec quidem ominis causa praefati, pergimus deinceps titulo nostro primum Principis nostri filium, Principis novi patrem, ornare, deinde vestrum omnium in honorem etiam alios decorare. Non omnes sane, quos volumus, hodie laudibus nostris adficere possumus; sed, velut in frugibus vendendis vosmet ipsi ex acervo magno grana quaedam aurea emptoribus ostendere soletis, non aliter vestro ex ordine amplissimo nonnullos, quasi exempli causa, Cancellario nostro, Praesidi vestro, praesentamus, fidemque damus etiam ceteros esse bonae frugi.

Your Royal Highnesses, your Grace the Chancellor, and all who are present to-day:

In the name of the University we offer our welcome to the Royal Agricultural Society of England on its second visit to Cambridge,—a visit paid under the presidency of our Chancellor and under the auspices of a Prince who has been its President on more than one occasion. On the authority of Cicero himself we are assured, first, that Xenophon deemed agriculture to be an eminently royal pursuit;[1] next, that it is salutary to the human race in general;[2] and, lastly, that, of all possible sources of profit, none is more excellent, none more delightful, none more worthy of humanity.[3] Such is the noble pursuit whose professors we welcome in *you*, who, in the calling of agriculture, claim to combine *Science with Practice*. While *you*, in expectation of a happy harvest, entrust the seed of your sowing to the bosom of the earth, *we*, with a hope no less bright than your own, endeavour to implant the germs of learning in the minds of our students. While *you*, in the cause of agriculture, are spreading the light of science far and wide across the fields of England, *we* have been lately setting apart a place for Ceres herself among the divinities honoured by our University. Further, your own prosperity and ours are to a large extent linked together. When *your* pursuits are prosperous, we share in your prosperity, so long as the rents of our farms, and consequently all our Colleges and the University at large, are in a flourishing condition. Therefore, on this day we can breathe no more auspicious prayer than that, by the aid of your Society, the gifts of the Earth that are granted by Heaven may be reaped by yourselves in ever-increasing abundance, to the advantage of the country at large and to the benefit of all our citizens; and that England may thus see descending upon her the benedictions promised to Israel of old:—"*Blessed shalt thou be in the field; blessed shalt be the fruit of thy ground, and the fruit of thy cattle, the increase of thy kine, and the flocks of thy sheep.*"[4]

Having thus far assured you of our good wishes for the future, we now proceed to offer the compliment of our honorary degree, first to our Prince's son, himself the father of a new-born Prince; and next to certain other persons, in the hope of doing honour thereby to all of yourselves. It is impossible for us to pay this compliment to-day to all whom we would desire to honour; but, even as in the corn market, the seller (as you are well aware) is wont to display to the buyer some few golden grains as samples of a goodly store, even so, out of your goodly company, do we now present to our Chancellor, and your own President, a few individuals by way of example, and in so doing we pledge our word that the remainder are of the same good quality.

[1] Cicero, *De Senectute*, 59. [2] *Ibid.* 56. [3] *De Officiis*, i 151. [4] Deut. xxviii 3.

Doctors of Law.

H.R.H. the Duke of York.

Dignissime domine, domine Cancellarie, et tota Academia:

Quam libenter Reginae nostrae augustissimae et Principis Alberti, olim Cancellarii nostri, nepotem Academiae totius nomine nunc primum salutamus.

Salutamus denuo patrem eius, Principem nostrum illustrissimum, quem triginta abhinc annos titulo eodem ornatum vidimus; salutamus matrem, omnium consensu pulcherrimam, quam hodie etiam ipsam adesse vehementer laetamur. Salutamus Principem, qui prope ex ipsa pueritia scientiae navali perdiscendae sese strenue dedicavit; qui maria magna emensus, colonias nostras, toto orbe a nobis divisas, toto corde nobis coniunctas, regni sibi aliquando fortasse destinati nondum conscius, invisit; qui populorum magnorum historiae studiosus, imperii Britannici gloriam navalem sibi carissimam esse identidem indicavit. Nuper Kalendis Iuniis, dum misericordia solita pauperum aegrotantium saluti consulebat, classis Britannicae victoriam centum abhinc annos eodem anni die reportatam inter omnium plausus palam commemoravit. Idem prope uno abhinc anno (iuvat recordari) inter regum principumque gratulationes, inter civium exultantium acclamationes, Ducis primi Cantabrigiensis neptim ab omnibus dilectam vitae totius consortem duxit. Hodie vero, gaudio novo elati, laetamur regni tanti heredis heredem filio feliciter esse auctum, et matre salva genus regium usque ad tertium gradum prospere esse continuatum.

Duco ad vos PRINCIPEM GEORGIUM FREDERICUM, DUCEM EBORACENSEM.

Your Grace the Chancellor, and members of our University:

We have now the pleasure of welcoming for the first time, in the name of the University, the grandson of our most gracious Queen and of the Prince Consort, our former Chancellor. We welcome once again his father, our most illustrious Prince, whom we saw presented for the same titular degree just thirty years ago; we welcome also his mother, confessed by all to be most fair, and we heartily rejoice in her presence here to-day. We are now offering our greeting to a Prince who, almost from his very boyhood, has zealously devoted himself to acquiring a thorough knowledge of the naval profession; a Prince who, while yet unconscious of the kingdom haply destined to be his own at some future day, traversed the ocean and visited those colonies that are so far from us in geographical distance and are yet so near to us in their feelings of loyal affection; a Prince who, as an eager student of history, has repeatedly proved how dearly he prizes the glory of England's empire on the seas. It was only lately, on the 1st of June, on an occasion when, with his wonted compassion, he was showing his interest in promoting the health of our afflicted poor, that he recalled amid loud applause the victory gained by the British fleet on that very day a hundred years before. It is scarcely a year ago (as we rejoice to remember) when, amid the congratulations of kings and princes, and amid the loud acclaim of a rejoicing people, his Royal Highness wedded a Princess who is universally beloved, a Princess who is the grand-daughter of the first Duke of Cambridge. And now we have a new cause for rejoicing in the birth of a Prince who happily continues the line of the descendants of the Queen to a third generation, as heir to the son of the heir apparent of the throne of England.

I present to your Grace and to the University His Royal Highness PRINCE GEORGE FREDERICK, DUKE OF YORK.

His Grace the Duke of Richmond and Gordon, K.G.

Sequitur deinceps Universitatis Aberdoniensis Cancellarius, vir in publicis rebus saepenumero cum laude versatus, cuius pater agricolarum societati quinquaginta quattuor abhinc annos praeses prope primus fuit, quique ipse societati eidem bis praepositus, inter Oxonienses suos honoris titulo anno eodem est ornatus, quo Cancellarii nostri pater, Cancellarius ipse, societati praefuit. Virum tot titulis iam pridem ornatum etiam nosmet ipsi hodie libenter decoramus. Atqui nullum titulum ipsi potiorem esse credimus quam a Principe nostro inter epulas regias societatis suae in honorem habitas palam fuisse appellatum "agricolarum amicum."

Duco ad vos periscelidis equitem illustrissimum, DUCEM DE RICHMOND.

Next in order comes his Grace the Chancellor of the University of Aberdeen. His Grace has often won distinction in the public service; his father was the second President of the Society, four-and-fifty years ago; he has himself been its President on two occasions; and he received an honorary degree from his own University of Oxford in the year in which the President of the Society was the late Duke of Devonshire, then Chancellor of our University, and the father of our present Chancellor. We gladly pay honour to-day to one who has long been adorned with many titles of distinction; and yet we venture to think that at the present moment there is no distinction which he prizes more highly than the fact that, at the banquet given in honour of the Royal Agricultural Society by her gracious Majesty the Queen, he was publicly designated by the Prince of Wales as *The Farmer's Friend*.

I present to you an illustrious Knight of the Garter, his Grace the DUKE OF RICHMOND.

Earl Cathcart.

Incedit proximus vir insigni lepore et litterarum amore praeditus, qui maioribus inter arma illustribus oriundus, Minervam et Cererem non minus quam Martem coluit. Ipsa Ceres filiam suam, solis ex lumine telluris in gremio absconditam, facibus accensis quaesivisse fertur; Cereris autem cultor insignis, quem hodie salutamus, nihil antiquius duxit quam, societatis suae fastis litterarum luce illustratis, Angliae totius agricolis facem doctrinae praetendere. Talium virorum merita, inter Cereris ministros non obscura, etiam Academiae in lucem hodie libenter proferimus, Cererem ipsam atque Solem veritatis arbitrum Euripidis verbis testati:

τήν τε πυρφόρον θεὰν
Δήμητρα θέμενοι μάρτυρ' ἡλίου τε φῶς.

Duco ad vos virum admodum honorabilem, COMITEM CATHCART.

The next to advance is one endued with a singular wit and a love of letters, who, although descended from ancestors distinguished in arms, has himself been a votary of Minerva and of Ceres, no less than of Mars. We learn from an ancient legend that, when Proserpine was removed from the light of day and concealed beneath the earth, Ceres lighted a torch to aid her in her quest for her lost daughter. The distinguished votary of Ceres whom we salute to-day has deemed it a foremost duty to illumine the records of the Society with the light of literature and to hold aloft the torch of Science before the agriculturists of England. The merits of such men, which are by no means obscurely known to the ministers of Ceres, we gladly bring forth to-day in the light of University life, while, in the words of Euripides, we summon Ceres herself and the light of the Sun to bear witness in their honour:

"Calling to witness heaven and earth,—Demeter,
Fire-bearing Goddess, and the Sun-god's light."[1]

I present to you the Right Honourable THE EARL CATHCART.

[1] Euripides, *Supplices*, 260, with the Scholiast.

Sir John Thorold, Bart.

Salutamus deinceps virum societatis vestrae consiliorum prope in omni parte praeclare meritum, Cancellarii nostri in loco in annum proximum Praesidem vestrum designatum. Per annos complures agrorum suorum reditu infeliciter imminuto, quanta animi cum magnitudine, quanta cum fortitudine, se gessit. Quam dignum laude illa Horatiana sese praestitit:

"est animus tibi
rerumque prudens et secundis
temporibus dubiisque rectus."

Duco ad vos Baronettum illustrem, IOANNEM HENRICUM THOROLD.

We welcome next in order one who has done excellent service to the Society in almost every department of its work, one who has been elected President for the ensuing year in succession to our Chancellor. For many a year, while the rents of his estates were unhappily diminishing, he has shown a rare courage and a singular magnanimity. He has in fact proved his right to praise no less lofty than that contained in the lines of Horace:

"A soul is yours,
Clear-sighted, keen, alike upright
When Fortune smiles, and when she lowers."[1]

I present to you an illustrious Baronet, Sir JOHN HENRY THOROLD.

[1] Horace, *Odes*, iv 9, 34.

Col. Sir Nigel Kingscote, K.C.B.

Adest deinceps vir in bello quondam insignis, in pace postea illustris, primum Senatui Britannico tres et triginta annos adscriptus; deinde Angliae totius nemorum silvarumque et Cornwalliae metallorum reditibus exigendis praepositus; denique societatis vestrae de negotiis cotidianis praeclare meritus. Adest "egregie cordatus homo," vir in epistolarum commercio admirabilis, in animalium salute exploranda et adiuvanda indefessus.

Duco ad vos de Balneo equitem insignem, virum Principis nostri in domo merito probatum, Robertum Nigel Fitz-Hardinge Kingscote.

' The next that is present to-day is one who was once distinguished in war, and has long been illustrious in the arts of peace. In the first place, he was for three-and-thirty years a member of Parliament; in the second, he has been appointed a Commissioner of Woods and Forests, and Receiver of the Duchy of Cornwall; and lastly, he has done admirable service in the discharge of the customary business of the Royal Agricultural Society. We have before us one whom Ennius would have described as "a man of excellent heart," an exemplary correspondent, and an unwearied student of animal hygiene.

I present to you a distinguished Knight Commander of the Bath, one who is held in well-deserved esteem in the Household of our Prince, Colonel Sir Robert Nigel Fitz-Hardinge Kingscote.

Mr. Albert Pell.

Iuris Doctorum agmen claudit alumnus noster, iudicis filius, qui adhuc iuvenis quattuor et quinquaginta abhinc annos societatis vestrae conventui primo Cantabrigiensi interfuit; qui postea, pestilentia gravi inter Britanniae boves saeviente, consilia salutaria solus obtulit pestemque tantam iussu publico opprimendam curavit; qui deinceps Senatui Britannico per annos septemdecim adscriptus, agri culturae patronus strenuus exstitit; qui nuper denique Academiam nostram Seneschalli sui cum auxilio de agri culturae studiis deliberantem magnopere adiuvit. Quod scientiae huius diplomata nostra hodie in honore sunt, talium virorum praesertim consiliis debemus.

Duco ad vos Academiae quidem nostrae artium magistrum, Britanniae vero agricolarum revera praeceptorem atque adeo doctorem, Albertum Pell.

The line of our honorary Doctors in Law closes with the son of a Judge and a member of our own University, who, as an undergraduate four-and-fifty years ago, was present at the first Cambridge Meeting of the Society. Afterwards, when a grievous plague was raging among the cattle of our own country, he stood alone in offering salutary advice which led to measures being taken by the Government that soon put an end to the pestilence. Thereupon, he was enrolled in the Senate of England, and for seventeen years proved himself an unwearied champion of agriculture in Parliament. Lastly, when our University with the aid of its High Steward (Lord Walsingham) was recently deliberating on the subject of agricultural studies, his advice was of the highest value. The respect in which our diplomas of agriculture are now held is pre-eminently due to the counsels of men such as these.

I present to you one who is a Master of Arts in our own University, but is at the same time a leading authority, a very *Doctor*, among the agriculturists of England, Mr. Albert Pell.

Doctors of Science.

Sir John Bennet Lawes, Bart., F.R.S.

Salutamus tandem par nobile collegarum qui de agrorum cultura, de pecudum alimentis variis, experimentis exquisitis una elaborandis annos quinquaginta, magnum profecto aetatis humanae spatium, dedicarunt. Tot annorum autem labores non modo chartae fideles in perpetuum custodient, sed etiam saxum ingens nomine utroque insculptum inter posteros testabitur. Ab ipso autem "monumentum aere perennius" erit exactum, experimentis tam utilibus, tam fructuosis, munificentia ipsius etiam in posterum continuatis. Auguramur, nec nos fallit augurium, in agri culturae annalibus talium virorum nomina fore immortalia.

Duco ad vos Baronettum insignem, Regiae societatis socium, virum doctoris titulo bis aliunde merito ornatum, Ioannem Bennet Lawes.

At length we reach the names of two generous fellow-workers who have devoted fifty years, a large portion of the length of life allotted to man, to aiding one another in the most elaborate experiments on the growth of crops, and on the various foods appropriate to the animals of the farm. The labours of all those years will find a perpetual memorial in the printed record of the investigations themselves, and will also be attested in the presence of posterity by the granite boulder that bears the names of both; while the generous provision which has been made for the future continuance of experiments that have proved so rich in valuable results, will ensure to the munificent founder himself "a monument more imperishable than bronze." [1] We prognos-

[1] Horace, *Odes* iii 30, 1.

ticate (and our prognostication is true) that in the annals of agriculture the names of such men as these will be immortal.

I present to you a Fellow of the Royal Society, who has twice already received an honorary degree elsewhere, the distinguished Baronet, Sir JOHN BENNET LAWES.

Sir Joseph Henry Gilbert, F.R.S.

Quos tot annorum labores una coniunxerunt, eos in laudibus nostris hodie divellere vix possumus. Constat tamen labores illos viri huiusce scientiae admirabili et industriae indefessae plurimum debere. Constat eosdem eiusdem scriptis, eiusdem orationibus, non modo in patria nostra sed etiam peregre maximo cum fructu esse patefactos. Cum collega suo summa concordia coniunctus, Plinii verba iure optimo posset usurpare: "nobis erat nullum certamen, nulla contentio, cum uterque pari iugo non pro se, sed pro causa niteretur."

"Felices ter et amplius
quos irrupta tenet copula."

Duco ad vos Regiae societatis socium, virum ab ipsa Regina equitem propter merita nominatum, IOSEPHUM HENRICUM GILBERT.

Those who have been joined together in the labours of so many years can hardly be set asunder or in any way separated by ourselves in the award of our meed of praise. It is agreed, however, that those long-continued labours owe a large debt to the scientific skill and the unremitting industry of him whom you now see before you. It is also agreed that by his writings and his lectures the results of those labours have been most fruitfully expounded in this and other countries. United with his fellow-worker by bonds of closest concord, he might justly apply to himself and his colleague the words of the younger Pliny: "There has been no conflict, no contest between us, while each of us like a true yoke-fellow, has been ever striving, not for himself, but for the common cause."[1]

"Thrice blest, and more than thrice, are they
Whom one strong bond unites for aye."[2]

I present to you a Fellow of the Royal Society, one whose merits have been recognised by his receiving the honour of knighthood from the Queen, Sir JOSEPH HENRY GILBERT.

[1] Pliny, *Ep.* iii 9. [2] Horace, *Odes*, i 13, 17.

MASTERS OF ARTS.

Mr. Ernest Clarke.

Vobis omnibus notum esse arbitramur concilii vestri per annos septem adiutorem strenuum et indefessum, virum in Britannia quidem societati antiquitatis studiosorum, inter exteros autem societatibus plurimis honoris causa adscriptum. In agro Suffolciensi natum fuisse constat virum insignem, qui scriptis suis fere centum abhinc annos in lucem missis agri culturam (velut alter Tremellius) "eloquentem reddidit." Viri tanti popularem, quem hodie laudamus, e loco suo natali spiritum eiusdem hausisse crediderim.

Duco ad vos ERNESTUM CLARKE.

We presume that you are all familiar with one who, for the last seven years, has been the ever-active and never-weary coadjutor of your Council, a Fellow of the Society of Antiquaries, and an honorary member of many Societies abroad. It is the county of Suffolk that claims the birthplace of that distinguished agriculturist (Arthur Young) who in his writings, which saw the light about a century ago, succeeded (like the Roman Tremellius) in "making agriculture eloquent."[1] We may well believe that that eminent man's fellow-countryman, whom we eulogise to-day, caught something of that spirit from the place of his birth.

I present to you Mr. ERNEST CLARKE.

[1] Columella, i 1, 12.

Dr. John Augustus Voelcker.

Claudit seriem patris in scientia chemica illustris filius in eadem scientia insignis, qui inter Germanos Philosophiae Doctor multa cum laude nominatus, etiam de agri cultura inter Indos publice rettulit. Idem, per annos novem societati vestrae in re chemica consilio dando, patris successorem sese dignum praestitit. Quod omnibus gratum, nemini tamen mirum sit; etenim experti nostis Horatianum illud:—

> "fortes creantur fortibus et bonis;[1]
> est in iuvencis, est in equis patrum
> virtus."

Duco ad vos IOANNEM AUGUSTUM VOELCKER.

We conclude with the name of a distinguished son of a father who was illustrious in the science of Chemistry; the name of one who in Germany attained with high credit the degree of Doctor of Philosophy, and who has since presented to the Government an official report on agriculture in India. As consulting Chemist to the Society for the last nine years, he has proved himself a worthy successor of his father: a fact which, though gratifying to all, need be surprising to none. Members of the Society know from their own experience the truth of the lines of Horace:

> "'Tis of the brave and good alone
> That good and brave men are the seed;
> The virtues, which their sires have shewn,
> Are found in steer and steed."

I present to you Dr. JOHN AUGUSTUS VOELCKER.

[1] Horace, *Odes* iv 4, 30.

In proceeding to notice the several sections of the Exhibition it should be mentioned that the views of the Judges are embodied in the statements made, whilst frequent quotations are given from the Judges' reports. The names of the Stewards and of the Judges, together with the complete List of Awards, will be found in the Appendix, pp. xcvi. *et seq*. This list affords such full details as to the ownership, breeding, and pedigree of the prize-winning animals that it is unnecessary to repeat these in the text.

LIGHT HORSES.

Thoroughbred Stallions.—The winners of the three Queen's Premiums of 150*l*., offered by the Royal Commission on Horse Breeding, and the Gold Medals offered by the Cambridge Local Committee at the Spring Show, held March 6 to 8, 1894, were exhibited—not for competition—in a special shed. They were *Serpa Pinto*, belonging to His Royal Highness the Prince of Wales; *Mount Gifford*, belonging to Mr. Donald Fraser; and *Persistive*, belonging to the Duke of Hamilton and Brandon.

Hunters.—Fifty-six entries were distributed amongst 7 classes, none of which call for any special notice, save that the yearling fillies (Class 7) "were unworthy of the show."

Cleveland Bays and Coach Horses.—An entry of 7 stallions, all from Yorkshire, and of 6 mares from various counties, made up this section. Mr. Lett's first prize stallion was considered far ahead of any other animal in Class 8. The first prize mare was regarded by the Judges as the finest Cleveland mare ever under their notice.

Hackneys.—The 13 classes allotted to this section contained 160 entries. Norfolk headed the list with 34 entries, followed by Cambs with 32, York 20, Hunts 15, Kent 14, Essex 7, Surrey 7, Suffolk 5, Warwick 5, Scotland 5, Chester 3, Derby 2, Hants 2, Herts 2, Lancaster 2, Middlesex 2, Wales (Montgomery) 2, Berks 1. The 39 class prizes were well scattered, York taking 10, Norfolk 8, Cambs 5, Chester 3, Kent 3, Hunts 2, Surrey 2, Warwick 2, Scotland 2, Essex 1, and Lancaster 1. In addition, Chester and Essex each secured a champion prize.

The 39 prize-winning animals were the produce of 24 different Hackney sires. *Connaught* sired two first prize winners and a second, one of the former taking the female championship. *Rufus* sired one first and one third prize winner, the former being the male champion. Other sires were represented by their produce in the following successes: *Reality*, two firsts and two thirds; *Agility*, two firsts and one third; *Lord Derby 2nd*, one first and two seconds; *Field Marshal*, one first and one second; *Copernicus*, one first; *Ruby*, one first; *Ritualist*, one first; *Wildfire*, one first: *Cadet*, two seconds and two thirds; *Danegelt*, two seconds; *Assurance 2nd*, one second; *Garton Duke of Connaught*, one second; *Lord Derby Junior*, one second; *Denmark*, one second; *Golden Star*, one second; *Curfew*, one third; *Evolution*, one third; *Heacham Swell*, one third; *Roan Confidence*, one third; *Saxon*, one third; *Stanley*, one third; *Vigorous*, one third.

Amongst the three-year-old stallions, above 15 hands (Class 10), Sir Walter Gilbey's *Hedon Squire*, subsequently selected as the male champion, "was an easy winner, looking and going his best." The other three-year-old stallions, above 14 hands (Class 11), were "rather disappointing" in comparison with Class 10. The two-year-old stallions (Class 12) formed not only a large class, but had good merit also. Mares above 15 hands (Class 14) made an excellent class, in which the first prize animal won her position mainly by her fine all-round action. The mares above 14 hands (Class 15) were not so good a class, but in it the winner was "far ahead of the others." The colt foals (Class 19) were "rather disappointing," whilst the filly foals (Class 20) were "just the reverse," and contained several animals of high merit, especially the winners of the first and second prizes.

Ponies.—This section comprised 15 entries in 2 classes. The stallions (Class 23) were "an excellent class, both for action and quality." The winner, Mr. Hollins's *Portwood Confidence*, "went with extraordinary force, his hock action being superb."

Harness Horses and Ponies.—Twenty-five entries of mares or geldings competed in 2 classes. In the class exceeding 14 hands Mr. (now Sir Gilbert) Greenall's *Lady Lofty* "scored rather an easy win, owing to her magnificent action and pace, combined with strength and quality." In the class not exceeding 14 hands Mr. Pope's *Magpie* "was able to beat the other competitors with ease owing to her extraordinary force of action and her quality."

Heavy Horses.

Shires.—A grand entry, to the number of 189, was contributed by the following 25 counties in England and Wales: Cambs 26 entries, Essex 20, Warwick 20, Middlesex 17, Beds 10, Herts 10, York 10, Lancaster 9, Chester 7, Hunts 7, Stafford 7, Kent 6, Bucks 5, Derby 5, Leicester 5, Gloucester 4, Norfolk 4, Notts 4, Lincoln 3, Monmouth 3, Northampton 2, Montgomery 2, Suffolk 1, Surrey 1, Carmarthen 1. The 33 class prizes were well distributed amongst 19 counties, of which Warwick took the lead with 4 firsts, 2 seconds, and one third, besides the female championship. Derby secured one first, and with it the male championship. Beds and Lancaster each took a first, a second, and a third, Monmouth a first and a second, Herts a first and a third, Middlesex and Notts each a second and a third, whilst Cambs, Chester, Gloucester, Hunts, Leicester, Lincoln, Montgomery, Norfolk, Northampton, Stafford and York each secured one prize.

The 33 prize-winning animals were the produce of 26 different sires. *Harold* had one first, two seconds, a third, and the male championship to his credit, and *Lincolnshire Boy* one first, with the female championship. The other sires, and the winnings of their produce, are: *Albert Edward*, two firsts; *Vulcan*, two firsts; *Regent II.*, one first and one second; *Albert Victor III.*, one first; *Dunsmore Willington Boy*, one first; *Hazlewood*, one first; *Hitchin Duke*, one first; *Prince William*, two seconds; *Bury Victor Chief*, one second; *Honest Tom*, one second; *Marmion II.*, one second; *Moulton Briton*, one second; *Premier Tom II.*, one second; *Potentate*, one second; *Vulcan of Worsley IX.*, one second; *Bury King William*, one third; *Bar None*, one third; *Carbonite*, one third; *Duke of Worsley*, one third; *Hitchin Conqueror*, one third; *Laughing Stock*, one third; *Lancashire Lad II.*, one third; *Royal William II.*, one third; *Salisbury*, one third.

As a whole, the Shire classes "were well filled with animals showing great substance, with first-rate quality, good feet, and nice silky hair." The aged stallions (Class 27), though the smallest class of Shires, included some grand animals. Class 31 was "a very grand class of mares." Class 35, yearling fillies, "although it contained some useful animals, was perhaps as weak as any in the section."

It may be noted that the Shire champions—Lord Belper's *Rokeby Harold*, and Mr. Parnell's *Rokeby Fuchsia*—have both secured the highest honours obtainable at the Shire Horse Society's Show.

Clydesdales.—There were 5 classes comprising 29 entries, to which England contributed 21, Scotland 4, and Wales 2. The county entries were—Chester 7, Cumberland 4, Durham 4, Kent 4, Dumfries 3, Glamorgan 2, Gloucester 1, Warwick 1, Wigtown 1. Of the 13 class prizes, Durham secured two firsts and a second, Cumberland two firsts and two thirds, Chester two seconds and a third, and Kent, Glamorgan, and Wigtown one prize each. In addition, the male championship fell to Durham, and the female championship to Cumberland.

The Judges report that the stallion classes were badly filled, and, with the exception of the prize animals, the quality of the exhibits was very moderate. Mares and fillies produced a much larger competition, and the merit as a whole was superior to that of the male classes. In the older stallion class was found the male champion, the Marquis of Londonderry's *Holyrood*, "a big, good-coloured, stylish horse, with good quality and bone, hair not quite so good, first-class action, good feet and pasterns, and certainly a valuable stallion." Three-year-old fillies (Class 41) made up "a really good class throughout," but the two-year-old fillies (Class 42) formed the best class the Judges had before them: "the five animals which received awards were certainly of great excellence." Mr. Graham's female champion "is a remarkably sweet animal, with beautiful feet and pasterns, and well brought out."

Suffolks.—Eleven classes were occupied by 103 entries, of which 87 were from Suffolk, 11 from Essex, 4 from Cambs, and one from Oxon. Thirty class prizes and two champion prizes were awarded, and, excepting a solitary third prize to Essex, Suffolk secured them all.

The aged stallions (Class 43) "formed a strong class, and a very good representation of the breed." The three-year-old stallions (Class 44) "were a poor show." The two-year-old stallions (Class 45) "were anything but a strong class, but were headed by a good colt." The show of brood mares was a very good one—"many grand mares amongst them." Both the three-year-old mares and the two-year-olds (Classes 49 and 50) "were very strongly represented, and formed a grand lot of young mares." The colt foals were "a poor lot," the filly foals "very good."

Agricultural Horses.—Ten entries of geldings, foaled in 1890 or 1891, competed in Class 54, and included "some useful horses of great substance and power." The class restricted to geldings got by a registered Suffolk stallion was vacant.

Cattle.

Shorthorns.—The Catalogue contained entries of 123 Shorthorn cattle, to which England contributed 115, Scotland 6, and Wales 2. As many as 26 English counties were represented by the following entries: York 10, Cumberland 9, Norfolk 9, Cambridge 8, Bedford 7, Northampton 7, Wilts 7, Westmorland 6, Essex 5, Lincoln 5, Somerset 5, Cornwall 4, Hereford 4, Lancaster 4, Berks 3, Hunts 3, Middlesex 3, Monmouth 3, Nottingham 3, Herts 2, Kent 2, Suffolk 2, Hants 1, Oxon 1, Rutland 1, Salop 1. The Scotch entries were from two counties: Berwick 4, Midlothian 2. The solitary Welsh county represented was Carmarthen, 2 entries. The 25 class prizes were distributed amongst 10 exhibitors representing 9 counties, viz., Wilts 7 prizes, Hereford 4, Yorks 4, Cumberland 3, Berks 2, Berwick 2, Monmouth 1, Somerset 1, Westmorland 1. In addition, Berks and Wilts each secured a champion prize.

The Judges report, "The show of Shorthorns has not been surpassed for some few years. There was considerable competition in most of the classes, particularly so among the females." Of the old bulls (Class 56) there was nothing to command attention beyond the prize animals. The champion male Shorthorn was found in Class 57 in Mr. J. Deane Willis's *Czarowitz*, but in the bestowal of this honour the assistance of the umpire was sought. Whilst Class 58 provided a strong competition, it produced "no animal of a leading character." Amongst the bull calves (Class 59) were "a few very choice animals."

The old cows did not give rise to any very strong competition. The Shorthorn female champion prize was given to Her Majesty the Queen's *Bouquet*, a three-year-old cow "which showed good dairy properties." The two-year-old heifers (Class 62) included some beautiful animals, "one of which contested very closely for the championship." The strongest competition was in Class 63, yearling heifers, "which contained many splendid animals and required the utmost thought and care in making the awards."

Herefords.—Fifty entries were made from 7 counties in England, and 2 in Wales, thus: Hereford 21, Worcester 11, Essex 6, Salop 6, Hertford 2, Berks 1, Norfolk 1, Brecon 1, Cardigan 1. Of the 18 class prizes, Hereford secured 10, Worcester 4, Salop 2, Essex 1, and Norfolk 1.

"The Herefords on the whole were good, especially the younger classes of bulls and heifers. Class 67 (yearling bulls), Class 70 (two-year-old heifers), and Class 71 (yearling heifers) all contained animals of exceptional merit."

Devons.—The West Country cattle, though far from home, mustered 25 entries, to which Devon contributed 10, Somerset 10, Berks 2, Cornwall 2, Norfolk 1. Of the 12 class prizes, 6 went to Somerset, 4 to Devon, 1 to Berks, and 1 to Cornwall.

Aged bulls were a good class, and the first prize animal was "far above the average." In Class 73, two-year-old bulls, no difficulty was felt in awarding the first prize. The cows (Class 75) made up "a very meritorious class." The two-year-old heifers were "short in numbers but good in quality." In the yearling class the first prize went to a heifer "of grand shape and quality."

Sussex.—The heavy cattle of the Weald Clays "were well represented throughout as to number and quality." To the total of 52 entries Sussex contributed 29, Surrey 12, and Kent 11. The 17 class prizes went, 7 to Kent, 5 to Surrey, and 5 to Sussex.

In the aged bull class the premier position was assigned to "a compact bull of great quality." In the two-year-old class the first prize went to a bull "of good quality, and neat." The yearling bulls made up "a very useful class." Of the Sussex females, the two-year-old heifers constituted "an extraordinary class of great quality."

Welsh.—Eleven entries in this section comprised 4 from Carnarvon, 4 from Merioneth, 2 from Denbigh, and 1 from Anglesey. Of the 9 class prizes, Carnarvon and Merioneth each took 4, and the remaining one went to Denbigh. The Judges say:—

> The Welsh cattle classes, as a whole, although the exhibits are few in number—owing no doubt to the distance of Cambridge from the Principality—were up to the average in point of quality and, in our opinion, quite worthy of the prizes awarded. The aged bull class was exceptionally good.

Red Polled.—At a centre so near to the home of the characteristic breed of East Anglia a large display was reasonably to be expected, and there were as many as 59 entries in the Catalogue. Of these, Norfolk entered 41, Suffolk 11, Herts 3, Essex 2, Cambridge 1, and Surrey 1. Of the 20 class prizes, Norfolk secured 17, including all the firsts, besides the two champion awards; Cambridge, Surrey, and Suffolk obtained one prize each. The report states:—

All the classes were numerically well filled, and presented a very creditable appearance. The old bulls, the cows, and the heifers were particularly good, but among the young bulls and some of the heifers slack loins and high tails were too prevalent. The females, with few exceptions, showed good milking properties, and excellent quality of flesh.

Aberdeen Angus.—Of this breed there were 33 entries, comprising 22 from England and 11 from Scotland. The English contingent represented eight counties, viz., Bucks 4 entries, Essex 4, Northumberland 3, Sussex 3, Bedford 2, Gloucester 2, Middlesex 2, York 2. From Scotland 5 were entered by Aberdeen, 3 by Banff, and 3 by Midlothian. Of the 8 class prizes, the three Scottish counties each took a first and a second, whilst Middlesex secured a first and Bucks a second. The solitary champion award fell to Middlesex.

The display was excellent. The aged bulls (Class 96) included "several animals of outstanding merit, and there was very little to choose between the first and second prize animals." Mr. Crisp's champion *Gilderoy* "is of great substance for his age, and carries a great amount of flesh."

Galloways.—To the 11 entries of Galloway cattle Cumberland contributed 4, Dumfries 3, Kirkcudbright 3, and Berwick 1. Of the 7 class prizes, Dumfries secured 3, Cumberland 2, and Kirkcudbright 2.

The display made up "a very fair representation of the breed as to quality." The cows and heifers "were remarkably good, particularly the first and second in each class."

Ayrshires.—A small lot of 7 entries represented the Scottish dairy breed. Dumfries contributed 5 of the entries, and took all of the 4 prizes; the 2 remaining entries were from Kirkcudbright. The quality throughout was "first class."

Jerseys.—In this section 143 entries were contributed by 20 different counties, as follows:—Essex 32, Herts 24, Sussex 17, Chester 11, York 8, Cambs 7, Hants 7, Bucks 6, Suffolk 5, Island of Jersey 4, Somerset 4, Surrey 4, Kent 3, Middlesex 3, Rutland 2, Warwick 2, Devon 1, Lancaster 1, Leicester 1, and Norfolk 1. Out of 17 class prizes, 3 firsts and 2 seconds went to Chester, whilst the counties of Essex and Herts each took 3 prizes, and the counties of Suffolk, Sussex, and York 2 prizes each. Of the prize-winning animals, 10 were bred in Jersey and 7 in England. All 6 of the prize cows were island-bred, and all 3 of the prize yearling heifers English-bred.

The classes "were, taken as a whole, of fair average merit. The females, indeed, were represented by a few exceptional animals, but we found that among the males the competition, though very close, did not include any animals which approached the ideal."

Amongst the aged bulls (Class 106) the first prize went to "a very smart animal, lengthy and feminine in type—an important point in our opinion in any dairy breed—with a beautiful head and neck, good shoulder, and well-placed teats. He is somewhat deficient in richness, and his quarters droop a little too much, though the setting on of his tail is neat." Of the young bulls (Class 107), the first prize animal just won his position. "He is a rich bull, full of quality, with a fine cow-like head, horn and neck, good shoulders, and level quarters. He touches nicely, and has a fair placement of teats. He is, however, rather throaty—a fault which will not improve with age."

The old cows (Class 108) "contained three or four beauties." The premier position was assigned to "a cow of the very highest quality, and with a beautiful udder. If her back were straighter and her type a little more robust she would be perfect." Amongst the three-year-old cows (Class 109) the first prize went to one which the Judges regarded as "the best in the show." "She is a grey cow of almost ideal beauty, and with an excellently well-balanced udder." Of heifers calved in 1892 (Class 110) the first prize animal "is a very promising youngster, of excellent quality, with capital shoulder and quarters. Her udder is large and well shaped, but the teats are rather too close together." Amongst the yearling heifers (Class 111), the first prize animal is "a lengthy yearling of much quality, and with a splendid promise of udder. She is good everywhere, but might be richer in colour."

Guernseys.—Two score of entries were made up by the following nine counties:—Middlesex 12 entries, Hants 9, Sussex 7, Herts 3, Suffolk 3, Cambs 2, Essex 2, Wilts 1, York 1. Of the 10 class prizes, Middlesex secured 2 firsts and 3 seconds, Suffolk a first and a second, Hants and Sussex each a first, and Cambs a second. Six of the prize-winning animals were bred in England and 4 in Guernsey.

The Judges report that the entries show a great decrease when compared with former years as regards both quality and number, and that the absence of fully developed, first-rate and valuable animals is particularly noticeable. This they attribute to the changes that have been made in the prize schedule.

Amongst the old bulls (Class 112) the contest between the first two animals was very close, the winner being "a good all-round bull, and having extraordinary development of teats." Of the cows (Class 114), the first prize animal "stood out far and away at the head, her well-shaped udder, milk veins, quality and constitution leaving little to be desired—an excellent cow in every way." The yearling heifers (Class 116) made up the best class the Judges had to deal with. "The most promising bag" of the first prize heifer "at once placed her to the front."

Kerries.—To the 22 entries in this section Cambs contributed 8, Wilts 5, Warwick 4, Middlesex 2, Queen's County 2, and Dublin 1. The 7 class prizes went: 2 to Cambs, 2 to Wilts, and one each to Warwick, Middlesex, and Queen's County, whilst Warwick also secured the champion prize. The quality of the animals was superior or excellent in all the classes.

Dexter Kerries.—The 26 entries were here drawn from a wider area than those in the Kerry section, 12 counties being represented in this case. Surrey made 4 entries, Warwick 4, Hants 3, Sussex 3, Bucks 2, Norfolk 2, Northumberland 2, Dublin 2, Beds 1, Devon 1, Rutland 1, Suffolk 1. The county of Norfolk figures best in the award list, having secured two first prizes and the championship. A solitary prize fell to each of the counties of Beds, Hants, Northumberland, Surrey and Warwick.

The old bulls (Class 120) were of excellent quality. Both the cow and the heifer classes were found to contain some animals which the Judges regarded as a mixture of the Kerry and Dexter breeds,

Dairy Cattle.—There were two classes arranged respectively for a milk test and a butter test, as explained in the following report:—

At the Chester Meeting of 1893, prizes were awarded solely upon the basis of the amounts of butter produced, as ascertained by the practical test of the churn. In all, 25 cows then competed. On the present occasion it was decided to revert to the system adopted previously, and to offer prizes both for *quantity* and for *quality* of milk; in short, for milk-producing and for butter-producing animals. Also, the experience of last year having shown that the determination of the amount of butter-fat by chemical analysis gave the results of competitions for butter-producing cows quite as satisfactorily as, and with less chance of error or loss than, the practical test of the churn, the competition for production of butter was this year decided by means of the chemical test.

Altogether, in the two Classes, 123 and 124, 20 cows competed, a number which, considering the wide difference, as dairying districts, between the neighbourhoods in which the Chester and Cambridge Shows were respectively held, must be considered satisfactory.

The cows were all milked dry, in the presence of the Stewards, at 7 A.M. on Monday, June 25, and the two milkings upon which the awards were made, took place on Monday evening at 5 P.M., and on Tuesday morning at 7 A.M., thus constituting a milking period of 24 hours.

The milk produced was at once weighed, and samples were drawn for analysis. The analyses were made in the University Laboratory, rooms in which, together with every facility and assistance, had been very kindly placed at Dr. Voelcker's disposal by Professor Liveing, the University Professor of Chemistry. The analyses themselves were made by Dr. Voelcker and his brother, Mr. E. W. Voelcker.

In CLASS 123 the prizes were awarded to the cows which gave the largest *quantity* of milk, irrespective of the weight of the animals. But, inasmuch as it is very undesirable to encourage the production of a large quantity of milk irrespective of its quality, it was decided that the quality of the milk should at least come up to the standard which Public Analysts have agreed should fairly be reached by genuine milk from properly-fed cows. This standard, it may be added, is one of 3 per cent. of butter-fat and 8½ per cent. of solids-not-fat, or 11½ per cent. of total solids.

A reference to the tables on the opposite page will show that in only one instance (No. 1257) was this standard not reached.

Out of the original 10 entries in Class 123 there was one absentee.

The quantities of milk yielded in the two milkings by all the three prize-winners were high, viz., 67 lb., 62 lb. 1 oz., and 60 lb. 14 oz. respectively. As was to be expected, almost all the cows entered were either Shorthorns or Shorthorn crosses. The first-prize winner (No. 1254) had previously obtained the first prize at the Canterbury Show of the Royal Counties Agricultural Society for the largest quantity of milk, and her attendant stated that for nine weeks previously to the present competition she had been giving over 60 lb. of milk daily. The third-prize winner (No. 1253) had also taken milking prizes before.

It will be noticed that the evening's milk was of richer quality than the morning's.

In CLASS 124 the prizes were awarded to the cows producing in two milkings the greatest weight of butter-fat, the quantity being determined, as stated previously, by chemical analysis of the milk.

There were, in all, 13 entries, but two cows did not appear, and as a third was taken ill on the Showground, her returns were not recorded.

This was, naturally, a competition among Jersey cows. It will be seen that none of the cows gave less than the minimum quantity of milk stipulated. The yields were extremely good, and the quality of the milk in several cases exceptionally high.

The first-prize winner (No. 1266) gave no less than 50 lb. 14 oz. of milk, the fat percentages of which were 5·85 and 4·6 respectively; while the second prize went to No. 1275, which yielded 44½ lb. of milk at the two milkings, the fat percentages being 5·0 and 4·7 respectively. The third-prize winner, though giving less weight of milk, showed fat percentages of as much as 7·6 and 7·0.

No. 1266 yielded nearly 43 oz. of butter-fat in the two milkings, and was a clear winner, the next two cows (No. 1275 and No. 1268) coming more closely together.

No. 1266 had not previously competed in any milking trials, but No. 1275 had won a medal at the Guildford Show of the Bath and West of England Society in the 'Jersey Test.' No. 1263, it was stated, had produced at the Royal Counties Show 1 lb. 12½ oz. of butter in two milkings, which is very similar to her production of 24·3 oz. of butter-fat on the present occasion.

Milk and Butter Tests.

Class 123.—*Dairy Cow, in-milk, of any weight, breed, or cross, giving the largest quantity of Milk, provided the milk be, on the average of two milkings, up to the standard adopted by the Society of Public Analysts.*

No. in Catalogue	Name of Exhibitor	Name of Cow	Breed of Cow	Age (yrs. mon.)	Date of Calving in 1894	Yield of Milk: Mon. even. (lb. oz.)	Yield of Milk: Tues. morn. (lb. oz.)	Yield of Milk: Total (lb. oz.)	Quality of Milk: Mon. even. Fat (per cent.)	Quality of Milk: Mon. even. Solids (per cent)	Quality of Milk: Tues. morn. Fat (per cent.)	Quality of Milk: Tues. morn. Solids (per cent.)	Awards
1253	Salisbury Baxendale .	*Bess*	Shorthorn	8 0 abt.	March 15	27 8	33 6	60 14	3·80	12·63	3·15	11·86	3rd, £5
1254	do. .	*Marsh Marigold*	do.	5 0 abt.	May 6	29 12	37 4	67 0	4·40	13·15	2·88	11·48	1st, £15
1256	Earl Cadogan . .	*Dairymaid*	Shorthorn Cross	—	April 1	13 0	23 4	36 4	5·60	13·69	3·10	11·38	[fied.
1257	T. M. Crook . . .	—	Shorthorn	5 0 abt.	May 23	20 4	23 13	44 1	2·90	11·56	2·40	10·93	disquali-
1258	G. F. King . . .	*Countess 7th*	do.	7 6	May 16, 1893	18 0	24 0	42 0	5·12	14·72	4·20	14·14	
1259	Sanders Spencer . .	*Miss Strawberry*	do.	7 0	June 2	29 8	32 9	62 1	3·73	12·07	2·86	11·33	2nd, £10
1260	Sir M. J. Stewart, M.P.	*Dewdrop of Bogside*	Ayrshire	9 1	April 7	18 13	19 10	38 7	3·78	12·0	3·10	11·78	
1261	Thomas Stokes . .	*Milky*	Shorthorn	6 2	April 30	25 0	31 14	56 14	3·80	12·34	3·0	11·46	R.N.
1262	William Tebbs . .	*Little Gem*	—	—	June 3	20 12	24 2	44 14	3·80	12·70	3·30	12·35	

Class 124.—*Dairy Cow, in-milk, of any weight, breed, or cross, giving the greatest weight of Butter-fat, as ascertained by chemical analysis, provided the yield of milk obtained in two milkings be not less than 25 lb.*

No. in Catalogue	Name of Exhibitor	Name of Cow	Breed of Cow	Age (yrs. mon.)	Date of Calving in 1894	Yield of Milk: Mon. even. (lb. oz.)	Yield of Milk: Tues. morn. (lb. oz.)	Yield of Milk: Total (lb. oz.)	Butter-fat in milk: Mon. even. (per cent.)	Butter-fat in milk: Tues. morn. (per cent.)	Weight of Butter-fat obtained: Mon. even. (oz.)	Weight of Butter-fat obtained: Tues. morn. (oz.)	Weight of Butter-fat obtained: Total (oz.)	Awards
1263	Salisbury Baxendale .	*Birch*	Jersey	6 0	March 10	12 2	15 2	27 4	6·10	5·10	11·9	12·4	24·3	
1264	do.	*Gorse*	do.	6 3	June 9	14 12	18 12	33 8	5·60	5·0	13·2	15·0	28·2	
1265	Sir E. Birkbeck . .	*Bubble*	do.	5 3	January 13	12 0	14 8	26 8	6·0	4·75	11·5	11·0	22·5	
1266	Mrs. E. R. Blackwell.	*Greek Maid 7th*	do.	3 1	May 11	26 14	24 0	50 14	5·85	4·60	25·1	17·7	42·8	1st, £15
1267	Lord Braybrooke .	*Bluebell 2nd*	do.	6 1	January 2	11 8	14 0	25 8	7·0	5·80	12·9	13·0	25·9	
1268	do.	*Mistral*	do.	6 6	Dec. 4, 1893	14 6	13 12	28 2	7·60	7·0	17·5	15·4	32·9	3rd, £5
1269	Earl Cadogan . .	*Buttermaker*	do.	5 9	April 14	14 8	17 9	32 1	5·30	4·80	12·3	13·5	25·8	
1270	Edward Carter . .	*Etona*	do.	6 1	April 14	ill	—	—	—	—	—	—	—	
1271	James R. Corbett .	*Stargazer C*	do.	4 1	May 6	17 0	15 10	32 10	6·50	4·70	17·7	11·7	29·4	R.N.
1274	Dr. Herbert Watney .	*Mayblossom*	do.	6 2	April 24	18 6	25 10	44 0	4·25	4·10	12·5	16·4	28·9	
1275	do.	*Vesta 2nd*	do.	9 0	April 16	19 12	24 12	44 8	5·0	4·70	15·8	18·6	34·4	2nd, £10

(Signed) Alfred Darby, *Steward of Dairying.*

Sheep.

Leicesters.—There were 20 pens representing 4 flocks; 3 in Yorkshire and one in Leicestershire. All the prizes went to Yorkshire flocks. The Judges regarded Mr. Hutchinson's first prize two-shear ram (Class 125) as "by far the best specimen in the ram classes," and Mr. Harrison's first prize pen of ewes (Class 128) as "by far the best specimens of the Leicester breed in the Show." On the whole, however, they did not consider the Leicester classes so good as in former years, as many of the exhibits were "far from the type of pure Leicesters."

Cotswolds.—Two dozen entries came from 5 flocks; 3 in Gloucestershire, one in Norfolk, and one in Oxon. The 10 class prizes all went to Gloucestershire. The display was "fairly representative of the breed," and the first prize pens were good throughout.

Lincolns.—There were 37 entries from 9 flocks, 6 of the latter belonging to Lincoln, one to Cambs, one to Notts, and one to Yorks. Of the 13 prizes, 11 went to Lincoln, and 2 to Cambs. The exhibit, as a whole, was "very creditable." The shearling rams (Class 134) made up an exceptionally good class. The shearling ewes (Class 136) were also "a very good class," Mr. Dudding's first prize pen being specially noticeable.

Oxford Downs.—Here again there were 37 entries, but from as many as 8 counties. Of the 13 prizes, Berks obtained 5, Herts 4, Northampton 2, Hunts 1, and Beds 1. The Judges "did not find the Oxford Downs of exceptional merit." In Class 139 (shearling rams) they "were compelled to discard some good animals on account of want of activity." The shearling ewes (Class 141) included some "of great weight and good character."

Shropshires.—A total of 112 entries from 27 flocks did duty for the West Midland breed. The flocks belonged—10 to Warwickshire, 7 to Staffordshire, 6 to Salop, 1 to Notts, 1 to Cardiganshire, 1 to County Meath, and 1 to the United States of America. Of the 13 class prizes, Salop secured 6, Warwick 3, Notts 2, and Stafford 2, whilst the championship went to Salop. Separate sets of Judges dealt with rams and ewes respectively. The two-shear rams (Class 143) "did not contain so many good sires as may sometimes be seen at the Royal Show, but there were a few of outstanding merit." The shearling rams were "a very good class all through, and contained fewer 'weeds' than usual." It included Mr. Mansell's champion, "an extra good ram, combining size with quality; he possesses a heavy coat of good Shropshire wool, and is very strong in his hind quarter and leg of mutton." The ram lambs also were a very strong class. The shearling ewes, though a good class, were not equal to what the Judges have seen at some previous Meetings of the Society. The ewe lambs, on the other hand, were "a very good class, and a credit to the breed."

Southdowns.—Two dozen flocks in 9 different counties contributed 105 entries. The flocks represented were 6 in Sussex, 4 in Cambs, 4 in Norfolk, 3 in Suffolk, 2 in Essex, 2 in Gloucestershire, one in Berks, one in Middlesex, and one in Surrey. Of the 13 class prizes, Sussex secured 6, Surrey 3, Essex 2, and Norfolk 2. Generally speaking, the Southdowns "were a good lot, showing more quality and character than of late." The class for ewe lambs "was very well filled, considering it was the first time a place had been given them at the Royal Show."

Hampshire Downs.—Fifty-one entries were contributed by 15 flocks in 6 counties. These flocks comprised 4 in Hants, 4 in Wilts, 2 in Berks, 2 in Cambs, 2 in Herts, and one in Beds. Four prizes went to Hants, and 4 to Herts, each county securing two firsts, a second, and a third; Berks took 2 prizes, Cambs 2, and Wilts 1. Taken as a whole, it was a very good show of Hampshire Downs. The ewe lambs were found to be "the best class of the breed," most of the pens noticed by the Judges "showing marked Hampshire type and character."

Suffolks.—There were 70 entries from 17 flocks in 4 counties, the flocks being 9 in Suffolk, 4 in Essex, 3 in Cambs, and 1 in Herts. Of the 13 prizes, 8 went to Suffolk, and 5 to Cambs, besides which the former county took the champion prize for Mr. Joseph Smith's ram, "a sheep smart in character, with good wool and black face." The shearling ewes "were the great feature of the show." Viewing the display of Suffolk sheep as a whole, the Judges regard it as "the best ever held, there being a marked improvement all along the line"; this they attribute in a great measure to the Suffolk Sheep Society.

Wensleydales.—There were 24 entries from 8 flocks. The older ram class was "exceptionally good, showing both size and quality," and the shearling ewe class "as good as could be got together." Considering the long distance from home the display generally was a satisfactory one.

Border Leicesters.—Seventeen entries from 5 flocks made up "an uniformly creditable lot," and the Judges regarded the display "as of a highly satisfactory character."

Somerset and Dorset Horned.—Here there were 16 entries, also from 5 flocks. The Judges considered all the classes very good, but the shearling ewe class as the best of the three.

Kentish or Romney Marsh.—Five breeders made entries in this section, but only two of them were represented by exhibits. Of the 13 sheep shown, several possessed good quality, and all were strong, healthy-looking animals, well adapted for feeding on the Kentish marshes.

Cheviots.—Nine entries were made from 4 flocks, and the two classes were good throughout.

Black-faced Mountain.—Eight entries represented 4 flocks, and both classes were good.

Lonks.—There were 5 entries from 3 flocks, and here again the quality was good.

Herdwicks.—Ten entries came from 4 flocks. The Judges considered the Herdwick ram class to be the best of the mountain breeds. Shearling ewes were excellent.

Welsh Mountain.—Nine entries were made from 3 flocks. "Judging from former shows these classes have improved both in size and quality, but still there is room for further improvement."

Poultry.

The entries, amounting to 578, were made up of the following numbers:—

Dorking	93	Langshan	33	Hamburgh	9
Game	70	Wyandotte	56	Any other recognised breed	46
French (any variety)	23	Plymouth Rock	47	Table Poultry (pairs)	40
Brahma and Cochin	66	Minorca	32		
		Leghorn	46		
		Andalusian	17		

Dorkings, taken all round, were superior. The Dark and Silver Grey chickens were very forward, but many showed, in weak legs, the evil effects of forcing. In the *Old English* and *Indian Game* classes there was strong competition, and some of the exhibits were very fine. In the *French* breeds, both the adult and the chicken classes contained a few good birds, but on the whole these breeds have deteriorated of late. Of the *Brahmas*, the adult classes included a few fine birds. The *Cochins* contained some exceptionally fine and handsome adult birds; the chickens of this breed held their own well against Brahmas, some being very forward and promising. Of the *Langshans*, the adult cocks were extremely fine, and the prize-winning hens were good. The chickens were very fair, but less numerous than they should be. *Wyandottes* presented some thoroughly typical specimens in the adult classes, and the young birds were full of promise; altogether they were a most creditable collection. In the *Plymouth Rocks* the cocks, excepting the prize birds, were inferior; the hens were fairly good, but showed the wear and tear of the breeding season; the chickens were rather backward. *Minorcas* were not a strong show, and the adults outnumbered the chickens. *Leghorns* were very good, the Whites being the best. *Andalusians*, on the other hand, were poor, and the same may be said of *Hamburghs*.

Ducks included entries of 22 Aylesbury, 17 Rouen, 26 any other useful breed, and 16 pairs of table ducklings. The *Aylesbury* adults were true to type, but—excepting the winners —this cannot be said of the young birds. *Rouens* were represented by some of the very best of their kind. The miscellaneous section contained a very nice show of *Pekins*, *Cayugas*, and Fancy Ducks, the last named being disqualified as not coming under the denomination "useful."

Geese—18 entries—were a splendid collection, and did full justice to the two leading sorts, Embden and Toulouse.

Turkeys—28 entries—were also an extraordinary display, the Mammoth American Bronze and the Cambridge being represented. The report states:—

This long line of Geese and Turkeys alone forms a magnificent display, which is in itself of the utmost significance, at once imposing, interesting, and instructive, and their appearing as they do in such force and excellence at the premier Agricultural Show should be a matter for justifiable congratulation.

Table Poultry.—The following is the report:—

This section in point of numbers and variety of breeds and crosses was fairly represented, but the same immature state was here apparent as in other classes, the same unaccountable climatic condition having somewhat retarded growth, giving the birds an appearance of being at least three weeks later in development than last year. Nevertheless, the quality throughout was good, and in the majority of cases the pure breeds well maintained their respective excellences, whilst the cross-breds were the result of judicious unions, such as have hitherto proved productive of good.

We especially note in this year's dressed birds the absence of crooked breast or other structural disfigurement.

Class 278. Pair pure-bred cockerels. 1. Indian Game. 2. Wyandottes. 3. Old English Game. R. Silver Grey Dorkings. 7 entries.

Dorkings, being rather backward this year, have to make way for the darker-fleshed breeds, which in this class are especially well grown, forward birds—solid lumps of meat.

Class 279. Pair pure-bred pullets. 1. Indian Game. 2. Dorking. 3. Dorking. R. Wyandottes. 10 entries.

Winners a very even couple, breast fairly imbedded in good solid flesh, very praiseworthy; as also the second, Dorkings, but a bit raw and scarcely a match pair.

Class 280. Pair cross-bred cockerels. 1. Indian Game and Dorking. 2. Game and Langshan. 3. Indian Game and Rock. R. Indian Game and Dorking. 14 entries.

As a lot very creditable, and fully sustain the reputation of these unions for table purposes.

Class 281. Pair cross-bred pullets. 1. Indian Game and Dorking. 2. ditto. 3. ditto. R. ditto. 8 entries.

All the same cross, and that a good one. The result shows beyond question the happy blend of even these two extremes; size and quality are hereby secured, and thus a bumping dish of good solid food is produced. We still commend this cross, and add five others for further experiments, such as from personal experience we can recommend as the best record combination up to date: La Fleche and Dorking; Dorking and Langshan; Langshan and Wyandotte; Indian Game and La Fleche; Old English Game and Langshan.

Ducklings as a lot were about up to the average of mid-summer displays.

Class 282. Pure-breds. 10 entries.

More than sustain their good reputation, Aylesburys being first and second; the winners a very superior couple of great size and substance, and of undoubted purity. Third Pekins, and reserve Cayugas, the latter small but a rare tit-bit.

Class 283. Cross-breds. 6 entries.

All the winners are the Aylesbury Pekin cross, which fairly demonstrates the usefulness of this alliance for the production of giant ducks.

Butter.

This section comprised 162 entries arranged in three classes. In Class 284, for one keg or other package of butter, not less than 14 lb. and under 40 lb. in weight, there were 21 entries. It was a condition that the kegs should be delivered to the Society on February 1, 1894, and the date on which the butter was made had to be stated. The Judges did not consider there was sufficient merit in any of the entries to justify their awarding prizes. Several of the exhibits they found to be decidedly bad, many being quite rancid. They add:—

The question of making butter for long keeping has not the interest that formerly made this department of dairy farming so necessary. Importations of butter from abroad bring to this country comparatively fresh butter at all seasons, so that we are to a great extent independent as regards the preservation of butter for keeping purposes. As regards the inferiority of the entries in this class, there were causes which might be supposed would operate against the keeping qualities that were almost inevitable. The butter might have been made from the milk of cows that had been fed upon food other than grass. It is generally admitted that the flavour of butter made from grass-fed cows cannot be obtained from that made from the milk of cows fed upon winter fodder.

It is true that preservatives of various kinds are in use that will keep butter sweet for a considerable time; but we must face the fact that the fine quality, the good flavour, and the keeping properties of butter are materially influenced by the feeding of cows, and preservatives can only maintain the quality that the butter has derived from cows fed upon food which is calculated to produce butter of high quality.

Class 285, for two pounds fresh butter, slightly salted, made up in pounds, attracted 72 entries. The Judges report:—

There was considerable uniformity in the entries here, and generally the texture, grain, and mode in which the butter was made up were good. We notice, however, that the flavour of the butter in this class was not of that high character that is now so necessary to command the best markets of the country. This may have been caused by want of skill on the part of the butter-makers *in the process of ripening cream*, and in its treatment previously to churning. Recent experiments have demonstrated that flavour in butter is largely influenced by systems of ripening cream before churning.

On the whole we must say there was general excellence in this class, but we desire to direct attention to the necessity for exercising considerable care in producing butter of fine flavour, the absence of which will not be compensated by attention merely to general appearance.

Class 286 was for "two pounds fresh butter, slightly salted, made from milk that has been drawn from cows other than Channel Islands or cows crossed with the Channel Islands breeds." The entries numbered 69, of which 65 were present. The Judges state:—

Of this class we must say that, whilst there was fair uniformity, there was not that high standard of quality that is desirable. There were no cases of absolutely bad butter, but there were few exhibits of the highest quality. As in the previous Class (285) we notice an absence of fine flavour.

The grain and texture of the butter were not equal to those in Class 285. This may have arisen through the butter of Class 285 having been made from the milk of Channel Island cattle or their crosses. Want of skill on the part of the makers may also have had its influence.

Viewing the butter exhibits generally, the Judges (Professor Carroll and Mr. Prideaux) add the following observations:—

On the whole the show of butter may be considered as satisfactory. There is considerable evidence of the results of dairy instruction in the country. Those who have given attention to the subject of dairying, and who remember the butter exhibited at the Shows of the Royal Agricultural Society a few years ago, must notice enormous advances in the later exhibitions. The greater uniformity in the quality of the exhibits is strong evidence of general improvement.

There is, however, room for further advance in this important industry, and the Society will do well in continuing its efforts in providing for its encouragement.

We respectfully suggest that the exhibits of butter might be left after adjudication in such positions that their quality may be seen by the persons visiting the Show, in order that those interested in dairying may obtain some idea of the qualities that were appreciated by the Judges.

This might to some extent be done if the butter, as cut by the Judges, were left exposed for examination.

The qualities that would be open for observation may be noted as—grain—colour—freedom from streakiness and moisture—solidity.

Cheese.

The 72 entries comprised—Cheddar 16, Cheshire 10, Stilton 11, any other British make 14, double Cottenham 1, cream and curd 20. The following is the report:—

We consider the exhibits generally very good, those from the Cheshire district more particularly so. Some of the Cheddars also were excellent, others lean and urnipe. Stiltons have the promise in them of being good, but at present they are a little unripe.

In Class 290 (any other British make), a portion of the exhibits were of excellent quality, but we scarcely feel justified in commending the class as a whole.

Class 291 (double Cottenham cheese) had only one exhibit, and this was of poor quality; consequently we make no award.

Class 292, for "three cream cheeses (Victoria), under 2 lb. weight each," was occupied by 14 entries. The Judges remark:—

Cream cheese varies considerably through the methods by which it is made, hence the difficulty of keeping clear of adverse criticism after awards are given. In some districts these cheeses are made through allowing the cream to part with its whey by means of slight fermentation and different methods of drainage. In others the addition of rennet is made in order to hasten the separation of whey. Two classes of cream cheese are thus obtained. Again, we find small cheeses, called cream cheeses, are put upon the market that are made by adding cream to sweet milk.

There are very few cases where Judges give satisfaction to all the exhibitors of cream cheese, and it will be difficult to arrange so as to avoid this condition.

It might be desirable to consider whether this industry is of such importance as to warrant the Society's establishing classes for cream cheeses made with and without the use of rennet.

The class on the whole may be considered as fairly satisfactory, the first prize cheese being of excellent quality, and made up in saleable form.

Class 293, "three curd and cream cheeses (double York), under 2 lb. weight each," contained 2 entries, and Class 294, "three curd cheeses (single York), under 2 lb. weight each," 4 entries.

There was considerable variation in quality of the cheese, showing that different systems of making had been adopted by exhibitors. It is apparent from the fewness of the entries in these classes that the farmers understand that the making of cheeses for which there is but a limited demand is not advisable for this country.

Cider and Perry.

The 74 entries in this section were above the average number. Of the 12 prizes awarded, Herefordshire secured 7, Norfolk 2, Gloucestershire 1, Somerset 1, and Worcestershire 1. As might have been anticipated, after the fine summer and apple crop of last year, the cider in casks (Class 295) was of good quality, and most of the exhibits were in excellent condition. The bottled cider made in 1893 (Class 296) was "a very good class—all exhibits in good condition, but a few not well 'up.'" The bottled cider made before 1893 (Class 297) was "not so good as a whole, though some of the exhibits were of very fair quality." Bottled perry (Class 298) made "a very good class, all the exhibits being in good condition."

Jams and Preserved Fruits.

There were 3 classes, embracing 10 entries, respecting which the Judge reports :—

On the whole the jams and bottled fruits in this section are good. No. 309 is particularly good—the fruit being whole and well preserved, but as there are only six different kinds of fruits in this collection, it cannot compare with Nos. 313 and 312 in this important respect.

It is very unsatisfactory to find that there is such a small competition in this section.

Hives and Honey.

The entries exceeded the average number, there being in all 222 entries disposed in 18 classes. Subjoined is the report :—

The interest taken in bee-keeping was fully maintained during the week of the Cambridge Show, and it can, we think, be fairly claimed for this department, that it was one of the most attractive on the ground, if we may judge by the crowds of visitors who inspected the exhibits of honey and appliances, and attended the lectures on bee-keeping, illustrated with practical manipulations with live bees, in the bee tent.

Everything in this department was exceedingly well arranged, and great credit is due to those who had the management.

In Class 302 there were two large collections of useful and well-manufactured bee goods, containing all articles that are required to carry on scientific bee-keeping in the most approved manner. It would have been more satisfactory had there been a larger number of entries in this important class, but the educational value of the display was none the less thorough, seeing that every improvement in hive and appliance manufacture was embodied in the collections shown.

In Classes 304 and 305, for hives, there was a good entry, but nothing particularly new worthy of special notice. In most instances the hives were better made, and owing to the more general use of machinery, the prices quoted were very reasonable.

On the part of a few manufacturers there is still a tendency to make hives too unwieldy and complicated for practical purposes. Particularly was this the case in those shown as " Wells hives," used for the double queen system, and we consider this tendency needs repressing.

In the classes for honey the entries were larger than they have been for some years, but, owing to the cold and ungenial weather in May and part of June, several of the intending exhibitors had no honey to stage. Notwithstanding the adverse conditions for the storage of nectar, continued almost up to the date of the Show, sufficient honey had been gathered to make a very creditable display.

Class 316, for granulated honey of 1893, was a strong class, and most keenly contested. The exhibits came from all parts of the kingdom, and were in such good condition and prime quality as to clearly establish the good keeping properties of British honey.

In Class 318, for any practically useful inventions connected with bee-culture, there was nothing specially worthy of mention.

In Class 319, for the most interesting and instructive exhibits, was one illustrating the easy and useful method of raising queen bees as practised in America and known as the Doolittle system.

Taken as a whole, the exhibition will compare very favourably with other years.

Competitions of Butter-makers.

These contests were conducted at the Dairy, which occupied an excellent position in the central part of the Show-yard. Here, also, Miss Maidment lectured every morning and afternoon on the six days of the Show, and, with the help of her assistants, gave frequent demonstrations in butter-making, cream cheese making, separating by machinery, &c.

It may be useful to place on record the quantity of milk consumed, and of butter produced, in connexion with the Trials of Churns (see pp. 487–97), and also with the ordinary work of the Dairy.

Churn Trials.

Cream received from contractor	830 quarts
Butter resulting sold	1,044 lb.

(Equivalent to $1\frac{1}{4}$ lb. per quart.)

Dairy.

Milk received from contractor	1,231 galls.
" stock in yard	1,033 "
Total	2,264 "
Less sold	33 "
	2,231 "
Equal to *cream* at, say, $\frac{1}{12}$th	186 "
Less sold	4 "
	182 "
Equal to *butter* at 4 lb. per gall.	728 lb.
Butter actually made and sold	760 "

The report of the Judges on the butter-making contests will be read with interest and profit by many who wish to qualify for these competitions.

The competition in butter-making at the Cambridge Show brought together classes of excellent merit. The difficulty of judging was extreme, in consequence of the great excellence and skill of the different competitors.

In Class I., open to the United Kingdom, there were ten competitors, many of whom appeared to have contested for honours in butter-making at previous Royal Shows and other butter-making competitions. The general merit here was of such high order that we were obliged to recognise it by giving prizes, high commendations, or commendations to all competitors.

The first prize was taken by Miss Edith Glenn, Little Barford, St. Neots, whose butter when ready for adjudication was in splendid condition, firm in texture, free from moisture, and made up in a tasteful manner. Not much inferior was the butter made by Miss Frances M. Cole, The Dairy, Home Farm, Tring, Herts, who was placed second, by a mere point or so. The third, fourth, and fifth prizes were taken by really excellent butter.

In the second day's competition (Class II.), amongst "female members of a farmer's family not in service or working for wages," there were seventeen competitors, the general excellence of whom was most satisfactory.

There appeared to be some novices here as regards competing for prizes, but a large number of those competing showed that they had been well instructed in the art of butter-making. Many of these had been pupils of Dairy Schools under County Councils, or had received instruction from County Council teachers. The first prize was awarded to Miss Agnes A. Walker, Dymock, Gloucestershire, and certainly the exhibit was of most excellent character. The other prizes were awarded to Miss Hetty Baynes, Broxted Hall, Dunmow, Essex; Miss Edith S. Wright, Appleby, Doncaster; Miss Rose Powell, Westry House, March, Cambs; Miss Gertrude Connell, Manor House, South Croxton, Leicester, in the order placed. The Reserve Number was awarded to Miss Mary Wilson, Stone Broom Lane, near Alfreton, Derby. Thus the prizes were allotted to competitors from over a wide range of England, thereby affording evidence of the extended influence of the Dairy Department of the Royal Agricultural Society of England.

The third day brought four competitors (Class III.) for the Society's prizes offered for Dairymaids and others residing in the Society's District A. The first prize was taken by Miss Elsie G. Cook, Clock House Farm, Ashford, Staines; the second was awarded to Miss Agnes Mary Watts, Fairgreen, Chipping Norton, whose butter came extremely close to Miss Cook's in general quality.

Another competition (Class IV.) for dairymaids and others for prizes offered by the Cambridge Local Committee brought together twelve competitors. Here there was considerable interest evidenced on the part of visitors to the Show. The Dairy was surrounded during the churning and butter-making by an enthusiastic assemblage. As might be expected, the butter made at this competition was not up to the excellence of the butter made previously, but it may be stated that there was really no incompetent butter-maker in the competition, whilst many of them were really good.

On Friday the competition for the Society's Silver Medal and prize of £5 gave the Judges a most difficult task in adjudication. This was the Champion Class, and was composed of the prize-winners of the previous competitions.

The temperature of the Dairy, although much lower than in any other part of the Showyard, was decidedly bad for butter-making. At one time the thermometer stood at 75° Fahr. in the coolest part of the Dairy, so that the competitors had need of knowledge and skill to manipulate butter under such difficult conditions.

It was knowledge and skill, without question, that enabled Miss Elsie Cook and Miss Hetty Baynes to bring their butter in such splendid condition at this competition, in such trying weather. The difficulty of placing their butter in positions of relative merit gave us no little trouble.

It would be impossible to find a finer collection of butter than was brought to be judged by the twelve persons who competed for the champion prize, and taking into account the trying character of the weather and the ordeal of working in the excitement of a showyard, the operators showed that they were accomplished in their art.

Horse-Shoeing Competitions.

These contests were limited to shoeing-smiths in the Society's District A, comprising the counties of Bedford, Buckingham, Cambridge, Essex, Hertford, Huntingdon, London, Middlesex, Norfolk, Oxford, and Suffolk. The Judges report:—

In Class I., Roadsters, there were 13 competitors, amongst whom there were several good workmen. With the exception that some of the competitors made the shoes much too light for roadsters, the work upon the whole was satisfactory. We awarded 5 prizes and one H.C.—and upon inquiry found that 5 of the 6 men placed were Registered Shoeing Smiths.

In Class II., Agricultural horses, there were also 13 competitors, none of whom had competed in Class I. The work done was very good, much better and more uniform than in Class I.

The 1st and 2nd prize winners were Registered Shoeing Smiths.

It is satisfactory to state that every man entered competed, and that there is now a marked improvement in the treatment of the foot.

A lecture, plentifully illustrated by specimens, was delivered by Mr. Clement Stephenson, F.R.C.V.S., at the Shoeing Forge on the Wednesday. The subject was "The Horse's Foot and How to Shoe it," and the address was listened to by a large number of farriers and others interested in the subject.

A "Cambridge Meeting" of the Past.

A delightful record of an old fair which used to be held on the outskirts of Cambridge has been preserved in the quaint writings of Defoe.[1] With this year's Meeting of the Society still fresh in the mind it is interesting by way of contrast to recall how business was conducted on almost the same spot in the earlier years of last century. To mutilate Defoe's description would be to deprive it of its most attractive charm; hence it is quoted *in extenso.*

I now draw near to Cambridge, to which I fancy I look as if I was afraid to come, having made so many circumlocutions beforehand; but I must yet make another digression before I enter the town (for in my way, and as I came in from Newmarket, about the beginning of September), I cannot omit, that I came necessarily through Stourbridge Fair, which was then in its height.

If it is a diversion worthy a book to treat of trifles, such as the gaiety of Bury Fair, it cannot be very unpleasant, especially to the trading part of the world, to say something of this fair, which is not only the greatest in the whole nation, but in the world; nor, if I may believe those who have seen the mall, is the fair at Leipzig in Saxony, the mart at Frankfort-on-the-Main, or the fairs at Nuremberg, or Augsburg, any way to compare to this fair at Stourbridge.

It is kept in a large corn-field, near Casterton, extending from the side of the river Cam, towards the road, for about half a mile square.

---

[1] *Tour through the Eastern Counties of England*, 1722. By Daniel Defoe.

If the husbandmen who rent the land, do not get their corn off before a certain day in August, the fair-keepers may trample it under foot and spoil it to build their booths, or tents, for all the fair is kept in tents and booths. On the other hand, to balance that severity, if the fair-keepers have not done their business of the fair, and removed and cleared the field by another certain day in September, the ploughmen may come in again, with plough and cart, and overthrow all, and trample it into the dirt; and as for the filth, dung, straw, &c. necessarily left by the fair-keepers, the quantity of which is very great, it is the farmers' fees, and makes them full amends for the trampling, riding, and carting upon, and hardening the ground.

It is impossible to describe all the parts and circumstances of this fair exactly; the shops are placed in rows like streets, whereof one is called Cheapside; and here, as in several other streets, are all sorts of trades, who sell by retail, and who come principally from London with their goods; scarce any trades are omitted—goldsmiths, toyshops, brasiers, turners, milliners, haberdashers, hatters, mercers, drapers, pewterers, china-warehouses, and in a word all trades that can be named in London; with coffee-houses, taverns, brandy-shops, and eating-houses, innumerable, and all in tents, and booths, as above.

This great street reaches from the road, which as I said goes from Cambridge to Newmarket, turning short out of it to the right towards the river, and holds in a line near half a mile quite down to the river-side: in another street parallel with the road are like rows of booths, but larger, and more intermingled with wholesale dealers; and one side, passing out of this last street to the left hand, is a formal great square, formed by the largest booths, built in that form, and which they call the Duddery; whence the name is derived, what its signification is, I could never yet learn, though I made all possible search into it. The area of this square is about 80 to 100 yards, where the dealers have room before every booth to take down and open their packs, and to bring in waggons to load and unload.

This place is separated, and peculiar to. the wholesale dealers in the woollen manufacture. Here the booths or tents are of a vast extent, have different apartments, and the quantities of goods they bring are so great, that the insides of them look like another Blackwell Hall, being as vast warehouses piled up with goods to the top. In this Duddery, as I have been informed, there have been sold one hundred thousand pounds' worth of woollen manufactures in less than a week's time, besides the prodigious trade carried on here, by wholesale men, from London, and all parts of England, who transact their business wholly in their pocket-books, and meeting their chapmen from all parts, make up their accounts, receive money chiefly in bills, and take orders: These they say exceed by far the sales of goods actually brought to the fair, and delivered in kind; it being frequent for the London wholesale men to carry back orders from their dealers for ten thousand pounds' worth of goods a man, and some much more. This especially respects those people, who deal in heavy goods, as wholesale grocers, salters, brasiers, iron-merchants, wine-merchants, and the like; but does not exclude the dealers in woollen manufactures, and especially in mercery goods of all sorts, the dealers in which generally manage their business in this manner.

Here are clothiers from Halifax, Leeds, Wakefield and Huddersfield in Yorkshire, and from Rochdale, Bury, &c., in Lancashire, with vast quantities of Yorkshire cloths, kerseys, pennistons, cottons, &c., with all sorts of Manchester ware, fustians, and things made of cotton wool; of which the quantity is so great, that they told me there were near a thousand horse-packs of such goods from that side of the country, and these took up a side and half of the Duddery at least; also a part of a street of booths were taken up with upholsterer's ware, such as tickings, sackings, Kidderminster stuffs, blankets, rugs, quilts, &c.

In the Duddery I saw one warehouse, or booth with six apartments in it, all belonging to a dealer in Norwich stuffs only, and who, they said, had there above twenty thousand pounds value in those goods, and no other.

Western goods had their share here also, and several booths were filled as full with serges, duroys, druggets, shalloons, cantaloons, Devonshire kerseys, &c., from Exeter, Taunton, Bristol, and other parts west, and some from London also.

But all this is still outdone at least in show, by two articles, which are the peculiars of this fair, and do not begin till the other part of the fair, that is to say for the woollen manufacture, begins to draw to a close. These are the wool and the hops; as for the hops, there is scarce any price fixed for hops in England, till they know how they sell at Stourbridge fair; the quantity that appears in the fair is indeed prodigious, and they, as it were, possess a large part of the field on which the fair is kept to themselves; they are brought directly from Chelmsford in Essex, from Canterbury and Maidstone in Kent, and from Farnham in Surrey, besides what are brought from London, the growth of those and other places.

Inquiring why this fair should be thus, of all other places in England, the centre of that trade; and so great a quantity of so bulky a commodity be carried thither so far; I was answered by one thoroughly acquainted with that matter thus: the hops, said he, for this part of England, grow principally in the two counties of Surrey and Kent, with an exception only to the town of Chelmsford in Essex, and there are very few planted anywhere else.

There are indeed in the west of England some quantities growing: as at Wilton, near Salisbury; at Hereford and Broomsgrove, near Wales, and the like; but the quantity is inconsiderable, and the places remote, so that none of them come to London.

As to the north of England, they formerly used but few hops there, their drink being chiefly pale smooth ale, which required no hops, and consequently they planted no hops in all that part of England, north of the Trent; nor did I ever see one acre of hop-ground planted beyond Trent in my observation; but as for some years past, they not only brew great quantities of beer in the north, but also use hops in the brewing their ale much more than they did before; so they all come south of Trent to buy their hops; and here being vast quantities brought, it is great part of their back carriage into Yorkshire, and Northamptonshire, Derbyshire, Lancashire, and all those counties; nay, of late, since the Union, even to Scotland itself; for I must not omit here also to mention, that the river Grant, or Cam, which runs close by the north-west side of the fair in its way from Cambridge to Ely, is navigable, and that by this means, all heavy goods are brought even to the fair-field, by water carriage from London and other parts; first to the port of Lynn, and then in barges up the Ouse, from the Ouse into the Cam, and so, as I say, to the very edge of the fair.

In like manner great quantities of heavy goods, and the hops among the rest, are sent from the fair to Lynn by water, and shipped there for the Humber, to Hull, York, &c., and for Newcastle-upon-Tyne, and by Newcastle, even to Scotland itself. Now as there is still no planting of hops in the north, though a great consumption, and the consumption increasing daily, this, says my friend, is one reason why at Stourbridge fair there is so great a demand for the hops. He added, that besides this, there were very few hops, if any worth naming, growing in all the counties even on this side Trent, which were above forty miles from London; those counties depending on Stourbridge fair for their supply, so the counties of Suffolk, Norfolk, Cambridge, Huntingdon, Northampton, Lincoln, Leicester, Rutland, and even to Stafford, Warwick, and Worcestershire, bought most if not all of their hops at Stourbridge fair.

These are the reasons why so great a quantity of hops are seen at this fair, as that it is incredible, considering, too, how remote from this fair the growth of them is as above.

This is likewise a testimony of the prodigious resort of the trading people of all parts of England to this fair; the quantity of hops that have been sold at one of these fairs is diversely reported, and some affirm it to be so great, that I dare not copy after them; but without doubt it is a surprising account, especially in a cheap year.

The next article brought thither is wool, and this of several sorts, but principally fleece wool, out of Lincolnshire, where the longest staple is found; the sheep of those countries being of the largest breed.

The buyers of this wool are chiefly indeed the manufacturers of Norfolk and Suffolk and Essex, and it is a prodigious quantity they buy.

Here I saw what I have not observed in any other county of England, namely, a pocket of wool. This seems to be first called so in mockery, this pocket being so big, that it loads a whole waggon, and reaches beyond the most extreme parts of it hanging over both before and behind, and these ordinarily weigh a ton or twenty-five hundredweight of wool, all in one bag.

The quantity of wool only, which has been sold at this place at one fair, has been said to amount to fifty or sixty thousand pounds in value, some say a great deal more.

By these articles a stranger may make some guess at the immense trade carried on at this place; what prodigious quantities of goods are bought and sold here, and what a confluence of people are seen here from all parts of England.

I might go on here to speak of several other sorts of English manufactures which are brought hither to be sold; as all sorts of wrought-iron and brass-ware from Birmingham; edged tools, knives, &c., from Sheffield; glass wares and stockings from Nottingham and Leicester; and an infinite throng of other things of smaller value every morning.

To attend this fair, and the prodigious conflux of people which come to it, there are sometimes no less than fifty hackney coaches which come from London, and ply night and morning to carry the people to and from Cambridge; for there the gross of the people lodge; nay, which is still more strange, there are wherries brought from London on waggons to ply upon the little river Cam, and to row people up and down from the town, and from the fair as occasion presents.

It is not to be wondered at, if the town of Cambridge cannot receive, or entertain the numbers of people that come to this fair; not Cambridge only, but all the towns round are full; nay, the very barns and stables are turned into inns, and made as fit as they can to lodge the meaner sort of people: as for the people in the fair, they all universally eat, drink, and sleep in their booths and tents; and the said booths are so intermingled with taverns, coffee-houses, drinking-houses, eating-houses, cook-shops, &c., and all in tents too; and so many butchers and higglers from all the neighbouring counties come into the fair every morning with beef, mutton, fowls, butter, bread, cheese, eggs, and such things, and go with them from tent to tent, from door to door, that there is no want of any provisions of any kind, either dressed or undressed.

In a word, the fair is like a well-fortified city, and there is the least disorder and confusion, I believe, that can be seen anywhere with so great a concourse of people.

Towards the latter end of the fair, and when the great hurry of wholesale business begins to be over, the gentry come in from all parts of the county round; and though they come for their diversion, yet it is not a little money they lay out, which generally falls to the share of the retailers, such as toy-shops, goldsmiths, braziers, ironmongers, turners, milliners, mercers, &c., and some loose coins they reserve for the puppet shows, drolls, rope-dancers, and such like, of which there is no want, though not considerable like the rest. The last day of the fair is the horse-fair, where the whole is closed with both horse and foot races, to divert the meaner sort of people only, for nothing considerable is offered of that kind. Thus ends the whole fair, and in less than a week more, there is scarce any sign left that there has been such a thing there, except by the heaps of dung and straw and other rubbish which is left behind, trod into the earth, and which is as good as a summer's fallow for dunging the land; and as I have said above, pays the husbandman well for the use of it.

I should have mentioned that here is a court of justice always open, and held every day in a shed built on purpose in the fair; this is for keeping the peace, and deciding controversies in matters deriving from the business of the fair. The magistrates of the town of Cambridge are judges in this court, as being in their jurisdiction, or they holding it by special privilege: here they determine matters in a summary way, as is practised in those we call Pye Powder Courts in other places, or as a Court of Conscience; and they have a final authority without appeal.

Conclusion.

The second Cambridge Meeting will be remembered as a highly successful gathering. It could not, indeed, be otherwise, for not one of the chief elements that make for success was lacking. The Show itself possessed many features of excellence both in the live stock and in the implement sections. The Town and the University vied with each other in giving the Society a hearty and hospitable welcome. The weather, which might have spoilt all, was as near perfection as we can ever expect it to be under an English sky, even at midsummer.

And thus it came to pass that, at a time of great stress, and after perhaps the most trying winter within the memory of farmers, the Royal Agricultural Society held in East Anglia a Country Meeting which, however gratifying its results may be to Members of the Society in general, cannot fail to be looked back upon with feelings of special satisfaction by those agriculturists of the Eastern Counties who were mainly instrumental in inducing the Society to revisit the scenes of its youth.

W. Fream.

13 Hanover Square, W.

THE TRIALS OF SPRAYING MACHINES AT CAMBRIDGE.

THE offer of prizes at the Cambridge Meeting for horse power machines for distributing *bouillie bordelaise*, or Bordeaux mixture, upon potato plants to prevent or cure disease was most timely and judicious; for, although the evidence in favour of this treatment in the United Kingdom is not so decisively favourable as in France and Belgium, there is quite sufficient to prove that it is of the greatest value. Fortunately, in the last few years, and since the discovery of the influence of sulphate of copper upon the fungus which causes the potato disease or "blight," there have been only light and partial outbreaks of the disease in this country, so that there have not been opportunities of thoroughly testing its efficacy. In this season, however, as there is a severe attack of disease in many localities, there will be occasions for trying it. And it may be said that at the time of writing this report striking instances of its preventive power have already been recorded.

There is also no doubt that some of the experiments with the Bordeaux mixture in former years have had unsatisfactory results, on account of its improper or unskilful composition, as well as of its irregular and injudicious application. It is therefore most important that suitable machines for equable and perfect distribution should be brought to the front. There are admirable hand machines of the "Knapsack" type for putting the Bordeaux mixture on potato plants; these are generally used in foreign countries and answer well for small acreages of potatoes, and where labour is cheap. But, in the United Kingdom, as labour is dear and many growers have large breadths of potatoes, horse machines are necessary, since it is most important that spraying should be done rapidly, especially when the disease has made its appearance and the treatment is remedial.

For the prize of 10*l.* offered by the Royal Agricultural Society at Cambridge, only four machines were entered. Of these three came to the trial ground, the remaining one, that entered by Mr. W. W. Cousins (No. 4685), having been damaged in transit and rendered unfit for working.

The machines that were actually tried are described in the Implement Catalogue as follows:—

CLASS III.—*Horse Power Machine for Distributing Bouillie Bordelaise or other Mixtures on Potatoes.*

No. in Catalogue.	Names and Addresses of Exhibitors.
4643	William Weeks & Son, Ltd., Maidstone, Price 37*l.* 10*s.*
4654	Strawsons, Ltd., 77 Queen Victoria St., London, E.C. 60 gallons. Price 25*l.*
4686	Ph. Mayfarth & Co., 16 Mincing Lane, London, E.C. "Syphonia." Price 22*l.* 10*s.*

The trials took place on Saturday, June 23, on the farm of Mr. J. H. Ridgewell, Histon Road, Cambridge, in a large field of potatoes well adapted for the purpose. The potato plants were not very high, but there was ample foliage to test the distributing powers of the machines.

The Judge had made up his mind that many points should be given to the machine that would spray the under as well as the upper sides of the potato leaves, for the reason that, as the potato fungus, *Phytophthora infestans*, appears first on the under sides of the leaves, it is most desirable that the Bordeaux mixture should be applied there, whether it be used as a means of prevention or as a cure of disease. It must be admitted that there is considerable diversity of opinion upon this subject. M. Girard holds that it is immaterial whether the under surfaces are sprayed or not; but, on the other hand, M. Petermann, who has conducted valuable experiments at the Belgian State Agronomic Station at Gembloux, states that it is indispensable to spray the lower surfaces of the leaves, particularly when the mixture is applied preventively.

Independently of its manifest superiority in other respects, No. 4654 thoroughly fulfilled this important requirement, as every part of the under surface was covered with the mixture by direct spraying, and the upper surfaces equally well by the mist which fell upon them. Neither of the other competing machines was arranged to spray the under surfaces.

The Strawsons' Machine, as will be seen by fig. 1, is a light water cart, with an arrangement of pump, tubes, and nozzles behind for distributing liquid compositions. Its barrel, holding 60 gallons, is set on a frame carried on high iron wheels, 4½ feet in diameter, with 3 inch tires. These wheels can be moved upon the axle and adjusted easily to suit the width of potato rows planted at from 24 to 30 inches apart. A powerful double-action pump with brass lining is fixed on the frame. Its lever is moved by gearing from the axles of the machine, and is attached to the gear of the machine by a bolt and pin, so that when the bolt is removed the pump can be worked by hand power for filling the barrel or agitating its contents. The flow-pipe of the pump, made of $\frac{3}{4}$ india-rubber hose, armoured, leads to the distributing pipes, being connected with them by a union joint.

From the flow-pipe of the pump a small tube with a tap is carried into the barrel, and supplies, at pleasure, a strong jet of liquid, which impinges on the strainer inside the barrel and agitates the liquid thoroughly, and at the same time keeps the holes of the strainer free from particles. This is an ingenious and most valuable feature of the machine.

Pipes for distribution are fixed upon long horizontal arms, extending about 6 feet beyond the wheels on either side. On these are fixed 7 steel shields, which hang down between the rows of potato plants to within 8 or 10 inches of the ground; a pair of nozzles on each shield are arranged to distribute the liquid right and left under the leaves of the plants.

The shields can be adjusted to suit various widths of rows, and

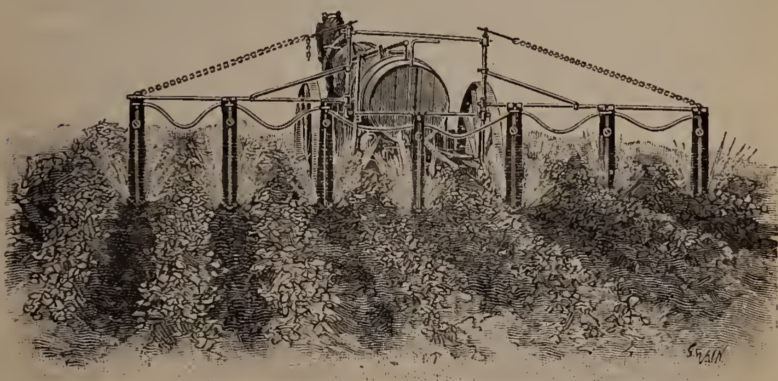


FIG. 1.—Strawsons' Potato-spraying Machine.

the nozzles can be set at any angle. The nozzles, which are like those known as Vermorel's nozzles, are well suited for distributing the Bordeaux mixture, as their spray forms a thick mist.

When the potato plants are very thick and high, making it difficult to spray the under surfaces, the whole of the shield arrangement can be quickly elevated high enough to spray the tops of the plants alone.

As there is naturally a thick sediment from the lime used in the Bordeaux mixture, it is essential that distributing machines should be furnished with perfect strainers. The Strawsons' machine has three strainers in succession. One is on the end of the suction hose, another is fixed in the hopper on the tap of the barrel, and a third is screwed on the end of the tap inside the barrel, through which the liquid is pumped into the distributing pipe when the machine is at work.

For travelling and passing through gates the projecting arms can be readily closed up behind the machines by removing a bolt.

One horse can work the machine, which will cover, it is said, from 8 to 15 acres per day. Its cost, which seems rather high, is 25*l.*

After the first turn or two, when slight stoppages occurred, owing to the pipes, taps and nozzles being new, there was hardly a hitch in the progress of the machine at work. The leaves were covered with the Bordeaux mixture in a fine mist. When the leaves were dry the bright blue deposit could be easily seen. It is calculated that about 8 acres could be got over per day, according to the work accomplished during this trial. But it must be remembered that everything was new, that the horse was not accustomed to the work, and the supply of liquid was not regular.

There could be no doubt whatever that this machine was entitled to the prize, as being by far the best of the three that competed. It is considered that it is admirably adapted for the application of Bordeaux mixture, and will prove of indescribable benefit to large potato growers in seasons of blight if a few necessary alterations and improvements are made, and the price is reduced.

The machine (No. 4643), priced at 37*l.* 10*s.*, exhibited by W. Weeks & Son, Limited, did not distribute the Bordeaux mixture at all regularly. In some cases the leaves were thickly covered, in others there was no mixture on them. This could be seen clearly when the leaves were dry. This machine holds only 50 gallons and sprays 6 rows. There was no effective strainer in the machine tried at Cambridge, consequently the jets were frequently choked. The spraying was confined entirely to the upper surfaces of the leaves.

The other machine, No. 4686, exhibited by P. Mayfarth & Co., 16 Mincing Lane, E.C., is styled "Syphonia, the Patent Self-acting Spray Distributor," and is priced at 22*l.* 10*s.* It is self-acting, the liquid contained in the long narrow tank being forced through the pipes and nozzles by a continuous pressure of air, no pump being required.

The tank, as shown in fig. 2, rests by means of two pivots in an upright position upon the frame, and holds 22 gallons of liquid, which will last about 25 minutes. Air is pumped in first up to a pressure of "1 atmosphere," indicated by the "manometer" fixed on the tank. Liquid for spraying is then pumped in until the "manometer" indicates "3 degrees of air

FIG. 2.—The "Syphonia" Spray Distributor.

pressure;" the main pipe is thereupon connected with the spraying pipes, and the machine is ready for work.

The distribution by this machine was irregular. There were not adequate straining arrangements, and stoppages frequently occurred. There was much delay in starting it and great difficulty in keeping it to work; but it is fair to say that this was due, at least in a degree, to the want of knowledge on the part of the person in charge of it as to its practical working in the field.

The following entries were made in the other class for spraying machines at Cambridge:—

Class IV.—*Machine for Distributing Insecticides and Fungicides upon Fruit Trees and Bushes.*

No. in Catalogue	Names and Addresses of Exhibitors.
4644	W. Weeks & Son, Ltd., Maidstone. Price 42*l.* (for liquids only).
4645	do. do. Price 18*l.* 18*s.* (for powders).
4655	Strawsons, Ltd., 77 Queen Victoria St. "The Antipest." Price 1*l.* 15*s.*
4656	do. do. The "Notus." Price 1*l.* 8*s.*
4657	do. do. The "Coronetta." Price 1*l.* 10*s.*
4658	do. do. The Fruit Tree Sprayer. 5*l.*
4669	Stott Fertiliser &c. Co., Deansgate, Manchester. Hop and Plant washer. Price 20*l.*
4670	do. do. Distributor. Price 5*l.* 10*s.*
4671	do. do. Hop and Plant Washer. Price 14*l.* 10*s.*
4687	Ph. Mayfarth & Co., 16 Mincing Lane, E.C. "Syphonia." Price 3*l.* 8*s.*
4980	Boulton & Paul, Norwich. No. 86A. Price 9*l.* 15*s.*
4981	do. do. No. 87A. Price 8*l.*
4981	do. do. No. 14. Price 8*l.* 10*s.*

There was one prize of 10*l.* offered in this class, which included machines for spraying high fruit trees and small bushes, machines drawn by horses and by hand, and machines carried on men's backs, commonly known as "Knapsack" machines. It was most difficult to award the prize, as it involved invidious comparisons of great things with small things, and there ought really to have been two classes, one for horse and hand power machines upon wheels, and another for "Knapsack" machines and other machines for small holdings.

It was soon seen that the horse machines must be set on one side, as they are only suitable for orchards or land planted with standards without bushes between them. No. 4644 is practically a hop washer, admirably suited for washing hop plants, and No. 4645 is a hop sulphurator perfectly adapted for putting sulphur upon hop plants to prevent or check mould, but not for use in fruit plantations. The "Knapsack" machines, Nos. 4655, 4656, 4657, 4658, and 4687, were then eliminated as being suitable only for small holdings. Some of these most useful machines are well suited for putting liquids and powders upon half-standard, dwarf, pyramidal, and espalier fruit-trees, and upon bushes. The "Antipest" is a good instrument, modelled on the lines of the Continental "Knapsack" machines, advantageously used for putting the Bordeaux mixture on vines and potatoes in France, Belgium, and Germany; and the other three entries of the same exhibitor had many valuable points. But in a country where labour is dear and holdings are large they cannot be compared with machines like those of Messrs. Boulton & Paul and the Stott Fertiliser, &c., Company, which are calculated to spray large areas of fruit land, planted with standards, half-standards, pyramids, and dwarfs, and fruit bushes that may be set between them, speedily and effectually.

With regard to the entries of the two firms just named, long and repeated trials were made of them, and every possible consideration was given to the respective merits of each. No. 4669, entered by the Stott Fertiliser, &c., Company, is a very good machine. Its pump is strong, and with long lengths of hose, and the patent nozzle fitted to them, liquid can be thrown high enough to spray tall trees. Its draught is fairly light.

Messrs. Boulton and Paul's machine is fitted with a very powerful and yet most easy working pump, able to force liquid great heights. It holds more liquid than the Stott Company's machinery, and it is as readily moved about; but it must be said that it is not so well constructed, except as regards its first-rate pump, nor so smart in appearance. The lengths of hose attached to it for the trials were not so long, and the nozzles, perhaps, not quite so good as those of the Stott machine, but the hose can of course be made of any length and any good nozzle may be applied. Seeing that there is a very great difference in the cost, the Stott Company's machine being priced at 20*l.* and Messrs. Boulton and Paul's at less than half the price, and that the pump of the latter is much superior, it was decided to give this the prize, though it must be recorded that the Stott Company's machine has very great merits.

The official list of awards in the competitions of spraying machines will be found in the Appendix, p. clxii.

The trees and bushes upon which these experiments were made are not planted regularly, so that it was rather difficult to work the machines. The owner, Mr. Ridgewell, however, placed all his fruit plantation at the disposal of the Steward and the Judge, and assisted them throughout these trials as well as the trials of the distributors of the Bordeaux mixture with the greatest assiduity and intelligence.

CHARLES WHITEHEAD.

Barming House, Maidstone.

MISCELLANEOUS IMPLEMENTS EXHIBITED AT CAMBRIDGE.

The Royal Agricultural Society's Country Meeting at Cambridge was the fifty-fifth of the series. The period between the first Show at Oxford in 1839 and the Show at Cambridge in 1894 has witnessed a wonderful development in the machinery applied to agricultural purposes and in the interest taken in the Shows of the Royal Society by all classes connected, in whatever degree, with the cultivation of land. The great stride in the exhibits of machinery may be gauged at a glance by a statement of the figures: in 1839 the number of implements entered for exhibition was 54; in 1894 the total was 6,031. But the latter figures, great as they are, have been exceeded on several previous occasions; notably at Kilburn in 1879, when, taking advantage of the nearness to the Metropolis, makers sent the huge total of 11,878 implements for exhibition. The facilities for transit afforded by the railway systems have tended to this remarkable increase. But, in addition, and more importantly, to withstand the competition of the foreigners, farmers have had to revolutionise their methods during the past half-century; and, to enable them if only partially to succeed, their need of labour-saving machinery has brought into operation all the ingenuity and the capital of makers who, eager to make their appliances known to the farmers, have availed themselves so freely as has been shown of the splendid opportunities afforded by the Royal Shows.

It is interesting to note that at the Cambridge Show of 1840 only 115 implements were exhibited; but the Judges in their Report referred to the exhibitors thus: "At considerable cost to themselves (they) had responded to the Society's invitation, and had sent from various parts of the country such a selection of implements as, beyond controversy, were never before collected in one showyard."

This remarkable statement conveys with striking force an idea of the poverty of the time in agricultural appliances. There were several duplicates of the different ploughs, chaff cutters, turnip machines, hoes, harrows, clod crushers, and drills, which made up the total display of 1840. In 1894 there were also many kinds of the same contrivance; but the wonderful variety of the machines makes clear the astonishing advance that has been made.

At this year's Exhibition there were rustic bridges; butter-makers; carriages; churns; corn drills; cinder sifters; steam diggers; draining appliances; distributors; electric lighting plant; elevators; oil, gas, steam, and petroleum engines; ensilage appliances; fencing; fire engines; forges; freezing machines; harrows; harvesters; hoists; haymaking machines; incubators; screw jacks; mangers; milling machinery; ploughs; pumps; mowing machines; root cutters; sheep dippers; sowing machines; stone pickers; threshing machines; weighing machines; winnowers; windmills; and a lengthy list besides of articles of direct and indirect service to the agricultural industry. Some of the new implements indicate processes unknown to the farmer of 1840—the binders, incubators, refrigerators, ensilage apparatus, &c.—and show the advance in the art of agriculture itself as well as in its mechanical appliances.

The applications for patents alone for agricultural inventions now average annually above four times the total of the known implements exhibited at Cambridge in 1840. In 1839, according to Mr. Pusey, the plough, the threshing machine, and the turnip cutter were the only implements in ordinary use. He pointed out that "the use of the drill machine, by which seed is laid in regular rows, has lately become frequent in southern as well as in northern England, although it has established itself so slowly that, for a long time, travelling machines of this kind have made yearly journeys from Suffolk as far as Oxfordshire for the use of those distant farmers by whom their services are required;" and *this* only fifty years ago.

The implements shown at the Oxford Meeting in the year Mr. Pusey wrote were, in great part, "crude, cumbrous, and ill-executed machines, the work of village ploughwrights and hedgeside carpenters" (Parkes' Liverpool Report, 1841). But, three years after, so much benefit had accrued from the massing of machines at the Shows, "and the annual congregating of agriculturists and mechanicians from all parts of the empire;" so many fresh ideas had been developed, that the Engineer of the Society was enabled to report that "the manufacture even of the commoner implements has already, to a great extent, passed out of the hands of the village ploughwright and hedgeside carpenter and become transferred to makers possessed of great intelligence, skill, and capital; while examples are not wanting in the higher classes of machinery to show that the fourth important object for which the Society was incorporated is to some extent fulfilled—viz. to encourage men of science in their attention to the improvement of agricultural machinery." If this were true fifty years ago, how considerably the truth is now emphasised could only have been realised to the full by those who were fortunate enough to make the survey of the magnificent machinery exhibited at the Royal Show of 1894. According to a very competent authority, the total value of implements now exhibited annually is 20,000*l.*, and the total annually manufactured beyond 3,000,000*l.*; "the larger, but unascertainable, portion of the machines representing this sum being exported."

The competition which British farmers have had to combat has produced this comparatively new industry of agricultural mechanics. What the British farmer has lost has been gained to some extent by the mechanician; but what he might have lost has, by the mechanician's skill and industry, and never-failing progress towards perfection, been saved to him. It may be said that British agricultural implement-makers export machines to most of the corn-growing countries, lightening man's labour, increasing the productiveness of the soil, cheapening the price of daily necessaries, and proving that the fierce competition which led to the production of labour-saving machinery has been to mankind, if not to the great majority of agriculturists themselves, an unmitigated blessing.

There was a great dearth of novelty in the implements entered at Cambridge for the Society's Silver Medals, some of the so-called "new" machines being revivals of old principles in altered forms. There were also some undisguisedly old; and there were too many of a trivial character, and these, apparently, entered but for one purpose—to secure the advertisement afforded by the Society's Catalogue.

There were a number of potato-gathering implements which appeared not only novel and ingenious, but also of a practical character, though it was impossible to adequately test their practicability as there were no crops sufficiently forward for the purpose. It would be well if a proper opportunity for trials could be afforded at some early date.

Awards of Silver Medals.

Altogether 115 implements were entered as "new," but 99 only were exhibited; and of the Silver Medals at the disposal of the Judges they were able to award only two. They consider that the Silver Medal of the Royal Agricultural Society of England should not be won except upon display of undoubted novelty, ingenuity, and perfection of workmanship. At the same time they trust that the notices which follow will prove that they have not lacked either appreciation of or sympathy with the aims of the makers of implements.

The medals were awarded to the following exhibits:—

No. in Catalogue.	Exhibitor.	Nature of Implement.
1641	Ben Reid & Co., Aberdeen .	Farmyard manure spreader.
2266	John Fowler & Co., Ltd., Leeds	Turnwrest plough, for steam cultivation.

Article 1641. *Messrs. Ben Reid & Co.*, Aberdeen. Farmyard Manure Spreader. Price 10*l*.—This is a new machine (fig. 1) for breaking and spreading farm manure in the "drill." The draught is light enough for one horse. It is mounted upon a pair of skeleton driving wheels which are concave instead of flat at the tyres, the concavity permitting the wheels to run upon the tops of the ridges. Motion is conveyed to a crank shaft which raises and depresses a trio of swiftly revolving, breaking, and spreading forks, whose action is of a reciprocating character. Manure which may have fallen out of the furrows is collected and guided into them by a pair of plates fixed in front of the distributing forks. These forks are capable of adjustment to the depths of the furrows and quantities of the manure thrown out by the driver while seated. In its trial upon 25 to 30 loads to the acre the work done was satisfactory.

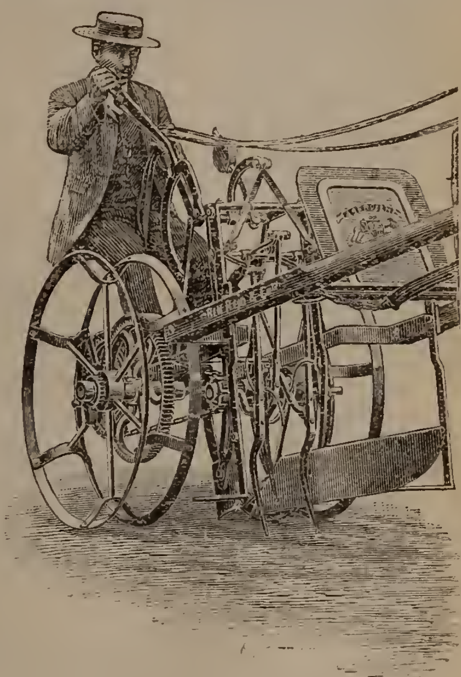


Fig. 1.—Ben Reid & Co.'s Farmyard Manure Spreader.

Article 2266. *Messrs. John Fowler & Co. Ltd.*, Leeds. Turnwrest Plough for Steam Cultivation. Price 180*l*.—Instead of the rigid beam to which it has been the custom to attach all gang ploughs, this eight-furrow turnover steam plough has a bar carried by wheels on each end, to which are attached by proper draught-links four pairs of ploughs; each pair being entirely separate from the others, and free to rise or fall with the varying surfaces of the land. Its superiority in exactitude of work over the rigid beam ploughs scarcely requires statement. The rigid beams worked irregularly over unequal surfaces because the ploughs, being fixed in an immovable line, were unable to make that equal attack upon the varying elevations which is within the power of the new plough. But this new plough has other points of superiority over the older ploughs. Each of its eight ploughs has two mould-boards: one rests in the air while the other is ploughing; but, when the end of the field is reached, the mould-board in the air, by an ingenious automatic arrangement, falls to the ground to do its share of the work, while the other takes its resting-place for the return furrow. The carrying wheels and frame do not affect the depth of the furrows. This is regulated independently, the weight of the shears and moulding boards ensuring uniformity. Its trial took place upon a piece of land where clover had been cut and stacked, and where the soil was heavy and wet. It proved itself capable of ploughing this at the rate of 30 to 40 acres per day. The plough is 19 feet long, presents a fine example of ingenuity and careful workmanship, and is altogether capable of accomplishing the end for which it was designed.

Other Exhibits.

There were several machines of a praiseworthy character, and amongst them the following deserve mention:—

Article 542. *Mr. T. A. Wynne Edwards*, Denbigh. Hay and Straw Box Baling Press. Price 30*l*.—This press (figs. 2 and 3) is horizontal. When the ram is back the open space measures 5 feet by 4 feet—a larger opening than in the vertical presses, easier to fill by throwing from the stack, and giving more room for a man to turn about and pack the hay. When filled, the lid is closed and fastened by automatic levers. Four strong racks and pinions, moved by a ratchet lever 7 feet 6 inches long, which is worked by two men, and the shaft of which is geared with the two main shafts of the press, then force in the ram. The lid is opened, the bale tied, and a false end falls back, permitting its easy extraction. With this press two men can truss and tie about $3\frac{1}{2}$ tons of hay or straw per day.

Article 737. *Mr. John D. McJannet*, Woodlands, Stirling, N.B. Weighbridge for Carts and Cattle. Price 18*l*.—This weighing machine (fig. 4) is meritorious in design and construction. The platform is 6 feet by 3 feet 6 inches, and is provided with end sole plates of roughened iron which increase the length to 9 feet. The plates are rounded at the edges to form a slope for the feet of the cattle, and rest upon strong angle irons. A cage holds the cattle. It is made in halves, the lower ends of each half passing through the weigh-table. At the top centre of each half there are two sets of double- and single-pronged joints, through the eyes of which strong iron pins are thrust to keep the frames in position. When the upper parts of the halves are thus fastened, the lower

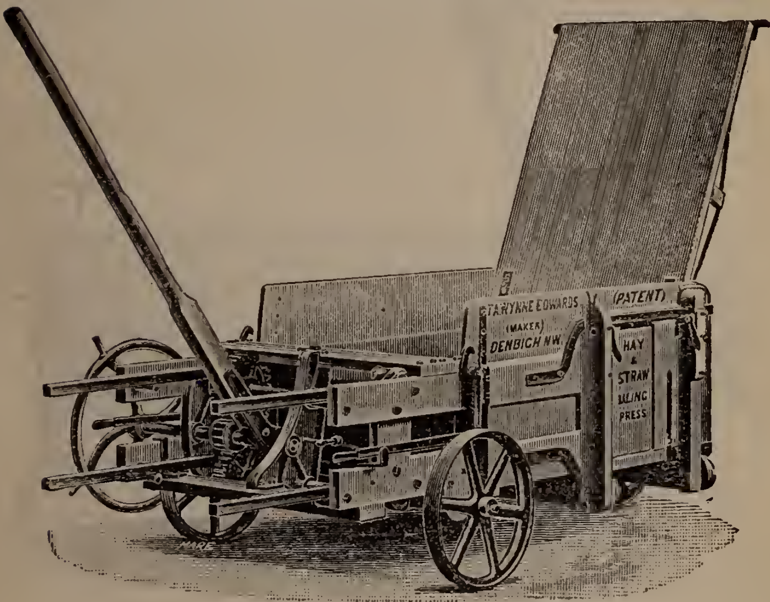


FIG. 2.—Edwards's Hay and Straw Box Baling Press.

ends are drawn tight and prevent possibility of disturbance or removal of the complete cage. Two men can easily erect the cage upon the table, or remove it, within one minute. It will hold one big bullock, or four stirks, or from seven to ten sheep.

Article 905. *Dairy Supply Co., Ltd.*, Museum Street, W.C. Laval Cream Separator, "The Humming Bird." Price 9*l.*—This is a small machine (fig. 5) calculated to separate fifteen gallons of milk per hour. Its merit lies in the application to its purposes of the familiar principle of the humming-top. The operator sits down, and by pulling a string conveys a backward and forward motion alternately, the string being continually wound and re-wound, with trifling exertion, until the work is done.

Article 968. *Messrs. Henry Pooley & Son*, Liverpool. Cattle Weighbridge. Price 80*l.*—This machine will weigh up to fifteen head of cattle at one time. The distinguishing feature is an immense shadowless dial, which is so designed that its indications may be read from any angle. The indicator is without springs and is absolutely automatic in action. It is devoid of "rack-and-pinion" movement, and the vibration of the finger is minimised

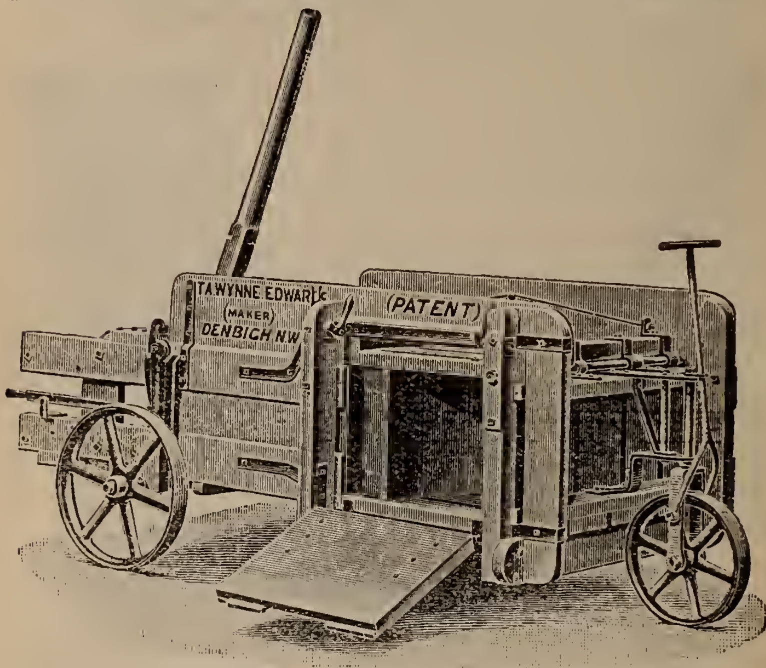


Fig. 3.—Edwards's Hay and Straw Box Baling Press.

by the employment of an air-valve. The pen and gates are of substantial construction. The machine may be fitted with the usual steelyard and loose weights, or with Pooley's patent steelyard, which obviates the use of weights. It is specially intended for auction marts and stockyards.

Article 995. *Captain H. S. Tunnard*, Rugby. Automatic Fire Alarm. Price from 12*l.*—This peculiarly sensitive automatic thermostat is the salient feature of a complete and effective system of fire alarm. It conveys the alarm on experiencing the slightest undue excess of normal temperature, and may be fitted in any convenient and conspicuous position as an ordinary thermometer. It records the exact position in the house in which the fire has broken out, and automatically gives the alarm by means of a gong placed above the front door on the outside, simultaneously with another gong placed in any room of the house, and also with a gong affixed at the nearest fire station. There the street or house in which the fire has broken out is notified to the fireman in charge by means of an indicating board. The exact position of the fire being thus shown to the fire brigade, valuable time may be saved by the accurate information and the earlier despatch of the fire engine, whilst increased possibility is thus afforded of curbing the dimensions of a fire. Those passing a house, on hearing the outside gong ringing, although no smoke

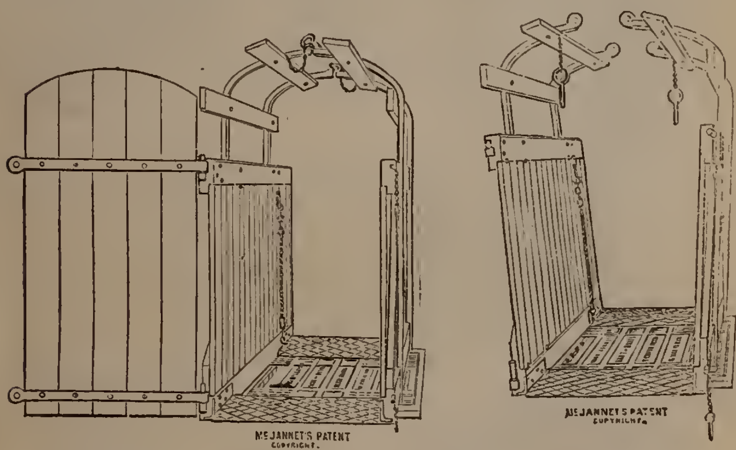


FIG. 4.—McJannet's Weighbridge for Carts and Cattle.

or flames may be visible, will be at once apprised of fire and ready to assist the inmates. The circuits in the house can be tested at all times. The efficiency of the thermostat is in no way impaired or affected by changes in barometric pressure, or by moisture in the atmosphere. It can be arranged to raise the alarm at any desired temperature, and is correct to one-tenth degree Fahrenheit. The apparatus cannot come into action except through an undue rise of temperature; and the risk of false alarms, either through accident or tampering, is entirely obviated. The apparatus can also be applied to the purpose of detecting the heating of ships' cargoes, the overheating of hay-ricks, &c.

Article 1256. *Mr. W. J. Burgess*, Magdalen, King's Lynn. Potato-Picking Machine, "Pioneer." Price 20*l*.—This machine can be attached to the potato-digging machines now in use. It has a revolving screen of large dimensions, which travels upon the ground by its central rim. With the rotary digging machine the picker is arranged to receive the potatoes as they leave the digger, which passes them into the screen. There the dirt and weeds are screened out, and guides conduct the potatoes into cups or pockets which empty their contents into a basket as the screen revolves. The picker can be set nearly to touch the revolving forks of the digger, or be easily placed at such reasonable distance from them as may be desired. A box with a movable side is fitted to carry the basket or sack immediately above ground, if it be desired to bag or skep the potatoes; or the box itself may be made removable if it be required to carry them into a heap at the headland before turning round. The heap at the headland may be made large enough to be earthed down for the winter. The combined machine is balanced upon the two driving-wheels of the digger, and will back or turn within its own length. There are no belts, gearing, cranks, or cams; and there is no side draught or weight upon the horse's neck or back. The frame of the picker is made of wood, with wires of galvanised steel firmly bedded in indiarubber, which are easily set to any distance apart. The entire machine is easy of alteration and repair anywhere. It is fitted with shafts and horse-tree for a pair of horses abreast, and a third may be attached in front of shaft if required. In action it is necessary to remove the haulms from the front if they are long, and the machine must be worked when the land is dry enough to use the ordinary land roller. It will clear the field, in combination with the digger, ready for the next crop, and takes one man and two lads to work three acres per day.

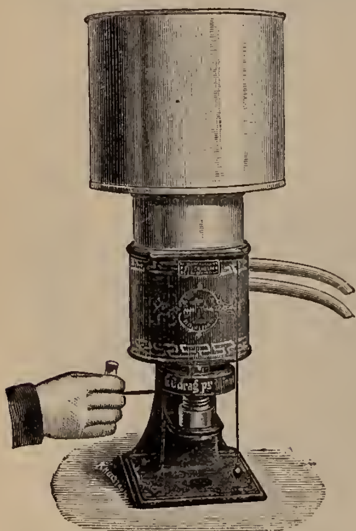


FIG. 5.—"Humming Bird" Cream Separator.

Article 1601. *Messrs. W. Rainforth & Sons*, Lincoln. Hollingsworth's Patent Cart. Price 22*l.*—This cart embodies many advantages, but is susceptible of further improvement. It automatically regulates the load upon the back of the horse to meet all gradients, and in descending hills the action of the horse applies a powerful brake to both wheels. The cart is self-tipping,

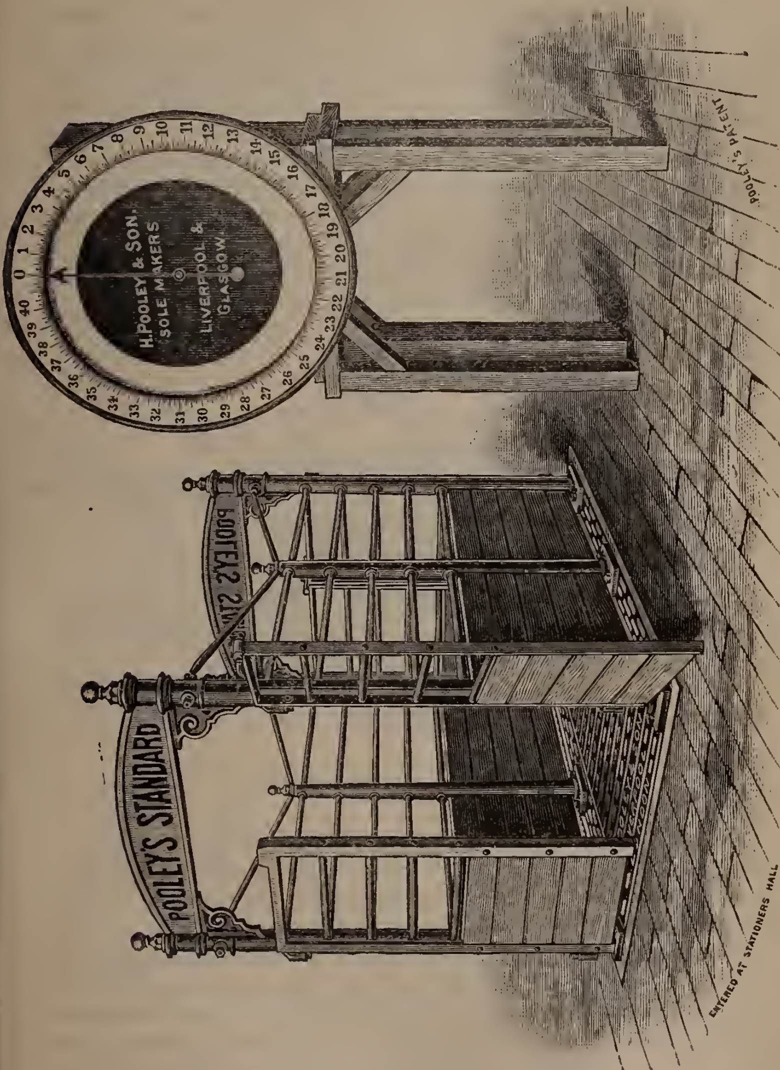


Fig. 6.—Pooley's Patent Automatic Cattle Weighbridge.

and it is not necessary for the man to leave the head of the horse to take off the tail-door, replace the same, or perform any other operation. It has a cranked axle, which reduces the height by one foot below an ordinary cart, thus lessening the labour in loading. It is fitted with $2\frac{1}{4}$-inch patent arms, and is calculated to carry 30 cwt. The weight of the whole is $10\frac{1}{2}$ cwt.

Article 1643. *Messrs. Ben Reid & Co.*, Aberdeen. Wire Strainer. Price 12*s.* 6*d.*—This is a small, exceedingly useful, and original form of wire strainer. It consists of a lever with double pawls working upon a ratchet bar. It can be quickly attached to work in the erection of new fencing, or in straining old wires which may have become loosened from the posts. It should prove a valuable aid to estate carpenters, and its cheapness places it within reach of the smallest users of wire fencing. The ingenuity displayed, both in the construction and application to its specific purpose, deserves high commendation.

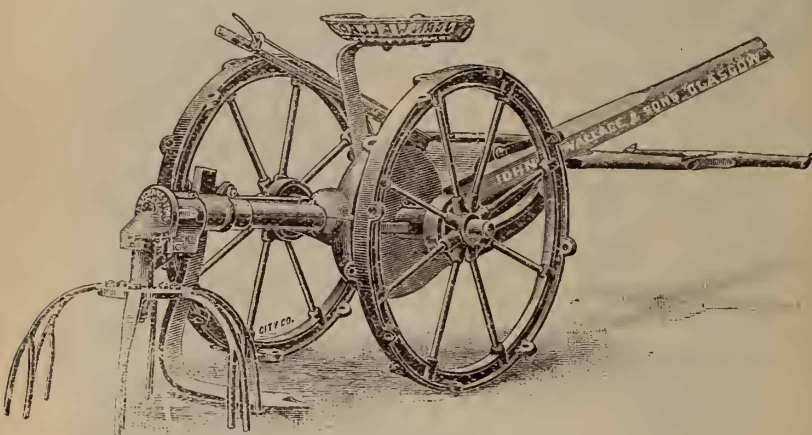


FIG. 7.—John Wallace & Sons' Potato Digger.

Article 1800. *Messrs. John Wallace & Sons*, Glasgow. Potato Digger. Price 14*l.*—The principal feature in this digger (fig. 7) is that the digging forks or graipes are made to revolve in a horizontal instead of in the vertical position employed in the construction of all other diggers. By the application of the horizontal position the following advantages are claimed: that the digger has rather lighter draught; that it is much less liable to clog up in long "tops" or "shaws"; that the potatoes are less scattered about and easier picked up, so that a screen is not absolutely necessary; and that no earth is thrown up to clog or cover up the whole machine, so that a man is enabled to work in comfort from the driver's seat. In addition to the above, the digger has the gearing completely enclosed, and only one lever is used for putting it in and out of gear, and in lifting and altering depth of sock. One of the best of the advantages claimed for the machine is that there is no necessity for removing the long haulms from its front before it can be worked.

Article 1811. *Mr. Henry Forman*, Chellaston, near Derby. Fork Plough. Price 5*l*. 5*s*.—This is a four-breasted cultivating plough (fig. 8), of simple construction, for which it is claimed that it is capable of covering double the width done by an ordinary plough, and doing the work of plough and cultivator at the same time. Also that, if required, it will act as the ordinary plough, but that when used as a cultivator it will turn the soil over and pulverise it. It is claimed further that it brings the weeds to the surface, to leave them exposed to the action of the weather, or in a condition to be easily removed. It can be adjusted to take a narrower furrow when finishing, thus leaving the sole of the

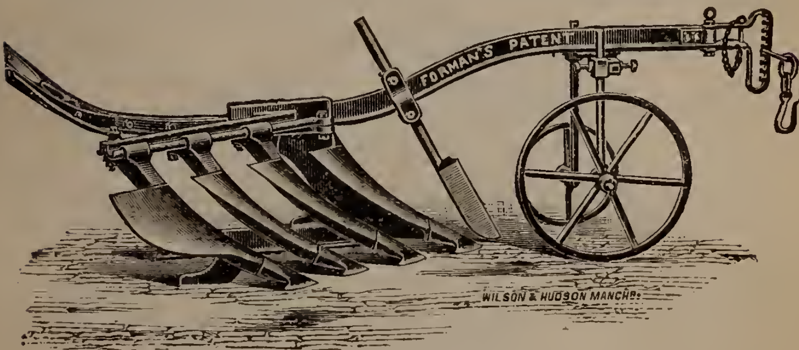


Fig. 8.—Forman's Patent Fork Plough.

furrow quite level, and giving a wide walk for the horses. It is said to require only the same horse-power as an ordinary plough. Both broad and narrow shears can be used: when the broad are employed, the ground is cleared and all weeds cut off: if the narrow chisel-pointed shears are used, the plough acts as an ordinary garden fork. In the trial, upon fairly deep soil, the digger acted more like a plough. As a consequence the draught was very heavy, since the soil could not work through the forks. Upon light land, which had been planted with peas and failed, a further trial of the plough disclosed more satisfactory results; but the weeds were buried instead of being brought to the surface of the soil.

Article 1967. *Mr. J. E. Cooke*, Bringsty, Worcester. String Tyer. Price 1*l*. 10*s*.—Cooke's Mechanical String Tyer is a simple apparatus, fixed to the end of a light wooden shaft, for tying string from cut lengths upon the wires in hopyards. It obviates the use of stages and ladders, and saves the expense of hooks, which sometimes turn upon the wires. As each string is secured along the shaft of the tyer while being placed in position, it cannot be blown about in windy weather. The knots are immovably fixed to the wires, and cannot slip or permit the strings to be blown together. As the operator works from the ground he is better able to judge where to tie, and is therefore enabled to preserve a uniform distance between the strings. It is also valuable for repairs to broken strings, and it renders work easy in corners and at awkward angles. One man can use it, and with it fix about four strings in a minute.

Article 2616. *Messrs. John Crowley & Co.*, Sheffield. Chaff Cutter. Price 28*l.* 16*s.*—Noticeable features are embodied in this New Combination Safety Lever Chaff Cutter. The lever is of the duplex type, enabling the machine to be stopped or reversed from either side; and it is so arranged that it cannot be moved in a wrong direction. A wooden roller, behind the pressure plate at the top, obviates danger to the man in charge by preventing a too near approach to the feed rollers. By a complete covering system every part of the machine, except the pulleys, is protected, whereby risk is minimised. Double-toothed rollers move the feed to the knives, and release themselves automatically as soon as the material is brought to the mouth. The mouthpiece is adjustable, and free from any projection which might impede the passage to the mouth. As the teeth of the rollers are placed diagonally, instead of in the usual rows, a firmer grip is maintained upon the material. The extent of resistance by the pressure plate can be adjusted, without ceasing work, by means of a set screw. The machine is excellent, and ought to find favour with employers, whose liability for accident is now more pronounced than ever.

Article 2667. *Messrs. T. J. Syer & Co.*, 45 Wilson Street, London, E.C. Estate Carpenter's Plow. Price 1*l.* 5*s.*—The plow (fig. 9) is designed to overcome the old difficulty experienced in making a motion of the fence parallel with the body of the tool. The fence is moved by universal action from one central screw on turning the thumb wheel, instead of by independent wedges. The arms are thus equally advanced or set back. A locking nut secures the screw at the desired distance. It is fitted with a convenient handle.

Article 2942. *Dr. I. MacWilliam Bourke*, 40 Redcliffe Square, London, S.W. Spring Hub Wheel. Price 3*l.* per pair.—By the arrangement of a set of springs, fitted either with ball bearings or slides, and adjusted between the axletree or axlebox, the necessity for exterior springs to vehicles thus fitted is obviated. Vibration, also, is much reduced. The entire movement is adjusted by one nut, and secured by a lock nut. The contrivance can be applied to wheels of whatever weight.

Article 3093. *Mr. C. R. Whitmee,* 279 and 281 York Road, Battersea, London, S.W. Manure Waggon. Price 50*l.*—While there is nothing absolutely new about this waggon, it is undoubtedly well-made and calculated to be of valuable practical service. It is intended for the conveyance of offensive manures, offal, and town refuse. Patent steel covers close hermetically and prevent the escape of smell. These can be opened and closed again by the operator standing upon the ground. The body is swung upon a strong frame by powerful steel hinges, and is so balanced that one man can tip the contents and easily restore it

FIG. 9.—Syer's Estate Carpenter's Plow.

to the working position, to be again fastened by a strong spring locking bar. There is no complicated gearing.

Article 3345. *Mr. W. B. Lake,* Braintree, Essex. Root Grater. Price 3*l.* 17*s.* 6*d.*—The feature of this very useful grater is that the teeth may be individually renewed when worn out. These teeth are made from cast steel and will cut easier and last longer than the old description, while, as arranged, it is impossible for them to be accidentally knocked out by stones or other obstructions. The arms of the wheel near the centre are worked away from the plate, thus enabling the teeth to be placed close to the spindle, which arrangement not only increases the capacity of the machine, but is also of great service in preventing roots from choking it.

Articles 3498 & 3499. *Messrs. Freeth & Pocock*, Wandsworth Road, London, S.W. The Empress Cream Separators for Hand and Steam Power. Price 30*l.* and 65*l.*—The same principles are employed in the construction of these two separators; the difference lies in the amount of production. The hand-power machine separates about 70 gallons per hour, the machine for steam 350 gallons in the same time. The revolving drum or bowl which separates the cream is so constructed that the quantity of milk passing through is claimed to be enormously increased without necessitating the use of removable trays. It is provided with an aluminium cylinder pierced by over a thousand holes, and resembling a honeycomb of circular form. Each of the holes or cells is said to act as an independent separator, and thus the efficiency of the complete separator is stated to be greatly increased.

Article 3915. *Weldless Chain Co., Ltd.*, St. Helens, Lancashire. Steel Weldless Agricultural Chains.—These weldless chains possess a greater amount of strength in proportion to their weight than those in ordinary use. They are an American product, and tests are reported to have proved them, upon an average, twice as strong, for each corresponding size, as the English welded chain, five times as strong as the double jack chain, and eleven times as strong as the single jack chain. In every trial they are reported to have given way in the material itself, and not, as in the case of the jack and welded chains, at the joints.

Article 5122. *Messrs. Blackstone & Co., Ltd.*, Stamford. Fly Brush or Dresser. Price 8*l.*—This implement, invented and patented by Messrs. D. J. Smith and C. Flink, appears to be decidedly useful and to do its work well. It consists (fig. 10) of a water-cart (to be drawn by a horse) which contains about 35 gallons. Its axles are made to telescope so that the wheels may be regulated to different widths apart, enabling the cart to run between the rows and clear the crop. A brushing apron of coarse canvas, about 20 feet from end to end, and capable of adjustment to the height of the crop, is attached to the rear of the machine. When at work the apron extends beyond the wheels, but it may be folded to the width of the machine for passing through gateways. Above, and fixed the entire length of the apron, is a perforated pipe, from which the insecticide solution from the circular tank runs down upon the apron, the supply of liquid being regulated by a cock within the driver's reach. As the apron passes over the crop across the drills, it brushes the under side of the leaf, where the fly is usually found, depositing the solution at the same time, and effecting the destruction of insects either upon the swedes or turnips or on the ground. The solution advocated is so distasteful that flies will not return to the plants and ground which have been treated with it. This operation, it is claimed, not only destroys the insects, but is calculated to benefit the crop by loosening the roots and causing them to strike farther into the soil. The machine in complete working order, and with the driver seated, weighs within 10 cwt., and may therefore easily be drawn by a light horse; it will cover from five to six acres per hour. It was tested upon swedes which were rather big for a fair trial. The liquid, which was a solution of paraffin and soft soap—a pint of paraffin to an ounce of soap—appeared to undergo uniform distribution, and no damage was done to the roots. The practical results, however, must be proved by the future condition of the crop.

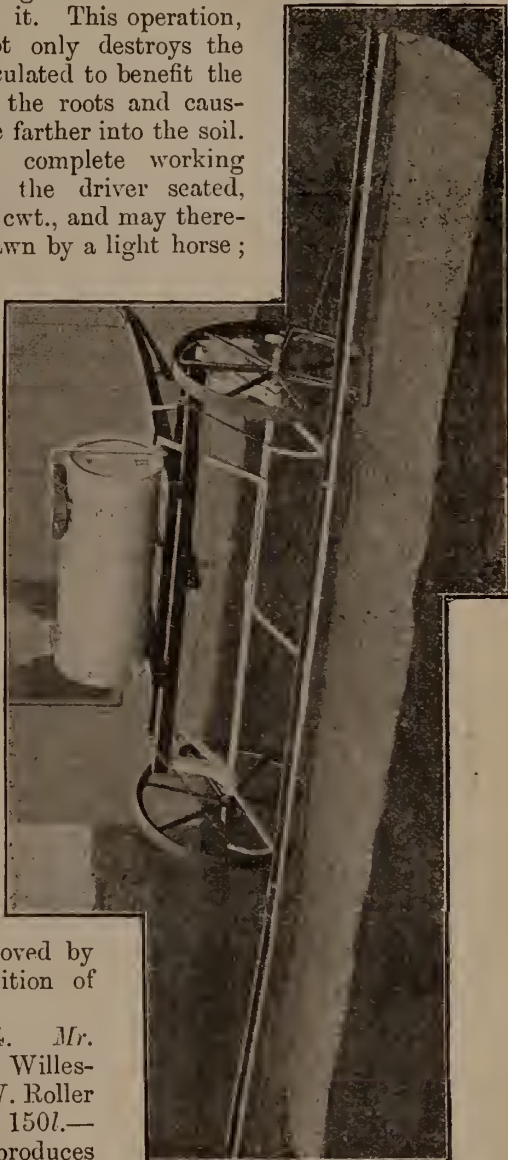


FIG. 10.—Blackstone's Fly Brush or Dresser.

Article 5304. *Mr. A. R. Tattersall*, Willesden, London, N.W. Roller Flour Mill. Price 150*l*.—This machine produces flour, dustless semolina and cran, by a process of gradual reduction. The wheat is poured into the top of the machine, to be broken upon three pairs of 12 by 6 inch rolls, which are grooved and chilled to great hardness. It passes through the first break, and thence to a patent sieve. The tails then pass to the second break, and again to a sieve. Both these sieves are kept from clogging by a brush travelling beneath each. The flour and middlings detached by the first and second breaks go together to a dusting centrifugal covered with silk. Through this the flour passes, and the semolina and middlings tail over the end free from dust and ready for purification. The tails of the second sieve pass to the third break, from which they go to the cran centrifugal. This produces flour, and tails the cran to a sifter, which divides it into sizes suited to the trade. The flour from the dusting centrifugal and that from the cran centrifugal run together into a sack, fit for sale. The machine breaks down an average mixture of wheat at the rate of one sack of flour per hour. It is driven by two horse-power only, and a single belt. It takes up very little room, occupying a space of 7 feet by 4 feet, and stands only 7½ feet high over everything. The hoppers of the centrifugals, which form its base, project below the floor. It is of substantial construction, free from complications likely to endanger continuity of work, is perfectly rigid, and runs with smoothness, while it requires no technical knowledge on the part of the attendant.

Article 5316. *Mr. Jas. Coultas*, Grantham. Plough, with Reversible Share, &c. Price 4*l.*—This plough (fig. 11) is manufactured by Messrs. Thos. Watson & Son, Spilsby. Its novel features comprise a reversible share, reversible point and reversible slipe, which are made in separate parts to economise cost of fittings. Twice the wear is thus obtained from this plough compared with that obtained from others. All the wearing parts are chilled. The breasts are made of special hard steel, and consequently are less subject to wearing, while the draught is lighter. More work is obtained and horseflesh saved. The machine is cheap and small, and fulfils all the advantages which its makers claim. The price of each share is 7*s.* 6*d.*

Article 5333. *Messrs. Ransomes, Sims & Jefferies, Ltd.*, Ipswich. Three-furrow Plough. Price 8*l.*—This useful plough (fig. 12), appropriately named the "Gang Forward," has been designed and constructed from the suggestions of Mr. Richard Stratton, of The Duffryn, Newport, Mon. Its salient feature is a seat for the driver contrived so that he may easily take his place and dismount, while the wheel, which runs directly beneath the seat, takes the weight of the man, thereby obviating any possibility of disturbance to the working of the plough. It is intended specially for getting over a large breadth of light ploughing with economy and greater celerity than with the older forms of ploughs. It breaks up turnip land after sheep, ploughs up the autumn stubbles, skims clover layers, and does general light ploughing in a most effective manner. Its three furrows each turn a depth of from 3 to 5 inches to a width together of 2 feet. The lever for steering is worked easily from the seat, as is also the lever by which the plough is raised for turning at the headlands. It is of comparatively light draught, and three horses will plough three acres per day—a considerably greater acreage than if the man in charge had to walk the distance. It

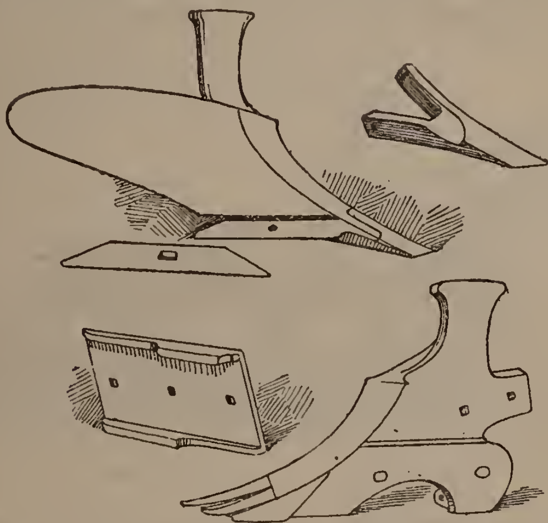


FIG. 11.—Jas. Coultas's Plough, with Reversible Share.

decidedly meets the present necessity for a cheaper method of cultivation, for, as has been shown, it will do work which is done by an ordinary single-furrow plough at one-third the cost. Also, where land requires cleaning, the work of this plough is superior to that of others, for, as the furrows are narrower, it enables the land to be, subsequently, more effectively operated upon by the harrows. It affords full clearance for weeds, long stubble, grass, or manure. The breasts are of steel, with cast chilled self-sharpening shares, made with renewable points if desired, and also in steel.

Article 5334—price 10*l.* 10*s.*—by the same makers, is the foregoing plough fitted with a seed-box, of one bushel capacity, with an adjustable slide and feeding apparatus. It is driven by a chain from the furrow wheel in such a manner that a regulated quantity of wheat, barley, or oats may be deposited in each of the three furrows. The corn drops at the back of each furrow in straight lines in any desired quantity and as evenly as if drilled, the next furrow slice being turned immediately upon it. It is well adapted for work upon heavy land.

Article 5572. *Messrs. Richmond & Chandler*, Manchester. Chaff Cutter, with Riddle. Price 50*l.*—This machine is fixed upon a rigid timber frame; the sifter works inside it with a circular motion; chaff is delivered at one end, cavings at the other, and sand and dirt beneath. The fly-wheel is provided with a cover, and the whole machine is everywhere cased in. There is no possibility of the short chaff going over the end of

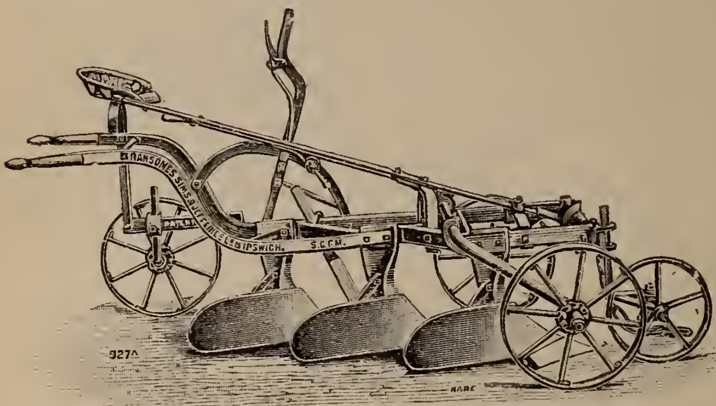


FIG. 12.—Ransome's New Three-Furrow Plough.

the riddle with the cavings as in the older machines; and the motion of the sieve is so arranged that it obviates the waste of time and power necessitated in stopping and reversing the former reciprocating riddles.

Article 5573. *Messrs. Richmond & Chandler.* Oat Bruiser, combined with a Splitter and Rubber. Price 9*l.* 10*s.*—The bruising rollers are smooth and of different diameters. The smaller roller is held to its work by means of a strong spring, which allows the passage of foreign bodies with the feed without damage to the mill. The iron nuts so often found in foreign oats, beans, and barley may now pass into the feed and through the mill without damage to the kibbling barrel, simply breaking off one of the triangular nibs. The pressure is adjusted by a hand wheel. The feed regulator is worked by a lever which is instantaneous in action. By means of an index-plate the feed when shut off can at once be re-admitted to the rollers in precisely the same quantity as before the stoppage, thus ensuring a perfectly regular sample. The barrel of the bean splitter being fitted with triangular steel cutters, works with little power, and the cutters can be so altered and refixed that each of their three angles may be used until it is worn away.

Article 5575. *Mr. R. Maynard*, Whittlesford Works, near Cambridge. Portable Combined Chaff Cutter. Price 59*l.*—This chaff cutter is fitted with a new exhaust cavings' elevator. In operation, when the cavings try to pass the spout they are sucked up and deposited in the feed-box, and all the foreign substances likely to damage the knives are left behind and allowed to fall upon the ground. By means of this elevator the cavings, as they are sifted from the chaff, are delivered on to and mix with the feed as it passes into the feed-box, and so are recut, nothing being left behind when the chaff cutting is done.

Article 5641. *Messrs. Geo. Stephenson & Sons*, Newark. Hay and Straw Baling Press. Price 70*l.*—Generally, this machine is similar in form to a familiar type of baling press. The material is fed forward from a hopper by a reciprocating platen through a horizontal rectangular shoot. The friction of the material in the shoot gives resistance to the compressive working of the shoot, and the hay emerges at the farther end. A board placed in through the hopper divides the formed bales from those adjoining, and each is wired as it moves forward. The novel features are a toggle motion at the rear of the platen, and a folder at the top of the bale chamber, which folds each portion of the material to make a bale quite smooth and of equal density in all its parts. The toggle arms are joined to the platen at a point of fixture on the same plane as the bottom of the shoot. Pivoted to the juncture of the two toggle arms is a connecting rod driven by spur gearing, ensuring that the advance of the platen occupies three-quarters of the revolution of the crank, and the backward motion one quarter. Thus a prolonged pressure is applied to the hay, which prevents rebounding. A pusher arm from the same crank packs the hay into the hopper. The size of the bale chamber is 16 inches by 18 inches, and the capacity of the implement about 15 cwt. in hay per hour, and these pressed to a density of about 12 lb. per cubic foot. It is driven by a single horse.

Article 5926. *Messrs. Woods & Co.*, Stowmarket. Stone-picking Machine. Price 20*l.*—This is a machine of light draught, travelling upon two high wheels, and drawn by a single horse. A number of collecting rakes with rows of bent steel teeth are mounted on three endless chains running round pitched wheels, driven from the travelling wheel of the machine. In their progress the collecting rakes are arranged to run parallel to the ground, and, simultaneously, to rake it. The stones raked into the bend of the teeth are there held until the rakes in their upward journey reach an angle at the rear of the machine which permits them to drop into a cradle, receiver, or bags, as may be determined. There is a simple arrangement for lifting the bags when filled, which is worked by levers, and enables a lad to easily remove and replace them. The machine was first tried upon stones lying thinly amid a crop of lucerne. It did its work fairly well, but in some places failed to remove all the stones. It was afterwards tried on land upon which stones had been thrown among one year's seeds. This was a fair and natural trial, but again the work was not done entirely satisfactorily. The construction, also, is too weak for heavy work. The Judges, however, are persuaded that the machine possesses undoubted merit, and that, with trifling additions to and variations from the original design, it ought to be rendered in every way as useful as it promises to be. They have recommended the machine for further trial and exhibition as a new implement next year.

Sheep-dipping Apparatus.

Class V. in the Implement Catalogue was allotted to sheep-dipping apparatus, for which a prize of 5*l.* was offered by the Society. There were six entries, all of which competed. The trials took place at the farm of Mr. J. B. Ellis, Redlands, Lolworth, on Friday, June 22. The Judges—Mr. J. B. Ellis and Mr. Alfred J. Smith—on their arrival found the machines all fixed and ready for work. A lot of two hundred and forty sheep, which had been shorn some seven or eight weeks previously, were equally divided amongst the competitors. Of these, ten in each case were first put through the bath and drainer as an example of the method followed by each apparatus, and as somewhat of a time test. This was, on the whole, satisfactory in every case. The method of immersion or dipping was, with one exception, that which we have seen in practice for many years past—throwing the animal into the bath, and after more or less handling and rolling about letting it walk out into the draining pens. The one exception (the apparatus of Messrs. B. Cannon & Co., Ltd.) had a contrivance for lowering the sheep into the bath by means of a cradle, wherein the animal retains its standing position. This, especially with ewes in lamb, may be an advantage, and, although in this case it did not stand the test, the principle, when further developed and the apparatus fitly constructed, may find favour with flockmasters. Then followed the thirty remaining shorn sheep, instructions being given to each competitor to dip them in the manner and under the same conditions as would be carried out were he actually working for an employer. After these had gone through the process, thirty-three sheep in the wool, half-bred hoggets, were penned for each competitor. These were dipped, or washed rather, with an addition of soft soap to the water; here instructions were given that each sheep should be thoroughly soaked, as would be necessary in treatment for scab. Only one apparatus was worked at a time, and, after taking all practical matters into consideration, together with the amount of inconvenience experienced by the sheep themselves, the Judges made the following awards:—

Prize: Messrs. FLETCHER, Bros. & Co., Grimsby. Price of apparatus (No. 1037 in Catalogue), 30*l.*

Reserve: Messrs. HILL & SMITH, Brierley Hill, Staffs. Price of apparatus (No. 4481 in Catalogue), 7*l.*; draining pen 2*l.* 10*s.* extra.

Highly Commended: Messrs. RAINFORTH & HAYWARD, Lincoln. Price of apparatus (Nos. 4435-6 in Catalogue), fixed 25*l.*, portable 28*l.*

The Judges wish to speak in favourable terms of the large fixed apparatus of the last-named firm. This appears well adapted and suitably constructed for large flocks both in England and the Colonies. In these trials nothing but water and soft soap was used, the trials being intended simply to test the apparatus, and not to determine the efficacy of different mixtures or dips.

My colleague in the judging of Miscellaneous Implements—Mr. Caleb Barker, Estate Office, Shadwell, Thetford—unites with me in expressing our indebtedness to the kindness of Mr. J. H. Ridgewell, Mr. H. Sanders, and Mr. William Kent, for giving land for the trials. We both desire, also, to record our thanks to Sir J. L. E. Spearman, Bart., Steward of Implements, for his valuable aid in accelerating our work; and likewise to Mr. F. S. Courtney, Consulting Engineer to the Society, and to his assistants, for their kind technical help.

THOMAS STIRTON.

West Stratton, Micheldever, Hants.

THE TRIALS OF CHURNS AT CAMBRIDGE.

AMONGST several competitions of mechanical appliances announced to take place in connexion with the Cambridge Meeting were two of special interest to the dairying industry, namely, trials of churns. The following are the particulars of the two classes assigned to these competitions, and of the prizes offered by the Society :—

Class VI. Churns capable of dealing with 10 quarts and upwards of cream (not to exceed one man power). First Prize 10*l*. Second Prize 6*l*. Third Prize 4*l*.

Class VII. Churns capable of dealing with from 5 to 10 quarts of cream (not to exceed one man power). First Prize 5*l*. Second Prize 3*l*. Third Prize 2*l*.

The attention of the Judges was directed by the Society to the following points :—

1. Simplicity of construction and durability, combined with facility of cleaning and of inspection.
2. Efficiency.
3. Cost.
4. Power required.

The churns which competed are indicated in the tables on the opposite page; and it should be noted that some of the competitors made a more modest estimate of the capabilities of their churns in entering for these competitions than they had done in previous catalogue descriptions.

The trials were conducted at the Dairy in the Cambridge Showyard on Wednesday, June 20, and the three following days. They were chiefly of interest because they gave an opportunity of comparing the new quick-churning machines with those of older make. The "Disc" Churn, it may be remembered, was awarded the Society's Silver Medal last year at Chester as the pioneer of a new movement in the direction of quick churning. In addition to the "Disc" Churns two other quick-working machines competed, viz., Bradford's "Fishback," and Vincent's Churn. These have without doubt come forward as a result of the interest aroused by the "Disc" Churn.

The ordinary 8-quart "Disc" Churn was fully described in the Journal last year.[1] This machine was entered, and competed in Class VII. The two "Disc" Churns which competed in Class VI. are constructed on similar principles, but with twin discs revolving on the same spindle, the discs in one case being concave at the periphery, and in the other divided into points—hence the name "star" discs.

Vincent's Churn was identical in construction in both classes. This is a box churn in which a dasher is placed on an oblique spindle. The dasher is made to revolve quickly by cog-wheel gearing placed at the upper end of the spindle.

[1] See Journal, Vol. IV., Third Series, Part 3, p. 555.

CLASS VI.

No. in Catalogue	Exhibitor's Name and Address.	Name of Churn.	Maximum amount of Cream with which Churn was declared to be capable of dealing.	Price.
			quarts.	£ s. d.
815	Edmund Richardson, Kendal.	No. 3, "Princess."	24	4 15 0
902	Dairy Supply Co., Museum Street, W.C.	"Victoria" (25-quart churn).	25	4 15 0
3323	Wm. Vincent, Arborfield Cross, Reading.	15-quart churn.	15	5 10 0
3393	Thos. Bradford & Co., Salford, Manchester.	"Horseshoe," Diaphragm End-over-end Barrel Churn.	30	9 5 0
3395	" "	"Diaphragm" End-over-end Barrel Churn, No. 12A.	20	4 17 6
3464	Disc Churn Co., 21 St. Thomas Street, S.E.	20-quart Star Discs.	20	6 10 0
3465	" "	16-quart Concave Discs.	16	4 12 6
4852	W. H. Samuel & Co. Leighton Buzzard .	"Triangular Barrel," No. 33.	30	4 17 6
4876	G. Llewellin & Son, Haverfordwest.	"Royal Triangular," No. 3.	25	5 15 0
4877	" "	"Eccentric End Over," No. 3.	25	5 5 0
4901	Bamber & Co., 14 Friargate, Preston.	—	40	5 5 0

CLASS VII.

No. in Catalogue.	Exhibitor's Name and Address.	Name of Churn.	Declared Maximum amount of Cream to be used in trials.	Price.
			quarts.	£ s. d.
816	Edmund Richardson, Kendal.	No. 2A, "Princess."	10	3 10 0
903	Dairy Supply Co., Museum Street, W.C.	"Victoria" (10-quart churn).	10	3 10 0
3324	Wm. Vincent, Arborfield Cross, Reading.	8-quart churn.	8	3 10 0
3396	Thos. Bradford & Co., Salford, Manchester.	"Diaphragm" End-over-end Barrel Churn, No. 11A.	10	4 5 0
3397	" "	"Horseshoe," Diaphragm End-over-end Barrel Churn.	10	6 6 0
3398	" "	"Fishback."	10	4 5 0
3466	Disc Churn Co., 21 St. Thomas Street, S.E.	8-quart ordinary disc.	8	3 10 0
4878	G. Llewellin & Son, Haverfordwest.	"Royal Triangular," No. 1.	10	3 15 0

Bradford's "Fishback" is a box churn in which a cylinder of wood studded with pegs is placed in a horizontal position, and made to revolve quickly by means of chain gearing.

With the exception of Bradford's "Horse-shoe" Churn, the other churns are so well known that it is needless to describe them. The novelty in the "Horse-shoe" is an arrangement by means of a fan and temperature cans for regulating the temperature of and for ventilating the churn. The arrangement is not a success.

The cream for the trials was provided daily from Manchester. Care was taken that for each separate test all the cream supplied to the competitors should be of uniform character. The churns were worked by the competitors' own demonstrators, who were allowed to have as much ice as they desired. The churning temperatures varied between 54° and 60° Fahr., and in most cases ranged from 56° to 59°. The quick-working churns, as a rule, churned at the higher temperatures.

The butter, when removed from the churns, was dried by the delaiteuse, and weighed immediately afterwards, samples being kept for comparison with each other as to the very important points of grain, texture, and flavour. The delaiteuse was used in preference to the butter-worker, in order that uniformity of treatment might be secured. Butter with a good grain and texture, however, was much more thoroughly dried in the delaiteuse than badly churned butter. Hence the latter had an advantage in weight.

In Class VI. each competitor in the first test churned the quantity of cream he considered would be likely to show his churn to the best advantage. Five selected churns were then worked by the electric motor with the same quantity of cream as in the first test, in order to ascertain the amount of power taken by each. No consideration was given by the Judges, when making up their awards, to the quantity or quality of the butter produced in this power test.

In the third test five churns were taken with the maximum amount of cream previously declared by the competitor, and finally four churns were tried with ten quarts (the minimum amount) of cream. The "Disc" Churns and Vincent's Churn were decidedly beyond "one-man power" in this class, and thus did not comply with the Society's conditions. The others were easily within "one-man power," and varied very slightly in the amount of power required. Diagram A, on p. 491, gives curves showing the power used by those churns in Class VI. which were tested on the motor, and Table A, on p. 492, records the measurements taken.

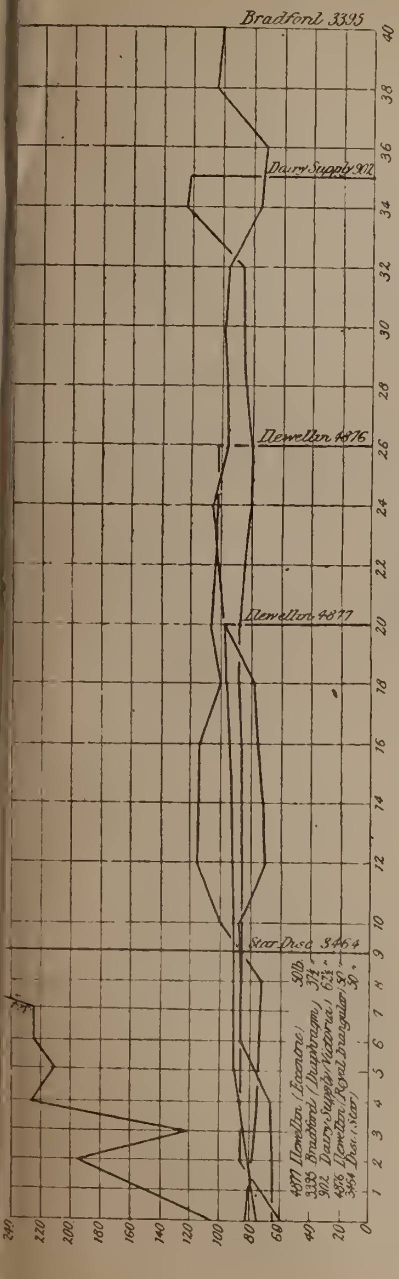


DIAGRAM A.—Trial of selected Churns in Class VI., with different Weights of Cream as stated on Diagram.

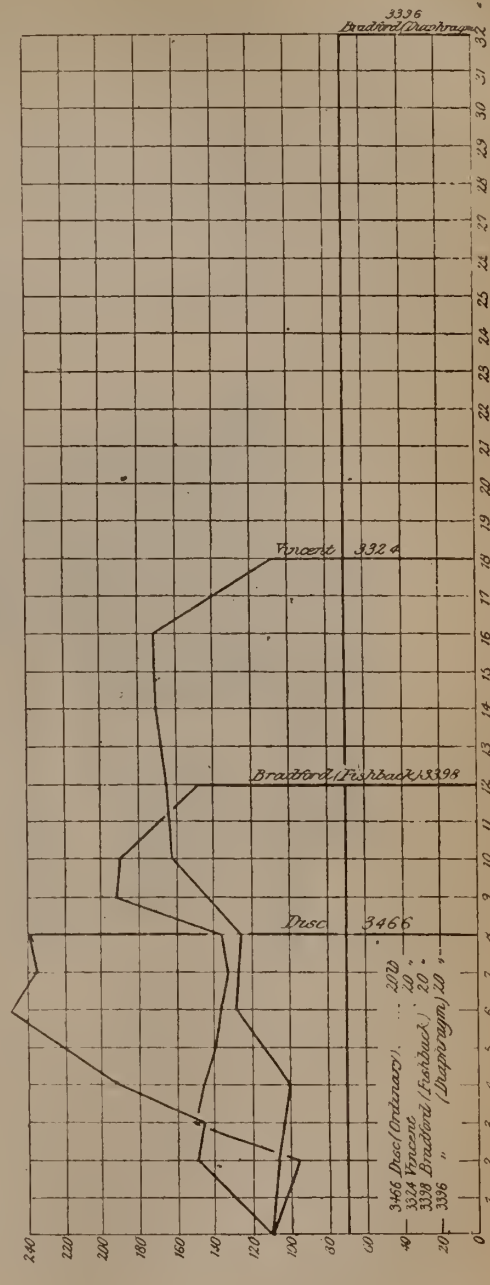


DIAGRAM B.—Trial of selected Churns in Class VII., with 20 lb. of Cream.

TABLE A.—*Trial of Churns in* CLASS VI.

No. of article	Name of exhibitor	Time of run	Weight of cream	Average No. of foot lb. per min.
		min.	lb.	
3395	T. Bradford & Co. (Diaphragm) . .	40	$37\frac{1}{2}$	2264·2
4877	G. Llewellin & Son (Eccentric) . .	20	50	2420·5
4876	G. Llewellin & Son (Royal Triangular)	26	50	2511·4
903	Dairy Supply Co. (Victoria) . . .	35	$62\frac{1}{2}$	2336·1
3464	Disc Churn Co. (Star Disc)	9	50	5468·3

Some of the results of the work of the four churns that were tested in all the trials are recorded in the upper table on the opposite page.

FIG. 1.—Bradford's End-over-End "Diaphragm Churn."

The success of the first Prize Churn (fig. 1) was chiefly due to the superiority of its construction and its general convenience, and to the excellence of the butter produced. The second and third Prize Churns (figs. 2 and 3, p. 495) were well constructed and did very good work.

Several of the churns were fitted with temperature chambers which are seldom used and are probably of no advantage. In the construction of the older types of churns the weakest point is probably the spring ventilator, which is difficult to clean, and often leaks.

In CLASS VII. the churns were first tested with the declared maximum amount of cream. Seven selected churns were next given 8 quarts of cream each, and were worked by the electric motor to ascertain the amount of power taken. These churns were then tested with 5 quarts of cream each (the minimum amount), and finally the "Disc" and the "Fishback" were worked a second time by the electric motor with 6 quarts of cream each.

CLASS VI.	Catalogue No.	Name of Exhibitor and Churn.	First test: Cream Lb.	First test: Per cent. of butter to cream	First test: Time of churning	Third test: Cream Lb.	Third test: Per cent. of butter to cream	Third test: Time of churning	Fourth test: Cream Lb.	Fourth test: Per cent. of butter to cream	Fourth test: Time of churning	Average per cent. of butter	Average time Minutes
1st Prize	3395	Bradford's End - over - End "Diaphragm," No. 12A	$37\frac{1}{2}$	51·79	$44\frac{1}{2}$	50	55·62	$48\frac{1}{2}$	25	50·94	32	52 78	$41\frac{2}{3}$
2nd Prize	4877	Llewellin's Eccentric End-over, No. 3	50	51·59	22	$62\frac{1}{2}$	53·57	40	25	51·62	$33\frac{1}{2}$	52·26	$31\frac{5}{6}$
3rd Prize	4876	Llewellin's "Royal Triangular," No. 3	50	52·66	$30\frac{1}{2}$	$62\frac{1}{2}$	53·62	30	25	50·81	29	52·36	$\frac{5}{6}$
—	902	Dairy Supply Co.'s "Victoria" 25-quart Churn	$62\frac{1}{2}$	53·45	32	$62\frac{1}{2}$	56·97	43	25	51·87	36	54·10	37

CLASS VII.	Catalogue No.	Name of Exhibitor and Churn.	Maximum test: Cream Lb.	Maximum test: Per cent. of butter to cream	Maximum test: Time of churning	Minimum test: Cream Lb.	Minimum test: Per cent. of butter to cream	Minimum test: Time of churning	—	—	—	Average per cent. of butter	Average time Minutes
1st Prize	3396	Bradford's End - over - End "Diaphragm," No. 11A	25	52·12	44	$12\frac{1}{2}$	47·50	40	—	—	—	49·81	42
2nd Prize	4878 equally divided	Llewellin's "Royal Triangular," No. 1	25	51·81	$52\frac{1}{2}$	$12\frac{1}{2}$	47·00	$32\frac{1}{2}$	—	—	—	49·40	$42\frac{1}{2}$
3rd Prize	903	Dairy Supply Co.'s "Victoria" 10-quart Churn	25	53·31	41	$12\frac{1}{2}$	47·62	44	—	—	—	50·46	$42\frac{1}{2}$
—	816	Richardson's "Princess," No. 2A	25	53·00	$38\frac{1}{2}$	$12\frac{1}{2}$	47·25	$32\frac{1}{2}$	—	—	—	50·12	$35\frac{1}{2}$
—	3324	Wm. Vincent (8-quart) . .	20	51·80	$18\frac{1}{2}$	$12\frac{1}{2}$	47·37	$9\frac{1}{2}$	—	—	—	49·58	14
—	3398	Bradford's "Fishback" (10 quarts)	25	51·62	11	$12\frac{1}{2}$	49·62	6	—	—	—	50·62	$8\frac{1}{2}$
—	3166	Disc Churn Co. (8-quart, ordinary discs)	20	50·39	6	$12\frac{1}{2}$	47·62	$7\frac{1}{2}$	—	—	—	49·00	$6\frac{3}{4}$

The lower table on p. 493 gives some of the results of the work of the seven churns which were tested with the maximum and the minimum amount of cream. Diagram B on p. 491 gives curves showing the power used by four typical churns of those which were tested on the motor with 8 quarts of cream, whilst Table B gives the recorded measurements for all the churns.

TABLE B.—*Trial of Churns in* CLASS VII.

No. of article	Name of exhibitor	Time of run	Weight of cream	Average No. of foot lb. per min.
		min.	lb.	
3396	T. Bradford & Co. (Diaphragm) . .	32	20	1892·7
4878	G. Llewellin & Son (Royal Triangular)	60	20	2517·8
903	Dairy Supply Co. (Victoria)	64	20	1847·2
816	Edmund Richardson (Princess) . .	72	20	2294·7
3324	William Vincent	18	20	3531·5
3398	T. Bradford & Co. (Fishback) . . .	12	20	3761·5
3466	Disc Churn Co. (Ordinary Discs) . .	8	20	4883·3

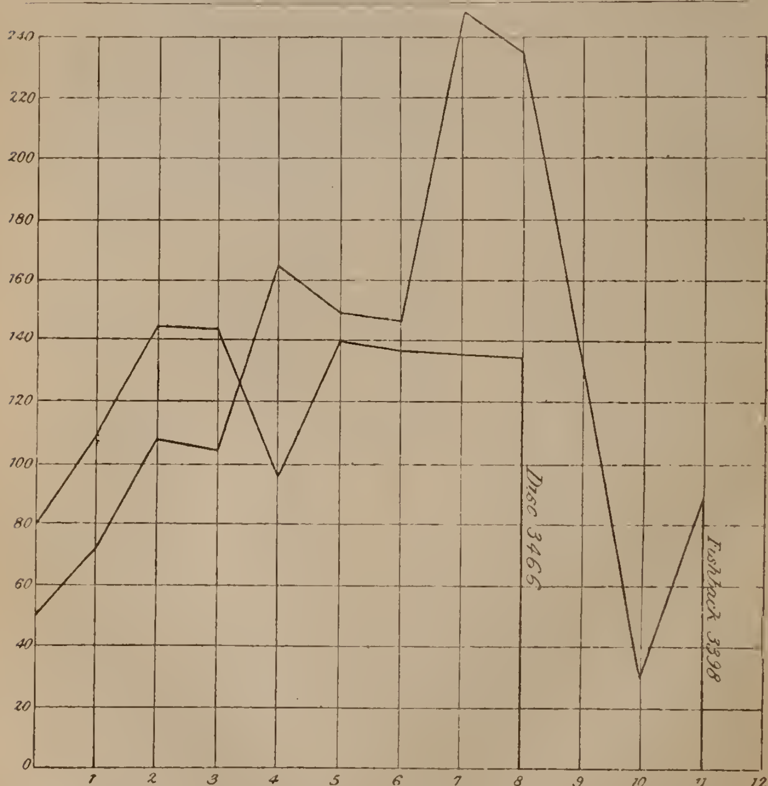


DIAGRAM C.—Trial of Disc and Fishback Churns (Class VII.) with six quarts of Cream.

Diagram C. gives curves of the "Disc" and "Fishback" Churns when tested with 6 quarts of cream.

As in the previous class, the success of the Prize Churns in Class VII. turned on precisely the same points, namely, excellence of butter produced, and superiority of construction and general convenience of the churns. These points more than outweighed the special advantages possessed by the quick-churning machines. The third prize machine in Class VII. is illustrated in fig. 4.

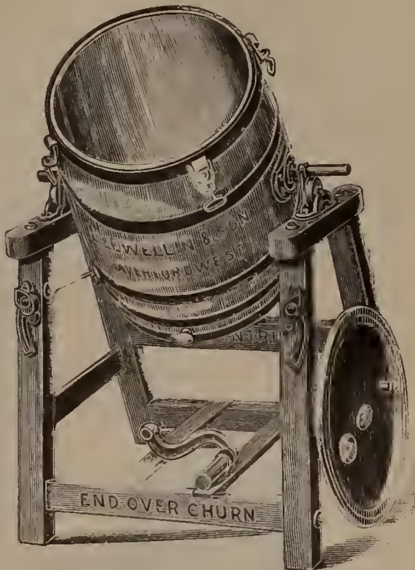


FIG. 2.—Llewellin's "Eccentric End Over" Churn.

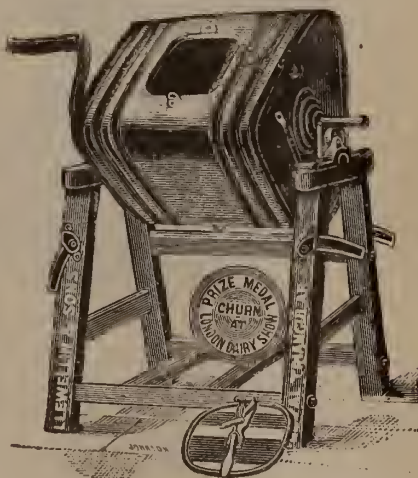


FIG. 3.—Llewellin's "Royal Triangular" Churn.

In the Diagram A, B, C the time taken—which was that recorded by the Judges when the churning was complete—is indicated in minutes by the figures along the horizontal base line, and the amount of power expended at any particular time by the irregular upper line of each diagram. The power was measured by driving each churn with an electric motor, readings being taken at short intervals of the amount of current used; so that the several points of the diagram fairly represent the amount of work expended at any given moment. The figures on the vertical scale are the measure of work equivalent to the number of pounds lifted one foot high.

Regarding the diagrams generally, it will be noted that the total amount of work expended—as represented by the areas of the several curves in the diagrams—was greater in the case of the slow-running churns than in that of the high-speed churns; in the latter case, however, it will also be seen that in some instances there were times when the power taken was excessive. In the case of the "Disc" and the "Fishback," 6 quarts of cream appears to be about the maximum quantity which can easily be churned at the speed at which the churns were worked during the trials.

Other weak points besides the excessive power required became apparent.

The "Disc," when churning eight quarts, leaked badly at the bearing of the spindle. This churn, even when churning a smaller quantity, keeps the floor of the dairy in a sloppy condition.

With the "Fishback" there was a difficulty in washing a large quantity of butter without over-churning it, on account of the tendency of the dasher to roll the grains of butter into a lump.

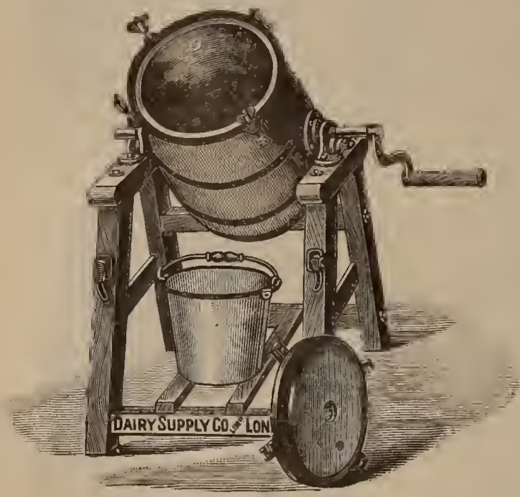


Fig. 4.—Dairy Supply Co.'s "Victoria" Churn.

Perhaps the strongest point in favour of the "Disc" Churn is its comparative freedom from the danger of over-churning.

The "Fishback" is a strong, well-constructed machine, and can easily be cleaned.

The "Disc" is inferior in construction. At the centre of the wooden disc there is a prolonged boss, which extends from one side of the churn to the other, and through which the wrought-iron spindle loosely passes. The hole through this boss is very inaccessible for cleaning, and when the spindle is withdrawn for the removal of the disc, the butter is liable to become fouled from this source. A brass tap for drawing off the buttermilk is an undesirable adjunct to this churn, on account of the liability of the metal to verdigris.

The "Vincent" made good butter, but the design and construction of this churn were not of such a substantial character as to ensure the very desirable quality of durability, and only warranted our regarding it as an experimental machine. An ingenious attachment of the strainer and the provision for turning over the box to drain are worthy of notice.

The full list of the awards made in these competitions is printed in the Appendix, p. clxii.

The Judges—Mr. D. A. Gilchrist and myself—are indebted to the Engineering Staff of the Society for the diagrams showing the power taken by the churns, and to the Dairy Stewards and officials for the efficiency of all the arrangements for carrying out the competitions.

PERCY E. CRUTCHLEY.

Sunninghill Lodge, Ascot.

TYPICAL FARMS IN EAST ANGLIA.

As a North-country farmer I freely acknowledge having learned much while engaged in the interesting work of inspecting—in connexion with this year's Country Meeting of the Royal Agricultural Society at Cambridge—the selected farms in the counties of Cambridge, Norfolk, and Suffolk. A great deal of what I may attempt to describe may seem commonplace to East Anglia farmers—so commonplace as to be deemed by them unworthy of space or attention. Believing, however, that the object of this paper is to give farmers at a distance some idea of the working of the land, and the management of stock in the above-named counties, it may be that many of these every-day details will prove as interesting to them as they have been instructive to me.

Within the space at my command it seems presumptuous on my part to attempt the description of the twenty-two large holdings which I saw. Every one of the number could have afforded the material for a lengthened report that would have been instructive to farmers in other districts of Great Britain.

I desire at the outset to acknowledge the kindness and courtesy with which I was invariably received, and the willingness with which answers were at once given to my rather inquisitive, though perhaps pertinent, questions.

In order that farmers in other districts may understand the position of their brethren in East Anglia, it may be well to notice the different local conditions under which the farms are held.

Cambridge Customs.

Michaelmas Entry.
Annual tenancies, as a rule.
Consuming value payable for Hay, Straw, and Roots.
Dung valued over per cubic yard.
Threshing of outgoing tenant's crop done by incoming tenant under supervision, and grain carted to market.

Norfolk Customs.

Michaelmas Entry.
Consuming value paid for Hay and Roots, Straw free.
Dung valued over per cubic yard.
Threshing of outgoing tenant's crop done under supervision, and carted to market.

Suffolk Customs.

Michaelmas Entry.
Consuming value paid for Hay.
Dung valued per cubic yard, and in some cases outgoing tenant receives half value of dung spread the preceding year for beans and young layers.
Roots free, but all labour, sometimes four or five ploughings, being payable.
Straw free.

Besides these local customs, outgoing tenants have claims for unexhausted manures and feeding-stuffs, either under the Agricultural Holdings Act, or by the agreement under which they farm.

It will thus be seen that a considerable amount of capital is needed to take possession of a farm in either of the three counties. This is different from the state of affairs in some of the northern counties of England, where an almost free entry into a holding induces keen competition for farms, with all the attendant risks to landlords and tenants.

With regard to the actual working of the land, the four-course system is very generally pursued, both on the heavy clays and on the light soils. On several farms where the soil is very light the present price of grain has driven tenants to make a departure from the ordinary four-course. Mr. Ellis in Norfolk, and Mr. Smith and others in Suffolk, have found that on their poorest sandy soils such grass as the land will carry is better than any crop they might attempt to grow, and they therefore plough less than they did. In Mr. Ellis's case there has been a gradual change of system on his medium soils. Grasses and clovers have been sown, fed off with sheep, and manured with a coating of farm-yard manure.

Treated in this fashion, a good thick sole of grass has been obtained, which is left down to be ploughed up as circumstances warrant. The working out of this departure from the ordinary four-course system enables the tenant to keep a large breeding stock, and at the same time it lessens the labour bill.

While there are symptoms of changes being made from the ordinary four-course on the lighter lands, I was unable to learn from any of the strong land farmers that they had any idea of altering their system. It is indeed difficult to see how such perfect, clean, strong land-farming, as I had the pleasure to inspect, can be maintained with grain at the present prices. Freedom of sale of straw and hay may in some instances help much, but the railway rates and other expenses operate to such an extent as to make a privilege like this of little value in ordinary years.

Several of the crops grown were new to me, as a North-country farmer. On the very light soils lupin and cole-seed, and on others mustard, trifolium, lucerne, sainfoin, and kohl-rabi were everywhere grown.

Sainfoin struck me as a most valuable crop, and its cultivation might, in my opinion, be extended to districts where at present it is not grown.

All know the difficulty of growing a full crop of clovers every fourth, or even fifth, year, and such a crop as sainfoin to alternate with clover would be of immense value.

On all the farms I visited the work was well done, and all through there was a thoroughness in every department which is unfortunately absent on too many farms. The ploughing, whether done by the high-wheeled Norfolk, the ordinary, or the one-handled Suffolk plough, was always straight and level; and no one from the North looking at the beautifully straight-round furrows in a Suffolk field could fancy they were the work of one-handled ploughs.

The amount of horse-hoeing and other land cleaning operations necessitates straight, regular drilling, and on every farm the drilling and sowing were perfect.

The labour question is one which cannot be gone into, but it may be stated that 10*s.*, 11*s.*, or 12*s.* a week, which is given as the wages paid, by no means represents the money earned by the farm labourers. After careful inquiry into all the complications connected with the labourer's pay in the counties visited, it seemed to me that the average weekly earnings of an average farm hand must be put at 15*s.* to 16*s.* The difficulty of getting at the exact amount of weekly pay arises through the great amount of contract work which is done.

Taking 16*s.* a week as the average wage earned by an able-bodied man, and deducting from this his house rent, say 1*s.* 3*d.*, North-country farmers will see that the wages are lower than with them. If, however, they care to compare their wages rate, per acre, with those of the several farms as given in the tables below, they will find that the East Anglia farmers expend quite as much on labour per acre as they do.

Nothing in connexion with the farming of East Anglia impressed me so strongly as the careful, thorough way in which the sheep are managed. On every farm I visited, whether it was strong, medium, or light land, the same careful management was evident.

On almost the whole of the farms large breeding flocks are kept, and at the time I was in the district they were all on the clovers or other green foods. In every case the lambs were running forward, and were being fed, separated from the ewes. This is effected by a double set of folds with creeps between them, through which the lambs can pass to the fresh or forward fold. One fold is moved daily so that the ewes may clean up what the lambs have left the previous day. In the forward fold the lambs, beside having the first bite of the food grown in the fold, generally get artificial food, and in most cases mangel are also spread about. The mangel seem to be relished by the lambs, as they are always well broken into before the ewes get a chance of them. In some cases, while the lambs were running forward on a fresh fold, the ewes were being partly fed on vetches or other green food brought from other fields and placed in feeding racks.

While all the lambs were fed forward, on several of the farms the single and twin lambs were separated, and both ewes and lambs fed somewhat differently, so that the whole of the lambs at weaning time might be a level lot.

As will be seen by the reports, on several of the farms for certain portions of the day the lambs are separated from the ewes. "Use is second nature," and, improbable as it may seem to flockowners who have never seen ewes and unweaned lambs grazing quietly in different fields, still they do so, and while the lambs are in every sense of the term "in clover," the ewes earn their living in a harder way.

The following brief descriptions of the holdings I visited may convey some idea of the different systems of management pursued. It may help the reader, however, if at this stage I briefly enumerate the names and addresses of the occupants of the several farms.

1. Mr. G. E. Daintree, near Littleport, Cambridgeshire.
2. Mr. H. J. Martin, Littleport, Cambridgeshire.
3. Mr. C. E. E. Cooke, Hinxton Grange, Whittlesford, Cambridge.
4. Mr. Christopher Parsons, Horseheath, Linton, Cambridge.

5. Mr. R. R. Holben, Barton, near Cambridge.
6. Mr. William Hagger, Little Eversden, near Cambridge.
7. Mr. Charles Dawson, Grange Farm, Bourn.
8. Mr. F. Parsons, Trumpington, near Cambridge.

9. Mr. J. B. Ellis, West Barsham, near Walsingham, Norfolk.
10. Mr. George Baly, Hardingham, Hingham, Norfolk.
11. Mr. John Morton, West Rudham Hall, Swaffham, Norfolk.
12. Mr. W. E. Learner, Dilham, Norfolk.
13. Mr. Garrett Taylor, Trowse, Norwich.

14. Mr. J. J. Paine, Rigby, Bury St. Edmunds, Suffolk.
15. Messrs. Estaugh & Wilson, Butley Abbey, Suffolk.
16. Mr. George Walker, Hackeston, Wickham Market, Suffolk.
17. The Colonial College, Hollesley Bay, Suffolk.
18. Mr. John Symonds, Thistleton Hall, Burgh, near Woodbridge, Suffolk.
19. Mr. S. R. Sherwood, Hazlewood, Saxmundham, Suffolk.
20. Mr. Alfred J. Smith, Rendlesham, Woodbridge, Suffolk.

1. *The Farm of* Mr. G. E. Daintree, *near Littleport, Cambridgeshire.*

This large farm, held from several landlords, consists almost entirely of peaty soil on a subsoil described as buttery clay. A portion near the main homestead is on higher ground and mostly under grass. It is held under yearly tenancies with freedom of cropping till the last year of tenancy. Sale of produce is allowed under certain restrictions. These stipulate as to the purchase of artificial manures in proportion to the value of hay or straw sold off.

The land is farmed chiefly on the five-course rotation—one-fifth roots, one-fifth oats, two-fifths wheat and one-fifth beans, peas, mustard, and seeds. Sometimes clovers and grasses. Seeds are left down two or three years if the plants are strong and good.

Only a small portion of the grass land is mown for hay, the balance is pastured with horses, cattle, and sheep. The following shows the extent of the farm and the annual outlay :—

Arable	Grass	Rent and tithes	Rates stated to have increased	Drainage rate	Artificial manures	Cake	Labour	Labour per acre
acres	acres	£		£	£	£	£	£ s. d.
1,000	200	951	17½ per cent. of late yrs.	100	120	650	1,750	1 9 2

There is also used for feeding a large quantity of home grown grain, generally about twenty acres of barley and seventy acres of oats, with all the beans, and tail corn.

The stock on June 11, consisted of—

96 horses.
227 cattle.
370 sheep.
70 pigs.
100 head of poultry.

The horses were mostly good useful Shires with a few Hackneys, and a number are bred annually. Several of the foals were suffering from what was termed "joint evil," which occasions a considerable loss each year.

The cattle were mostly young steers and heifers, feeding, but thirty-four cows are kept for dairy purposes.

A large number of calves are bought at an average cost of about 40*s.* each.

These are fed on new milk for ten days and afterwards gradually turned on to separated milk and meal. The cream is made into butter twice a week, to be sold at an average price of 1*s.* per pound. Owing to the difficulty of keeping the yards clean, through scarcity of straw this year, the cows were driven into temporarily erected folds in the fields to be milked. These were moved from time to time so as to insure cleanliness and comfort.

The sheep are Oxford Downs and are quite a superior lot. A number of the lambs are "rickety." As many as forty are more or less affected this year. The lambs are reared in the ordinary way and sold fat as shearlings after clipping.

At the time of my visit all the crops were large and so full of blade as to look too big to stand; and the heavy rains following soon after must have caused great loss and waste.

The nature of the soil encourages a great growth of soft straw, and in ordinary seasons much waste must take place in the large open bullock yards. In fact, round many of the farm buildings in the Fen Country straw seems to answer the purpose of road-making during the winter months, to be gathered up in early summer and carted into heaps in the fields as manure. Owing to the widespread drought of last year there was a great demand for straw, and Fen farmers made a good price of all they could spare. This, however, was quite an exceptional case, and, generally speaking, straw has to be destroyed and turned into what is called dung in every way possible. Any arrangement with the railway companies which would lower the rate for carriage of straw to the great consuming centres would be of immense benefit to this straw-producing district.

On such an extensive holding as that which Mr. Daintree farms there is a large annual outlay in dyke-cleaning, as these dykes intersect the whole of the arable land at frequent intervals. These channels are scoured every four or five years at a cost of 1*s.* 6*d.* to 3*s.* a chain. No statement was made of the gross annual expense of this work, but it must be a considerable amount, as the water-courses are all kept in good condition.

A statement was made by Mr. Daintree to the effect that, speaking generally, rents had been lowered about 50 per cent. in the Fen Country of late years.

2. *The Farm of* Mr. H. J. Martin, *Littleport, Cambridgeshire.*

This farm, belonging to the Rev. H. J. Martin, about four feet above sea level, is entirely of fen soil, a black peaty surface resting on clay. The annual rainfall is given as twenty-four inches.

To anyone from the North, or in fact from almost any part of England, the situation and surroundings of such a farm are most striking. An entirely level tract of land intersected with large main water-courses, and again subdivided by small water-courses or dykes, as they are locally called, however good and valuable it may be as agricultural land, seems uninteresting and depressing to a stranger.[1] The drainage throughout the whole extent of

[1] The late Sir Andrew Ramsay, Director-General of the Geological Survey, penned (*Phys. Geol. Gt. Britain*) the following graphic picture of this flat, undiversified country:—

"The great plain of the Wash consists partly of peat on the west and south, but chiefly of silt. Those broad flats, about seventy miles in length from north to south, and forty in width, include an area of more than 1700 fens is effected by conducting the water in the smaller water-courses, or dykes, to common centres, where it is pumped up into the larger water-courses or levels as they are called, whose beds are raised up with embanked sides to a height sufficient for the discharge of their contents into the ocean.

A drainage rate is levied throughout the district and the pumping is done by steam. Formerly windmills were largely used, but these have almost entirely given place to steam engines.

Mr. Martin's farm is 200 acres in extent, 190 being arable and 10 grass. The annual payments are as follows:—

Rent	Drainage rate	Ordinary rates	Artificial manures	Labour	Labour per acre
£ s.	£ s.	£ s.	£ s.	£ s.	£ s.
185 17	17 10	25 17	65 0	300 0	1 10

No statement was made as to cakes or corn bought for feeding, and the labour bill has in some years been as high as 39*s.* 9*d.* per acre, when what is termed claying was being done. Claying means trenching up clay from below to spread it on the surface. This is an expensive operation, but one that tends to the production of great crops of grain and roots generally throughout the fen soils resting on a clay subsoil.

Mr. Martin can farm as he likes, with power to sell off produce. His ordinary course of cropping is green crop, wheat, oats, wheat, clover, wheat. It is sometimes varied to green crop, oats, wheat, clover or beans, wheat.

There were on the farm—

15 horses.
10 cattle.
14 pigs.
And 200 head of poultry.

The ploughing is all done with two horses; the soil being easy to work, four horses are considered sufficient to work 100 acres. Mr. Martin breeds a number of heavy horses, and the brood mares are of a very superior class.

---

square miles. The whole country is traversed by well-dyked rivers, canals, drains, and trenches. Standing on the margin of the flat, or walking on the long, straight roads or dykes, cheerfulness is not the prevailing impression made on the mind. The ground looks as level as the sea in a calm, broken only by occasional dreary poplars and willows, and farmhouses impressive in their loneliness. The soil of these fens, ere the crops grow, is often as black as a raven, the ditches are sluggish and dismal, and the whole effect is suggestive of ague. Windmills of moderate size stand out from the level as conspicuous objects; and here and there the sky-line is pierced by the ruins of Crowland Abbey, Boston Tower, and the massive piles of the cathedrals of Ely and Peterborough on the margins of the flat. Yet it is not without charms of a kind, as when at sunset sluice and windmill and tufted willows, combined with light clouds dashed with purple and gold, compose a landscape such as elsewhere in Western Europe may only be seen in the flats of Holland. The same impression, in less degree, is made on the banks of the Humber, where the broad warped meadows won from the sea by Nature and art lie many feet below the tide at flood; for, walking in the fields behind the dykes, when the tide is up, good-sized vessels may be seen sailing on the rivers above the level of the spectator's head. An old and entirely natural loamy silt, somewhat of the same character, follows the course of the Ouse, and, to a great extent covering the fertile Vale of York, passes out to sea in the plains that border the Tees."—Ed.

Bullocks are generally bought in the autumn to consume the roots and convert the straw into manure.

All the crops were good, and the land, much given to surface and other weeds, was clean and well farmed.

Weeds were collected and burned, and the ashes were being mixed with mineral superphosphates and drilled into the land for the roots.

3. *The Farm of* Mr. C. E. E. Cooke, *Hinxton Grange, Whittlesford, Cambridge.*

This is a large arable farm belonging to Major de Frevelle, the altitude being 90 feet on the river banks and about 230 on the higher fields. The subsoil is chalk and gravel, and the soil a fairly friable one, with a considerable mixture of clay, requiring careful and seasonable working.

It is held under a lease begun in 1889, the tenant having power to sell hay or straw, but he must bring back feeding stuffs of an equal value. He can farm as he sees fit, but must leave the farm at the expiry of his lease under a four-course system. Compensation for unexhausted improvements is arranged for in the agreement.

Being a Norfolk man, Mr. Cooke has all along managed his farm to some extent different from his neighbours.

Under the four-course system he has a great breadth of roots, and with the help of cake and corn he feeds a large number of bullocks and converts his straw into valuable manure to be spread on the layers for the wheat-crops.

Last year's drought caused a failure of the clovers, and the ordinary rotation is for a time disjointed. This year a considerable breadth of barley is following barley, while the old layers were left, entailing a shorter acreage of wheat.

Owing to the situation of the main farm buildings the farm is an expensive one to work.

Built on the river side, in the heart of the grass land, the buildings are at the lower extremity of the farm and distant from the arable fields.

To reduce expenses and save labour in haulage of roots and manure, Mr. Cooke has built a bullock yard near the centre of the farm. This he has done almost entirely at his own expense.

The whole of the grass land is pastured. It lies along the river side and is fairly good, but not what could be termed rich feeding grass.

Subjoined are the particulars of the extent, annual outlay, &c.:—

Arable	Grass	Rent	Rates	Artificial manures	Cakes, &c.	Labour	Labour per acre
acres	acres	£ s.	£ s.	£ s.	£ s.	£ s.	£ s.
900	125	935 0	58 10	250 0	966 0	1,537 0	1 10

In the matter of feeding stuffs, about 400 quarters of home-grown oats and 60 to 70 quarters of light wheat and barley are annually consumed.

The amount given for labour includes wages paid to gardener, grooms, &c., and the rent given includes the game rent, as the tenant has the shooting.

There were on the farm on the 8th of June—

58 horses.
9 old steers.
4 cows.
3 calves.
520 ewes, rams, and hoggets
677 lambs.
24 pigs.
And 200 head of poultry (no chickens counted).

The stock of cattle was under the average number at the season of the year, and the pigs, owing to a recent visitation of swine fever, were much below the ordinary number.

With regard to the horses, a large and valuable stock of pure-bred Shires is kept. Five pedigree mares with their foals were in the grass fields near the buildings, while six yearling colts and fillies were being grazed in a poorer pasture.

At work, or on the rougher pastures, were twelve other mares and fillies, while the stud horse Heydon Duke, 11612, stood at the buildings. This is a powerful dark brown horse, 17 hands high, got by Sterling, 4066, from Brown Duchess (Vol XI.).

The sheep are carefully managed. The ewes are pure Suffolks, and the lambs are crosses with the Southdowns and Cotswolds. The lambs by the Southdown rams are sold fat, while the others are weaned and fatted during the autumn and winter. At the time I saw the flock the ewes were being fed on the layers, with lambs running forward.

Generally two-thirds of the root crops are eaten on the land with sheep, while one-third is carted to the bullock yards.

The land was all through clean and well farmed, and the crops generally promised to be good.

Part of the oats had suffered through the May frosts, which had also caught a considerable breadth of the early swedes, and re-sowing had to be done.

4. *The Farm of* Mr. Christopher Parsons, *Horseheath, Linton, Cambridge.*

Farming at an altitude of some 200 feet above sea level on a very mixed soil, Mr. Parsons, without any pretension at display or effect, manages his land well and grows good crops. The buildings are poor, the property being held by the present owner under very peculiar conditions.

Part of the soil is heavy clay and part of a light heathy nature.

There are 425 acres of arable land and 75 acres of grass, which is mostly grazed with horses, cattle, and sheep.

Sheep are folded on the lighter land grass fields, mangel, &c., being carted on for them.

The present rent is 12*s.* an acre, paid by the tenant, while the tithe, 4*s.* 6*d.* an acre, is paid by the landlord. The rates are about 55*l.* a year.

The four-course system is followed: all the hay and straw is consumed on the farm and a large quantity of good farmyard manure is made.

The root crops are put in with farmyard manure, and artificial manure at an average cost of 25*s.* an acre. There were on the farm—

28 horses.	375 lambs.
13 cattle.	16 pigs.
3 cows for use of household.	And a stock of poultry.
317 ewes.	

Considerable care has been devoted to breeding strong useful horses, an entire horse being kept and young horses reared.

The cattle stock are not expected to do much to pay rent, but sheep are looked upon as rent-payers, and receive great attention.

The ewes with single lambs are folded by themselves, the lambs running forward and being liberally fed on beans and cake, to go out as fat lambs.

Those with double lambs, on a different part of the farm, are equally well, if not better, fed; their lambs are not expected to go off to the butcher, but are weaned and fed off about Christmas. At the time I saw the farm the ewes with double lambs were folded on sainfoin, getting a fresh brake daily.

The pigs on the farm are sold off as small porkers when they weigh about 5 imperial stones.

On the strong clay portion of the farm the mangel was sown in rows 36 inches apart, and on June 8 furnished a strong, good plant after being singled out. To me a novel system of cultivation was being pursued in the mangel field.

An ordinary plough, minus the mould board, was being run on each side of the rows, quite close to the plants, at a depth of 4 or 5 inches. On strong clay soil this system of cultivation drains the water from the young plants and opens up the soil to the action of the air, while at the same time it assists in the cleaning of the land.

On the stronger clay fields Mr. Parsons uses shoes or sledge-shaped supports under the beams of the ploughs in place of the ordinary wheels. These shoes are said to work better than wheels on the sticky clays, as the latter are apt to wind up and become useless.

Mr. Parsons still threshes a considerable quantity of his corn with flails. There is a very large barn on the farm which is filled in the autumn, and, during winter, and at odd times, when work is slack, the grain is threshed out with flails.

The labour on the farm runs to 30*s.* per acre.

5. *The Farm of* Mr. R. R. Holben, *Barton, near Cambridge.*

This is a large arable farm, the management of which is somewhat different from any other inspected. Almost the whole of the straw is sold off and horse manure is bought on. By an arrangement with the London and North-Western Railway Company, Mr. Holben's straw goes to their stables, while he buys their horse manure, delivered at Lord's Bridge Station, near the extremity of the farm.

Another feature is steam cultivation, two sets of tackle being kept on the farm.

Farming 850 acres, under five different landlords, and 150 acres belonging to himself, Mr. Holben has experience of several sorts of land. With a proportion of strong clay of good quality there is a considerable breadth of poor clay land, difficult to work, and not at all kindly.

There are 900 acres of arable and 100 acres of grass land.

No exact statement was given as to rent, although it was spoken of as being rather under 30*s.* an acre. The rates were put at 148*l.*, and the labour bill at 1,400*l.*

The numbers of stock were—

24 horses.	935 lambs.
4 cows.	55 pigs.
550 sheep.	And 200 head of poultry.

The four-course system is strictly adhered to, except on the higher lying poor clays, where grasses are now left down for three or four years. A neighbouring farm, adjoining the poor fields, has gone out of cultivation. It has been found that these poor fields, if sown away in a clean state, will, for several years, carry a fair covering of grass. This system, while saving the labour bill, insures a certain amount of out run for the ewe flock at seasons of the year advantageous to the stock and to the working of the better fields. Last year only 14*l.* 7*s.* was expended on artificial manures, but 581 tons 3 cwt. and 3 qrs. of horse manure was bought on, at the cost of 116*l.* 4*s.* 6*d.*

With regard to the horses, a few superior two- or three-year-old colts are bought annually, and a like number of high class, heavy, seasoned horses are sold off. The horses are fed during summer in the horse yard on such green food as may be in season. The few cows that are kept are for the use of the house, and occasionally a lot of bullocks are bought if the root and straw crops are big, and prices tempting. Speaking generally, Mr. Holben's experience has been that, as manure makers, cattle are expensive.

The sheep have received a great deal of attention. Formerly a considerable number of tups were sold, but of late years fat lambs have been reared and sold from one of the two flocks of sheep kept on the farm. The lambs from the second flock are sold as stores in the autumn of each year.

No particulars were given about pigs or poultry.

6. *The Farm of* Mr. Wm. Hagger, *Little Evesden, near Cambridge.*

Mr. Hagger farms under three landlords, the Earl of Hardwicke, Mr. Mortlock, and the rector of the parish.

The total acreage is 362, and about three-quarters of this lies on the flat and the balance on the higher lands. The farm is widely spread and difficult to work, as the farm roads, or rather tracks, are bottomless in wet weather. The altitude may be put at 50 to 60 feet above sea level, and the annual rainfall at about 26 inches.

The soil is a rich, sticky clay, and one that needs most careful working. At the time of my visit the neighbourhood generally was one blaze of yellow, the wild mustard or runch (charlock) being in full flower, and a prevailing weed in the district. By careful hand weeding and constant attention Mr. Hagger's fields were practically clear of this weed, and all through the land was clean and exceedingly well managed. The following table gives particulars of acreage, outlay, &c :—

Arable	Grass, all grazed	Rent	Artificial manures bought	Cake and corn bought	Own grain consumed	Gross labour bill	Labour bill per acre
acres	acres	£ s.	£ s.	£ s.	£ s.	£ s.	£ s.
342	20	320 0	68 0	607 0	368 0	543 0	1 10

The land is worked upon the four-course system, and the tenant believes no other rotation would be suitable. Sainfoin is largely grown and very much valued. Its market price as hay is less than that of clover, but Mr. Hagger values it quite as highly for home consumption.

A considerable breadth of beans is annually grown. These are all consumed at home, as well as about one-third of the barley and one-fifth of the wheat grown.

When I visited the farm the live-stock consisted of—

23 horses.	55 pigs.
24 cattle.	250 head of poultry.
380 sheep.	

There were two cart mares and one nag mare, with their foals, and several cart colts and fillies on the grass.

All the cart horses were being fed in the yards.

Four cows are milked, and after the house is supplied the cream is made into butter to be sold, and calves are reared on the skim-milk. As in every other department, careful attention is given to the young cattle, and through being kept in the yards and well fed many of them go out to the butcher at about 18 months old.

A flock of cross-bred ewes is kept, and before my visit 50 fat lambs had been sold at 39*s*. each. Fifty more were expected to bring about the same price. The balance of the lambs after the fat lambs are drawn out are well fed and generally go out before Christmas, when others are brought in to be fed on and sold fat as soon as they are clipped.

A number of breeding sows are kept, and Mr. Hagger has a great belief in pigs being a paying stock. Last year 300*l*. was drawn for pigs bred and reared on the farm. They are sold to local butchers and go off weighing 10 to 12 imperial stones.

Chickens and eggs bring in a considerable sum annually, but no figures were given as to this.

No one could walk over this farm without being impressed with the thorough way in which all the work is done. As has been stated, the soil needs careful working, and in no department is any waste to be seen. A large extent of the farm has been drained, the owners finding the tiles, the tenant doing all the rest.

7. *The Farm of* Mr. Charles Dawson, *Grange Farm, Bourn.*

This is a strong clay land farm, in a poorly farmed clay land district, where the effects of unremunerative wheat growing are plainly visible.

Mr. Dawson's farm shows evidence of careful management and thoroughness. The land is clean and the hedges are trim and well kept. No statement was made as to the altitude of the farm. The subsoil is strong clay, and on no part of the farm did I see any free working land.

There are 510 acres of arable land and 70 acres of grass, a considerable portion of which has been laid down of late years. The land is worked on the four-course rotation. Last year the failure of seeds had the usual effect of upsetting the regular rotation, and what might be termed cross cropping has been resorted to. After farming the land as tenant for 22 years Mr. Dawson bought the farm last year. The following particulars were volunteered. Besides the 580 acres of farming land there are 40 acres under timber, mostly young larch about 25 years old. Twenty years ago the estate changed owners, the price including timber being 20,560*l*. Since then 5 acres have been planted, houses have been built, and roads made. The present owner paid 12*l*. an acre for the land, 620 acres, and 560*l*. for the timber; in all 8,560*l*. Low as this price seems, Mr. Dawson affirmed that he did not consider it a good investment, but having a rather extensive business in the district as a steam threshing-machine owner, he stretched a point to keep possession of his home.

Considering the condition of the land it really seems cheap at 12*l*. an acre, even with grain at the present low prices.

At the time I visited the farm the live stock consisted of—

26 horses.	170 lambs.
9 cows.	100 pigs.
9 young cattle.	200 hens and chickens.
18 calves.	And 12 ducks.
150 ewes.	

Of the 26 horses, 16 were working horses, 6 were one- and two-year-olds all bought in except one, a cart mare and foal and 2 nags. Young cart horses bought in relieve seasoned saleable horses, so that year by year there is something coming in from the horse stock.

The dairy work is carefully managed by Mrs. Dawson, whose butter has a local reputation. No figures were given as to the income from butter sold, but the statements made gave me the impression that the receipts from butter, eggs, and chickens amounted to a considerable sum. The skim-milk is given to the calves and pigs; the calves are kept in the yards the first summer, and some of the most forward go out, as beef, at about 24 months old.

The ewes, Oxford Down crosses, are large-framed, good sheep.

Pigs are looked upon as one of the best paying stocks on the farm. They are kept in comfortable yards and fed on cheap grain, mangel, vetches, &c. As a rule they are sold locally at a weight of 10 to 11 imperial stones, but sometimes they are made up to 15 or 16 stones and sent to Birmingham. The manure made in the pig yards is highly valued.

8. *The Farm of* MR. F. PARSONS, *Trumpington, near Cambridge.*

This farm, owned by Mr. E. B. Foster, is situated in the village of Trumpington, close to Cambridge.

It is about 50 feet above sea level, and the annual rainfall averages about $23\frac{1}{2}$ inches.

The subsoil under part of the farm is chalk and chalk marl; part is a bed of phosphates, and the remainder gravel, which crops up at intervals all over the farm.

The soil is a kindly, good one, easy to work, and capable, as was quite evident, of producing splendid crops.

The extent and annual payments are as follows:—

Arable	Grass	Rent	Rates	Artificial manures	Cakes, &c.	Labour	Labour per acre
acres	acres	£ s.	£ s.	£ s.	£ s.	£ s.	£ s.
316	64	560 0	46 9	40 0	580 0	665 0	1 15

Along with the cakes, &c., bought, the whole of the beans grown on the farm (generally over 120 qrs.), with 200 qrs. of oats, and all the tail corns are consumed on the farm.

At the time of my visit there were on the farm—

14 working horses.
35 cows.
2 bulls.
And about 100 head of poultry.

No horses are bred on the farm, but strong young horses are bought annually, and fully seasoned ones are sold to go to town work. The horses are fed both in summer and winter in yards, but owing to the loss of a large straw stack last year through fire, they were running in a small paddock and being fed on green food given them in temporarily arranged mangers or troughs. Only powerful, good ones are bought, as these have a ready sale when they get to an age to be drafted out as town horses.

Situated so near Cambridge, where milk can be delivered morning and night, dairy farming is pursued under favourable circumstances. The cows are evidently selected with great care, and are a very grand lot. They are mostly Shorthorns, with big frames and good bags.

Mr. Parsons considers that his cows, having to be kept on high-rented, good land, and expensively fed, must be of high average excellence as milkers before they can do what is expected of them.

All the calves are sold to farmers, and find, as a rule, a ready sale. About 40*s*. each is the usual price, although last year they made less. The cows are brought into the yards twice a day to be milked. They are then tied up and fed, the state of the pastures and the condition of the cow being carefully considered in the amount of cake and meal each receives.

The milk all goes to one firm in Cambridge, and the price is the same all the year round. This price I am not at liberty to give, but it struck me as being low.

Mr. Parsons, however, explained that there was a growing competition in milk selling, and but for the fact that he has had a long connexion with the firm, and his milk has a good reputation, he could not make the price he does. As in the case of thousands of dairy farmers all over the country, abortion causes great loss and disappointment, and although much attention has been given to the subject, Mr. Parsons speaks of it as mysterious.

There were no sheep on the farm at the time of my visit, but 700 to 900 lambs are annually bought in soon after the hay is stacked. The clover, sainfoin, and other aftermaths are invariably eaten off with a high-class stock of lambs, none of the layers being twice mown or seeded. In root culture, kohl rabi and mangel are grown in alternate stretches across the fields, the former to be eaten off with sheep, and the latter to be carted home to be shredded and mixed with cut chaff for the cows. The lambs bought in June or July are invariably sold off fat by the end of March, at whatever price is current for mutton in the spring. In a lengthened experience Mr. Parsons has found that holding later, even although prices improve, upsets his whole system of management and causes ultimate loss through spring seeding being delayed.

Little need be said with regard to the farming, as its reputation is wide and well deserved.

The whole of the land is clean and the crops were all that could be desired. The fences were well kept and clean at the roots.

The four-course system is generally carried out. Tares or vetches are seldom grown, but this year, owing to the failure of last year's clovers, some extent is under this crop, which is being cut green for the horses. Sainfoin is largely grown and very highly spoken of. It is grown alternately with clovers and beans.

9. *The Farm of* Mr. J. B. Ellis, *West Barsham, near Walsingham, Norfolk.*

Of this large farm, 1093 acres are rented from Lady Katherine Balders, and 220 acres from Lord Hastings.

Along with this, 125 acres of marsh land at some distance from the farm are held under yearly agreement. In all the figures in the following statements as to rent, labour, and manure expenditure, neither the extent nor the rent of the outlying land is considered, but it may be stated that an average rent, one year with another, runs to about 48*s.* per acre.

In working these outlying acres in conjunction with the home farm, a valuation is put upon stock sent to and brought from them, so that there is no mixing up of accounts as to returns from the farm, although the possession of such marsh grass land may be, and often is, a great convenience in the live stock management of the farm.

The farm is some 200 feet above sea level, and the average annual rainfall may be put at 24 inches.

The soil varies from a good mixed one, on a chalky clay subsoil, to light, almost worthless, sand.

The present tenant has held the 1093 acres for 21 years, following his father, who had held the farm for 56 years. He is just entering upon a 10 years' lease. Along with the land he has the sporting rights, and the rents of 11 cottages conveniently situated on the farm.

The 220 acres held from Lord Hastings are rented at 20*s.* per acre without the game. There is one cottage along with this holding, and the farm buildings are extensive and superior. The tenancy is from year to year, and the conditions are in every way liberal.

Putting the whole under one farm, seeing there are no separate accounts kept of these two tenancies, the following table may be given:—

Arable	Grass	Rent including tithes	Average rates for past 2 years	Gross labour, average of past 2 years	Gross expenditure for manures, average of past 2 years	Gross expenditure for cake, corn, &c., average of past 2 years	Average of past 2 years of labour per acre
acres	acres	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
1,200	110, all pastured	1,151 0 0	118 11 5	1,718 8 0	380 18 10	1,390 19 8	1 5 9¾

On May 29, when the farm was visited, the live stock were—

221 cattle.
1080 sheep.
82 horses.
10 pigs.
Some 200 head of poultry.

The cattle consisted of 41 Jersey cows, some 20 young Jersey stock, and the remainder of feeding steers.

These feeding steers are mostly Shorthorns, although occasionally a few Herefords are grazed and are bought in during the autumn, fed in yards through the winter, and sold off the pastures during the summer. Their winter food consists of roots, straw, and about 5 lb. of cake per day, although in the matter of cake there is no fixed rule, the condition of the stock and the state of the markets regulating this to some extent. On the grass a liberal supply of cake is given, 4 to 6 lb. per day, as may seem necessary.

A few years ago Mr. Ellis turned his attention to dairy farming, and having secured a market in London for his butter, made entirely from the milk of Jersey cows, he is satisfied that a portion of his grass land of rather poorer quality yields a better return under these Jersey cows than when grazed with steers.

Till October 1893 the number of Jersey cows was kept at 25, but, as has been said, there are now 41 on the farm. The gross receipts from October 1892 to October 1893 were 538*l.* 3*s.* 8*d.* This was for butter alone, as no calves were sold and nothing was counted for skim-milk used on the farm and given to pigs, poultry, &c.

Every care is taken to maintain the high standard of excellence which secures a ready sale for the butter in London. With the increased stock of cows on the farm, about three-fourths of the calves have been fed off as veal, only the best of the heifer calves being kept. Heifers are put to breed at about nine months old, which brings them into the dairy at a little over 18 months.

There is nothing elaborate about the buildings on the home farm, but cleanliness and the comfort of the animals are carefully attended to. While on the subject of buildings it may be noticed that at convenient centres on this wide farm there are yards erected, and bullocks are fed on the roots and fodder grown in the fields in close proximity, so that both in food and manure carting there is a great saving. The average amount received for bullocks sold during the past five years was 3,932*l.* 12*s.*

With regard to the sheep stock there are now about 550 ewes in place of 80 to 100, which were kept a few years ago. The low price of grain led

Mr. Ellis to alter his system of farming to some extent. Up to a few years ago the four-course was closely adhered to, but now upon the lighter soils grass is left down for two, three, and even more years.

On these new-laid fields a larger ewe flock is kept, and at the time of my visit the sheep were being folded over a field of good grass on land rented at about 12*s.* an acre. In laying down these lighter land fields to grass for several years every care is taken to have the land thoroughly clean. Having been well manured for roots, and a certain proportion of the roots eaten on the land with sheep, the seeds are drilled in with the barley after the land has been horse-hoed between the barley rows, sown 9 inches apart.

The first year the seeds are mown, then eaten, and in the autumn 10 to 12 loads of rotten dung are spread per acre, and experience has proved that such a covering of farm-yard manure insures a good thick sward of grass the following seasons.

The average sales of sheep during the past five years amounted to 4614*l.* 12*s.* 9*d.* per annum.

There are a few Shire mares kept, and by breeding strong good sorts, a certain number of seasoned horses are annually sold and younger ones taken into the working stock.

Taken up to do half a day's work when they are two and a half years old, they are, the following summer, allowed a run on the marshes and again taken up in the autumn to do their full share of the work on the farm.

There was no waste land over this wide farm. At such places as had been stack foundations, or where mangel heaps had been laid, the land had been carefully worked and sown with some kind of crop. The crops were grown close to the fences, which were well kept, although on the lighter lands they were purposely left high.

10. *The Farm of* Mr. George Baly, *Hardingham, Hingham, Norfolk.*

This farm, close by Hardingham Station, was one of the Society's Prize Farms in 1886. It is from 110 to 120 feet above sea level. The soil is a loam inclining to clay, on a gravel and clay subsoil.

The owner is the Earl of Kimberley, the tenancy is an annual one, and the farm has been in the family for nearly 100 years. The ordinary Norfolk covenants apply, with compensation under the Agricultural Holdings Act.

The farm is worked on the ordinary four-course of cropping, and according to the agreement all produce, hay and straw, must be consumed on the farm unless authority be given by the landlord for selling off.

The rotation is given by the tenant as wheat, roots, barley, hay, as a rule, but sometimes barley is grown after wheat, sometimes barley after hay, and barley after barley when seeds fail. "Oats are also sometimes grown after hay instead of wheat, and at the present time I have twenty-one acres growing after barley where seeds failed." The following table gives particulars of expenditure, &c.:—

Arable	Grass	Rent	Rates	Labour, average of 2 past years	Artificial manures	Cake, corn, &c.	Labour per acre
acres	acres	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
170	30, all grazed	265 0 0	16 18 6	321 12 0	82 0 0	387 0 0	1 9 5

Whilst the arable land is carefully farmed and clean, with crops of all sorts looking well, the main business on the holding is the production and sale of milk. Thirty-five to forty cows are milked, and being close by the station the milk is sent by train to Yarmouth and London. At one time the cows, and in fact the cattle stock, were Norfolk Polls, but owing to the repeated losses through that great scourge to all dairy farmers—abortion—rearing of home-bred stock and adhering to a particular breed have been abandoned. The cows at present on the farm are of all breeds and are brought in near, or after calving, to suit the requirements of the dairy. They are milked at half-past five in the morning and at half-past four in the afternoon. Two men and two boys do the milking. In winter the cows are tied up and fed on shredded roots mixed with cut hay and straw, with decorticated cotton and linseed cakes, and meal. A careful man, as feeder, attends to the wants of the cows individually, and no hard and fast rule is laid down as to the amount of artificial food each cow is to receive. In the summer the cows are grazed on the meadows. These consist of a tract of land along the sides of a stream, and, although fair grass, are by no means first-rate pastures. A portion of the land is low-lying and full of water grasses of little value, and one can quite understand that it suits a dairy stock better than a fattening one.

A Shorthorn bull runs with the cows, but, as has been said, very few young cattle are reared. Whether the system now being pursued is more or less profitable than when, as formerly, the dairy cows were almost all pure-bred Polls, and the produce were reared so that the herd was self-sustaining, and perhaps more, I had no direct evidence. I could gather, however, from Mr. Baly, that necessity, not inclination, drove him to a mixed—what might be termed a flying-stock.

A considerable quantity of moss litter is used in the cow houses and sheds, and the liquid manure is collected in a tank to be carted out and distributed over the grass land for mowing. This mowing land forms no portion of the old grass land, but is new-laid to be broken up as the tenant feels inclined.

At present there is a plot of some four acres of lucerne, a very heavy crop, where, last winter, the liquid manure was distributed. With a dairy stock attention must necessarily be given to the growth of crops to suit the requirements of the cattle at the different seasons of the year. Mr. Baly seemed fully alive to this, and with vetches at different stages of growth, cabbages of early and late varieties, and different sowings of soft turnips, the sufficiency of feed for his cows in milk was fully assured.

There were at the time I visited the farm fifty-five cattle in all, six of these being young calves, while several dry barren cows were being fatted for the butcher.

There were five pigs and 160 head of poultry. The poultry are kept for their eggs, which are sent to Yarmouth to the parties who get the milk. No chickens are reared, but they are bought when able to scratch for themselves at a shilling each. The poultry houses are primitive, and the fowls seem to receive less attention than some might think they deserve.

11. *The Farm of* Mr. John Morton, *West Rudham Hall, Swaffham, Norfolk.*

Mr. John Morton has been tenant of this farm for nearly 11 years.

It is about 200 feet above sea-level, and the annual rainfall is about 23 inches. The soil is a light, friable one on a chalk, gravel, and clay subsoil. Taken all through, it must be classed as good land, and, being well managed, it is productive and clean.

It is held under a yearly tenancy from the owner, the Marquis of Cholmondeley. The agreement is in accordance with the Agricultural

Holdings Act, leave being given, but not taken advantage of, to sell one quarter of the hay, straw, and roots grown in any year.

While a large quantity of manures and feeding-stuffs are annually bought, no figures were given as to the amount paid, and the following table will make other payments clear:—

Arable	Grass	Rent and tithes	Rates	Gross labour bill for past year	Average labour bill per acre
acres	acres	£ s. d.	£ s. d.	£ s. d.	£ s. d.
650	100, 97 of which are pastured	500 0 0	75 0 0	937 10 0	1 5 0

Along with his farm Mr. Morton owns 40 acres of marshes on which he grazes 40 steers, and after they are brought to the home farm to be fed in the yards on roots, &c., his ewes are sent down to the relief of the home land.

He puts the rent of his own land at 80*l.* a year. This would seem a reasonable sum considering the stock it carries. The four-course system of farming is followed generally, but not absolutely adhered to.

In Mr. Morton's case, as well as in that of almost all others whose farms were gone over, last year's drought, by killing the clovers and grass-seeds, upset the regularity of the course of cropping.

Many expedients were tried to meet the loss of the clovers; catch-crops were grown, barley followed barley, and winter oats were grown to be fed off with the ewe flock up to a certain time and then allowed to stand for a crop.

In other fields thousand-headed kale, Italian rye-grass, and trifolium were tried, and although, taken as a whole, they were poor subtitutes for a full plant of clover, a considerable quantity of valuable feed was raised.

Mr. Morton made the statement that, after expending 250*l.* on seeds last year, he considered the drought left him with less than 20*l.* worth.

Before, however, last year's drought affected the regular rotation, part of the land had been left down in grass. Having dunged a seed-field in preparation, as is the custom, for wheat, he did not plough it up; and after four years in grass it is now a beautiful close sward which will be allowed to lie so long as the grass looks as well as it now does.

At the time of my visit there were on the farm

37 pedigree Shorthorn cattle.	47 horses.
3 crossbred cattle.	12 pigs, 40 having just been sold.
680 sheep.	60 head of poultry.

The pedigree cattle consisted of 14 cows, 6 in-calf heifers, 7 yearling and heifer calves, 9 yearling and bull calves, and one stock bull. Great attention has been given to the selection of sires, and the herd all through is a level good one. Lately a good market has been opened up for the young bulls in South Africa; and, to suit the trade, attention has been given to the colour of the sires used, reds being much preferred by the exporters.

While there is no pretension to anything great in the matter of dairy work done on the farm, here, as in everything else under Mr. Morton's management, practical care and attention are exercised.

Butter of a superior quality is made, and commands a ready sale in a local market. Mr. Morton's daughters get a bonus of 1*d.* a pound for all butter sold at 1*s.* per lb. The following is a statement of the dairy account for the past three years:—

		£	s.	d.
For year ended October 11, 1891	. . .	514	1	1
" " " 1892	. . .	520	18	6
" " " 1893	. . .	538	3	8

During the first year 6 calves were sold, realising 20*l.* 14*s.* 9*d.*; but no calves were sold the two following years, nor was there any value put upon odds and ends of milk given to the pigs. While speaking of the dairy and the interest taken in it by the ladies of the family, it may be well to state what was done last year with poultry, although no money statement was given. There were reared last year 177 chickens, 33 turkeys, and 44 ducklings, and during the season 2,200 eggs were collected.

With regard to the sheep, the ewes are large-framed crosses between the Suffolk and Cotswold, and the tups used are of the Oxford Down breed.

Cake and corn are freely used in the feeding flock, and the whole of the young sheep are expected to be off the farm fat when they are about twelve months old.

It is quite beyond the province of this short notice of Mr. Morton's farm and stock to speak of the West Rudham Hall Shire horses. Mr. Morton is well known as a judge and famous breeder of heavy horses, and the inspection of the mares with their foals, and the young stock in the fields, was most interesting.

12. *The Farm of* Mr. W. E. Learner, *Dilham, Norfolk.*

Situated 20 to 47 feet above sea level, with an average district rainfall of 26½ inches, this is a farm of superior land on a sand, gravel, and partly clay subsoil. With the exception of one field it is in a compact block intercepted with country and farm roads, and well fenced with well-kept, low hedges. It is held from two owners, F. H. Windham, Esq., and Mr. H. M. Taylor, in about equal proportions, while 10 acres are rented from the Honing Poor Trustees. The following figures show the extent of land, payments, &c.:—

Arable	Grass	Rent and tithes	Rates	Average labour bill	Labour per acre
acres	acres		s. d.	£ s. d.	£ s. d.
501	18, all grazed	1,027 7 6	81 0 0	856 7 0	1 13 0

Mr. Learner has kept strictly to the four-course rotation of cropping; this is wheat, roots, barley, and then seeds—*i.e.* clovers and rye-grass.

For the past few years a portion of the clover lays, 15 to 20 acres of cow grass, after being fed off till the first week of June, have been allowed to grow and ripen to be cut and saved for seed in the autumn. As this has been a profitable crop, some 14 acres of white clover is to be seeded this year. Both these fields of cowgrass and white clover looked well, being a full plant and free from weeds. The land is all clean and beautifully farmed; at the time of my visit the clover-seed fields were being carefully gone over and hand weeded. To save the land from becoming clover-sick different seeds are sown in alternate rotation, so that there are generally eight years between the croppings of the same variety of clovers.

One could not fail to admire the general excellence of the corn crops, while the hay and roots were also most promising.

At the time of my visit there were only 27 cattle on the farm, as the bullocks intended for winter feeding were on the marshes for the summer.

From 250 to 300 bullocks are fed off during the winter, nearly all of them in boxes, when the whole of the manure, rich through the use of large quantities of cake, is made under cover.

Several conveniently situated buildings, substantially and carefully divided into feeding boxes, have been built to save labour in root and manure carting.

There are no drains from the feeding boxes; the great quantity of grain grown on the farm allows the free use of straw as litter, and the dung is carted from the boxes to heaps in the fields, full of liquid manure. The dung-heaps are twice turned before being carted on the land, the clover lays before being ploughed for wheats, getting about 10 loads per acre. Very little artificial manure is used on the farm; the roots being grown with about 10 loads of farmyard dung and 2 cwt. of mineral superphosphate per acre. No statement was made as to the gross quantity of cake consumed annually, but all the feeding cattle were said to get whatever quantity of cake they could or would fairly eat.

With 300 bullocks on a full ration of cake the manure must be rich, and the condition of the soil and crops was sufficient evidence of this. In good times, when wheat made a fair price and beef made 7*d.* to 8*d.* per lb., such a system of farming as I have attempted to describe was doubtless a profitable one, but one can quite understand Mr. Learner's anxiety for the ports again to be open, so that Canadian store cattle may be available as fattening stock.

Only a small percentage of the British farmers want to see these Western store stock brought into the country, and if they are kept out I have no doubt that a man with Mr. Learner's energy will soon adapt his system to meet the changed conditions under which he may have to farm.

Of the 17 cattle on the farm 8 or 10 were what are termed road bullocks. These had been bought in during May, and under the care of a lad were grazed on the roads spoken of as running through the farm.

During the heat of the day and at night they were shut up in a covered yard, and while keeping the roadsides and hedge backs tidy, with the help of cake and meal when under cover they were likely to grow into money.

There were in the boxes in the homeyard 7 animals in preparation for the shows, and a very good lot they were. One, a pure bred Hereford heifer, was afterwards a prize winner at the Cambridge Meeting of the Royal Agricultural Society.

Amongst several good steers a roan polled cross-bred to be shown in the class of steers under three years of age at Christmas, seems a most promising one, while a pure bred Shorthorn and a Hereford are also very good.

Thirty-four horses were upon the farm, 24 to work the land, 1 Shire stallion, 6 foals, and three hackney mares and geldings.

One hundred and sixty lambs had just been bought and were being fed on a field of rich clover with a full allowance of cake. These were expected to be fit to go off in autumn.

A fair stock of poultry is kept in two movable houses; these are shifted about the farm to pick up what may be left when the stacks are threshed at the different buildings.

13. *The Farms of* Mr. Garrett Taylor, *at Whitlingham, Trowse, and Kirby, Norfolk.*

This large and intensely interesting stretch of farming is held by Mr. Taylor from three landlords—the Corporation of Norwich, Messrs. J. & J. Colman, and Mr. J. J. Colman, M.P.

It is a light porous soil, for the most part resting on gravel, and is from 10 to 50 feet above sea level.

The Whitlingham Hall farm is held on lease under peculiar conditions, while the other two are ordinary yearly tenancies.

In attempting to give some idea of this large holding and its many features, I can only, in the space at my command, touch a few of what seemed to me the most striking, knowing well that I must overlook a number of important ones.

The following table gives the extent of the holding, and the working and other expenses for last year:—

Arable	Grass	Rent	Rates	Artificial manures	Cake, corn, &c.	Gross labour	Labour per acre
acres	acres	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
691	441	1,535 8 0	174 8 8	160 0 0	2,807 11 0	2,815 18 0	2 9 8

The actual amount paid for cakes and other food brought on to the land was 1,082*l.* 11*s.*, and home-grown corn to the value of 1,725*l.* was consumed, whilst some 90 tons of wheat straw, 90 tons of hay, 465 tons of mangel, and 45 tons of swedes were sold off the farm.

The portion of the farm known as Whitlingham Hall is, as has been indicated, held under peculiar conditions. Taken from the Corporation of Norwich, the tenant is bound, under his agreement, to receive the sewage of the city of Norwich, which is spread over some 340 acres, of which 40 acres belong to the farm held from Messrs. Colman.

About 140 acres of the irrigated land is under grass, which is all pastured during summer. In the middle of the summer when the grass grows faster than it can be fed off it is cut and made into silage for winter use. The sewage grass, although difficult to save as hay, is easily converted into valuable feed in the form of silage.

The arable portion of the sewage-dressed land is worked on a two-course system—mangel and oats alternately. This has been found to be the most suitable course of cropping, and has been adhered to for a considerable time.

Under the Whitlingham lease the tenant, at his own expense, does all repairs, finding all materials and labour, but by his agreement he has a claim, at the expiry of his lease, for all permanent improvements he may effect, such as erection of buildings, making ducts, sluices, &c.

He may crop as he sees fit, and sell off what he likes.

Excluding the small area of arable land under irrigation, the whole of the ploughing land on the entire holding is farmed under the usual four-course Norfolk rotation—wheat, roots, barley, hay.

With regard to the system of manuring, for wheat, some 11 to 12 loads of farmyard manure are spread on the clover roots (ollands) to be ploughed in. About the end of March or beginning of April a mixture of 3 cwt. of broad salt and ½ cwt. of nitrate of soda is applied per acre.

For mangel some 10 loads of farmyard manure, 3 cwt. of salt, and 1 cwt. of nitrate of soda are applied per acre before sowing, and a further dressing of 1 cwt. of nitrate of soda per acre is given after the plants are singled. When farmyard manure is scarce 4 cwt. of superphosphate is substituted.

For barley, where the roots have been carted off, 2 cwt. of superphosphate per acre is applied to the land about a month before seeding time, and 1 cwt. per acre of nitrate of soda just as the young plant is showing above ground. No artificial manure is applied where sheep have been folded on the roots.

Mixed clover and other seeds are sown with the barley, and after the grain crop is reaped, 8 to 10 loads per acre of farmyard manure is spread during the winter, and greatly aids the clovers and grasses. Any bleached straw or rough manure which may be on the surface in the spring is raked up and carted off, so as to prevent damage to the hay.

A large quantity of farmyard manure is made on the holding, and every care is taken of it. In the fields several large heaps were carefully squared up, with shallow trenches cut all round them. These led into holes or temporary pits at the several corners of the heaps, to serve as tanks from which any liquid manure exuding from the heaps could be laved back again.

All the grain crops were heavy—too heavy, I fear, for the weather following my visit. The hay was good and well mixed with clovers. The roots were a full plant, although up to the beginning of June they had grown slowly. All the land was clean.

Interesting as were the crops, the live stock on the farm were such as to leave a deep impression on the mind of anyone privileged to see them. There were altogether—

124 horses, 1 mule, and 1 donkey.
279 cattle.
1273 sheep.
47 pigs.
And 318 head of poultry.

The horses consisted of—

5 Shire stallions.
42 Shire working mares and horses.
16 Shire fillies and geldings.
10 foals.
11 Hackney stallions.
17 Hackney mares.
8 Hackney fillies.
5 Hackney foals.
1 Hackney gelding.
5 milk-cart horses.
2 stewards' horses
1 mule.
1 donkey.

The cattle, all Red Polled pedigree animals, comprised—

103 cows in milk.
13 dry cows.
30 heifers in calf.
37 yearling heifers.
36 heifer calves.
5 bulls.
18 bull calves.
33 yearling steers.
4 steer calves.

There were in the flock—

388 ewes.
465 lambs.
163 ewe hoggets.
257 feeding sheep.

The pigs were made up of—

8 sows.
4 boars.
11 store pigs.
24 fat pigs.

And of fowls there were—

200 hens.
66 ducks.
25 turkeys.
22 geese.
5 guinea-fowls.

It is quite impossible for me to attempt to describe the live stock; space will not allow anything beyond a passing glance at the three extraordinary collections—the horses, the cattle, and the sheep.

The Shire mares with their foals were on the grass, and were wide and short-legged, full of quality and substance.

Every care is taken in the selection of sires used, and both the Shire and

Hackney youngsters give sufficient evidence of the ability and judgment brought to bear on the horse department of this great stock farm.

With regard to the cattle, volumes might be written. A more imposing picture than the one I witnessed could not well be imagined. In a large, gently sloping, sewage-irrigated field, of deep blue-green grass, 100 in-milk, Red Polled, pedigree cows, were grazing—all of one mould, and all of one colour. Under a bright evening sun the combination of colours was perfect, while a closer inspection of the individuals composing the herd afforded absolute proof of their practical utility.

The cows are milked night and morning, the whole of the milk being sent to Norwich, except the Sunday afternoon supply, which is set in pans and butter made from the cream.

The cows are turned out during the grass season, and in winter are tied up in stalls in well-arranged byres to be fed on roots, cut oat straw and silage, with a mixture of dried brewers' grains, decorticated cotton cake, malt, and a small quantity of condiment meal.

The milk is weighed at every milking, and full records are kept, showing the milking powers of every cow in the herd. Such records must have been an immense assistance to Mr. Taylor in the matter of mating and breeding his herd.

The calves are reared on calf foods, meals, and cakes, with roots and fodder in winter, and green food and mangel in summer. The steers, and such heifers as are not to be brought into the dairy, are fed off young, being well attended to and kept improving when they are strong enough to eat. Being raised without milk they look thin and weedy for the first few months of their lives, but they soon begin to look smooth and pretty. A yard is set apart for the young bulls that are for sale, and buyers are allowed to pick the lot at a fixed price so long as the supply lasts.

The ewes are all Southdowns, and here again the great number together, and the almost perfect uniformity of character throughout the flock, strike one in a very impressive way. The lambs are well fed, every care being taken to prevent any check in their development and growth. On the richer grass fields during the day, the ewes are folded on the lighter arable lands at night.

The breeding stock of pigs run in a very natural way, grazing out in well-sheltered paddocks during the summer. They are Tamworths, and are preferred on account of their natural hardiness and great feeding propensities.

A well-arranged covered yard is set aside for the feeding pigs; these are fed on wheat and barley meal.

The poultry stock have been kept up to about the same number for years. The hens are a mixed breed, chickens and eggs being both considered in the management of the poultry yard.

14. *The Farm of* MR. J. J. PAINE, *Risby, Bury St. Edmunds, Suffolk.*

This is a light land farm on chalk and marl, some 220 feet above sea level, with an average rainfall of about 27 inches.

It is almost entirely arable, there being only 10 acres of grass on the holding, the extent of which is 480 acres.

It has been farmed by the present tenant 23 years, and by the family 56 years. The owner is John Lysaght, Esq.

The tenancy is a yearly one, and there are no restrictions as to cropping, but the four-course has been adhered to. The tenant has power to sell hay, straw, and other produce. Until last year little advantage was taken of this, but last year's high prices for straw and hay induced the tenant to dispose of a considerable quantity of old hay and wheat straw.

The following table gives extent, outlay, &c.:—

Arable	Grass	Rent	Rates	Artificial manure	Cakes and feeding-stuffs	Labour	Labour per acre
acres	acres	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
470	10	497 10 0	57 12 0	68 0 0	800 0 0	724 0 0	1 10 2

Fifteen per cent. of the rent has been returned for the past year and a half, and the labour is now quite 100*l.* a year less than formerly. Over and above the 800*l.* paid for cakes, &c., all the light or tail corn grown on the farm is consumed.

The stock on the farm were

19 horses.	680 sheep and lambs.
10 cattle.	64 pigs.

And about 100 head of poultry.

Compared with the average stocking the cattle were said to be, for the season of the year, about 20, and the sheep 80 to 100 short.

At present the farm is under the following crops, in round figures:—

Wheat . . 42 acres	Beans . . . 16 acres	Cabbages . 9 acres
Barley . . 115 „	Peas . . . 18 „	Turnips . . 100 „
Oats . . . 24 „	Potatoes . . 10 „	Layers (clovers, &c.) . . 131 „

The farm is clean and well farmed, and being of a light nature is well suited for sheep.

A pure-bred flock of Suffolks was formerly kept, but last year Cotswold tups were introduced, and the lamb stock promise to grow into large-sized sheep.

A few of the lambs are sold fat from the ewes, but the large proportion are fed off on roots and sold in early spring.

Only two or three cows are kept for the use of the house, and bullocks are bought in to consume roots and make manure in the yards and boxes in winter. Bullock feeding is not looked upon as a profitable business, and cattle have come to be considered a necessary evil, as manure-heap makers.

The horses, which are of a strong useful class, lie out in an open yard summer and winter, without a single bit of roof shelter.

They are fed on green food carted into the yards in summer, and on steamed wheat straw chaff in winter.

By a simple arrangement steam from a portable engine, which does the chaffing and other work, is conducted in pipes through the chaff heap in the barn, and a sufficient quantity is forced into the heap to set up fermentation.

Since this system has been adopted Mr. Paine claims that his horses have been entirely free from colic and other troubles, while they are, at less expense, kept in good condition and fit for their work.

There is a silo on the farm, and every year silage is made and is said to be most useful.

15. *The Farm of* Messrs. Estaugh & Wilson, *Butley Abbey, Suffolk.*

This extensive holding, the property of Lord Rendlesham, is situated on the Suffolk coast, 10 to 50 feet above sea level, with an annual rainfall of some 20 inches. The soil varies very much; part of the arable land is rich good loam, part medium light land, and the remainder very light sand.

There is a proportion of good grass land, perhaps 200 acres, another 100 acres of fair grass, and some 1,800 acres of poor sheep walk. The entire holding is over 2,800 acres in extent, and the present tenants came into possession at Michaelmas, 1891, under an eight years' lease. The conditions under which they farm are liberal, free sale of produce being allowed for the first seven years, and freedom of cropping for the first six.

The following table gives the extent, rent, labour, &c.:—

Arable	Grass and sheep walk	Rent	Rates	Labour
acres	acres	£ *s.* *d.*	£ *s.* *d.*	£ *s.* *d.*
710	2119	650 0 0	98 3 11	1132 0 0

No artificial manures are used, and no statement was made as to amount expended on cakes, meals, &c. The impression given was that, in the matter of feeding-stuffs, the farm was self-sustaining.

Although there is a considerable extent of light land, part of it very poor sand, there are two to three hundred acres of good soil on the lower part of the farm, where splendid crops of all sorts were being grown.

Part of the good grass land is mown every year, and a portion of the marshes is grazed or mown, as circumstances require. Some of the low-lying land adjoining the marshes is being sown down to grass, the landlord providing seeds but stipulating that such fields shall not be ploughed out.

The tenants are also sowing down part of the wheat-growing land at their own expense. Some fields formerly sown down, but full of weeds, are being ploughed up to be bare fallowed, cleaned, and sown away again.

A large quantity of hay is made, and during my visit a stack of superior clover hay was being delivered, having been sold at 6*l.* 10*s.* per ton. There is a wharf on the farm and a road was being made to it, good material being plentiful on the higher portion of the farm.

There were on the farm

50 horses.	1000 sheep and lambs.
60 cattle.	And 250 pigs.

Good heavy horses are bred, and at two years of age they are worked half time, and go into the regular teams at three. This allows a draft of seasoned horses to be sold annually.

With the exception of a few cows the whole of the cattle were being fed in boxes on mangel, hay, and meal. About 100 cattle are annually brought in and fed in well-arranged comfortable boxes.

The sheep stock receive great attention. The ewes, all pure-bred Suffolks, are put to high class Suffolk rams. At the time of my visit the lambs were being fed on mustard, while the ewes were drawn off daily to range on the poorer lands. A flock of shearling sheep were being fed on lupins in one of the light sandy fields, as a preparation for turnips to be sown on the flat.

Pigs are bred and fed on the farm, an outlying set of farm buildings being entirely taken up with this stock, which the tenants hold is a paying one, although no figures were given.

Considering the extent of this holding and the fact that there is a large breadth of really good land, the rent may seem an easy one, but it must be borne in mind that the game belongs to the landlord, the farm having been taken with a clear understanding on this point.

16. *The Farm of* Mr. George Walker, *Hackeston, Wickham Market, Suffolk.*

This is a beautifully farmed holding, belonging to Lady Huntingford. It is 80 to 90 feet above sea level, and the annual average rainfall is given at 27 inches. The following table gives the extent, &c.:—

Arable	Grass	Rent	Rates	Artificial manure	Cakes, meals, &c.	Labour	Labour per acre
acres	acres	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
246	64	221 0 0	30 6 6	92 17 0	360 9 0	443 10 0	1 7 3

Besides the feeding-stuffs bought, grain grown upon the farm to the value of 106*l.* 14*s.* was consumed last year. It may also be stated that the labour bill has been much reduced, and was last year about 47*l.* under the average of former years.

About one-third of the arable land is heavy clay, one-third a good loam, and the balance a rather light sandy soil. The four-course shift is strictly adhered to, the rotation being wheat, barley, and roots, a fourth each, with one-eighth clover and one-eighth peas and beans. A fresh agreement was entered into last year by which the tenant is allowed freedom of cropping on certain fields adjoining the woods and plantations in which game is very plentiful. He is also allowed to sell one-half the hay and straw grown on the farm, on condition that the proceeds be spent on manures or oilcakes.

There were on the farm

15 horses.
20 cattle.
584 sheep and lambs.
27 pigs.
And 30 head of poultry.

The horses were suitable for the farm, and the cattle kept were not looked upon as directly profitable, but were needed to convert the straw into manure.

The sheep are the important stock on the farm, and receive much attention and care. From a Suffolk ewe foundation the flock has been crossed, and they are now large framed, heavy sheep.

The present crop of lambs are by Oxford Down tups, and are a beautiful level lot. They are run off from their dams every morning, and fed on a rich pasture with an allowance of bran and cake till noon, when they join the ewes on a poorer pasture.

Mr. Walker makes a point of feeding the ewes well from the time they are half gone in lamb, believing he gets stronger lambs, while his ewes are healthier.

A few fat lambs are annually sold, and the balance of the lot are sold as stores in June.

The following is a statement of the net receipts for sheep, after deducting amounts paid for stock bought in:—

	£ s. d.		£ s. d.
1889–90 . .	402 12 8	1891–92 . .	365 17 3
1890–91 . .	434 2 2	1892–93 . .	324 11 5

The pigs are all bred on the farm, and from a detailed statement of the sales for the past four years the net average income amounted to 86*l.* per annum.

All the crops on the farm were good, the wheats and clovers exceptionally so. Long stretches of wire-netting were in use to protect the crops from game and rabbits, but after all there was considerable damage.

Many of the young mangel plants were eaten off, leaving the land bare in parts of the field. Mr. Walker remarked that he had been born under game, and grown up with it, otherwise he could never have submitted to the amount of damage annually done.

For the past four years the receipts for grain were—

	£	s.	d.		£	s.	d.
1890 . . .	1,059	5	0	1892 . .	728	15	10
1891 . .	863	8	8	1893 . .	503	11	6

17. THE COLONIAL COLLEGE *Farms, at Hollesley Bay, Suffolk.*

This is a large holding, the extent in round numbers being 1,000 acres arable and 600 acres pasture, with a considerable acreage under timber, and a further extent returned as heath.

The subsoil is red crag on the London clay, the soil is good, and the annual rainfall from 19 to 20 inches; the altitude above sea level is 70 feet.

The farm is the property of the College, and is generally cultivated on the four-course system.

The College charges itself 21*s.* an acre rent, including tithes.

About two-thirds of the grass-land is grazed, and a third mown for hay. Cattle and sheep grazing on the marshes (the farm is close on the coast) consume large quantities of artificial food, this, even on the portions mown, being considered sufficient manurial return for the hay taken off.

At the time of my visit the crops all looked well, the land was clean, and the management evidently good.

There are seven different sets of buildings or homesteads on various parts of the farm. These, as far as possible, are assigned to the different kinds of stock.

The stock consists of

48 working horses.	490 lambs.
20 colts and fillies.	500 grazing sheep.
50 cows.	100 pigs.
300 breeding ewes.	And about 600 head of poultry.

The cattle stock vary much in numbers according to the season.

There are several superior pure bred Suffolk mares, and the young stock from these are very good, great attention being given to the sires used.

The dairy is managed so as to meet the requirements of the College as a dairy school. Butter and quite a number of the different kinds of cheese are made, so that the students may practically understand the different systems. Milk is sold so far as needed by neighbours and people employed on the estate.

The breeding sheep receive particular attention, and are a level good lot of pure Suffolks. They are managed in the usual way of the district, every care being taken to keep the lambs well.

About 1,700*l.* a year is paid for feeding-stuffs, cakes, corn, &c., and some 300*l.* worth of home-grown grain is annually consumed on the farm. The labour bill in 1893 was 2,160*l.*, about the usual amount. This sum does not include a large annual expense incurred for gardens, workshops, &c., which is not charged to the farm.

A stretch of nice working land is set apart and cut up into garden plots for the students. Much interest is evidently taken in these plots, students vying with each other in the neatness of their work, and the crops their individual plots produce.

Workshops are provided and every opportunity is afforded the students to practically learn the different trades.

18. *The Farms of* Mr. John Symonds, *Thistleton Hall, &c., Burgh, near Woodbridge, Suffolk.*

To anyone who has had to farm clay land, a visit to Thistleton Hall and the neighbouring occupations could not fail to be most interesting. With the space at my command it is quite impossible to do justice to the management and work seen during my brief visit. Situated in the heart of a country which seems but poorly farmed, Mr. Symonds's land, and the condition it shows, are most striking. Driving along towards the farm thistles seem to be the principal crop in the many fields, as they overshadow, in a very decided way, whatever crops may have been planted. On entering Thistleton Hall farm the hedges, the crops, and their freedom from weeds are at once striking and impressive. Large square-shaped, clean fields, with low, well-kept hedges, at once attest the careful attention to detail and management which are equally evident on closer inspection. I speak strongly in this case, being quite aware of the difficulties to be met in attempting to keep a strong clay land farm up to the mark, in these days when grain makes such a miserable price.

Thistleton Hall and Heaths farms have been in the occupation of the family, as tenants, from 1806 till about 1874, when Mr. John Symonds bought them. Their extent is 350 acres, and adjoining them, and leased from several proprietors, are Old Tom, Red House, Hatherley, and Church farms. The total extent under the holding is 650 acres.

The soil is a strong clay loam, with a whitish clay subsoil, of a marly nature. In such a season as last, when the drought caught the land in a sodden state, full crops of any sort were out of the question, and failures of such crops as clovers and other small seeds were a certain consequence. In ordinary seasons this kind of land can bear drought well if a good tilth has been obtained and seeds are put in with sufficient moisture to start them. The altitude of the farm is from 150 to 200 feet above sea level, and the average rainfall is about 26½ inches. The whole of the arable land on Thistleton Hall and Heaths farms has been drained with 2 inch pipes about 3 feet deep and 8 to 9 yards apart. All these drains are shown upon a map which is most interesting through its absolute completeness; not a single acre but has been drained, and the plan shows catchwells at all the junctions for the collection of sediment and as facilities for periodical inspection. The hired land held under a thirteen years' lease, expiring in 1901, is some 300 acres in extent, and is held from three different landlords. Much of this land has been drained by the tenant, hedges have been stubbed out, and field fences have been straightened. The conditions of the tenancies are to farm as the tenant may see fit, but in "a husbandlike manner," until the last year of the tenancy, when "the land must be cultivated according to the four-course shift." The usual Suffolk customs are meant to apply at the termination of the tenancy.

In the statement made by Mr. Symonds the tithe rent is given on the whole 650 acres, and the sum named, 140*l.* 4*s.* 4*d.*, is I expect pretty evenly spread over the whole extent of farming. This being so, and putting the rent of land owned at the same as that rented, namely 25*s.* per acre, the following table gives the annual expenses, &c.:—

Arable	Grass	Rent	Rates	Artificial manures	Cake, corn, &c.	Labour	Labour per acre
acres	acres	£ *s.* *d.*	£ *s.* *d.*	£ *s.* *d.*	£ *s.* *d.*	£ *s.* *d.*	£ *s.* *d.*
570	80	952 4 4	74 12 7	200 0 0	1,142 6 1 and £560 worth of home grown grain	1,022 10 0	1 13 0

Linseed cake is bought with a guarantee as to purity ; very little cotton cake is used ; the whole of the beans grown upon the farm—generally about 50 acres—are used for feeding, and latterly a considerable quantity of the wheat. Maize is given with beans as feed for the horses, and with other foreign grains it is used as pig food.

In ordinary seasons 400 to 500 shearling sheep and about 60 bullocks are fed during the summer to go out as fat before harvest, when 500 to 600 lambs are bought, but the failure of the root crops through last year's drought entailed empty bullock yards and sheepfolds. Any practical farmer can fancy how this state of matters must upset the whole economy of such a holding. At the time of my visit there were

51 horses.	1 cow.
11 bullocks.	And 206 pigs.

Pigs are looked upon as profitable stock, and are fed in dry, warm, well-littered yards.

The land is too heavy to carry the feeding sheep in winter, and convenient folds are made for them near the straw stacks and where they can be allowed to run out on some of the grass land. These folds are kept littered and dry, and in wet seasons sheep are often fed in the bullock yards.

The four-course system is the one generally adopted, and in fact it has never been departed from except that during the past six years a portion of the fallow shift has been put to mangel seed growing, a crop which has proved a paying one.

19. *The Farm of* Mr. S. R. Sherwood, *Hazlewood, Saxmundham, Suffolk.*

This farm, on the River Alde, near the coast, is from 20 to 60 feet above the sea level. The annual rainfall is put at 24 inches, and the soil is generally light, on a sandy subsoil. The farm belongs to T. Vernon Wentworth, Esq.; the present occupier has held it since 1881 as a yearly tenant, under the usual Suffolk customs. He has perfect freedom as to cropping and sale of produce.

His payments, &c. are as under:—

Arable	Grass	Rents and tithes	Rates	Manures	Cake, corn, &c.	Labour	Labour per acre
acres	acres	£ s.	£ s.	£ s.		£ s.	£ s.
272	193	347 0	34 0	100 0	£700 and £155 worth of home grown grain consumed	597 10	1 10

Of the grass land, over 90 acres are poor, almost barren, sheep walk, mostly covered with furze, and the remainder, low-lying meadows, cannot be termed superior quality, although evidently it produces a considerable quantity of rather rough food for stock.

About a quarter of these meadows is annually mown for hay.

The usual four-course system is generally pursued on the arable land, the exception being some of the lighter fields, and these, if the layers are a thick good plant, are allowed to lie down two or three years.

Being light land it is much given to the growth of annual and surface weeds, while twitch seems a prevailing weed in the neighbourhood. Mr. Sherwood's farm is free of twitch and all through it is clean and well farmed.

The crops generally looked well, but one could easily see that drought in summer would tell very hardly on such land. The stock consisted of—

12 cart horses.	432 lambs.
5 cart mares with foals.	60 shearling ewes.
1 Hackney mare and foal.	50 fattening sheep.
5 cows and 3 calves.	7 pigs.
11 bullocks fattening.	140 hens and chickens.
278 ewes.	

There is an idea of increasing the cows and adopting milk-selling, but at present only home wants are considered in the matter of milk and butter.

Eleven bullocks were being fatted in the yards. These had been bought in forward condition, and as a weighbridge has been erected on the premises everything bought and sold is carefully weighed. The average cost of the lot was 29*s.* 4*d.* per cwt. on the farm. The weighing machine is very cleverly arranged, while cattle and sheep weighing is the most important work to which it is devoted, and strong substantial pens are so fitted as to make this work easy; carts can be backed on and weighed in a simple and easy manner. Mr. Sherwood, like all others, encountered strong opposition in his determined resolution to buy and sell by weight, and he is to be congratulated on his practical system of work in this direction.

The sheep are looked upon as the rent payers and great attention is devoted to them. A pure-bred flock of Suffolks are kept, and as an evidence of their quality it may be stated that Mr. Sherwood has gained three silver cups for his flock; one for a flock of 400, one for 250 to 400, and one for 100 to 250. The cup for the 250 to 400 flock was won two years in succession in 1892 and 1893.

No one can see the flock without being impressed by the evenness of the sheep, while the number of lambs is evidence of the careful management of the ewes.

20. *The Farms of* Mr. Alfred J. Smith, *Rendlesham, Woodbridge, Suffolk.*

As tenant under Lord Rendlesham and the Marquis of Bristol, Mr. Smith occupies the wide extent of 1,778 acres.

Of this some 600 acres are returned as heath and waste of little agricultural value. Of these lands nothing more need be said, in this short report, than that they are useful at certain seasons of the year and are convenient as an outrun for sheep.

Volumes might be written describing the eleven hundred and seventy odd acres, the balance of Mr. Smith's holding. On every hand one sees evidence of much natural ability and practical common sense being brought to bear on the management of the farm, where the most minute details receive careful attention.

The subsoil is given as London clay. The soil varies from a rather stiff loam to gravel and poor sand. The altitude is put at about 77 feet, and the rainfall at about 25 inches.

Rendlesham farm has been in Mr. Smith's occupation 28 years, and Eyke farm 20 years, under yearly tenancies.

656*l.* 9*s.* is paid as rent and tithes for Eyke farm, but as this holding includes a public-house and 11 cottages, it is difficult to arrive at the actual agricultural rent. I, however, put the whole in the following table, and allowance must be made for the above sub-tenancies as well as for 9½ acres of land also sublet, and one must remember that something over 600 acres of the total extent of land given are almost worthless:—

Arable	Grass	Heath and waste	Rent and tithes	Rates	Artificial manures and feeding-stuffs	Gross labour	Labour per acre
acres	acres	acres	£ s. d.	£ s. d	£ s. d.	£ s. d.	£ s. d.
885½	286	606½	1,174 7 1	117 14 0	1,670 7 10	1,786 3 5	1 10 0 about

It must be borne in mind that the cost of labour per acre is calculated excluding the heath and waste land, and in the matter of grass land 50 acres of newly laid land is included.

The system of farming on the two holdings is somewhat different, and it will be necessary to speak of them in this respect separately.

Rendlesham farm is cultivated on the four-course shift, the rotation being wheat, roots, barley, ½ clover and grasses, and ½ beans, peas, or white clover seed.

Of late years some 200 acres of the poorest land has been allowed to lie in such grass as it can produce, as it was unable to contribute its share towards the labour and other expenses.

In describing the working of this farm Mr. Smith said: "My practice is to make my fallows as soon as the wheat (or oat crop now largely grown in the place of wheat) is off. I breed many foals, and by taking the oldest of these off the mares in August, I have their dams and the two and three years old colts, coming off the grass land, to put to work on the stubbles at a time when, in most years, fallows can be made. Of course couch or spear grass is forked out of even the cleanest of the stubbles, and all are either drilled with trifolium or rye and tares, &c.

"As soon as these are fed off the following spring, the land is directly cropped with mangel, swedes, turnips, or maize."

Such is the ordinary system, and he further remarks, "The very poor lands are now growing lupins, and will make a considerable amount of sheep feed in the autumn; on the whole worth as much as a white turnip crop."

On the Eyke farm the rotation is "⅕ wheat or oats, ⅕ roots, ⅕ barley, $\frac{1}{10}$ peas, $\frac{3}{10}$ clover and grasses, $\frac{2}{10}$ of which lays two years. The idea of this course of cropping is that nearly ⅕ of labour, horse and manual, is saved. My wheat or oat crop never follows peas, and I have a much larger area of clover and grasses for my flock. Moreover the peas are never planted on the same ground at a less interval than 10 years, as the portion selected for peas is that on which the two years' grasses were grown."

If grasses fail the second year, cole-seed or mustard takes their place.

A considerable extent of this farm is also sown away to lie five or more years.

About one-fifth of the grass land is intended to be mown annually but, where so large a flock of sheep is kept, dry seasons make a deep inroad upon the meadows, and very little old land hay is made. When mown, the grass-land is manured; about 15 cart-loads of farmyard manure are applied, and during frosts, in winter, the low meadows get a covering of from 40 to 50 loads of what is termed crag, a soil that contains much shell and consequently phosphates.

At the time I visited the farm there were

91 horses.	855 lambs.
123 cattle.	100 shearling ewes
580 ewes.	19 pigs.

And about 200 head of poultry.

The horses are all Suffolks, and the Rendlesham stud holds a very high position. There are 12 stallions: five of these are travelling, three are two-year olds, and four are yearlings.

There are 30 mares and 13 foals, one mare having died.

Mr. Smith's stallion Wedgewood, 1749, was winner of the gold medal at the Windsor Show in 1889, and has been the sire of a very large number of prize-winning stock.

The cattle are pedigree Red Polled stock, and consist of—

49 cows.	15 young heifers.
8 bulls.	And 15 calves.
36 heifers.	

With regard to the cows the object in view is milk production, the milk from one dairy being sent direct to London during the winter, and to the coast watering resorts during the summer. That of the other is retailed in Woodbridge.

A milk record is carefully kept, and the first six cows, in 1891, gave 39,688¾ pints, in 1892, 38,369¾ pints, and in 1893, 35,487½ pints, or an average of 6,308 pints per cow per year. As to the system of rearing the calves, Mr. Smith says: "The calves are allowed to suck their dams till they begin to eat, the herdsman, after a few days, robbing the cows before they are allowed to suckle, night and morning, leaving only a scanty meal for the calves, which have always an allowance of fresh dainty food. The more of this they eat the less mother's milk the stocksman leaves to them, until they are entirely weaned. This may be a primitive method, but, on the whole, I find it answers."

Sheep, as will be easily understood, form an important part of the live stock. A registered flock of Suffolks is kept, and a beautifully level lot they are.

The usual course of management pursued is to send the 600 ewe flock, soon after Michaelmas, for a month's run on the heavy land stubbles in parishes some distance from home. They are then brought home, divided into lots, and sent to the marshes near the sea. After three or four weeks they are again put together, on the heath land, with a small fold of white turnips per day till Christmas. If roots are short they get a little cake, corn, or malt culms. The allowance of artificial food is gradually increased till lambing time.

Fresh lambing yards are erected annually in selected fields, the shelter fences being constructed of furze tied up in faggots and set on end, and having a foothold in the soil.

Thirty or 40 acres of rye is always provided for the earlier feed for the ewes and lambs. This, with the meadows, young layers, and 15 to 20 acres of rye and tares reserved for night folds with the lambs running forward, is expected to carry the flock forward to May 1. It may be stated that during the entire spring all the twin lambs get cake. Trifolium, drilled on the wheat and oat stubble as soon as the crops are off in the autumn, is expected to supply the flock with a fresh fold each day till June 1, when spring tares and oats mixed are ready, and able with the help of artificial food or corn to carry the flock till weaning time.

Care is taken to have a supply of mangel all through the early summer. These are spread in the forward fold so that the lambs get the first bite, but about one half of the roots are left by the lambs and cleaned up by the ewes.

I have gone into detail to some extent as to the management of Mr. Smith's flock of sheep, in the hope that I may have been able to give sheep owners in other parts of the country some idea of the system more or less pursued in Suffolk and, in fact, in East Anglia.

Although only 19 pigs were on the farm in June, a number are bought in about September each year, and fed off by April.

A mixed breed of poultry is kept, about 100 head at each farm. A larger number Mr. Smith considers would not be profitable.

One industry must not be overlooked. Bees are kept, and the hives are taken to the white clover fields where, in a good season, honey is quickly made, and the seed returns of the clover are much increased. This is only one of the many instances of careful forethought and management everywhere so evident at Rendlesham. The relationship existing between the master and the men on the farm was a most pleasing feature, and one that must largely contribute to the general thoroughness of work everywhere seen.

I was furnished by Mr. Smith with some interesting returns of the gross value of corn grown on his farms in the four years 1880–83 and the four years 1890–93. These I give:—

		£	s.	d.
1880, 1881, 1882, 1883	Total value of grain and seed on both farms: Average per year . . .	3,875	5	$1\frac{1}{2}$
1890, 1891, 1892, 1893	Total value of grain and seed on both farms: Average per year . . .	2,559	8	$0\frac{1}{2}$

Conclusion.

In conclusion I may state that I put the following question in writing to the twenty gentlemen whose holdings I visited:—

"What expedients, if any, are being adopted to meet the present agricultural depression in your neighbourhood?"

Ten gave no replies to the question; the others answered as follows:—

From Cambridge:

1. "Rents have been reduced 50 per cent. Sow the poor lands down with grass, sainfoin, or lucerne, which would lessen the cost of horse and manual labour; also, if meat is making a good price, feed cattle, sheep, and lambs, with one-third wheat (coarsely ground) with other mixture."

From Norfolk:

2. "The light lands are going down to sheep walks. Barley and oats are grown in place of wheat, expenses are cut down, implements and machinery are not purchased so freely as they were some years ago."
3. "The most is made of all produce from the farm and no waste is allowed; less corn is grown and more stock are grazed."
4. "General reduction in rent. Keeping labour bill as low as possible. In some instances, cross cropping; selling hay and straw, horse breeding, more especially Hackneys."

From Suffolk:

5. "Every endeavour to produce more, especially mutton and beef."
6. "Large percentages returned on rent days."
7. "Rigid economy at all points."
8. "Reduction of rents; selling hay, straw, and roots."

9. "Landowners have reduced rents, the acreage of wheat sown is much less, barley and oats being substituted with doubtful advantage. Farmers appear to trust more to general all-round carefulness than to any heroic remedies for the present lamentable state of agriculture."

10. "We have gone to our landlords for reduction of rent. We have curtailed household expenses in many ways, and have undertaken anything outside the farm that promised to bring in revenue. We all work,—my son, the only one of eight now at home, does the work of those on the farm of his age; next year he must move up. We have kept our labour bill as low as possible, and many operations tending more to neatness than profit are now discontinued. We have substituted oats in the room of wheat to a large extent, and have abandoned the cultivation of a great deal of the poorest land. Year by year we are compelled to admit that the high scientific, costly farming of 25 years since will not answer on our uncertain description of land under existing circumstances and prices."

These are the answers given to a question which seems an all-important one, so far as agriculture is concerned.

Although in the districts I visited derelict farms are almost unknown, yet in a neighbouring county they are quite common, and whole districts are going out of cultivation.

What the end is to be cannot at present be seen. It is quite evident, however, that, apart altogether from such exceptionally well-managed farms as those I had the pleasure to go over, the general condition of the farms in all districts where corn is looked upon as the mainstay has been, if slowly, yet surely declining.

Nor is this to be wondered at. The income from corn sales is now one half what it was ten years ago, beef is cheaper, mutton is cheaper, wool is lower, and so are all the less important products of the farm. On the other side, while we have manures, feeding-stuffs, and machinery lower, and in most cases rents reduced, yet the actual working expenses of the farm, the rates and the taxes, amount to as much as, if not more than, when products realised nearly, if not quite, twice as much.

It may be poor consolation for us, as farmers, to know that we are not so badly off as our brethren in those foreign and colonial countries whose products have demoralised our markets, yet it seems to many that foreign supplies must have a stopping point, and unremunerative production must cease.

Dark as the prospects may now be, we may be nearer better farming times than anyone imagines. Such farms as I inspected —full of manure, clean, and in good heart—may, and it is to be sincerely hoped that they will, prove veritable gold mines to their enterprising and intelligent occupiers when the change takes place.

ROBERT BRUCE.

Darlington.

THE INFLUENCE OF DEXTER CATTLE ON OTHER BREEDS.

Indian agriculture is a subject of continuous interest to England. It affords many difficult problems, on account of the widely different conditions under which it is carried on. Much agricultural knowledge has been brought to bear upon it within recent years, but it is usually admitted that a good deal remains to be done. In a land where the cow is held sacred, cattle-breeding must always be a matter of interest as well as of importance; consequently it is not surprising that from time to time endeavours have been made to improve the native breeds of cattle. As far back as 1832 a crossbred Indian bullock was exhibited at the Smithfield Show, and attracted considerable notice. In this case, as in other instances of crossing with English breeds, the typical hump over the shoulders common to Indian cattle was bred out. Notwithstanding various attempts to improve the breeds on their native runs, it can hardly be said that the Indian cattle have been largely influenced by breeds imported with that view. It may be that these breeds have not "nicked in" with the native breeds, or that the crossbred animal has not thriven sufficiently to warrant the more extensive adoption of breeds not accustomed to the circumstances of soil and climate which prevail in India—varied even as these are in that great country of mountain and plain.

That the cattle of the country should not have undergone greater transformation is the more striking when it is borne in mind how rapidly the cattle in the widely different climates of North America and the Argentine have been influenced by the pure breeds of England. Parts of the Argentine are as hot as some of the districts of India, so climate can hardly be held accountable for all. The prejudices and apathy of the natives are doubtless reasons why the animals have not been improved, for the natives of India appear far less inclined to place themselves in direct communication with the English markets than do the smart agriculturists of the New World. Many other causes might no doubt be adduced to show why the improvement has been so slow; but probably one of the main reasons why the crossing which has been practised has not spread more rapidly is the want of adaptation to circumstances on the part of the heavy breeds of England. Given even so hot a climate as that of Northern Queensland, the Shorthorn thrives on its rich pastures; so, too, will the Hereford and other heavy breeds; but these are essentially the breeds of rich plains, and not of sparsely pastured mountains, forests or jungles. They have been developed by careful selection and on rich diet into the finest breeds in the world, and it is no more a slur on their capabilities that they do not necessarily adapt themselves to some less advantageous circumstances of feeding, than it is on the Lincoln sheep that it does not thrive so well on a thin-skinned turf growing on a hill slope, as it does on a rich lowland pasture; or that a forest breed does not maintain its type and keep sound on its feet when brought to the lowlands. It therefore appears desirable that small native breeds of cattle, accustomed to hard conditions of life, should be mated with animals which possess

Fig. 1.—Zebu Bull in the Zoological Gardens, Dublin.

superior points acquired or maintained under somewhat similar conditions of hard living. Unfortunately, such breeds are not common, and there is a further difficulty in that they may not "nick in" with the breed they are desired to improve; but, on the other hand, the inferior points in the two breeds may be accentuated, and harm, rather than good, result. The breed used to improve the other must not only be superior in appearance and in thriving properties, but must be prepotent, so that it shall endow the inferior with its good points. This brings us face to face with another difficulty: the hardy hill breeds which have been improved by careful selection are rare. The breed required to cross with native cattle must be good milk producers, as well as good meat producers, for among some castes the meat is of secondary importance to the milk. In the course of this article we hope to draw attention to one breed of small cattle possessing many of these good characteristics which should recommend it to those who are interested in the development of Indian native breeds.

In the Zoological Gardens at Dublin is an animal of great interest, in that it is a cross between a Zebu bull and a Dexter Kerry heifer. This crossbred heifer shows how very prepotent the Dexter is over the Zebu, for at first

FIG. 2.—Zebu-Dexter Heifer in the Zoological Gardens, Dublin.

glance it appears to be almost a perfect Dexter. The hump has disappeared, and the line from the shoulders to the setting of the tail is perfectly straight, thus at once doing away with two inferior characteristics in the Zebu. The portrait of the Zebu bull shown in fig. 1 represents an animal with a short goose-rump, and with the tail set on several inches below the line of the back; whereas, that of the heifer cross (fig. 2) shows how thoroughly this great failing has been made good, while the buttocks are both deeper and fuller. It would be difficult to realise a greater transformation in the hind-quarter; that portion, where the best meat on the animal lies, has been developed in the first cross.

The heifer is well ribbed, and thick through the heart; the falling away behind the shoulders so common even in otherwise well-bred animals is not present, for as the deficiencies of the Zebu's hind-quarters are made good by the Dexter, so the deep shoulders of the Zebu seem to have to some extent been reproduced in the cross, although the hump has gone. The head is rather remarkable; the coarse, double-turned horns of the Zebu have disappeared, and in their place are the slightly curved, upright horns of the Dexter, whose chief fault in this case is that they are somewhat close together at the base. The head is well shaped, and gives one an impression that the animal is a cross between a Dexter and a Jersey. This is due to the fact that the muzzle is almost identical in colour and marking with that of a Jersey. However, the muzzle of the Zebu bull has this mark also, and this is the only point in the whole cross in which the Zebu has strongly identified itself. This heifer is one of three animals of the Zebu-Dexter cross which were bred in the Gardens, one of the others having died, whilst the third was sold when young, all trace of it being lost.

The Zebu itself is not devoid of good points, for the offal is not abnormally heavy, and the tail is beautifully fine. The coarseness of the horn is one of its chief features of ill-breeding, though its throatiness is not a good point; but altogether the animal does not possess the frame of a milk-producing or beef-making beast. It has some points similar to the Jersey beyond that of the muzzle, for the face is fine, and the limbs are deer-like. The bull is about the same height at the withers, except for the hump, as the heifer cross—42 inches. The Zebu in its native state, however, varies considerably in height, being much bigger in the northern provinces of India than in the southern. The Dexter, too, varies, for, whereas a highly-bred Dexter heifer is prized greatly if it does not exceed 40 inches, it is found that under more generous treatment this height is considerably increased. The Zebu is one of the oldest breeds of cattle, for the most ancient drawings depict the animal as now found.

The origin of the Dexter, moreover, is a matter of conjecture, though it is probable that it cannot be classed among the really ancient breeds. It is locally supposed that it established itself in Kerry through being part of a cargo of animals shipwrecked on the coast; but whether they came from Spain, from the Highlands of Scotland, or from one of the several other countries suggested, has never been proved. The breed has existed alongside of the Kerry breed, and has in many cases become merged with it, but it is not until the early part of the century that there is any record of special pains being taken to preserve the type. Mr. Dexter, agent to Maude, Lord Hawarden, is credited with having taken upon himself to establish the breed by careful selection. He recognised the valuable characteristics it possessed both as a milk-producing and beef-making animal, and by his endeavours and example the type was preserved from total extinction. The breed being, as a rule, in the hands of small farmers, after his death little pains were taken to keep it pure, and it seemed probable that it would become extinct, when, some twenty-five years ago, Mr. James Robertson was attracted by it, and again brought it to the notice of breeders. He searched all parts of Kerry for the best specimens; and, by opening up a market with England for the breed, aroused an interest in it which has been of the greatest value to the breeders in that hilly county. Since then, by means of its own undoubted merits and the formation of the Herd Book, it has been brought prominently forward, until, perhaps, at the present day there is no breed of cattle growing more rapidly in favour, or for which the price has increased so much during the past few years. Heifers less than three years old, not 40 inches in height, at their first calf frequently give daily three gallons of milk of good quality, with no food but that obtained from a moderate pasture. The frame is compact, and the loin, ribs, and hind-quarters are well developed, affording meat of excellent quality in those parts most appreciated by butchers. The flavour of the meat is so good that, taking into consideration its size compared with that of other breeds, it has been called the Southdown among cattle. For the sake of comparison a portrait of a Dexter heifer, *My Queen*, with which Mr. Robertson won several prizes, is given in fig. 3. This heifer, barely 40 inches in height, at her first calf gave over three gallons of milk per day for a long period, although only three years old.

The early effort to establish fixity of type, together with later endeavours, has resulted in producing a breed which possesses that valuable characteristic of pedigree animals—prepotency, or the power of transmitting its distinguishing properties to animals of other breeds. The prepotency of such breeds as the Shorthorn, Hereford, and others carefully bred for a number of years, has had a marked effect on the less carefully selected animals in all English-speaking countries.

We have seen how strongly the Zebu has been influenced. As the Zebu is a poorly-bred animal, it is not surprising that such a breed should undergo considerable transformation when crossed with a well-bred one, for it is an accepted rule of breeding that the less carefully selected animal yields readily to the better bred one. As showing how prepotent the Dexters are, even with animals on which great care has been bestowed for a long period, we give in fig. 4 an illustration of a Shorthorn-Dexter cross. The animal here shown was bred by Major Barton, of Straffan, who possesses an old-established herd of Shorthorns of considerable repute. Noticing how well the two breeds mated, he set to work to produce a cross-breed possessing its own fixity of type, which should combine the valuable properties of the two breeds. With

FIG. 3.—Dexter Heifer *My Queen.*

the animals thus bred he has taken several prizes, and he has on his place animals the result of several crosses. The one here illustrated, *Fairy King*, is a yearling; its great-great-great-granddam was a pure-bred Dexter, which was crossed with a Shorthorn, and the offspring of the succeeding generations have been systematically mated with Shorthorn bulls. Both breeds are traceable in *Fairy King*, the Shorthorn having made considerable impression on the head, but the legs and hind-quarters are those of the Dexter, and generally there are indications throughout of the influence of Dexter breeding. What is more important, the good characteristics of the two breeds have been retained. A better idea of the Dexter points in this animal is realised when the head and neck in the portrait are covered by the hand. As showing how much of the Dexter is in him, Mr. Robertson's Dexter bull, *The Parson*, is illustrated in fig 5, and an examination of these two portraits will, perhaps, show more clearly to what degree the Dexter type is preserved through the crossings which have resulted in the production of *Fairy King*, than could be

FIG. 4.—Shorthorn-Dexter *Fairy King*.

explained in words. The steers from similar crossing have proved themselves to be of excellent beef-making properties, and the heifers are equally good in the dairy.

As another instance of the value of Dexters for crossing purposes, an illustration of a Dexter-Jersey cross is given in fig. 6. This animal is one of several bred by Mr. Toler Garvey, who has made systematic experiments with the cross. Like some others interested in dairy breeds of cattle, Mr. Garvey began first to cross the Jersey with the Kerry, hoping thereby to combine the cream-producing propensity of the Jersey with the milking capacity of the Kerry, and at the same time to gain for the offspring greater hardiness than the Jersey possesses. This cross did not answer his expectations, as the breeds appeared antagonistic. He then tried the Dexter in the place of the Kerry, and has had reason to be well satisfied with the result. Mr. Garvey keeps careful milk records, and is thus able to see exactly how well suited the breeds prove when crossed. In a letter to me Mr. Garvey says, "These cows are

FIG. 5.—Dexter Bull *The Parson.*

good—not wondeful—milkers as to quantity, but excellent as to quality, producing from 10 to 12 lb. of butter per week. The pure bred Jersey calves are, as you know, very unprofitable to rear; but with this cross they are very good—quickly putting on beef, and that of excellent quality. So far I am well pleased with this experiment."

Another cross which has proved successful is that of the Polled Angus with the Dexter, but, as this is chiefly favourable from a beef-producing point of view, it is only necessary to make mention of it in passing.

Three crosses have now been illustrated, in all of which the good points of the Dexter show prominently, yet it would be difficult to find three breeds more widely differing in make. Although the Shorthorn ranks high as a milking breed, it is rather as a beef producer that the more highly bred specimens are viewed. The Jersey is essentially a milk producer, while of the Zebu it may be said that it is not particularly good in either direction. As the Dexter has shown its prepotency on two of the oldest established pedigree breeds, it can scarcely be a chance that the Zebu-Dexter heifer should have retained so much of the Dexter type. The influence of the Dexter is the more remarkable, as the

FIG. 6.—Dexter-Jersey Cross.

sire usually has greatest influence on the outward form of the offspring, but we have seen that in this case the Zebu bull has had but little effect.

Another feature in the crosses resulting from mating the Dexter with other breeds is that the size and proportions of the Dexter are to a great extent retained. This indicates that it is a breed which may, with reasonable safety, be put with those breeds which do not exist under the most favourable conditions with regard to pasture. A not-too-heavy animal results; it comes on both sides from breeds which have existed under unfavourable circumstances in respect to food and climate; and, although it is far superior in make to the Indian native animal, there is little reason to suppose it would rapidly deteriorate. The Zebu is frequently used for draught purposes, but there is no ground for suggesting that the Dexter cross would prove injurious in this respect, as it is both agile and handy, while its sturdiness denotes strength. It is also docile and possesses great intelligence.

Even such small breeds of cattle as the little "Pigmy" might reasonably be crossed with the Dexter, for from all outward appearances the two would mate well.

Having seen how well the Dexter crosses with breeds so widely different, it is, I repeat, fair to assume that it is not by an accident that the excellent little animal in the Dublin Zoological Gardens acquired its good points, or that the Dexter characteristics are so prominent. Were the same results obtained on all the cattle in India, the increased value of the animals would represent a very great sum. A sudden change throughout the whole country is impracticable, but it is quite possible to produce a considerable alteration within a reasonable period of time. It is at any rate worth while for those interested in the agricultural development of India to give a careful and systematic trial at convenient centres, in order to see how far success might be attained. Such matters, left to chance, or to the care of individuals with small scope, cannot realise the best results, and through want of proper guidance frequently prove to be labour lost. The illustrations which have been given speak for themselves, and show at least that there are sound reasons for a thorough trial being made; if such should be carried out there is a reasonable likelihood of great good being accomplished.

W. J. Malden.

Cardington, Bedford.

Official Reports.

QUARTERLY REPORT OF THE CHEMICAL COMMITTEE.

JULY, 1894.

1. Mr. James Norris, of Castle Hill, Blechingley, Surrey, sent for analysis, on May 18, a sample of Linseed-cake, 3 tons 4 cwt. of which he had purchased, and which was invoiced as follows:—

33 bags Round Italian Linseed Cakes made of linseed with natural admixture. 3 tons 4 cwt. 25 lb. at 6*l.* 18*s.* 9*d.* per ton = 22*l.* 5*s.* 6*d.*

Dr. Voelcker's report was:—

	May 24, 1894.	
Moisture	13·47	100·00
Oil	12·57	
[1] Albuminous compounds (flesh-forming matters)	27·94	
Mucilage, sugar, and digestible fibre	28·33	
Woody fibre (cellulose)	10·95	
[2] Mineral matter (ash)	6·74	
[1] containing nitrogen	4·47	
[2] including sand	1·89	

A cake not only impure by reason of the foreign seeds in it, but positively poisonous owing to the presence of a very considerable quantity of castor-oil bean.

The cake is also somewhat acid.

Mr. Norris stated that he had had a number of fat lambs die, and that on calling in Mr. A. Glover, V.S., Godstone Station, he examined a dead lamb, and said it died from eating impure artificial food. The vendors, when complaint was made to them, gave Mr. Norris a certificate of analysis stating that the cake was "pure." Fresh samples were drawn at the vendors' request, and submitted to a third chemist. Ultimately it was satisfactorily ascertained that the delivery of cake was a mixed lot, and that, while some of the cakes comprising it were free from castor-oil bean, others contained a very large proportion of this poisonous seed.

Altogether Mr. Norris lost over thirty lambs.

As Dr. Voelcker pointed out to Mr. Norris, castor-oil bean could hardly be considered as "natural admixture."

---

2. Mr. Norris also sent, on May 18, a sample of 4 tons of Linseed-cake which he had purchased from Messrs. Taylor & Pinnock, of 36 Mark Lane, London. This cake was invoiced:—

May 4. 43 bags linseed cake, 4 tons 1 cwt. 1 qr. 8 lb., 6*l*. 13*s*. 9*d*. per ton on rail = 27*l*. 3*s*. 10*d*.

a footnote reading :—

Fertilisers and Feeding Stuffs Act 1893.

The above cakes are warranted made from cleaned seed only, without admixture; but as such seed can neither be grown absolutely pure, nor made so by machinery, the cakes must necessarily contain a small portion of the natural impurities grown with the seed.

Dr. Voelcker's report was :—

	May 24, 1894.	
Moisture	12·62	100·00
Oil	10·15	
[1] Albuminous compounds (flesh-forming matters)	31·19	
Mucilage, sugar, and digestible fibre	31·75	
Woody fibre (cellulose)	7·85	
[2] Mineral matter (ash)	6·44	
[1] containing nitrogen	4·99	
[2] including sand	1·14	

An impure cake containing a great deal of weed seeds, chiefly spurry.

When Mr. Norris complained, the vendors wrote :—

36 Mark Lane, E.C. : May 30, 1894.

James Norris, Esq., Blechingley.

Dear Sir,—We have yours of yesterday, and have cancelled your order for linseed. We shall send down to-morrow, as arranged, to sample the linseed cake of which you complain, but it must be understood that we do not admit any liability in the matter. If you had any cause of complaint or claim you should have given due notice according to the Act within ten days after receipt of the goods or the invoice, whichever was the later, instead of which you paid for the goods on May 16 (some time after receiving both goods and invoice) without one word of complaint, and it is not till thirteen days after payment that you intimate that you are not satisfied. As you are aware, we do not sell cake to be "absolutely pure," as it must necessarily contain some foreign seeds grown with the linseed, and which cannot by any possible process be dressed out of it, and therefore the cake you have received may possibly contain some small percentage of "spurry" or other seeds, and this is distinctly expressed in our invoice; but if, as you allege, it does contain "spurry," this seed, we are advised, contains starch, and is quite harmless.

You seem to be under the erroneous impression that the trade is to be bound by anything Mr. Voelcker says or reports, and you must allow us to say that you have not proceeded at all in accordance with the Act, as if you were not satisfied with the cake you should have given us notice, that we may jointly take three samples and seal—one to be taken by us, one retained by you, and one sent to the County Analyst (not to Voelcker), and, if necessary, one to be afterwards sent to the Chief Analyst of the County, whose decision would be final. Not having acted in conformity with the Act, you have forfeited your right to claim.—Yours truly,

(Signed) Taylor & Pinnock.

Dr. Voelcker, in reply, pointed out that the limitation of ten days only applied in the case of samples analysed under the Fertilisers and Feeding Stuffs Act, and did not apply to samples submitted, as these were, and in respect of which it was specially provided that there might be a remedy at common law, though no proceeding of a criminal nature could be taken under the Act if ten days had been allowed to elapse.

Dr. Voelcker also called attention to the fact that the cake, being invoiced "Linseed-cake," should have been pure, whereas, so far as the sample he examined went, he reported further :—

The quantity of weed seeds is very large indeed; it is not a case where a little seed has been left in through not being able to be perfectly removed, but the cake is a positively impure and adulterated one.

---

3. Mr. Beville Stanier, of Hillhampton, Stourport, sent for analysis, on May 14, a sample of 4 tons of cake which he had bought as "Linseed-cake."

The letter from the vendor, containing the offer for purchase said :—

"Linseed-cake Square, seedy Polish, about 16 per cent. oil. 8*l.* per ton, cash monthly; 2*s.* 6*d.* ton less, cash with order. Free on rails Hull. This is really very good value."

The invoice read :—

4 tnos Square, seedy Polish Linseed-cake, about 16 per cent. oil, at 8*l.* net monthly as per quot. 32*l.* on rails Hull. Less 10 per cent. disc. cash per ret.

The vendor stated that he obtained the cake from Messrs. Alfred Denniss & Co, of Hull, and the invoice given to him described the delivery as "Sq. Polish Linseed cakes."

On arrival of the cake, Mr. Stanier noted that it was mouldy, and complained to the vendor about it.

After sending a sample to Dr. Voelcker for analysis, Mr. Stanier received the following report :—

May 17, 1894.

Moisture	13·64	100·00
Oil	10·34	
[1] Albuminous compounds (flesh forming matters)	21·19	
Mucilage, sugar, and digestible fibre	34·05	
Woody fibre (cellulose)	7 15	
[2] Mineral matter (ash)	13·63	
[1] containing nitrogen	3·39	
[2] including sand	9·75	

A cake adulterated with nearly 10 per cent. of sand, and containing, besides, a large quantity of weed seeds and starchy impurities. It is externally very mouldy, and is not a fit cake to be given to stock.

After Mr. Stanier had complained to the vendor, the latter received the following letter from Messrs. Alfred Denniss & Co. :—

Hull: April 12, 1894.

Dear Sir,—We are surprised at your letter. The small stone and small piece of wood are not samples of the bulk. These cakes are made by Russian peasants. We give no guarantee with them, except oil about 16 per cent. The small stone and small piece of wood were of course accidentally in the cake. We note a little mould on one of the samples; there was none when the cake left here. The close confinement in a truck under the hot sun must have produced this. We have opened the samples, and find them all right inside. We have made a usual delivery of this kind of cake. Any "rubbish" inadvertently sent we will take back, but if you examine the bulk you will find none.—Yours faithfully, A. D. & Co.

A request being made for the taking of fresh samples, this was done, one portion being sent to Dr. Voelcker, who reported as follows :—

B. Stanier, Esq. June 4, 1894.

DEAR SIR,—I have examined the further sample of cake. It is only fair to say that it does not contain nearly the quantity of weed seeds that the first sample did, though there is certainly too much for a "pure" cake. Nor is there as much sand, though the amount still reaches the high figure of 7¼ per cent. The cake is mouldy just like the first one, and because of the sand and the condition, is not a fit cake to give to stock.

If you crush the cake up and stir it in water you can *see* the sand settle down by itself. Outwardly, both samples look much alike, and I have kept some of the first one in case the vendors wish to have a piece of it.—Yours faithfully, J. AUGUSTUS VOELCKER.

Correspondence then passed between the vendor and Messrs. Denniss & Co.

Hull: June 4, 1894.

SIR,—Yours received. We have had the samples analysed (the samples you sent), and find they give 4 per cent. less ash than the analysis you sent, also 2 per cent. more oil. The cakes were free from mould when they left here, and looked a usual delivery for this class of cake, which does not keep well in warm weather. We have never had these cakes so low in oil before, and fancy the mould has something to do with the low percentage (mould which came on after delivery here); the sample you had analysed is either not a fair one or is inaccurately analysed.

We enclose copy of analysis of the pieces you sent us. We point out that we guaranteed nothing but oil. Any deficiency in this we shall be glad to pay for, allowance being made for the influence of mould, for which we are not responsible, for lessening the percentage. If you have any suggestions to make I shall be glad to hear from you.—Yours truly,

(Signed) A. DENNISS & Co.

[Copy.]

Chemical Laboratory, 11 High Street, Hull: May 30, 1894.

Certificate of Oil Cake from M. D. Penney, F.C.S.

Sample.—Square Polish linseed cake (several pieces) from Messrs. Alfred Denniss & Co.

Moisture	12·32	100·00
Oil	12·54	
[1] Albuminous compounds	24·81	
Mucilage, starch, &c.	35·22	
Woody fibre	6·03	
Ash	9·08	
[1] nitrogen	3·92	
equal to ammonia	4·76	

(Signed) M. D. PENNEY.

After Mr. Stanier had commented on certain differences that appeared between the analyses, and had inquired what compensation he was entitled to claim, Dr. Voelcker wrote :—

June 8, 1894.

As regards the difference of analysis between the two lots of cake, I am not at all surprised at this, and it in no way implies that the analysis of either was incorrect.

When you get cake of this impure nature, the impurity may be very unevenly distributed, and the delivery be really a mixed lot. Referring to the certificate of Mr. Penney sent you by the vendor, you will note, in the first place, that, whereas the cake was described to you as "*Linseed* Cake," it was called by Mr. Penney "Oil Cake"; also, there is no statement as to whether the cake was pure or not, nor reference to the mouldy condition it was in.

Again, though the ash is stated, the percentage of *sand* is not given separately. You would do well to write and ask for information on these points, as the certificate does not give them. As to any seeming discrepancy of analysis, this can soon be set at rest by your asking the vendor to instruct Mr. Penney to send me a sealed sample of the cake which he examined, and which gave 9·08 per cent. of ash, and I will be happy to submit to Mr. Penney a portion of either of the two samples I had from you, and which I reported on as containing respectively 9·75 per cent. of sand and $7\frac{1}{4}$ per cent. of sand. We can then readily see whether there is a discrepancy of analysis, or if the variation is in the samples themselves.

But, even taking Mr. Penney's low figure of 9·08 per cent. of ash, I can maintain that this would (if the quantity of sand were stated) show an amount which would alone render a cake impure, and not one which should be called Linseed Cake, and this, even apart from the presence of weed seeds and the mouldy condition, would justify you in refusing delivery. As regards the oil, this is not the real point of the case, and you have nothing to do with how the cake came to be in its mouldy condition or how it lost some of its oil. Your position is that you had *Linseed Cake* guaranteed to you with 16 per cent. of oil, and that you had a right to expect that you should receive linseed cake, and that it would be in fit condition for feeding. As it now has turned out, you have received a cake which I consider to be highly dangerous to give to stock, and which is not, and should not be, described as linseed cake. I would certainly advise you not to use the cake, but return it at the vendor's expense.

The matter is not one which can be decided merely by compensation for inferiority of quality. It is a case of a cake not being fit or safe to use, and you cannot assess the difference between a good and wholesome cake and one like that which I examined for you, on such a basis as you indicate.—Yours faithfully, J. AUGUSTUS VOELCKER.

Mr. Stanier, on receipt of this letter, wrote to the vendor, drawing his attention to the various matters alluded to in Dr. Voelcker's communication. The vendor received the following reply from Messrs. Denniss & Co. :—

Hull : June 22, 1894.

DEAR SIR,—Yours received dated 13th inst. We would point out that we sold the cakes as Polish Cakes of the usual quality. See our invoice. They are always high in ash and a little gritty, as anyone conversant with the usual quality of this make will affirm. We gave no guarantee of purity, and did not invoice them as Linseed Cakes. As to the mould there was none on when the cake left here, or we should not have sent it.

The oil, as already pointed out, might have been reduced by the mould.

We very much regret the mould came, but it is no fault of ours. We do not know what influences, such as damp and close atmosphere, the cake was subjected to after leaving here—influences favourable to the development of mould. Your friend should have kept part of the cake sent to Voelcker that it might have been retested. Oil is worth four shillings per unit, and as that is 4 per cent. below our guarantee, we will allow on that basis, or, to end the matter, 1*l.* per ton, which we think should meet the case.

Dr. Voelcker might send Mr. Penney part of his cake, but one piece is no criterion of a bulk.—Yours faithfully, A. DENNISS & Co.

Ultimately Mr. Stanier was made an allowance by the vendor of 6*l.* on the transaction, 5*l.* of which, the latter stated, had been allowed to him by Messrs. Denniss & Co.

---

4. Mr. D. W. Philip, of The Ashes, Whitacre, near Birmingham, submitted for analysis, on June 6, a sample of manure which, he stated, was manufactured by a horse slaughterer, and was sold at 5*l.* per ton. Mr. Philip had not actually purchased any, but sent a sample first in order to ascertain what the value of the manure was.

Dr. Voelcker's report was :—

June 12, 1894.

Moisture	48·45	100·00
[1] Organic matter	5·50	
Phosphate of lime	4·22	
Oxide of iron, &c.	32·34	
Sand	9·49	
[1] containing nitrogen	2·73	
equal to ammonia	3·31	

A poor manure, nearly 60 per cent. of which is made up of water and sand, and it is not worth more than a third of the price you are asked to pay. It is in bad condition.

No further particulars were obtainable.

5. Mr. R. O. Taylor, of Perton Court, near Wolverhampton, sent, on June 22, for analysis, a sample of what was invoiced to him as "Roasted Nitrate of Soda." The price charged was 3*l.* per ton delivered.

Dr. Voelcker's report was as follows :—

July 10, 1894.

Moisture	3·89	100·00
Nitrate of soda	·39	
Potash	2·03	
Insoluble silicious matter	3·79	
Sulphate of soda, oxide of iron, &c.	89·90	

This material contains only a very small amount of nitrate of soda, which, with about 2 per cent. of potash, constitutes the sole manurial properties it possesses. It is practically little more than sulphate of soda, and its value to you, as a manure, would not be 10*s*. a ton. In fact, I would prefer not to use it at all.

Mr. Taylor only purchased 6 cwt. on trial.

---

6. Mr. Henry Pye, of St. Mary's Hall, near Rochester, sent, on June 25, for analysis, a sample of what had been offered to him by a local dealer as "Guano," and costing 7*l*. a ton. It was recommended as a manure for hops.

Mr. Pye, before purchasing, sent a sample for analysis to Dr. Voelcker, and received the following report:—

July 10, 1894.

Moisture	8·94	100·00
[1] Organic matter	10·51	
Phosphate of lime	7·05	
Carbonate of lime, salt, &c.	10·86	
Sand	62 64	
[1] containing nitrogen	2·16	
equal to ammonia	2·62	

This ought not to be called Guano. It is nothing more than sea sand, shells, &c., with a little fish bone.

The worth of such a manure as the above would not be more than 2*l*. a ton, instead of the 7*l*. a ton charged.

EMLYN, *Chairman*.

July 25, 1894.

LOUPING-ILL IN SHEEP.

THE investigations recorded in this article were undertaken at the desire of the Veterinary Committee of the Royal Agricultural Society, in order to obtain information regarding the cause of the disease termed louping-ill. The investigations were begun in the month of May 1893, in the county of Northumberland, on farms situated in the North Tyne district. I take this opportunity of expressing my indebtedness to gentlemen in the district—and particularly to Mr. John Robson, of Newton, and Mr. Hedley, Whickhope—who lent valuable assistance in the inquiry, both by communicating information gained from their own experience of the disease and by procuring cases from the adjoining farms.

The plan of the inquiry was as follows:—

1. To study the symptoms in the living subject.

2. To make a careful *post-mortem* examination of each case obtainable.

To make inoculation experiments to test the transmissibility of the disease.

It was rather unfortunate, in one sense, that the disease at the time of my visit to Northumberland was much less prevalent than it usually is in the month of May, but during the ten days' stay I had the opportunity of submitting fifteen cases to *post-mortem* examination.

Record of Cases Submitted to *Post-mortem* Examination.

Case 1.—A lamb about three weeks old, said to have been ill for 3 or 4 days. Complete motor paralysis of the hind legs and quarters. Sensation in the paralysed parts not appreciably impaired. Eye bright and intelligent. Lamb sucks ravenously when held up to the dam. It was killed by bleeding.

Post-mortem.[1]—A number of ticks were adherent to the skin, and at the point of attachment of some a small abscess had formed. A cover-glass preparation of this pus (subsequently stained and examined) showed numerous bacilli, apparently in pure culture. The spleen was much enlarged and somewhat softer in consistence than normal. The liver contained an abscess as large as a hazel nut and surrounded by a zone of necrotic liver tissue. It also contained two other areas of necrosis without distinct suppuration. A small abscess was present between the longus colli muscle and the spine at the level of the third and fourth dorsal vertebræ. The suppuration involved the bodies of these bones and extended through them to the spinal canal, which at this point contained a quantity of pus around the dura mater (the outermost membrane covering the spinal cord). The dura mater was here slightly adherent to the bodies of the third and fourth dorsal vertebræ. The pus of this spinal abscess when examined microscopically showed bacilli resembling those found in the tick abscess. Attempts to obtain a cultivation of this bacillus failed.

Case II.—The carcass of a lamb about three weeks old, found dead that morning, had been seen alive the previous evening. It had been unable to stand for some days owing to paralysis, which, according to the shepherd's report, affected the fore limbs mainly.

Post-mortem.—Many ticks were present on the skin, and in some cases a small abscess with thick pus had formed around the point where the tick was adherent. The liver contained one pea-sized abscess. The dura mater at the middle of the neck was inflamed and slightly adherent to the floor of the spinal canal. The body of the underlying vertebra was found to contain pus, which, on microscopic examination, showed numbers of micrococci in pairs and in groups. Tubes of gelatine and agar inoculated from this pus yielded cultures of a micrococcus whose characters will be described later.

Case III.—A ewe, said to have "lost the power of her back," and gone down about 14 days previous. She lay flat on her side with the fore-legs extended and stiff; the hind legs were less rigid; skin sensitive everywhere. When the ewe was set up on her haunches she could support herself with the fore-legs. No convulsive fits had been observed at any time. She was killed by bleeding.

Post-mortem.—No ticks were detected on the skin. The liver was

---

[1] In order to avoid unnecessary repetition only the lesions or abnormal conditions discovered at the *post-mortem* are recorded, but in every case except those specially mentioned, the muscular system, the brain, the spinal cord, and the principal organs of the abdomen and chest were examined. In all the lambs special attention was paid to the navel and the umbilical vessels.

cirrhotic (indurated), and the bile ducts contained numerous living flukes. Some of the mesenteric glands were enlarged, indurated, and gritty on section. The bronchial glands were in a similar condition. The lungs contained some pseudo-tubercles, and there was a quantity of dropsical fluid in the pericardium. The blood was examined microscopically for micro-organisms, but none were found.

Case IV.—The carcass of a lamb, killed two hours previously as a hopeless case of louping-ill. The skin had been removed before it was brought to me, and unfortunately no history of its illness was obtainable.

Post-mortem.—This revealed no abnormality of any importance, save the presence of a ball of hard grass mixed with wool in the fourth stomach. A microscopic examination did not reveal any bacteria in the blood. The blood and spinal cord of this lamb were used for the inoculation of 2 lambs (*see* Experiment 1).

Case V.—A lamb about 3 or 4 weeks old, said to have been unable to stand for a fortnight. The paralysis affected the hind limbs only. Killed by bleeding.

Post-mortem.—A number of ticks were adherent to the skin. The spleen contained six pea-sized abscesses with tough yellow pus. A similar abscess was present under the latissimus dorsi muscle, and another between the bodies of the third and fourth lumbar vertebræ; the latter bulged into the spinal canal and pressed on the spinal cord. Pus from these abscesses showed under the microscope numerous staphylococci, and cultures of the same were obtained from the spinal abscess (*see* Experiments with cultures). The brain was not examined.

Case VI.—The carcass of a ewe, found dead the same morning, and sent as a case of louping-ill. The abdomen was distended with gas, and putrefaction was already well advanced. The liver and kidneys were almost pulpy in consistence, and the lungs were congested. The case appeared to be one of "sickness" or braxy, and the brain and spinal cord were therefore not examined.

Case VII.—The carcass of a lamb which had died on an adjoining farm. The skin had been removed before it was brought for examination, but it was said that some ticks were present. The lamb had been unable to stand for 4 days previous to its death, owing to paralysis of its hind limbs.

Post-mortem.—One pea-sized necrotic area in the liver. The fourth stomach contained a mass of dried grass mixed with wool. Some congestion of the coverings of the spinal cord in the cervical region; surface of brain abnormally moist.

Case VIII.—A ewe. Been unable to stand for some days. Lies on side with neck stretched, head resting on ground, and both fore and hind legs extended. No convulsions had been noticed. Consciousness appeared unimpaired, and the legs were moved freely when pricked with a pin. Killed by bleeding.

Post-mortem.—Fairly numerous pseudo-tubercles in the lungs. Cerebro-spinal fluid taken at the foramen magnum was used for inoculation (*see* Experiment 3). No bacteria could be found in the blood on microscopic examination.

Case IX.—A yearling ewe, which had been unable to stand for 12 days. Position exactly the same as in the previous case. There appeared to be no impairment of either sensation or consciousness, and at intervals both fore and hind legs were moved backwards and forwards. Killed by bleeding.

Post-mortem.—A few pseudo-tubercles in the lungs. Cerebro-spinal fluid in excess both in spinal canal and cranial cavity. Some of this fluid was used for inoculation (*see* Experiment 2). No bacteria were discoverable by the microscope in either the blood or cerebro-spinal fluid.

Case X.—The carcass of a lamb which had been taken ill on the previous day, and had died 3 hours before my arrival at the farm. The owner stated that it had shown symptoms of brain disturbance, and lost the power of its legs.

Post-mortem.—There were a few ticks on the skin. The mucous membrane of the small intestine was congested, and there were some spots of extravasation in the wall of the duodenum. The fourth stomach contained a considerable quantity of fine sand adhering to the mucous membrane. The spleen was swollen and the consistence of its pulp was diminished. The kidneys were congested. The pericardium contained about 2 ounces of clear, almost colourless, fluid. Numerous small spots of blood extravasation were present in the muscles of the back and loins. No bacteria were discoverable by microscopic examination in the spleen or blood.

Some of the pericardial fluid was used for inoculation (*see* Experiment 5).

Case XI.—The carcass of a lamb several weeks old. Died a few hours before my arrival at the farm.

Post-mortem.—Numerous ticks on skin. Violent inflammation and blood extravasation at their points of attachment. Intense inflammation of the large intestine, with extravasation of blood into the lumen of the bowel. The fourth stomach contained a ball of dried grass and wool. Spleen slightly enlarged and softened. Liver pale. Lungs and kidneys congested. The brain was slightly œdematous. Neither blood, spleen-pulp, nor cerebro-spinal fluid showed any bacteria when examined microscopically. Blood from the heart was used for inoculation (Experiment 7).

Case XII.—The carcass of a lamb, several weeks old, found dead and brought the same day for examination. It had been first noticed ill on the previous day—unable to rise, but frequently struggled.

Post-mortem.—No ticks on skin. Abdomen tympanitic from putrefactive decomposition. Stomach ruptured, apparently *post-mortem.* Kidneys pulpy. The other organs were not examined.

Case XIII.—The carcass of a lamb brought 24 hours after death. Been ill for 24 hours.

Post-mortem.—Putrefaction had not made so much progress as in the preceding case, although a longer time had elapsed since death. No ticks on skin. Small bowel congested. Spleen swollen and softened. The fourth stomach contained a compact mass of dry grass, wool, and sand. Kidneys somewhat pulpy. Brain and cord not examined.

Case XIV.—A lamb about a month old. Had been ill for about a week, and unable to get up. Lies on side, sometimes holding the head up, and at others resting it flat on the ground. No evidence of impairment of sensation or consciousness. Sucks the finger, and can stand for a little when placed on its legs. Killed by bleeding.

Post-mortem.—No ticks on skin. A small quantity of fluid in the pericardial sac. A marked excess of fluid in the cranial sub-arachnoid space, and brain tissue somewhat œdematous. The pericardial and cerebro-spinal fluids, and the blood, were used for inoculation (Experiments 4 and 8).

Case XV.—A lamb about a month old. It had died about 2 hours before my arrival at the farm. Its illness had lasted for 4 days, during which time it "lay and trembled."

Post-mortem.—The fourth stomach contained a ball of grass and wool. Spleen a little enlarged. A small quantity of fluid in the pericardium, Cranial pia mater slightly congested, and excess of cerebro-spinal fluid. No bacteria were discoverable by microscopic examination in the spleen-pulp or cerebro-spinal fluid. Blood and pericardial fluid from this lamb were used for inoculation (Experiment 6).

Inoculation Experiments with Natural Products.

Experiment I.—Two half-bred lambs, about 1 month old, were inoculated with blood and spinal cord of a lamb said to have died from louping-ill (Case IV). The inoculation was performed as follows. About 2 c.c. of blood from the heart were mixed with an equal volume of sterile bouillon, and by the aid of a glass rod a piece of spinal cord was mashed up in the mixture. The liquid was then divided between the two experimental lambs, the seat of injection being the inside of the thigh.[1]

Result.—Negative.

Experiment II.—A lamb about 4 months old was inoculated with about 1 c.c. of cerebro-spinal fluid from a yearling ewe killed while suffering from louping-ill (Case IX.). The fluid had been preserved for 8 days in a sealed glass tube. The seat of inoculation was the inside of the thigh.

Result.—Negative.

Experiment III.—About ten drops of cerebro-spinal fluid from a ewe killed while suffering from louping-ill (Case VIII.) were injected under the skin of the thigh of a four months old lamb. The fluid had been kept for 9 days in a sealed tube.

Result.—Negative.

Experiment IV.—About 20 drops of mixed pericardial and cerebro-spinal fluid from a lamb killed while suffering from louping-ill (Case XIV.) were injected under the thigh of a four months old lamb. The fluid had been preserved for 4 days in a sealed tube.

Result.—Negative.

Experiment V.—About 15 drops of pericardial fluid from a lamb dead from louping-ill (Case X.) were injected under the skin of the thigh of a four months old lamb. The fluid had been preserved for 5 days in a sealed tube.

Result.—Negative.

Experiment VI.—About 20 drops of mixed blood and pericardial fluid from a lamb dead of louping-ill (Case XV.) were injected under the skin of the thigh of a four months old lamb. The blood and pericardial fluid had been preserved in a sealed tube for 17 days.

Result.—Negative.

Experiment VII.—About 15 drops of heart blood from a lamb dead of louping-ill (Case XI.) were injected under the thigh of a lamb about four months old. The blood had been preserved in a sealed tube for 19 days.

Result.—A slight cord-like induration appeared at the seat of inoculation on the second day; it persisted for a few days, and then declined without suppuration. The general health of the lamb appeared undisturbed.

Experiment VIII.—This experiment exactly repeated the preceding one, save that the blood had been taken from the heart of Case XIV. and preserved in a sealed tube for 18 days.

Result.—Negative.

---

[1] In all these experiments the usual precautions against accidental contamination were taken. Fluids were aspirated into tubes previously sterilised by heat, and the hypodermic syringes used for injecting had been sterilised in the same way.

Experiment IX.—A four months old lamb was inoculated inside the thigh with about 20 drops of mixed blood and pericardial fluid from a lamb dead of louping-ill (Case X.). The blood and pericardial fluid had been preserved for 19 days in a sealed tube.

Result.—Negative.

Experiments with Cultures.

In all the cases except those in which the carcass was already more or less putrid, tubes of gelatine and agar were inoculated from blood, pus, pericardial fluid, or cerebro-spinal fluid. In Cases X. and XI. the tubes inoculated from the blood yielded apparently pure cultures of two different micro-organisms, but as these cultures were found to be devoid of pathogenic effects when tested by inoculation (into lambs) it may be concluded that their presence was accidental.

The tubes inoculated from the abscesses of Cases II. and V. yielded pure cultures of a micrococcus, and inoculation experiments with these cultures had results in harmony with the view that the organisms in question were the actual cause of the disease.

The experiments, nine in number, have been performed on sheep of various ages (from lambs four or five months old, to yearlings and old ewes), and with so little variation in the result that it would be waste of space to describe the whole series in detail. The following two experiments will suffice to illustrate the pathogenic properties of the micrococcus.

Experiment I. *June* 24, 1893.—Injected about 20 drops of a liquefied gelatine culture (first culture from Case V.) under the skin of each thigh of a four months old lamb.

June 26.—Extensive branny swelling at the seat of inoculation in each thigh.

June 28.—A well defined abscess about the size of a hen's egg has formed in each thigh.

June 29.—Washed the skin on the inside of the right thigh with saturated aqueous solution of mercuric chloride, and pierced the abscess with a sterile glass pipette. A quantity of thick yellow pus forced its way into the tube, and from this cover-glass preparations and cultures on agar were made. The former showed among the pus cells groups of micrococci, and apparently pure cultures of the same organism were obtained in the tubes of agar.

The abscess in the left thigh burst spontaneously a few days later, but more than a fortnight elapsed before healing was complete.

Experiment II. *February* 2, 1894.—Injected into the thigh of a yearling sheep about 20 drops of sterile water holding in suspension a culture on agar (7th generation) of the micrococcus obtained from the vertebral abscess of Case V. The skin of the thigh had previously been washed with 5 per cent. solution of carbolic acid in water.

February 3.—Diffuse redness and swelling around the seat of injection; a flat yellow pimple marks the point where the hypodermic needle was inserted.

February 4.—Swelling more prominent and better defined.

February 8.—A distinct abscess has formed on the side of the thigh.

February 10.—Pierced the abscess, as in the previous case, with a sterile pipette. From the pus thus obtained the micrococcus was recovered in pure culture.

This micrococcus has characters which mark it out as a new species. The single organisms are spherical, with a diameter of about $\cdot 3\mu$, but in the abscesses they are usually present in pairs or in irregular groups. It grows rapidly at all temperatures between 70° and 100° F. On slanting agar tubes its cultures have a faint yellow tinge, and the colour is deeper but the growth scantier in the case of potato cultures. It rapidly liquefies gelatine, and deposits at the bottom of the tube a nearly colourless precipitate. When cultivated in milk the latter becomes coagulated. It excites suppuration when injected under the skin of the rabbit or guinea-pig, but only an inflammatory swelling, which disappears without the formation of an abscess, in the horse and ox.

Pathology of Louping-Ill.

In the face of the experiments described above it will hardly be doubted by anyone that the micrococcus was the actual cause of disease in the cases in which it was found (II. and V.). In each of these two cases, it will be remembered, there was discovered an abscess, which apparently had its origin in one of the bones of the vertebral column, but which involved also the coverings of the spinal cord. The lambs suffered from paralysis, and the abscess in each case offered a perfectly satisfactory explanation of this symptom. It is true that in none of the animals subcutaneously inoculated with cultures of the organism did paralysis set in, but that in no way invalidates the claim that the disease excited by the injection of the cultures and that present in the original lambs (Cases II. and V.) were identical in their nature. The paralysis in the natural cases was in a sense an accident depending upon the situation of the abscess, and it is not at all unlikely that cases perfectly identical as regards their nature pass undetected or end in recovery when the abscesses are situated in the muscular system, the lungs, the spleen, or the liver. On the other hand, it is very probable that by injecting cultures of this organism into the veins of young lambs, so as to insure the transport of the germs by the blood stream, and thus bring about a chance of their becoming arrested in one of the bones of the spinal column, cases identical, as regards the symptoms, with II. and V. would be produced.

In Case I. also, the paralysis was fully explained by the abscess discovered in connexion with the spinal cord, and, although the strict proof was not led, owing to the failure to cultivate the bacilli present in the pus, it is hardly open to doubt that these bacilli were the cause of the disease.

It may therefore be said that in twenty per cent. of the cases examined, the *post-mortem* examination afforded a complete explanation of the symptoms, and showed that the disease was bacterial as regards its cause. But in the remaining cases (with the exception of Nos. VI. and XII. which were probably cases of the so-called 'sickness') the exact nature of the disease is not so clear.

In Cases IV. VII. XI. XIII. and XV. the fourth stomach contained a compact ball of wool and dried grass, and there is a strong presumption that this was the cause of the illness. In the same way it is probable that the sand found in the fourth stomach was at the root of the mischief in Case X. At any rate, it ought to be noted that no evidence was obtained from these cases to show that the disease was transmissible by inoculation.

In Case III. the *post-mortem* revealed a variety of morbid conditions, which in combination may have been accountable for the symptoms exhibited.

In Cases VIII. IX. and XIV. it must be confessed that the cause of the illness was not discovered. In two of these cases the cerebro-spinal fluid was unusually abundant; but in all three cases inoculation experiments made with the fluid had a negative result.

From what has been said it must be evident to anyone that the fifteen cases investigated by me in Northumberland were not all of one disease, and the question arises, which of them were cases of louping-ill? In one sense it may unhesitatingly be answered that the whole fifteen were cases of louping-ill. The object of my investigation was to discover the nature, and, if possible, the cause of what passes under that name among sheep farmers and shepherds in Northumberland, and every one of the fifteen cases was submitted to me as a case of louping-ill. All the cases had been diagnosed as examples of louping-ill by men of great experience, and, indeed, cases which the *post-mortem* afterwards proved to be beyond any doubt due to different diseases were presented as typical and unmistakable examples of louping-ill.

This experience did not occasion me any surprise, as in previous investigations conducted in Dumfriesshire and Galloway I had found that the term louping-ill does not represent a well-defined pathological entity, but really covers deaths from a variety of causes.

It is a very noteworthy fact that almost all the earlier descriptions of the disease should agree in according to it a remarkably complex and variable train of symptoms. In illustration of that I may quote the following account of the symptoms by Fair.[1]

"On the animals being slightly attacked there is an evident falling off in condition, and a dull heavy appearance, with deadness of coat. There is a loss of power in one or more limbs, and sometimes of a whole side, or even the whole animal, as if struck with palsy or tetanus, of both which diseases, as well as apoplexy, it seems to participate in no slight degree; the head and neck being more or less frequently, according to the violence of the attack, convulsively or spasmodically contracted or drawn towards the shoulders or back, with a violent tremor or constriction of the œsophagus, so as to endanger suffocation when any liquid, however small the quantity, is attempted to be conveyed into the stomach. This is also much retarded, or prevented from being accomplished, by a convulsive and spasmodic locking of the jaw, a frothy saliva being at the same time emitted from the mouth, more especially when the convulsive fits have come on, which, in severe cases, frequently takes place from once to twice every five minutes,

[1] *The Veterinarian*, Vol. xii. 1839.

accompanied by a very laborious and quick respiration. The hurried breathing, however, subsides altogether as soon as the fit has terminated. In this state the animal will remain for hours or days, and if he does not rally from it death, sooner or later, ensues. . . . Some few instances, however, have occurred among my flock when they have most unexpectedly recovered, so as to again follow their neighbours and get entirely well, and in other cases they have for a length of time dragged a seemingly powerless hind leg behind them, and the left leg oftener than the right one. When this, however, takes place, the limb still remains cold and dead for a time in despite of the use of friction or stimulants. If it is a fore-leg it is not uncommon, after the sheep gets on its feet again, for a tumour of the size of a pigeon's, or even of a hen's egg, filled with pus or ichor, to appear. On being punctured it presently subsides and is lost. These abscesses usually appear in the neighbourhood of the joints; but sometimes about the arms, the brisket, or any neighbouring part of the body. Other symptoms of this disease are a wild excited appearance on being approached by a man, dog, or any other animal, and even by one of their own species; a champing or gnashing of the teeth, and foaming at the mouth while yet on their legs, accompanied by vertigo and delirium, also the assuming of a rotatory or sidelong motion. . . . In this complaint there is also not unfrequently, when they have taken the ground, a great appearance of sickness. The animal likewise exhibits great restlessness and anxiety, mingled with debility—he trembles and tosses his limbs about, as if enduring great pain. At this time there is also less of involuntary tremor and convulsive twitchings than at other stages of the disease; and it seems as if the seat of the complaint was in the thoracic or abdominal viscera. . . . In fact, the disease does occasionally assume so many different forms, although each is more or less connected and allied with the other, that the most skilled veterinary practitioners may for a while be puzzled to say whether it is most akin to tetanus, apoplexy, or palsy."

At the present day no one with any pathological knowledge can read the last sentence quoted without a suspicion that Fair described not one but several different morbid conditions, for the history of veterinary pathology warns the student to be on his guard whenever he reads that a disease whose cause is not certainly known assumes many different forms. This tendency to describe diseases as assuming many different forms has been a fruitful source of error, and the reason is obvious. While the pathology of a disease—that is, its real nature and cause—is still unknown, its definition must rest mainly on a description of its symptoms and lesions, and in such a case it is quite unwarrantable to regard entirely different sets of symptoms and lesions as manifestations of the same disease. For example, when Fair wrote that louping-ill occasionally assumes many different forms he made an assumption not warranted by his knowledge, and he would no doubt have been puzzled to say why he preferred to believe that the many different forms were varying manifestations of one disease rather than so many different diseases.

At the present day, both in England and in Scotland, shepherds appear, like Fair, to regard louping-ill as a disease that assumes many different forms, for during the month of April and May they call every case of illness in the flock louping-ill when the subject of it is found paralysed or unable to stand, and this quite independent of whether a previous convulsion or tetanic stage has been observed or not. The result, as might have been expected, is that when a series of cases of so-called louping-ill are submitted to the test of *post-mortem* examination, they have to be sorted out under several different headings, and the confusion in the matter is so great that one has difficulty in determining which of the morbid conditions should have the term louping-ill reserved for it.

Without attempting to decide which of them has the best claim to the name, I feel warranted in saying that the following are the principal morbid conditions at the present time grouped under the head of louping-ill :—

1. Pyæmic spinal meningitis, caused by pyogenic bacteria.
2. Gastritis and enteritis from indigestible substances (wool, sand, dried grass) in the stomach or intestines.
3. Disorders of brain functions, paralysis, and general weakness, with, in some cases, excess of cerebro-spinal fluid in the cranial cavity, but without gross lesions in any of the organs of the body.

The first two of these conditions cover most of the cases of louping-ill in lambs, and the third includes the bulk of the cases in adult sheep. The cause or causes of the last of these groups of cases have not yet been satisfactorily determined, but all the experiments hitherto made indicate that these cases are not bacterial or transmissible by inoculation.

Prevention.

1. *Pyæmic spinal meningitis.*—This includes those cases of louping-ill in which the essential lesion is an abscess involving the spinal cord or its coverings.

Before discussing the possibility of preventing cases of this kind, it will be necessary to make further reference to the cause of the disease. The abscesses owe their origin to the presence of germs, and before anyone can confidently say whether it would be possible to devise and carry out measures that would prevent the entrance of these germs into the system of the sheep, he must be able to figure to himself the natural mode of infection, and the habit of the parasite.

The common methods by which disease-producing germs obtain access to the animal body are :—

1. The alimentary canal, with the food or water.
2. The air passages, with the inspired air.
3. Wounds or abrasions of the skin.
4. The umbilicus or navel (during the first few days of life only).

In infection by inhalation, especially in diseases characterised by pronounced lesions (such as abscesses), the lungs or their lymphatic glands are almost always the seat of disease, and, in like manner, structural alterations of some part of the alimentary tube or its associated glands are generally present when the disease germs have been taken in with the food or water. In the cases of pyæmic meningitis in lambs that have come under my notice no abscesses were present in connexion with the respiratory organs, and it is therefore probable that the inhaled air was not the carrier of the infection. The possibility of infection by means of germs taken in with the food or water cannot be so certainly excluded, for although no abscesses were discovered in connexion with the alimentary tube, some were present in the liver.

Both in England and in Scotland, there is in louping-ill districts a very general belief among farmers and shepherds that ticks are somehow concerned in the production of the disease, and, assuming what I shall subsequently show to be probable, viz., that the germs which are responsible for the formation of the abscesses are soil organisms, it is not by any means a far-fetched idea that ticks may sometimes be the instruments of infection. Indeed, Case I., in which the pus that had formed around the point of attachment of the tick to the skin contained a bacillus morphologically similar to that present in the spinal abscess, is strongly suggestive of this view.

Infection by means of the umbilicus or navel is a comparatively common occurrence in the young of all the domesticated animals, but this method of infection is usually easy of detection at the *post-mortem*, owing to the presence of suppuration or some other form of inflammation at the navel itself, or along the course of the vessels that pass backwards and forwards from it inside the body. As previously stated, special attention was given to these parts in all the lambs examined, but in every case the navel was perfectly healed up, and its vessels appeared quite normal.

Coming next to discuss the probable habit of life of the germs concerned in louping-ill, it would be all-important if one could state whether they belong to the class of obligatory, or to that of facultative, parasites—to know, in other words, whether pyæmic meningitis is a contagious disease or not, for, be it observed, there are many germ diseases, such as tetanus, actinomycosis, and black-quarter, that are neither contagious nor infectious in the ordinary sense of these words. These are the diseases whose germs ordinarily live and propagate outside the animal body in soil or water, and are only occasionally, and in a manner accidentally, the cause of disease, while the strictly contagious diseases, such as glanders and swine fever, are caused by germs which in natural circumstances never propagate except in the bodies of animals.

There need be no hesitation in venturing the opinion that none of the forms of louping-ill is contagious. The fact that the disease is only met with in the spring months, and that it is not already diffused over the whole country, but is still obstinately attached to particular districts, and even to particular tracts of unfenced moor or hill, is wholly inconsistent with the view that contagion plays any part in its development. The only assumption that is in keeping with the known facts regarding the occurrence of the disease (pyæmic meningitis) is that it is caused by germs that are normal inhabitants of the soil. It is probable that there are certain districts in which these germs are present at all seasons of the year, and in numbers that would make any attempt to destroy them utterly futile.

If future investigations should confirm the suspicion that ticks are instrumental in infecting the lambs, it is possible that something in the way of prevention might be done, by dipping or smearing of the young lambs with some substance that would prevent the ticks from attaching themselves. On the other hand, if infection takes place by way of the alimentary canal or the navel, it is difficult to imagine a feasible method of prevention.

2. *Indigestible substances in the stomach or intestines.*—The *post-mortem* examinations which I made in Northumberland appear to indicate that in a considerable proportion of the cases diagnosed as louping-ill in lambs the illness is caused by the ingestion of such matters as dried grass, wool, and sand. In the cases in which the presence of grass and wool in the fourth stomach was noted, these substances were compacted together into a ball-like mass, which in some instances was as large as a hen's egg. It appears probable that the lambs, having reached the age at which they naturally begin to eat grass, ingest the dried stems simply from lack of a more succulent herbage, and it is plausible to suppose that this in large measure is the explanation of the statement that louping-ill attacks the most thriving lambs (which would be the first to take to eating grass) and is most prevalent in cold backward springs (which retard the growth of the young grass). It is no easy matter to suggest a feasible method of averting the danger, since in practice it would hardly be possible either to eat the pasture so bare as to leave none of the withered grasses over the winter, or to remove the young lambs to succulent pasture before they begin to take to solid food.

If, as seems not improbable, the wool which is found mixed with the dried grass in the fourth stomach is pulled from the neighbourhood of the udder during the lamb's efforts to seize the teat, something in the way of preventing this might be done by clipping the long wool from the mammary gland and its neighbourhood at lambing time. This operation—the so-called "udder-locking"—was, I believe, at one time more frequently practised than it is at the present day.

Previous Investigations.

By way of conclusion I may briefly indicate the results obtained by others who have recently investigated this disease.

In the year 1879, the Teviotdale Farmers' Club appointed a committee to investigate the cause of louping-ill, and in the following year the committee published its report. The report is interesting chiefly on account of the extraordinarily discrepant views quoted in it regarding the symptoms and cause of the disease, and the conditions under which it manifests itself. No one can read the report without feeling that much of the difference of opinion summarised in it is due to the fact that several different diseases were described under the term louping-ill by the persons whom the committee consulted. The inquiries of the committee were mainly directed towards throwing light on the alleged rôle of ticks, and of ergot or other fungi in the herbage, as causes of the disease, but the report admits that the results of the inquiry were "more negative than positive." Mr. Brotherston, who made a list of the flora of certain louping-ill farms in Upper Teviotdale, discovered ergot on no fewer than twenty-three specimens of grasses, and the late Professor Robertson (then resident at Kelso) therefore thought it not unnatural to regard louping-ill as a form of "spasmodic ergotism," but in experiments which the committee made with ergot of rye on five sheep "the results were disappointing," as the only effect produced was scouring.

As regards the tick theory, the committee ascertained that, while in most cases ticks were found where the disease prevailed, this was not universally the case, and they found it difficult to believe that the effect of the ticks could be more than indirect, "either as carriers of the poison or as exhausting the stamina of the sheep and making them more liable to disease."

The Transactions of the Highland and Agricultural Society for 1883 contain a report by a special committee on Louping-ill and Braxy. Mr. Brotherston, who at the instance of the committee, visited infected farms in Dumfriesshire, Roxburghshire, and Selkirkshire, found that the prevalence of louping-ill was "in proportion to the quantity of old withered grasses left from the previous year's growth." The committee ascertained that ticks might exist without louping-ill, and they were informed that louping-ill occurred without ticks, but, as regards the latter statement, they remarked that perhaps the disease referred to was not "true louping-ill." By way of prevention, the committee recommended (1) direct improvement of hill pastures, and (2) indirect improvement by keeping down rank and excessive vegetation.

Professor Williams, who was a member of the above committee appointed by the Highland and Agricultural Society, sent in a special report, in which he claimed to have discovered the cause of louping-ill. At the *post-mortem* examination of sheep killed while suffering from this disease, Professor Williams found a jelly-like substance lying external to the dura mater (the outermost covering of the spinal cord), and he regarded this as a zooglœa formation or mycelial growth. From the spinal fluid and from the blood in such cases cultures were made, and one of the organisms thus obtained—a bacillus—was regarded as the cause of the disease, though this conclusion was not supported by any experiment to show that the disease was transmissible by inoculation with either the jelly-like substance or the bacillus cultivated from it.

Professor Williams's cultivation experiments were made with such obvious disregard of the precautions necessary in bacteriological investigations as to render his conclusions quite untrustworthy, and there can be little doubt that the jelly-like substance which he described as a mycelial growth was simply the adipose tissue that normally exists between the dura mater and the bones of the spinal canal.

In Part III. Vol. IV. of this Journal (1893) there was published (pp. 625–36) a report on the Etiology and Pathology of Louping-ill by Dr. Klein, and special interest attaches to this, as Dr. Klein's investigations were made almost simultaneously with my own, and in the same district. Like some other reports on the same subject, Dr. Klein's account of the pathology of louping-ill is vitiated by failure to recognise that the name covers a variety of diseases. He made *post-mortem* examinations of eleven sheep and six lambs, but, unfortunately, he does not describe the symptoms exhibited in each separate case, and his account of the lesions is given in such a form as to make it impossible to strictly compare his results with my own. A most remarkable point in connexion with Dr. Klein's *post-mortem* examinations is that he does not appear to have made it a rule to examine the spinal cord, for whereas he mentions all the other principal organs of the body, if only to state that they were normal, the spinal cord is not once referred to. On the other hand, he found the most constant lesions in the brain, and next after that, in the lungs, heart, pericardium—organs that were certainly normal in appearance in most of the cases examined by me. Dr. Klein cultivated a variety of microbes from the fluids or tissues of diseased sheep, but he failed to prove that any of these were causally related to louping-ill ; indeed, the latter statement might be put more strongly, for the two experiments which he made with the microbe that was most frequently encountered, furnish strong evidence that this germ is not the cause of louping-ill.

J. McFadyean.

Royal Veterinary College, Camden Town, N.W.

Notes, Communications, and Reviews.

THE EVOLUTION OF THE BRITISH BREEDS OF CATTLE.

[During the Meeting of the Society at Cambridge this year Professor McKenny Hughes, F.R.S., exhibited at the Woodwardian Museum a series of skulls and horn-cores arranged to illustrate the origin of the dominant breeds of cattle during successive periods of English history, and he has very kindly furnished for publication the following note on the collection.—Ed.]

In the inferences drawn as to the evolution of the British breeds of oxen, chief importance is attached to the results of excavations. If certain forms of skull and skeleton have been found associated with other fossils, with coins, or with pottery of known age, such positive evidence may be safely relied upon, provided the excavations have been watched by careful and competent observers. The negative evidence also is of increasing value as observations are repeated and extended, until it may often be safely urged that, as certain forms of horn and skull have never been, they are not likely ever to be found associated, with remains of a certain age in this country.

The skull of a *Bison*, which had been found in the river gravels a few miles from Cambridge, was placed first in the collection made at the Woodwardian Museum on the occasion of the Society's recent visit. This animal, like the American bison, which was commonly, but improperly, called a buffalo, was fine-boned in the limb, but ponderous in the head and in the muscular and bony arrangements for supporting it. Its skull was easily distinguished by the protuberant ridge between the horns, the large angle which the forehead makes with the occipital region, and the very forward position of the base of the horn-cores. This species lasted through the time when man used rough unpolished stone implements, but has not been found in Britain with the remains of the men of the polished stone age.

Next in order came the *Urus*, or *Bos primigenius*, which is first found with the bison in the ancient river terraces. It lived on, after the bison had become extinct, throughout the age of Neolithic man, who certainly hunted it. This is proved by a very interesting skull which was found in the Fen north of Cambridge, with a polished stone implement sticking in the forehead, having been poleaxed, perhaps, when mired. The skull of this species is quite different from that of the bison. The forehead and occipital region are inclined to each other at an acute angle; there is no protuberance between the horns, but the sweep of the base of the horn-cores is prolonged across the ridge between them. The forehead is flat or slightly concave, and the horn-cores bend first out, then forward and downward, and finally the points approach one another with an upward curve. This was a very large animal; the skull of one of them measured thirty-six inches in length, and the form is so well marked that it is not likely that it could have been overlooked if come across in any excavations. But there is no record of the *Urus* having been found in Britain associated with Roman objects or any remains that would show that it lived on later, at any rate, than the bronze age.

With the *Urus*, however, there appeared a small ox, known as *Bos longifrons* or *brachyceros*. It was about the size of a Kerry cow, had small horns sharply curved forward, and a considerably elevated ridge between them. This was the ox which the Romans found in Britain. Their middens are full of its bones. Mr. Ernest Clarke was good enough to lend me for exhibition some specimens of the young of this breed, which were dug up about 1863 from a foundation in London Wall, and are now in the possession of the Royal Agricultural Society.

When, however, we come upon a station where the Romans had long resided, in a settled district where agriculture and the improvement of the cattle could be attended to, we find that this small breed had been modified—not superseded by the introduction of a different breed and the disappearance of the native cattle—but improved by crossing the native breed with the new stock, for specimens intermediate in form and size occur among them.

Now comes the interesting question, What was the new breed with which *Bos longifrons* was crossed by the Romans? It cannot have been the great *Urus*, for that had been long exterminated in Britain, and, even if there had been any of that breed available, it would not account for the modifications we observe in the improved breed, the head of which is not relatively so long, and the horns of which turn outward and upward; whereas the *Urus* is distinguished by exactly the opposite characters. It seems natural, therefore, 'to inquire what was the form of the ox which the Romans themselves bred at home, and probably imported into their provinces. Turning to the contemporary sculpture and coinage of Rome we find exactly what is required; an animal of medium size with upturned horns, which we know from Roman authors was generally fulvous or black, while, sporadically, white individuals appeared, and these were then, as among some races at the present day, much prized.

The Roman cattle now referred to have nothing to do with the great Podolian breed, but must have been in form not unlike the modern Ayrshire. The white individuals were wanted for sacrificial purposes, and, having down to the middle ages a greater market value they were kept apart. It is probable that all important establishments, whether ecclesiastical or feudal, had their own herd, which was kept within enclosures. Perhaps some of their descendants remain at Chillingham and, with a stronger German cross, at Chartley. The form of the *Urus* is well known, and so is that of the Chillingham breed, but there is little resemblance between them ; while, in form, the Chillingham and the Highland cattle can hardly be distinguished.

From the Celtic Shorthorn and the cattle introduced by the Romans came all our earlier breeds. Then followed the time after the Roman legionaries had been withdrawn, when smaller or larger bands of Saxons, of Angles, Jutes, and Danes, arriving from time to time, kept the country in such an unsettled state that cattle breeding was impossible, and the country was unsafe for any but those who lived in strongholds. The herds roamed over wide tracts of country, and as there was no selection, there was, of course, a reversion to the numerically predominating native type. So among the hundreds of horn-cores found associated with mediæval remains in the eleventh- and thirteenth-century ditches round Cambridge we notice very little deviation from the form of *Bos longifrons*. In the refuse of Roman or early mediæval age we find no remains of longhorned cattle. But in later mediæval times large cattle were introduced from the Low Countries, and soon modified the stock in all the southern and eastern counties, being crossed with the native breeds, which had retained in one place more of the type of the Celtic Shorthorn, and in another more of the character of the Roman breed. The specimens of the horn-cores of longhorn cattle which were exhibited were given to me by Mr. Francis C. A. Barclay, who procured them from a drain, which was inferred to have been made about 200 years ago on his father's property at Forest House, near Epping Forest.

What the origin of the German Longhorns was, and whether we can find traces of *Bos frontosus* being brought in by the Scandinavian invaders, would take us beyond the scope of our present inquiry.

The conclusions arrived at, briefly stated,[1] differ from those usually received, in that it is considered as proved that the *Urus* is not the progenitor of any of the native breeds ; that the White Park cattle are not a true breed, and not derived from any native wild breed ; that the influence of the Roman introduced cattle was considerable ; that the real basis of our English cattle is to be found in the Celtic Shorthorn, which was first modified by the Roman cattle with upturned horn ; then after mediæval reversion to the longifrons type, of different extent in different districts, was again modified by the introduction of German slouching Longhorns.

T. McKenny Hughes.

Cambridge.

---

[1] For fuller discussion of the question see *Proc. Soc. Ant.*, London, June 14, 1894.

THE AGRICULTURAL HOLDINGS ACT.

Meaning of "Determination of Tenancy."

In the first volume of the current series of the Journal[1] I drew attention to three cases, one English and the others Scotch, bearing upon the subject of the determination of farm tenancies, which, as I then pointed out, appeared to be of importance to landlords and tenants of agricultural land in both countries, not only because the words "determination of the tenancy" are used in the same context in both the English and Scotch Agricultural Holdings Acts, but also because in both countries farm tenancies often come to an end as regards part of a farm at one period of the year, and as regards other part or parts of it at another or others. By the first section of each Agricultural Holdings Act a tenant who has made on his holding any of the scheduled improvements is entitled to obtain from the landlord compensation for the same "on quitting his holding *at the determination of a tenancy*;" and by Section 7 of each Act the tenant is required, "two months at least before *the determination of the tenancy*" in the case of English holdings, and "four months at least before *the determination of the tenancy*" in the case of Scotch holdings, to give notice in writing to his landlord of his intention to make a claim for compensation. In the English case, which I reported in 1890, the Queen's Bench Division of the High Court of Justice in England, and in the first of the two Scotch cases, which I reported at the same time, the Court of Sessions in Scotland, decided that the words "determination of the tenancy" in Section 7 of each of the Acts meant the time when a total determination of the tenancy took place, and not the time when the greater part of the farm (1,000 acres out of 1,200) in the English case, or the arable part of the farm in the Scotch case, was given up. The principle of these decisions has recently been held to be correct by the judgment of the House of Lords—which I may perhaps remind readers of the Journal is the ultimate Court of Appeal alike for England and Scotland—in a case in which James R. Black was appellant and John Clay respondent; and as that case, though coming from Scotland, has, in effect, settled the point of law in both countries, it has been deemed expedient that a note of it should appear in these pages.[2]

Mr. Clay, it appeared, was tenant of a farm in Berwickshire under a lease for nineteen years, which commenced in 1860. The term of nineteen years was extended for thirteen years beyond that period, and the provisions in the lease were made to apply to such extended term. Now the lease provided that the farm was thereby let "for the space of nineteen years from and after the entry of the said John Clay, which, notwithstanding the date or

---

[1] Vol. I. (Part I.), 3rd Series, 1890, p. 204.

[2] Black *v.* Clay, reported in the *Weekly Notes* for 1894, p. 120.

dates hereof, is declared to be to the houses (with the exceptions aftermentioned), grass and fallow lands on May 26, 1860 ; to the arable land in corn crop at the separation of the crop of the same year from the ground ; and to the barns and barnyard and two cothouses at Whitsunday 1861, from these periods respectively to be possessed by the said John Clay during the space above written."

In May 1891 Mr. Black, who was the owner of the farm, obtained a decree ordering Mr. Clay to remove (following the stipulations in the lease) from the houses, grass and fallow lands at the term of Whitsunday 1892 ; from the arable land at the separation of the crop of the same year from the ground ; and from the barns and barnyard and two cothouses at Whitsunday 1893.

Mr. Clay accordingly quitted possession of the houses, with the exception of the barns, barnyard and two cothouses, and also of the grass and fallow lands at the term of Whitsunday 1892 (May 1892), and on June 6th following he gave Mr. Black notice of a claim for compensation for improvements under the provisions of the abovementioned Section 7 of the Scotch Act. Mr. Clay's next step was to apply to the Sheriff of the County under the Scotch Amendment Act 1889 (which has made the proceedings in Scotland for the appointment of the tribunal to assess the compensation much simpler than the proceedings in Scotch cases originally were and than the proceedings in English cases still are), to appoint a competent and impartial person to be the referee. Mr. Black thereupon commenced an action for an interdict or injunction to restrain all further proceedings towards the assessment of compensation, upon the ground that the notice served upon him was not in time within the meaning of the aforesaid seventh section ; his contention being that the lease determined at Whitsunday 1892, when Mr. Clay ceased to hold the grass and fallow lands, and that Mr. Clay's subsequent possession of the arable land was not a possession as tenant, but only a privilege accorded to one whose tenancy was already at an end.

The Courts of First Instance and of Appeal in Scotland having decided adversely to Mr. Black, and refused to stop the proceedings for assessing compensation, Mr. Black appealed to the House of Lords, and that House, on June 22 of the present year, unanimously affirmed the decision appealed from.

In the course of his judgment the Lord Chancellor (Lord Herschell) is reported to have said :—

"It appears impossible to avoid the conclusion that, as to the barns, barnyard, and cothouses, a tenancy is created a year later, and terminates a year later than the tenancy of the grass lands ; and if there be a separate *ish* [1] or determination of the tenancy as to these, how could the lease be construed otherwise than as creating a tenancy in the arable lands which is to continue until the 'separa-

[1] "Ish" is a Scotch law term which is equivalent to the English expression, termination of a lease or tenancy.

tion of the crop' after the term of Whitsunday? The words of the demise are the same with regard to all three subjects, which are to be possessed for the space of nineteen years from the periods named respectively." For these reasons his Lordship came to the conclusion that the contention that under the lease there was but one "ish," namely, as from Whitsunday when the tenancy of the grass land came to an end, could not be supported.

Lord Watson also gave judgment to the same effect. He said :—That the contract embodied in the lease made effectual provision for three terms of entry, and three terms of "ish," in regard to different portions of the subjects let; and that, until the arrival of each term of "ish," a proper right of tenancy existed, with respect to such part of the subjects let as the tenant was bound to quit possession of at that term. That the "separation of the crops" ought to be read as signifying the term of Martinmas (11th November), the two being in popular language and legal effect equivalent expressions when they occur in a Scotch lease. That the expression "determination of a tenancy," in Secs. 2 and 7 of the statute, referred to the time when the tenant finally gave up possession of the subjects which in the statute are described as his "holding." A holding which entitles the tenant to the benefit of the provisions of the statute must, according to Sec. 35 of the Scotch Act (Sec. 54 of the English Act), be either wholly agricultural or wholly pastoral, or in part agricultural and as to the residue pastoral. Mr. Clay's holding, in so far as it consisted of lands in crop after Whitsunday 1892, was agricultural, and that was sufficient for the disposal of the appeal.

In the subsequent part of his judgment Lord Watson dealt with the further point, to which I alluded in the second of the Scotch cases which I reported in 1890, namely, whether the principle above enunciated applies to the case—so very common by custom in England—where the outgoing tenant has the right to use the barns and other farm buildings, or part of them, for some time after the period at which he gives up possession of the lands of the farm. On this point his Lordship is reported to have said that he entertained serious doubts whether, after Mr. Clay's removal in the autumn of 1892, that gentleman remained in possession of any holding within the meaning of the Act, for his Lordship was of opinion that the bare possession of a barn, barnyard, and two cothouses, unconnected with any land either pastoral or agricultural, was not a possession of a holding recognised by the Act.

This latter part of Lord Watson's judgment, it will be noticed, confirmed the decision of the Sheriff of Aberdeenshire in the second Scotch case which I reported in 1890; and as the reasons for the judgment would be similar in cases of farms in England, it is only reasonable to infer that our English Courts would decide this point in the same way if it should come before them.

This case of Black *v.* Clay is, I believe, the first that has been taken up to the House of Lords under either the English or the Scotch Agricultural Holdings Act; and it occurs somewhat opportunely in support of the concluding paragraph of the last case I reported for the Journal (see *ante*, p. 359), for the limitation of the right of appeal is as strong in the Scotch as in the English Act—perhaps stronger: "The decision of the Sheriff on appeal shall be final" (Sec. 20 of the Scotch Act).

S. B. L. DRUCE.

9 Old Square, Lincoln's Inn, W.C.

A FUNGUS ON BUTTER.

A PIECE of butter, taken from one of the samples exhibited at Cambridge, was submitted to me for examination by Professor Carroll. It weighed about ¼ oz., and displayed six dark-brown circular specks, averaging 2·5 mm. in diameter. Under a low power they were seen to consist of felted masses of brown branching filaments, each divided by closely recurring transverse septa into small, square compartments, many of which showed a tendency to sprout somewhat after the manner of yeast-cells. The lateral prolongations thus formed were cut off by septa from the mother-cell and were of a darker brown. Older specimens of these laterally budded-off spores became multiseptate from intercalation of transverse partition-walls, or spuriously so from formation of fresh buds at the apex. Many of the cells were almost wholly filled by a shining globule.

The condition above described (figs. 1 and 2) is identical with

FIG. 1.—Mycelium of Dematium. Form on butter, showing chlamydo-spore formation, and development of secondary spores by budding. (×200.)

FIG. 2.—Spore-chain on butter. (×200.)

Dematium pullulans, De By., and is to be looked upon as an imperfect state of some Sphærioid Pyrenomycete. It is hardly possible to state what is the precise species, for there is no doubt that many sphæriaceous fungi assume in their imperfect stage forms indistinguishable from *Dematium pullulans*. Thus, Brefeld has shown that *Sphærulina intermixta*, a species occurring on rose-twigs, possesses an imperfect form identical with the Dematium in question. He considers the close segmentation of the brown mycelium to be chlamydo-spore formation, and points out that the individual segments or chlamydo-spores reproduce themselves like yeasts by sprouting. Such spores are frequently to be met with as unbidden guests in beer-wort, where they vie with the true yeasts in unbounded power of prolification, and are one of the causes of viscidity.

In order to ascertain something of the life history of this fungus, I planted some spores on sterilised slices of potato, on drops of sterile nutrient gelatine, and on filter-paper that had been moistened with sterile broth. All these substrata were kept damp, and sheltered

FIG. 3.—Low power view of part of gelatine colony. (×about 80.)

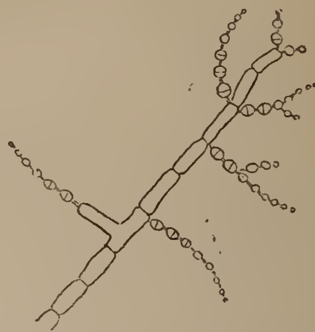


FIG. 4.—Diagrammatic view of branching system of fungus grown on gelatine.

from contamination, in a moist chamber. Germination occurred on all three media with great rapidity, and in a few days the site of inoculation was covered with a dense mass of dark-brown mould-growth. The gelatine culture being on a slide had only to be placed under the microscope, when the following details were at once made out (figs. 3, 4, 5). The youngest portions of the hyphæ, spread out a long distance into the gelatine, were colourless and septate only at lengthy intervals. Passing inwards towards the centre of the colony the hyphæ gradually assumed an olive hue, and gave off aërial branches, many of which ended in spore-chains. Several rather lengthy, often somewhat echinulate, basidial cells were produced close together from the end of the filament, and each bore a string of ovate spores which were distinctly beaked at each end so as to look like a somewhat loosely strung chaplet. The older spores were often uniseptate. Many of them had budded and thus given rise to secondary spore-chains. I observed a single basidial cell bear two distinct sterigmata, each of which gave rise to a distinct spore-chain. Another curious feature was that the basidial cells were articulated to the hyphæ by two points, one at each side of their basal end. Between these two points there was a concavity of the basal end. The spore-bearing hyphæ are often produced as lateral offshoots of submersed hyphæ.

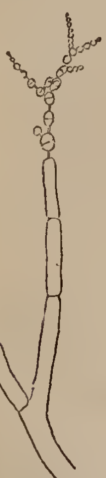


FIG. 5.—Portion of fig. 3 showing the connexion between the spores. (×250.)

The central part of the culture-spot is quite opaque, from the close massing together of the dark-brown spore-chains. Many of the submersed hyphæ do not throw off aërial branches, but, instead, exhibit a tendency to close transverse septation—Brefeld's chlamydospore formation.

A distinguished botanical authority, to whom I submitted a cultivation, identified it as typical *Cladosporium herbarum*, Lk. It appears to mé, however, to differ in several notable respects from the descriptions of that ubiquitous form as given by Cooke, Massee, and Saccardo. On the other hand, Corda figures in his *Icones Fungorum* a "*Penicillium Olivaceum*," which is very near the specimen I have under my eyes, but which I have been unable to trace in the more modern books. Its specific name would now ensure its exclusion from Penicillium. In his *Mykologische Untersuchungen*, Bd. X., Taf. VI., f. 40, Brefeld depicts a brown mould almost identical with mine, which he has traced to *Sphærella punctiformis*.

Whatever be the exact botanical position of this organism, I think there can be little doubt that it belongs to the developmental cycle of one or other of the Pyrenomycetes that infest the wood used for making butter-boxes. Some months ago I was requested by a leading box-manufacturer in Dublin to ascertain the nature of certain black spots on the interior of deal boxes used for packing butter. I found the spots to consist of a fungal development almost identical with that which I now describe as occurring on butter. It seems natural to suppose that the spores still present on the imperfectly seasoned planks may be induced to develop by the moisture exuding from the butter. Inasmuch as parchment paper is generally interposed between the wood and the butter, one must suppose that either a solution of continuity takes place in the paper, or that the fungal hyphæ grow through it on to the butter—a by no means unwarranted supposition, for damp paper is a happy hunting-ground for the botanist on the look out for both *Mucedines* and *Dematiei*.

Should this occurrence of brown mould on butter become unpleasantly frequent, then it might be necessary to suggest some means of keeping it in check. By selecting for boxes only such wood as is carefully seasoned; by brushing over the interior of the boxes with some harmless antiseptic, such as boracic acid or boro glyceride, and treating the paper in the same way; and, lastly, by avoiding the introduction of superfluous moisture with the butter and ensuring closeness and uniformity of packing, the desired end may, I believe, be readily accomplished.

EDMOND J. McWEENEY.

Bacteriological Laboratory,
Albert Farm, Glasnevin, Dublin.

WHEAT, SHEEP, AND CATTLE IN 1894.

The issue by the Board of Agriculture, at an earlier date than usual, of certain sections of the Agricultural Returns of Great Britain, renders available a series of figures which, though interesting at any time, are specially valuable at this period of the year. The "preliminary statement" given on pp. 583–84 differs from that which has hitherto been published at so early a date in setting forth for the first time the figures as to hay.

TABLE I.—*Areas of Wheat, Potato, and Hay Crops, and Numbers of Cattle, Sheep, and Pigs in* 1894 *and in* 1893.

Crops		England	Wales	Scotland	Great Britain
		acres	acres	acres	acres
WHEAT	1894	1,826,626	56,470	44,866	1,927,962
	1893	1,798,869	54,562	44,093	1,897,524
Increase in 1894		27,757	1,908	773	30,438
POTATOES	1894	340,557	34,038	129,859	504,454
	1893	355,553	35,024	137,244	527,821
Decrease in 1894		14,996	986	7,385	23,367
HAY FROM CLOVER AND ROTATION GRASS	1894	1,558,799	170,135	392,970	2,121,904
	1893	1,496,467	168,403	382,138	2,047,008
Increase in 1894		62,332	1,732	10,832	74,896
HAY FROM PERMANENT GRASS	1894	4,178,720	510,649	163,073	4,852,442
	1893	3,606,918	499,009	164,553	4,270,480
Increase (+) *or Decrease* (−) *in* 1894.		+571,802	+11,640	−1,480	+581,962
Live Stock		No.	No.	No.	No.
CATTLE (of all ages)	1894	4,450,607	695,000	1,201,506	6,347,113
	1893	4,744,059	738,608	1,218,009	6,700,676
Decrease in 1894		293,452	43,608	16,503	353,563
SHEEP (of all ages)	1894	15,509,995	3,078,641	7.272,864	25,861,500
	1893	16,805,280	3,101,890	7,373,164	27,280,334
Decrease in 1894		1,295,285	23,249	100,300	1,418,834
PIGS (of all ages)	1894	2,013,823	227,668	148,535	2,390,026
	1893	1,793,456	200,676	119,398	2,113,530
Increase in 1894		220,367	26,992	29,137	276,496

A still greater advance has been made by the issue, in September, of further details relating to the wheat, potato, and hay crops, and to cattle, sheep, and pigs. From these figures Table I. has been compiled. It shows that the wheat crop and the hay crop from temporary grass land both extended their areas in 1894 as compared with 1893, alike in England, Wales, and Scotland; that permanent

TABLE II.—*Acreages of Wheat, and Numbers of Sheep and Cattle, in each County of England, as on June* 4, 1894.

County	Wheat		Sheep		Cattle	
	1894	Increase (+) or decrease (−) on 1893	1894	Increase (+) or decrease (−) on 1893	1894	Decrease on 1893
	acres	acres	No.	No.	No.	No.
Bedford	40,016	+ 4,158	100,411	− 19,164	30,772	4,680
Berks	38,867	+ 371	182,334	− 31,000	38,003	6,368
Buckingham	38,383	+ 2,736	188,531	− 30,845	66,770	7,304
Cambridge	96,658	− 1,783	209,929	− 29,015	49,379	6,413
Chester	12,621	+ 2,471	78,541	− 18,977	169,618	7,661
Cornwall	27,679	+ 420	415,031	− 30,701	190,749	10,509
Cumberland	4,510	+ 502	520,811	+ 10,732	138,118	1,762
Derby	14,581	+ 1,301	186,188	− 23,939	141,010	8,918
Devon	62,901	+ 724	868,708	− 50,456	264,969	8,014
Dorset	21,657	− 1,074	383,693	− 26,441	79,955	3,614
Durham	16,306	+ 2,969	217,788	− 10,060	71,899	330
Essex	124,592	+ 6,405	276,269	− 54,346	72,932	13,820
Gloucester	49,384	− 1,185	333,855	− 46,170	108,506	13,698
Hants	63,603	− 2,380	385,133	− 9,055	74,979	6,189
Hereford	28,291	− 131	309,441	− 29,118	89,934	4,775
Hertford	52,415	+ 3,732	115,474	− 27,202	30,051	7,022
Huntingdon	32,669	+ 2,174	104,581	− 7,219	30,841	2,458
Kent	57,927	+ 4,901	899,374	− 76,579	65,071	12,181
Lancaster	17,356	+ 2,680	508,264	− 8 692	225,439	11,393
Leicester	23,213	+ 617	307,853	− 34,661	133,178	6,021
Lincoln	180,170	− 724	1,153,863	− 120,453	237,055	15,857
London	343	− 44	6,399	+ 961	6,732	913
Middlesex	3,614	− 326	18,792	− 5,802	16,222	2,349
Monmouth	7,867	+ 161	193,005	− 19,590	45,433	3,843
Norfolk	125,734	− 17,274	519,321	− 71,546	113,505	12,575
Northampton	46,261	+ 1,802	397,595	− 43,722	119,617	3,062
Northumberland	8,655	+ 2,091	992,789	− 21,949	105,682	3,580
Notts	39,430	− 94	217,358	− 23,286	84,714	7,359
Oxford	37,418	+ 1,608	245,929	− 26,262	54,919	6,187
Rutland	5,033	− 68	83,152	− 6,228	17,613	846
Salop	34,896	− 2,615	445,461	− 50,060	163,382	7,869
Somerset	33,419	+ 915	524,097	− 37,615	212,476	10,256
Stafford	22,373	+ 387	246,186	− 37,543	151,503	7,953
Suffolk	106,020	− 4,914	40[illegible],302	− 49,364	62,772	8,059
Surrey	23,442	+ 384	74,467	− 6,476	40,764	5,578
Sussex	61,249	+ 1,776	461,209	− 38,812	102,043	10,265
Warwick	38,577	+ 3,077	265,121	− 43,780	95,923	11,017
Westmorland	246	+ 10	356,089	− 1,145	62,935	1,019
Wilts	55,334	− 3,748	546,335	− 40,415	100,349	5,826
Worcester	36,695	+ 2,813	157,076	− 34,319	60,175	8,202
York, E. Riding	60,700	+ 3,738	438,977	− 20,287	86,537	4,631
York, N. Riding	29,013	+ 6,492	676,427	− 27,786	167,651	6,024
York, W. Riding	46,478	+ 2,702	694,836	− 16,868	270,432	7,052

grass land was mown for hay upon a greater area in England and in Wales, but upon a lesser area in Scotland; and that the area under potatoes declined in all three sections of Great Britain. The table further indicates that in England, in Wales, and in Scotland the number of cattle as well as the number of sheep diminished, whilst the number of pigs increased.

In a note upon "Wheat and Sheep in England in 1893," which appeared in the Journal last year (3rd Series, Vol. IV. Part IV. pp. 866–77), tables were introduced to show that in 1893 the area of wheat and the number of sheep had alike decreased in every county of England. Such a sweeping assertion cannot be made this year, though it is possible to make the hardly less startling statement that cattle have diminished in numbers in every English county. Save for moderate increases recorded in a couple of counties, it would be correct to say that sheep also had undergone an equally general decline, whilst the total diminution under this head in England exceeds the serious decline recorded in 1893. With regard to the areas of wheat the changes in the counties are usually of but moderate extent, though the number that register an increase is greater than the number that show a decline. Moreover, whilst the largest decrease is 17,274 acres in Norfolk, the largest increase is only 6,492 acres in the North Riding of York. Table II. is specially constructed to show the changes which the English counties have severally experienced in the areas assigned to wheat, and in the numbers of sheep and cattle of all ages. It may, perhaps, be usefully studied in conjunction with the paper, already referred to in last year's Journal, where the table on p. 868, which shows the acreage of wheat in each county of England, and that on p. 876, which shows the number of sheep in each county, are more particularly of interest.

Wheat in England.—In Table III. are recorded the changes in

TABLE III.—*Number of Acres of Wheat in England in each Year from* 1885 *to* 1894.

Year	Acres	Increase (+) or decrease (−) on previous year	Year	Acres	Increase (+) or decrease (−) on previous year
1885	2,349,305	−181,406	1890	2,255,694	− 65,810
1886	2,161,126	−188,179	1891	2,192,393	− 63,301
1887	2,197,580	+ 36,454	1892	2,102,969	− 89,424
1888	2,418,674	+221,094	1893	1,798,869	−304,100
1889	2,321,504	− 97,170	1894	1,826,626	+ 27.757

the area of the wheat crop of England for the last ten years. It is seen that the diminution in area which has been in progress since 1888 has received a slight check this year, when for the first time in six years an increase is registered on the year. Ten years ago—in 1884—the wheat crop occupied 2,530,711 acres in England, or 704,085 acres more than in the present year. The average annual area for the 5-years period 1876–80 was 2,863,288 acres, and for the preceding period of five years, 1871–75, it was 3,284,445. The area of wheat in England is now only about 60 per cent. of what it was a score of years ago. Nevertheless at the present time it constitutes nearly 95 per cent. of the entire wheat acreage of Great Britain, for in this island wheat is very characteristically the crop of England.

Sheep in England.—No recent fluctuation in the sheep population of England is equal in extent to that which took place during the year ended June 4, 1894. As will be gathered from Table IV., the

TABLE IV.—*Number of Sheep of all Ages in England in each Year from* 1885 *to* 1894.

Year	Number	Increase (+) or decrease (−) on previous year	Year	Number	Increase (+) or decrease (−) on previous year
1885	16,809,778	+381,714	1890	16,841,288	+1,001,406
1886	16,402,138	−407,640	1891	17,874,722	+1,033,434
1887	16,452,508	+ 50,370	1892	17,993,756	+ 119,034
1888	15,788,794	−663,714	1893	16,805,280	−1,188,476
1889	15,839,882	+ 51,088	1894	15,509,995	−1,295,285

losses in sheep during the last two years, amounting as they do to close upon two and a half million head, have more than swallowed up the gains that accumulated in the four years 1889–92. Only on two occasions since 1866—the period for which the Agricultural Returns have now been collected—has the number of sheep in England fallen to so low a level as at present.[1] The annual average number for the 5-years period 1871–75 was, indeed, 18,717,511, so that twenty years ago sheep were more numerous than now by upwards of three million head. This year's decline exceeds the heavy diminution of last year; furthermore, in 1893 there was no county decrease equal to this year's loss of 120,453 sheep in Lincolnshire, or 76,579 in Kent, or 71,546 in Norfolk.

The present distribution of sheep in Great Britain is, in round numbers—England 60 per cent., Wales 12 per cent., and Scotland 28 per cent. To this year's decrease of 1,418,834 head in Great Britain, England contributed 91·3 per cent., Wales 1·7 per cent., and Scotland 7 per cent.

Cattle in England.—As with sheep, so with cattle, this year's movement exceeds in dimensions that of any other recent year, as is evident from the number of 293,452 head by which this year's decline is measured in Table V. The diminution of over half a million head in the last two years has gone a very long way towards wiping out the increase which accrued during the three years 1890–91–92; and with two exceptions (1888 and 1889) this year's number of cattle in England is the lowest of the decade.

Moreover, the total of 4,450,607 for the current year is almost

[1] In 1881, when the number of sheep in England was 15,382,856; and in 1882, when the number was 14,947,994. Liver fluke was very prevalent during these two years, and led to considerable mortality among sheep.

identical with the 4,451,658 of ten years ago (1884). It is much higher, however, than the total of 4,064,800, which may be taken as the annual average of the decade 1871–80.

It should specially be noticed (Table II.) that a decrease in the number of cattle has this year taken place in every county of England, Lincolnshire taking the lead with a loss of 15,857 head. Of the cattle of Great Britain, as now distributed, 70 per cent.

TABLE V.—*Number of Cattle of all Ages in England in each Year from* 1885 *to* 1894.

Year	Number	Increase (+) or decrease (−) on previous year	Year	Number	Increase (+) or decrease (−) on previous year
1885	4,713,101	+261,443	1890	4,617,641	+264,984
1886	4,769,119	+ 56,018	1891	4,870,215	+252,574
1887	4,623,715	−145,404	1892	4,968,590	+ 98,375
1888	4,352,826	−270,889	1893	4,744,059	−224,531
1889	4,352,657	− 169	1894	4,450,607	−293,452

belong to England, 11 per cent. to Wales, and 19 per cent. to Scotland. Of the loss of 353,563 head of cattle in the year ended June 4, 1894, 83 per cent. was borne by England, 12 per cent. by Wales, and only 5 per cent. by Scotland.

Many points of practical interest might be brought out by a discussion of the circumstances which have led to the fluctuations in the wheat areas of the English counties, and to the almost general decline in the numbers of sheep and of cattle during the present year. Space, however, is not available for such a digression, and we must rest content with directing the attention, at the earliest possible moment, of farmers, and particularly of sheep and cattle breeders, to the changes which are recorded in the figures here tabulated.

W. FREAM.

13 Hanover Square, W.

THE SUMMER OF 1894.

THE summer of 1894 proved a somewhat disheartening time for the English farmer. Up to the close of April the weather of the agricultural year had been so unusually favourable that the most sanguine hopes were entertained as to the approaching harvest. In May, however, a steady deterioration set in, and from this time onward to the close of August the country experienced an almost constant succession of cloudy skies and low temperatures, with frequent storms of thunder, hail, and rain. Towards the close of June there was, it is true, a marked improvement, and for a time it seemed quite possible that the summer would even yet lend its aid in the production of a harvest of abnormal excellence. Such expectations as these were, however, soon falsified, for after ten days or so of genial sunshine the atmosphere again fell into as unsettled a state as ever, the tendency for the remainder of the season being for the conditions to become more and more inclement. July was certainly worse than June, while August proved quite as rainy and decidedly cooler than either of the two preceding months. The general result of so much bad weather was to materially diminish the high expectations which prevailed early in the season. The beneficial effects of the winter and early spring months were, however, not entirely effaced; and although the reports from the country were far from unanimous, their general tenor seemed to encourage the belief that, in spite of so adverse a summer, the harvest of 1894 would be quite equal, if not superior, to the average of recent years.

The leading features in the weather of the past summer are shown in the table on p. 577 which gives for various parts of England and Wales a summary of the conditions relating to the temperature, the rainfall, and the bright sunshine of the entire season.

Temperature.—The mean temperature was above the average during the last week in June and the first week in July, and equal to the normal during the closing days of July and August. At nearly all other times the weekly values were below the average, the deficit being usually slight, but rather considerable in the third week of August. Taking the summer as a whole, the mean temperature was decidedly low, the difference from the average ranging from about half a degree in the north-eastern, midland, and north-western counties and the Channel Islands to very nearly a whole degree in the remaining English districts. From an examination of the maximum and minimum temperatures, taken separately, we see that the absence of warmth was confined almost exclusively to the daytime, the night readings being in many districts either equal to or slightly above the normal. The day temperatures showed, on the other hand, a marked deficiency, ranging from about half a degree in the north-eastern counties to a degree and a half in the north-western counties, and to about a degree and three-quarters in the eastern and southern districts. The coolness of the past summer was, as a matter of fact, due to the abnormal prevalence of dull weather, the effect of which was shown in two ways. In the first place, the absence of bright sunshine prevented the thermometer from rising to its normal height in the daytime; while, in the second place, the undue prevalence of cloud hindered the progress of terrestrial radiation, and thus kept the nights fairly warm. The highest day temperatures recorded during the summer were observed at the close of June or the beginning of July, when the thermometer rose to 85° and upwards in most of the English districts, and to 87° in the eastern and south-western counties. Over the country generally the thermometer at no other time reached 80°, and during the greater part of the season the maximum readings were seldom as high as 75°. In the southern counties and the Channel Islands, however, a reading of 80° was attained at the close of August. The lowest night temperatures were observed on various dates in the first half of June. In the eastern counties the thermometer did not go below 40°, but in the midland counties it fell to 36°, and in the south-western district to 35°. In the two regions last named slight frost occurred on the surface of the ground.

Rainfall.—The excessive rainfall of last summer was due to two distinct sets of cyclonic disturbances, which appeared alternately over the northern and extreme southern parts of the United Kingdom. The former systems, which were of considerable size, advanced in most instances from the Atlantic, and passed either directly over Scotland, or along the west and north coasts of that country. The latter systems were much smaller, and were either developed in the neighbourhood of our south-west coasts, or advanced in a north-easterly direction over the Bay of Biscay, France, and the English Channel. The area of greatest disturbance consequently lay, in nearly every case, over the northern or the extreme southern parts of our islands, and it was in these regions that the heaviest rains were experienced. In the east of Scotland (a district affected by the northern depressions) the total fall during the summer was 32 per cent. in excess of the average, while in the north of Scotland it was as much as 58 per cent. in excess. In the extreme south of England (a region affected by the small southern depressions) the excess was even greater, the rainfall over the district lying between the Thames and the Channel being 36 per cent. more than the average, while in the Channel Islands themselves it was no less than 62 per cent. in excess of the normal. At St. Aubin's, Jersey, where the total amount was more than double the average, the past summer was by far the wettest experienced for at least thirty years. Over the northern and eastern parts of England the excess of rainfall was not very great, while in the midland counties (a district which escaped the worst effects either of the northern or the southern depressions) there was a slight deficiency. The number of rainy days was in excess of the average in all parts of the country; but in this respect also the midland counties were the lightest sufferers, the districts most affected being the northern and extreme southern counties. Of the numerous heavy downpours which occurred over England in the course of the summer, the most important were those of June 4, July 10, 24, and 29, and August 2, 9, and 25. The July falls were especially heavy in the south. On the 10th of the month over an inch and a half was experienced in many parts of the southern and south-eastern counties, and over two inches in some parts of Sussex; on the 24th more than an inch was recorded in the south-western counties, and between two and a half and three inches in the neighbourhood of Bristol (where serious floods occurred); on the 29th, amounts ranging between an inch and an inch and a half were experienced in several parts of Sussex and Hampshire, and more than two and a half inches at Westbourne

Temperature, Rainfall, *and* **Bright Sunshine** *experienced over* **England** *and* **Wales** *during the thirteen weeks ended September* 1, 1894.

(The Summer Season.)

Districts	Temperature							
	Highest observed	Lowest observed	Day temperatures		Night temperatures		Day and night temperatures combined	
			Mean	Difference from average	Mean	Difference from average	Mean	Difference from average
	°	°	°	°	°	°	°	°
North-eastern counties . .	84	37	63·8	−0·6	50·7	−0·4	57·3	−0·5
Eastern counties . . .	87	40	66·7	−1·7	51·3	+0·2	59·0	−0·8
Midland " . . .	86	36	66·9	−1·0	50·2	0·0	58·6	−0·5
Southern " . . .	86	39	66·7	−1·8	53·5	+0·2	60·1	−0·8
North-western counties, including North Wales .	83	38	63·8	−1·5	52·3	+0·4	58·1	−0·5
South-western counties, including South Wales .	87	35	64·2	−1·0	52·3	−0·8	58·3	−0·9
Channel Islands . . .	81	45	64·1	−1·3	55·8	+0·4	60·0	−0·4

Districts	Rainfall				Bright Sunshine			
	Days with rain		Total fall		Duration		Percentage of possible amount	
	Number	Difference from average	Amount	Difference from average	Hours recorded	Difference from average	Percentage	Difference from average percentage
			ins.	ins.				
North-eastern counties .	52	+ 8	8·0	+0·8	436	− 23	30	− 2
Eastern counties . .	50	+ 5	7·9	+0·8	484	−81	34	− 6
Midland " . . .	48	+ 3	7·2	−0·4	438	−68	31	− 5
Southern " . . .	51	+ 9	8·7	+2·3	514	−75	37	− 5
North-western counties, including North Wales	55	+ 8	9·6	+0·6	411	−57	29	− 3
South-western counties, including South Wales	58	+10	10·5	+1·5	485	−116	35	− 8
Channel Islands. . .	56	+ 7	11·0	+4·2	546	−138	39	−10

NOTE.—The above Table is compiled from information given in the Weekly Weather Report of the Meteorological Office. The averages employed are :— For Temperature, the records made during the twenty years, 1871–90; for Rainy Days, the values for the thirteen years, 1878–90; for total Rainfall, those for the twenty-five years, 1866–90; and for Bright Sunshine, those for the ten years, 1881–90.

(near Emsworth). The rainfalls of June 4 and August 2 and 9 were restricted mainly to the northern parts of the country, and were as a rule less heavy than those in the south. On August 9, however, more than two and a half inches are said to have fallen in the neighbourhood of Carlisle. In nearly all cases the torrential rains were accompanied by thunderstorms, and in many instances by hail, the destructive effect of the latter upon the crops being often very serious.

Bright Sunshine.—A deficiency in the amount of bright sunshine was reported throughout nearly the entire summer, the only times in which any excess was shown being the end of June and the beginning of July, when fine weather prevailed over the entire country, and the last week in August, when the southern districts were alone favoured. Taking the season as a whole, we see from the table that the duration of sunshine was below the average in all districts, the deficiency being comparatively small in the north, but exceedingly large in the south. Over our southern counties the mean daily amount was about three-quarters of an hour less than the average, and in the south-western counties about an hour and a quarter less; while in the Channel Islands the deficiency was as much as an hour and a half. Although any comparison with so abnormally fine a summer as that of 1893 may seem a little unfair, the subjoined facts are of some value in furnishing a proof of the extreme variability of our climate and the wide vicissitudes to which the English farmer is exposed. Over the midland, eastern, and southern counties the aggregate duration of bright sunshine in the summer of 1894 was about 150 hours less than in that of 1893, the mean daily amount showing a deficiency of nearly an hour and three-quarters. In the south-western counties the aggregate duration this year was about 230 hours less than in 1893, the mean daily amount showing a deficiency of about two hours and a half. This difference, however, large though it undoubtedly was, sinks into insignificance when compared with the state of things existing in the Channel Islands, where the amount of sunshine last summer was nearly 320 hours smaller than in the fine season of 1893. Last year the mean daily amount of sunshine in that locality was as much as nine hours and a half; this year the amount was only six hours—a deficiency for the entire summer of no less than three hours and a half per day. The Channel Islands, usually one of the most favoured spots in the British area, seem, in fact, this year to have experienced more rain and a greater deficiency of bright sunshine than any other part of the country.

RECENT AGRICULTURAL INVENTIONS.

The subjects of Applications for Patents from June 9 *to Sept.* 8, 1894.

N.B.—Where the Invention is a communication from abroad, the name of the Inventor is shown in italics, between parentheses, after the name of the applicant.

Agricultural Machinery and Implements, &c.

No. of Application. Year 1894.	Name of Applicant.	Title of Invention.
11465	BLACKSHAW, F.	Seed drills.
11479	JOHNSTON, W., and GRAY, J.	Hardening knife sections of harvester binders, &c.
11789	SLEEP, W. H. & R.	Cultivators.
11819	CALDWELL, P.	Hay, &c., forks.
12071	PHILLIPS, J. F.	Haymaking machines.
12096	MCKENZIE, W.	Threshing ,,
12186	BOULT W. (*Hull, Canada*)	Seed drills.
12228	SCALES, E.	Chaff cutters.
12264	STEEVENSON, J. E.	Cultivating, &c., land.
12298	HOWARD, J. H.	Ploughshares.
12317	SANDEMAN, W. (*Greenwood*).	Threshing machines, &c.
12373	ROBINSON, J.	Wrought metal ploughshare.
12403	WALDOCK, H. G.	Chaff-cutting machines.
12461	LIVENS, F. H.	Straw-bruising apparatus for threshing machines.
12743	TOWNSEND, C. E., and NUNAN, T.	Hay rakes.
12843	HILL, M. T.	Hay turners.
13237	COOK, T. W.	Hay, &c., elevators.
13498	THOMPSON, W. P. (*Grabner, Germany*)	Fastening device for scythes.
13659	BENNETT, E.	Press-drill for attaching to a plough.
13963	SCOTT, E. (*Chambers & Co., U.S.A.*)	Side delivery hay rake, &c.
13964	SCOTT, E. (*The Sandwich Manufacturing Co., U.S.A.*)	Swathe or windrow hay loader.

No. of Application. Year 1894.	Name of Applicant.	Title of Invention.
14050	Whiting, G. L. . .	Cultivator.
14085	Watts, S. . . .	Hand plough for potatoes.
14201	Kearsley, G., & others	Mowing machines.
14259	Osborn, J. . . .	Safety self-feeder to chaff-cutter.
14050	Whiting, G. L. . .	Cultivator.
14485	Gerth, J., & anr. . .	Harrows.
15566	Pierce, P. . . .	Mowing and reaping machines.
16236	Holben . . .	Feed apparatus for threshing machines.
16298	Anderson, W. . .	Reaping and binding machines.
16663	Garfitt, C . . .	Hay-cutting knife.

Stable Utensils and Fittings—Horse-shoes, &c.

11400	Thompson, W. P. (*Ehler, Germany*) . . .	Safety stirrup.
11434	Peronnet, J., & anr. .	Horse-collars.
11497	Garnier, E., & Ellis, W.	Pneumatic horse-collar.
11775	Torrens, J. A. . .	Appliance for picketing horses.
11781	Harries, Y. E. . .	Saddle-bars.
12058	Machell, H. . .	Appliance to hold reins on a carriage.
12116	Terry, J. . . .	Horse-shoes.
12399	Mihaloczy, A. . .	Safety stirrup.
12792	Benfield, J. . .	Horse-shoes.
12793	„ . . .	„
12794	„ . . .	„ and roughing cogs.
13119	Prangley, R. F. . .	Mangers.
13132	Thudichum, L. M. (*Terry, U.S.A.*) .	Feed bag.
13212	Grunfelder, L., & anr.	Horse-shoe pad.
13286	Pack, C. . . .	Stopping horses by electricity.
13347	Thompson, W. P. (*Gibbs, U.S.A.*) . . .	Horse-shoes.
13496	Thompson, W. P. (*Haddorf & anr., Germany*)	Stirrup.
13602	Garvie, C. A. . .	Air-inflated horse-collar.
13691	Fabry, J. . . .	Protecting pastern points of horses.
13966	McKenny . . .	Muzzle for horses.
13985	Bywater . . .	Side-saddles.
14026	Money, J. . . .	Combined horse-shoe and pad.
14051	Bill, D. K. . . .	Horse-collars.
14097	Guest, C. H., & Greenall, J. . . .	Harness collars.

No. of Application. Year 1894	Name of Applicant.	Title of Invention.
14335	BURRELL, F. J. .	. Harness collars.
14378	INSTONE, A. J. .	. Tethering apparatus.
14640	BAILEY, C. I. C. .	. Horse-shoes.
14703	SEWELL, F. G. & H. J. .	. Collars.
15378	ZILLWOOD, A. .	. Nosebags.
15508	GORMAN, J., & BOLT, A.	Restraining runaway horses.
15546	TORRENS, J. A. .	. Saddle-bars.
15578	SUTHERLAND, J., & anr.	Horse-shoes.
15786	SPOHR, P. . .	. Joint horse-bit.
16142	JOHNSON, J. Y. (*Little, New Zealand*) .	. Horse-clipping machine.
16502	MCKELVIE, D. N.	. Back bands and trace chains.
16657	HILL, J. . .	. Rough for horse-shoes.
16991	CLOKE, T., & anr. .	. Self-locking pad for horses.
17008	LEWIS, H. . .	. Nosebags.
17073	CORP, J. . .	. Harness.

Carts and Carriages.

11759	LANG, W. V. .	. Hand brake.
11956	ANGUS, W. . .	. Brake mechanism.
12249	TRIMMER, J. .	. Key sticks for tip carts.
13763	SARGENT, W. D. .	. Brake shoes.
13862	WILLIAMS, W. .	. Carts for loading, &c., hay.
14093	WALMSLEY & SMITH	. Carts.

Dairy Utensils, &c.

11393	CASSE, W. F. .	. Preserving milk, &c.
12778	WALLWORK, R. .	. Churns.
13057	DUNCAN, J. H. H.	. Making butter.
13712	NASH, R. G. . .	. Sterilization and preservation of milk.
13722	WRIGHT, S. H. .	Producing butter.
14128	CHEELD, S. . .	. Churning butter.
14129	,, . . .	,, and drying butter and testing milk.
14458	,, . .	. Holders or carriers for bottles of milk-testing machines.
14638	SHIELS, A. . .	. Vacuum regulating apparatus for milking machines.
14789	,, . .	. Teat cups for ,, ,,
14832	DAUL, A. . .	. Making butter.
14845	DE LAVAL, C. G. .	. Mechanical milking apparatus.

No. of Application. Year 1894.	Name of Applicant.	Title of Invention.
15027	SHIELS, A. . .	Vacuum controlling apparatus for milking machines.
15493	DUNCAN, J. H. H.	Manufacture of butter.

Poultry and Game, &c., Appliances

11698	MCLAREN, D. .	Egg carrier.
12081	NEIL, A., & anr. .	Safety egg carrier.

Miscellaneous.

12234	CHRISTOPHER, H. M.	Apparatus for bathing the legs of animals.
13033	FLETCHER, R. S. & T. C.	Portable sheep-dipping apparatus.
13067	BLACKIE & WHITE	Preparations for dipping, &c.
13178	MILLOT, A. M. .	Food for cattle.
14003	DAVIS, J. G. . .	Feed troughs.
14882	CASTLEDEN, G. .	Beehives.
16075	DAWS, G. . .	Branding cattle, &c.

Numbers of Specifications relating to the above subjects published since March 10, 1894.[1]

Specifications of 1893.

10404, 11424, 12177, 12268, 13620, 13866, 14099, 14312, 14371, 14382, 14391, 14654, 14921, 15352, 15636, 15762, 15893, 16241, 16330, 16424, 16768, 17240, 17250, 17499, 17584, 17714, 17724, 18606, 18628, 18768, 19173, 19201, 19498, 19580, 19817, 21406, 23678, 23868.

Specifications of 1894.

400, 3734, 6773, 8133, 8360, 10409, 10944, 11479, 12116, 12186, 12373, 13212.

[1] Copies may be obtained at the Patent Office (Sale and Store Branch), 38 Cursitor Street, London, E.C. (Price 8*d.* each copy.)

STATISTICS AFFECTING BRITISH AGRICULTURAL INTERESTS.

Agricultural Returns of Great Britain, 1894.

Preliminary Statement *compiled from the Returns collected on June* 4, 1894, *showing the Increase or Decrease on the Returns for the Years* 1893 *and* 1892 *respectively.*

A.—1894 compared with 1893.

Crops	**1894**	1893	Increase	Decrease	Increase	Decrease
	Acres	Acres	Acres	Acres	Per cent.	Per cent.
Wheat	1,927,962	1,897,524	30,438	..	1·6	..
Barley	2,096,034	2,075,097	20,937	..	1·0	..
Oats	3,253,145	3,171,756	81,389	..	2·6	..
Potatoes	504,454	527,821	..	23,367	..	4·4
Hay, Clover, & Rotation Grasses	2,121,904	2,047,008	74,896	..	3·7	..
„ Permanent Pasture	4,852,442	4,270,480	581,962	..	13·6	..
Hops	59,535	57,564	1,971	..	3·4	..
Live Stock	No.	No.	No.	No.	Per cent.	Per cent.
Cows & Heifers in Milk or in Calf	2,460,086	2,554,624	..	94,538	..	3·7
Other Cattle:—2 years & above	1,516,672	1,580,242	..	63,570	..	4·0
„ 1 year & under 2	1,217,145	1,354,523	..	137,378	..	10·1
„ Under 1 year	1,153,210	1,211,287	..	58,077	..	4·8
Total of Cattle	6,347,113	6,700,676	..	353,563	..	5·3
Ewes kept for Breeding	9,668,002	10,128,676	..	460,674	..	4·5
Other Sheep:—1 year & above	6,342,730	6,911,063	..	568,333	..	8·2
„ Under 1 year	9,850,768	10,240,595	..	389,827	..	3·8
Total of Sheep	25,861,500	27,280,334	..	1,418,834	..	5·2
Sows kept for Breeding	351,119	308,722	42,397	..	13·7	..
Other Pigs	2,038,907	1,804,808	234,099	..	13·0	..
Total of Pigs	2,390,026	2,113,530	276,496	..	13·1	..

B.—1894 compared with 1892.

Crops	1894	1892	Increase	Decrease	Increase	Decrease
	Acres	Acres	Acres	Acres	Per cent.	Per cent.
Wheat	1,927,962	2,219,839	..	291,877	..	13·1
Barley	2,096,034	2,036,810	59,224	..	2·9	..
Oats	3,253,145	2,997,545	255,600	..	8·5	..
Potatoes	504,454	525,361	..	20,907	..	4·0
Hay, Clover, & Rotation Grasses	2,121,904	2,135,362	..	13,458	..	0·6
„ Permanent Pasture	4,852,442	4,489,626	362,816	..	8·1	..
Hops	59,535	56,259	3,276	..	5·8	..
Live Stock	No.	No.	No.	No.	Per cent.	Per cent.
Cows & Heifers in Milk or in Calf	2,460,086	2,650,891	..	190,805	..	7·2
Other Cattle:—2 years & above	1,516,672	1,666,706	..	150,034	..	9·0
„ „ 1 year & under 2	1,217,145	2,627,186	..	256,831	..	9·8
„ „ Under 1 year	1,153,210					
Total of Cattle	6,347,113	6,944,783	..	597,670	..	8·6
Ewes kept for Breeding	9,668,002	17,957,049	..	1,946,317	..	10·8
Other Sheep:—1 year & above	6,342,730					
„ „ Under 1 year	9,850,768	10,777,655	..	926,887	..	8·6
Total of Sheep	25,861,500	28,734,704	..	2,873,204	..	10·0
Sows kept for Breeding	351,119	—[1]	—	—	—	—
Other Pigs	2,038,907	—[1]	—	—	—	—
Total of Pigs	2,390,026	2,137,859	252,167	..	11·8	..

[1] Not separately distinguished in 1892.

Acreage of Hops.

Preliminary Statement compiled from the Returns collected on June 4, 1894, showing the Acreage under **HOPS** in each County of England in which Hops were grown, with a Comparative Statement for the Years 1893, 1892, and 1891.

Counties	1894	1893	1892	1891
	Acres	Acres	Acres	Acres
Berks	11	11	10	11
Gloucester	39	33	39	25
Hants	2,911	2,795	2,775	2,749
Hereford	7,525	7,079	6,797	6,560
Kent	35,520	34,815	34,058	34,266
Notts	—	—	11	14
Salop	140	123	117	112
Suffolk	17	21	18	20
Surrey	1,935	1,845	1,938	1,955
Sussex	7,589	7,326	7,124	7,150
Worcester	3,848	3,516	3,369	3,280
Total	59,535	57,564	56,259	56,142

Note.—In 1894 as compared with 1893 the following counties show increases:—Gloucester, 6 acres; Hants, 116 acres; Kent, 705 acres; Salop, 17 acres; Surrey, 90 acres; Sussex, 263 acres; Worcester, 332 acres. The only decrease is Suffolk, 4 acres.

JOURNAL

OF THE

ROYAL AGRICULTURAL SOCIETY OF ENGLAND.

ROTATION OF CROPS.

CONTENTS.

INTRODUCTION AND HISTORICAL SKETCH.

IT has frequently been explained that the general scope and plan of the Rothamsted field experiments have included the growth of some of the most important crops of rotation, each separately, year after year, for many years in succession on the same land, without manure, with farmyard manure, and with a great variety of chemical manures—the same description of manure being, as a rule, applied year after year on the same plot. But, besides such experiments, what may in a sense be called complementary series have also been made—on the growth of crops in an actual course of rotation, without and with different manures. Lastly, others have been conducted on the mixed herbage of permanent grass-land, both without and with various manures.

It is obvious that the results of the field experiments with individual crops must of themselves throw much light on the characteristic requirements of the particular crop under investigation; whilst those on the growth of crops in an actual course of rotation will serve to confirm and control those obtained with the individual crops; and they will, in their turn, receive elucidation from the results with the individual crops. Then, again, the results of experiments on the application of different manures to the mixed herbage of permanent grass-land, which includes, among others, members of the botanical families that contribute some of the most important of our rotation crops, may, independently of their value in reference to the special objects for which they were undertaken, be expected to afford interesting collateral evidence in regard to the requirements of individual plants when thus grown in association, instead of separately year after year, or in rotation, as in the other series of experiments. Obviously, too, the chemical statistics of the crops so variously grown, and of the soils of the plots upon which they have been grown, must afford very important data for further study and elucidation.

The individual crops which have been grown separately year after year on the same land include—wheat, barley, and oats, as members of the Order Gramineæ; beans, clover, and other plants, of the Order Leguminosæ; turnips of the Cruciferæ; sugar-beet and mangel-wurzel of the Chenopodiaceæ; and potatoes of the Solaneæ. Then, the experiments on rotation include those with members of three different Orders of plants—turnips of the Cruciferæ, barley and wheat of the Gramineæ, and clover and beans of the Leguminosæ. Lastly, there are the experiments on the mixed herbage of permanent grass-land, which, besides gramineous and leguminous plants, includes numerous species of other natural Orders.

The first experiments made were those with root-crops, which were commenced in June 1843, so that the present year (1894) is the fifty-second of their continuance. The second were those on wheat, commenced in the autumn of 1843, so that the crop just harvested is the fifty-first grown in succession on the same land. The experiments with beans were commenced in

1847; but, for reasons which have been explained in various papers, they have not been continued up to the present time. Those with clover were commenced in 1848, and have been succeeded on the same land by others with various leguminous plants, which are still continued. Then, of the other more important series, those on barley were commenced in 1852, and are still in progress, the crop of the present year being, therefore, the forty-third in succession. Experiments with oats were commenced in 1869, and continued for ten years; and others, on the growth of wheat alternated with fallow, but without manure, were commenced in 1851, and are still going on, 1894 being, therefore, the forty-fourth year. Of the other field experiments, those on the mixed herbage of permanent grass-land were commenced in 1856, so that this year completes the thirty-ninth of their continuance. Lastly, the experiments on an actual course of rotation were commenced in 1848, and are still continued, so that the present is their forty-seventh year.

In former papers in this Journal, and elsewhere, the influence of exhaustion, manures, and variations of season, on the amounts of produce, and on the composition, of certain individual and typical crops, when each is grown separately year after year on the same land, have been considered. In this way, there have been discussed the characteristic requirements and results of growth—of various cereal crops, of various root-crops, of potatoes, and lastly, of various leguminous crops. Results of the experiments on the mixed herbage of grass-land have also been given from time to time.

Our subject on the present occasion is the *Rotation of Crops*. The mere numerical results of the field experiments made at Rothamsted on rotation have been recorded in the annual "*Memoranda*"; but no systematic discussion, either of them or of the laboratory investigations undertaken in connection with them, has hitherto been published; and although the present communication embodies a good deal of detail, and a somewhat comprehensive consideration of it, there still remains much which could not be included within the limits of this paper.

The practice of Rotation is admitted to be the foundation of the improvements in our own agriculture which have taken place during this and a considerable part of the last century. It is of great importance, therefore, carefully to consider, both in what the practice itself consists, and how its benefits are to be explained.

If the rotation of crops as followed in our own country, indeed over large portions of Europe, were to be defined in the fewest possible words, it might be said that it consists in the alternation of root-crops, and of leguminous crops, with cereals. In the

United States, however, it is a gramineous crop—maize—which largely takes the place of root-crops in Europe.

The cereals constituting such a very important element of human food, it was natural that they should be grown almost continuously so long as the land would yield remunerative crops. Hence, the history of agriculture, not only in our own country, but in others where these crops were of high relative value, shows that it very generally came to be the custom to grow them for a number of years in succession, and then to have recourse to bare fallow; or, in some cases, to abandon the land to the growth of rough and weedy herbage, affording scanty food for domestic animals.

The improvement upon these practices, attainable by alternating other crops with the cereals, was very much earlier recognised in the case of the leguminous than of the root-crops, the introduction of which is of comparatively recent date.

It was, in fact, distinctly recognised by the Romans more than 2,000 years ago, that certain leguminous crops were not only valuable as food for animals, but that their growth enriched the soil for succeeding crops—in fact, that they were of value as restorative crops grown in alternation with the cereals. There is, however, very scanty indication that root-crops were an element in their alternate cropping.

As in the agriculture of the ancients, so in that of more modern times, especially in our own country, various leguminous crops were grown in alternation with cereals long before roots were so interpolated.

It was, indeed, not until about, or after, 1730 that Lord Townshend, who, as Secretary to George I., had been in Hanover, and there seen turnips growing as a field crop, on his return introduced them on his own estate in Norfolk, and there founded the celebrated Norfolk four-course rotation of turnips, barley, clover, and wheat. His own land was previously to a great extent a marshy or sandy waste, and its value was increased enormously under the new system. It was, however, not until towards the end of the century that it became generally adopted even throughout his own county. In this extension Mr. Coke, of Holkham (afterwards Earl of Leicester), was largely instrumental, and the practice seems to have next extended into Lincolnshire.

It was thus that *The Four-course Rotation*, or, in other words, the alternation of root-crops and of leguminous crops with cereals, became established. Such alternation is, in fact, the basis of all the various rotations which are adopted in different parts of our own country; and also to a great extent which are followed in many other countries.

It is worthy of remark that, although we owe the introduction of the essential elements of our rotations to the example of our Continental neighbours, we, with one or two immaterial exceptions, obtain more per acre of all the staple saleable products of rotation, grain and meat, under our landlord, tenant, and labourer system, than any other country in Europe, or than in America, under whatever advantages of climate, or under whatever system of holding, or of size of holdings. Thus, there is not a single country in Europe that reaches our average produce per acre of wheat; only Belgium and Holland approach, but they do not equal, us in the produce of barley; only Belgium, Holland, and Norway exceed us in acreage yield of oats; and no country approaches us in acreage produce of potatoes. Again, whilst several countries exceed us in number of cows to a given area, and some in the number of pigs, not one equals us in weight per acre of other cattle than cows; and not one nearly approaches us in the weight of sheep to a given area. Nor, notwithstanding the great depression of our agriculture in recent years, the result of the low prices of produce, is there any probability that we shall soon lose our pre-eminence in production per acre.

There can be no doubt that the effect of the extension of the growth of green crops was—to a great extent to get rid of unprofitable fallows, greatly to increase the supply of stock food, especially for winter feeding; so to lead to a largely increased production of meat and milk, to a greatly increased supply of manure, and thus to enrich the land for the growth of grain, which, accordingly, yielded much larger crops.

We have now to endeavour to ascertain how the admittedly very beneficial effects of alternate, as distinguished from continuous, cropping are to be explained. It will be well first very briefly to refer to some of the chief theoretical explanations that have been put forward, and afterwards to discuss the results of various direct experimental investigations conducted at Rothamsted on the subject of rotation.

The first definite theory as to the benefits of the alternation of crops assumed that the excreted matters of one description of crop were injurious to plants of the same description, but that they were not so, and might even be beneficial, to other kinds of plants.

At first Liebig pronounced this theory of rotation to be the only one having any really scientific basis. Later he seems to have modified his view considerably; and to have supposed that the explanation was—not that the excreted matters of one description of plant were injurious to another of the same description, but that, as the different plants had such very different mineral requirements, the alternation of one kind with another relieved the soil from exhaustion. In his latest work, however, after many years of controversy, he obviously more fully recognised that nitrogen probably played some important part in the matter.

More than fifty years ago Boussingault published the results of an investigation, extending over a period of ten years, to determine the chemical statistics of some of the rotations actually followed in his own locality, in Alsace; and he came to the conclusion that the difference in the amounts of nitrogen taken up by the different crops constituted a very important element in the explanation of the benefits of rotation.

We can only further briefly refer to the results and conclusions of the late Professor Daubeny, of Oxford, who commenced a series of experiments in the Botanic Garden there in 1834. One of the original objects he had in view was to test the truth of De Candolle's theory that the excretions of one description of plant were injurious to plants of the same description. He soon came to a negative conclusion on the subject; and recognised the validity of Boussingault's argument that the actual facts of vegetation in different parts of the world conclusively showed that the same description of plant may continue to grow healthily on the same land for long periods of time. On this point it is scarcely necessary to add that the experience at Rothamsted on the growth of various agricultural crops year after year on the same land for many years in succession is conclusive against the theory of injurious or poisonous excretions.

But, as already said, Dr. Daubeny continued his experiments for ten years; and although, in accordance with the prevailing ideas of the time, all his analytical results related to the mineral constituents of his soils and crops, his main conclusion was, that the benefits of rotation were probably as much connected with the available supply of the organic as of the inorganic constituents.

What, then, are the indications of the results of many years of investigation of the subject, in the field and in the laboratory, at Rothamsted?

THE EXPERIMENTS ON ROTATION MADE AT ROTHAMSTED.

The experiments have been conducted in Agdell Field. An area of $2\frac{1}{2}$ acres is devoted to the purpose. The ordinary four-course rotation of—turnips, barley, clover (or beans), or fallow, and wheat, was adopted. The experiments were commenced in 1848, so that the eleventh course of four years each was completed with the harvest of 1891; and the wheat which has just been sown (October 1894) is the fourth crop of the twelfth course, and will complete the forty-eighth year of the experiments.

The area of $2\frac{1}{2}$ acres was divided into three main divisions, which have, respectively, been under the following conditions as to manuring:—

1. Without manure from the commencement.

2. For the first nine courses, manured with superphosphate alone, applied only for the turnip crop commencing each course; that is, once every four years. For the tenth, and each subsequent course, salts of potash, soda, and magnesia, have been applied as well as superphosphate.

3. A complex artificial manure, also applied every fourth year; that is, for the turnips commencing each course. This manure comprises—superphosphate, salts of potash, soda, and magnesia, ammonium-salts, and rape-cake; and it supplies about 140 lb. of nitrogen per acre for the four years' course; that is, an average of 35 lb. of nitrogen per acre per annum.

The complex manure (3) was designed to be, in great measure, a substitute for farmyard manure; and it was used instead of it, in order that the amount of the different constituents supplied might be more accurately known than would have been the case if farmyard manure had been employed.

It should be further explained, that when the land is under turnips, the roots, with their leaves, are removed from one half of each of the three differently manured plots; whilst, on the other half of each, the produce is consumed on the land by sheep; or, if the weather be unsuitable for this, the roots are sliced, and both roots and leaves are spread on the land. Thus, each of the three main divisions is divided into two, making so far, six in all.

Then again, after the first course of four years, in the third year of each course the leguminous crop was grown on only half of each of the three differently manured plots, and the other half was left fallow. Lastly, as clover cannot be relied upon on such land so often as once in four years, beans have frequently been grown instead.

We have finally, therefore, twelve plots instead of only three. That is to say, each of the three differently manured plots is divided into four as above described, and as indicated in the heading of the several Tables; and, as the same form of Table will, as far as possible, be adopted throughout, it is very desirable that a clear idea of the arrangement should be formed at the outset. It will be seen that under each of the three main divisions designated in the heading according to the manuring, the results are sub-divided, showing first the produce obtained where the roots were carted from the land; and secondly, where they were fed (or left) upon it. Lastly, under each of these two conditions so far as the disposal of the turnips is concerned, there is again a sub-division into two—one where in the third year of the course the land was left fallow, and the other where either clover or beans was grown.

Each year the amount of produce on each of the various plots is weighed; samples of each crop are taken; in all the dry substance and the mineral matter (ash), and in many the nitrogen, is determined; in many cases also complete analyses of the ashes of the crops have been made. Lastly, determinations of the total nitrogen have been made in the surface soils, and in the upper layers of the sub-soils, at different periods; and the nitrogen as nitric acid has also been determined to a considerable depth. As to the results themselves, only brief reference to the main indications of these various investigations can be made.

Tables I., II., III., and IV. give the amounts of produce of the turnips, the barley, the leguminous crops, and the wheat, respectively, in each of the eleven years in which each was grown, in the eleven completed courses. Each Table is divided into three main divisions—the upper one giving the roots, or the grain, &c., as the case may be; the middle the leaves, or the straw; and the lower one the total produce—roots and leaves, or grain and straw, together.

The Swedish Turnip Crops.

Referring to Table I., relating to the Swedish turnips, it is seen that in the first year, 1848, there was, both without manure and with superphosphate alone, much more produce than in any subsequent year; showing that, at the commencement, the land was in somewhat high condition due to previous treatment. Then, again, as already said, for the tenth and eleventh courses, salts of potash, soda, and magnesia, were used as well as superphosphate. For these reasons, the results of

TABLE I.—*Experiments on the Rotation of—Roots, Barley, Clover (or Beans), or Fallow, and Wheat; in Agdell Field, Rothamsted.* 11 *courses,* 44 *years,* 1848–1891.

1. ROOTS—SWEDISH TURNIPS.

Years	Unmanured				Courses 1–9 superphosphate only. Courses 10 and 11 mixed mineral manure				Mixed mineral and nitrogenous manure			
	Roots carted		Roots fed		Roots carted		Roots fed		Roots carted		Roots fed	
	Fallow	Beans or clover	Fallow	Beans or clover	Fallow	Beans or clover	Fallow	Beans or clover	Fallow	Beans or clover	Fallow	Beans or clover
	ROOTS.											
	tons cwt.	tons cwt.	tons cwt.	tons cwt.	tons cwt.	tons cwt.	tons cwt.	tons cwt.	tons cwt.	tons cwt.	tons cwt.	tons cwt.
1848	8 15¼	3 5½	8 17¾	5 9	14 12	11 5¾	17 5	11 0¾	19 14¾	10 18	21 9	11 9
1852	1 17	1 6	1 7¼	0 19½	12 16	11 3¼	13 13¼	12 10¼	20 8¼	19 16½	19 10¾	19 6
1856	2 5½	1 12	1 14	1 0¼	8 10½	6 16	9 13¾	9 16	16 8¼	16 13¾	16 19¾	17 1¼
1860	0 1¾	0 1	0 1½	0 1	1 13¾	1 9¼	2 0¾	1 18¾	4 7½	4 7½	4 7	3 12
1864	0 7½	0 8¾	0 9	0 8½	2 12¾	3 8	3 19½	3 18¾	9 2½	8 16¼	9 5½	8 8½
1868	Crop	failed	—	—	—	—	—	—	—	—	—	—
1872	2 11⅞	1 14⅝	2 9¼	1 9½	7 2¼	8 10⅝	8 7½	9 10⅛	16 12	16 19⅞	16 11¼	16 10
1876	1 11½	0 17¼	1 12¼	1 1	9 13¼	9 8¼	10 8¼	11 5¾	15 9¾	17 16	18 17¼	17 19¼
1880	1 12⅝	0 14	1 18¼	1 1	11 4	9 19½	11 18¾	11 3¾	22 10¼	21 19½	22 7¼	22 6¼
1884	0 17⅞	0 5	1 0¼	0 12	7 19¾	8 13¼	8 12½	10 6	14 18¼	14 6¾	14 16¼	14 0¾
1888	0 15	0 2¼	1 3	0 8	7 2⅝	10 7⅛	8 6	12 9¼	21 11¼	23 12¾	21 3¾	20 17⅝
Average 8 courses, 1852 to 1880	1 6	0 16⅝	1 4	0 15⅛	6 14⅛	6 6⅞	7 10¼	7 10½	13 2⅜	13 6⅛	13 9¾	13 2⅞
Average 2 courses, 1884 and 1888	0 16½	0 3⅝	1 1⅝	0 10	7 11⅜	9 10¼	8 9¼	11 7⅝	18 4¾	18 19¾	18 0	17 9¼
	LEAVES.											
1848	0 19¾	2 5¾	1 0½	3 7¾	1 15	5 6¼	1 19¾	4 10	2 6¼	7 11¾	2 6¾	1 1¼
1852	0 5¾	0 4¼	0 4	0 3¼	1 2¾	1 0¼	1 2¼	1 2	2 0	1 16½	1 17¾	1 13
1856	0 2¼	0 2½	0 2	0 1½	0 8	0 7½	0 12¼	0 14½	0 11½	0 12½	0 12½	0 11¾
1860	0 0⅛	(6¼ lb.)	0 0¼	(5 lb.)	0 2	0 1½	0 2	0 1¾	0 3½	0 3¼	0 5¾	0 4½
1864	0 0¾	0 0¾	0 0¾	0 1	0 4½	0 4¾	0 5¼	0 4¾	0 9	0 8¾	0 9½	0 8¾
1868	Crop	failed	—	—	—	—	—	—	—	—	—	—
1872	0 8⅛	0 8¾	0 7¼	0 7¾	0 14⅝	0 17⅜	0 17⅜	0 19½	1 14¼	1 15¾	1 13½	1 19
1876	0 5¼	0 5	0 5⅛	0 5	0 17	1 8½	0 16½	1 7½	1 14¾	2 15¼	2 0¾	3 3
1880	0 3⅞	0 2¼	0 4	0 3	0 12½	0 11¾	0 12⅞	0 11	1 16	2 3¼	1 18	1 18¾
1884	0 7⅜	0 3⅛	0 7	0 5	0 18⅛	1 0¼	0 18¾	1 3	2 15¼	3 3¼	3 6¼	3 3¾
1888	0 7⅛	0 1⅞	0 7⅝	0 3¼	0 15¼	1 1½	0 16	1 3	1 17⅞	2 5¾	1 15	2 0½
Average 8 courses, 1852 to 1880	0 3¼	0 3	0 2⅞	0 2⅝	0 10⅛	0 11½	0 11	0 12⅝	1 1⅛	1 4⅜	1 2¼	1 4⅞
Average 2 courses, 1884 and 1888	0 7¼	0 2½	0 7¼	0 4⅛	0 16⅞	1 0⅞	0 17⅜	1 3	2 6½	2 14½	2 10⅝	2 12⅜
	TOTAL PRODUCE.											
1848	9 15	5 11¼	9 18¼	8 16¾	16 7	16 12	19 4¾	15 10¾	22 1	18 9¾	23 15¾	19 0¼
1852	2 2¾	1 10¼	1 11¼	1 2¾	13 19½	12 3½	14 15½	13 12¼	22 8¼	21 13	21 8½	20 19
1856	2 7¾	1 14½	1 16	1 1¾	8 18½	7 3½	10 6	10 10½	16 19¾	17 6¼	17 11¾	17 13
1860	0 1⅞	0 1	0 1¾	0 1	1 15¾	1 10¾	2 2¾	2 0½	4 11	4 10¾	4 12¾	3 16½
1864	0 8¼	0 9½	0 9¾	0 9½	2 17¼	3 12¾	4 4¾	4 3½	9 11½	9 5	9 15	8 17¼
1868	Crop	failed	—	—	—	—	—	—	—	—	—	—
1872	3 0	2 2⅞	2 16½	1 17¼	7 16⅞	9 8	9 4⅞	10 10	18 6¼	18 15⅝	18 4¾	18 9
1876	1 16¾	1 2¼	1 17⅜	1 6	10 10¼	10 16¾	11 4¾	12 13¼	17 4½	20 11¼	20 18	21 2¼
1880	1 16½	0 16¼	2 2¼	1 4	11 16½	10 11¼	12 11⅞	11 14¾	24 6¼	24 2¾	24 5¼	24 5
1884	1 5¼	0 8⅛	1 7¼	0 17	8 18¼	9 13½	9 11¼	11 9	17 13½	17 10	18 2½	17 4½
1888	1 2⅛	0 4⅛	1 10⅝	0 11¼	7 18⅛	11 8⅝	9 2	13 12¼	23 9⅛	25 18½	22 18¾	22 18⅛
Average 8 courses, 1852 to 1880	1 9¼	0 19⅝	1 6⅞	0 17¾	7 4¼	6 18⅜	8 1¼	8 3⅛	14 3½	14 10½	14 12	14 7¾
Average 2 courses, 1884 and 1888	1 3¾	0 6⅛	1 8⅞	0 14⅛	8 8¼	10 11⅛	9 6⅝	12 10⅝	20 11¼	21 14¼	20 10⅝	20 1⅜

the first, and of the tenth and eleventh courses are excluded from the averages to which attention will chiefly be confined. In this Table, however, as well as in those relating, respectively, to the barley and the wheat, averages are given at the foot of each division of the Tables, not only for the eight intermediate courses—second to ninth, but also for the two succeeding courses —tenth and eleventh, for which potash, soda, and magnesia were used as well as superphosphate. But, for the leguminous crops the averages are, for reasons that will be explained, taken differently.

The first point to notice in the results is that, under each condition as to manuring, there is very great variation in the amount of produce from year to year according to the seasons. Thus, in 1868, the crop entirely failed on all the plots, although seed was sown twice. Again, whilst the complex manure containing nitrogen yielded more than 22 tons of roots in 1880, the same manure gave little more than 4 tons in 1860; the average yield over the eight courses being about $13\frac{1}{4}$ tons. Against this, the average by superphosphate alone ranged from about $6\frac{1}{2}$ to about $7\frac{1}{2}$ tons; whilst without manure there was an average of only about 1 ton.

Referring to this last result, it is particularly to be observed that this assumed restorative crop yields practically no produce at all when grown without manure.

The plot with superphosphate alone gives very much more than that without manure, but still very much less than an average agricultural crop. The increase, such as it was, was largely due to the greatly increased development of feeding-root within the surface-soil under the influence of the phosphatic manure; and the necessary nitrogen, beyond the small amount of combined nitrogen annually coming down in rain and the minor aqueous deposits from the atmosphere, has doubtless been gathered under the influence of the increased root-development from the previous accumulations within the soil itself. There is, in fact, perhaps no agricultural practice by which what is termed the *condition* of land, that is the readily available fertility due to recent accumulations, can be so rapidly exhausted as by growing turnips on it by superphosphate alone—provided of course that the seasons are favourable.

Compared with the produce with superphosphate alone, the mixed manure, supplying, besides superphosphate, not only salts of potash, soda, and magnesia, but a liberal amount of nitrogen, yielded, on the average of the eight courses, nearly twice as much, or between 13 and 14 tons of roots; though, as already pointed out, it yielded in some seasons over 20 tons per acre. There can be no doubt that, the necessary mineral constituents being available, there was a large increase of produce due to the supply of nitrogen in the manure.

The figures in the middle division of the Table show that the produce of leaf as well as that of roots was increased by superphosphate, and that it was still further increased by the mixed manure containing nitrogen.

The next point is to consider the effects of the other conditions besides those of different manure supply; that is, the removal of the root-crop, or the feeding or the spreading of it upon the land; also whether, in the third year of each course, a leguminous crop was grown, or the land was fallowed.

It is seen that, *without manure*, whether clover or beans were grown, or the land were fallowed, there was even rather less average produce of roots over the eight years where they had been fed on the land, than where they had been carted off; but with such very small crops the differences are immaterial, if not accidental.

On the *superphosphate* plots, where the produce was much higher, and where there would, therefore, be more loss to the land by removal, the crops were materially better on the fed portions of the plots.

On the *mixed manure* plots, on the other hand, with nearly twice as much produce as with superphosphate alone, there would be still greater difference between the condition of the land where the roots were carted off and where they were fed on; but there was very little difference in the average produce of the root crop.

It will be seen further on, that the higher condition of the land where the more highly manured roots were fed upon it had a very marked effect on the succeeding cereal crops, and especially on the immediately succeeding barley. This was the case on both the superphosphate and the mixed manure plots.

The difference of effect on the average produce of the root-crop, by fallowing, or by growing beans or clover, in the third year of each course is, in the comparable cases, practically immaterial under each of the three different conditions as to manuring.

Before passing from Table I. it is to be observed that there was higher average produce over the tenth and eleventh courses with superphosphate and potash, soda, and magnesia, than over the preceding eight courses with superphosphate alone. But, as there was also increase in a greater degree with the mixed mineral and nitrogenous manure over the two than over the eight years, it is obvious that the character of the seasons had a good deal to do with the result. It is noticeable, however, that on the plots with potash, soda, and magnesia, as well as superphosphate, in the two courses, there was a higher produce of roots on the plots where beans or clover were grown than on those that were fallowed; a result doubtless due to the increased growth of the leguminous crop under the influence of the potash manuring, and

SWEDISH TURNIPS.

GROWN IN FOUR-COURSE ROTATION, IN AGDELL FIELD.
45*th year*, 1892. *First Crop, Twelfth Course.*

UNMANURED CONTINUOUSLY.
Crop of roots, 1892: 8¼ cwts. per acre.

MINERAL MANURE, COMMENCING EACH COURSE.
Crop of roots, 1892: 11 tons, 6½ cwts. per acre.

MINERAL AND NITROGENOUS MANURE, COMMENCING EACH COURSE.
Crop of roots, 1892: 24 tons 18 cwts. per acre.

to accumulation of nitrogen in the soil thereby. It may further be observed (though not shown in the Table) that in 1892—that is, the first year of the twelfth course—the produce of the manured plots was generally higher than in either of the two preceding courses.

The accompanying figures represent selected typical Swedish turnip-plants, grown in 1892—without manure, with the mixed mineral manure alone, and with the mixed mineral and nitrogenous manure. Each plant was fixed upon a scaled background and so photographed, and the figures as given are about one-twentieth natural size, and strictly comparable. The quantities of produce recorded show that without manure it was less, but that by each of the two descriptions of manure it was considerably more, than the average of the preceding courses; and both the reversion to the uncultivated condition without manure, and the increased growth under the influence of each of the manures, are strikingly illustrated, both by the figures and by the amounts of produce given. Indeed, the results conclusively show how artificial a product is the cultivated root-crop, and how dependent it is for its successful growth on an abundant supply of available food—nitrogenous as well as mineral—within the soil.

The Barley Crops.

Table II. gives the produce of barley, the second crop of the course, and therefore always succeeding the roots, in each of the eleven years in which it was grown, in precisely the same form as that of the Swedish turnips recorded in Table I.: the upper division giving the grain per acre, the middle division the straw, and the lower one the total produce, grain and straw together.

As in the case of the root-crops, so in that of the barley, the produce in the first course is excluded from the calculation of the averages to which reference will chiefly be made. Indeed, the results of the first year of barley confirm the conclusion that the land was in somewhat high condition due to recent accumulations. The produce of the tenth and eleventh courses is also excluded from the averages, on account of the change of manure on the superphosphate plot for the tenth and succeeding courses.

Referring, however, first to the results of each of the eleven years, it is seen that, under each condition of manuring, or other treatment, there is very great variation in the amount of produce from year to year, due to variations in the characters of the seasons. Thus, without manure, the average produce over the eight courses was about 30 bushels per acre, whilst in 1857 it was in each case more than 40 bushels, and in some considerably more; but in 1869 and in 1873 it was not much over 20 bushels, and in the last two courses considerably less than 20. A glance down the columns recording the produce on the manured plots will show that in their case also there was a wide range in amount above and below the averages, according to season.

Referring now to the average produce of the eight courses (second to ninth), the first point to notice is, that whilst the

Table II.—*Experiments on the Rotation of—Roots, Barley, Clover (or Beans), or Fallow, and Wheat; in Agdell Field, Rothamsted.* 11 courses, 44 years, 1848–1891.

2. BARLEY.

Years	Unmanured: Roots carted: Fallow	Unmanured: Roots carted: Beans or clover	Unmanured: Roots fed: Fallow	Unmanured: Roots fed: Beans or clover	Courses 1–9 superphosphate only. Courses 10 & 11 mixed mineral manure: Roots carted: Fallow	Courses 1–9 superphosphate only. Courses 10 & 11 mixed mineral manure: Roots carted: Beans or clover	Courses 1–9 superphosphate only. Courses 10 & 11 mixed mineral manure: Roots fed: Fallow	Courses 1–9 superphosphate only. Courses 10 & 11 mixed mineral manure: Roots fed: Beans or clover	Mixed mineral and nitrogenous manure: Roots carted: Fallow	Mixed mineral and nitrogenous manure: Roots carted: Beans or clover	Mixed mineral and nitrogenous manure: Roots fed: Fallow	Mixed mineral and nitrogenous manure: Roots fed: Beans or clover
DRESSED GRAIN.												
	Bush.	Bush.	Bush.	Bush.	Bush.	Bush.	Bush.	Bush.	Bush.	Bush.	Bush.	Bush.
1849	33¾	44⅞	44⅞	48	29⅛	29⅞	41	42¾	37	28⅞	44⅛	42⅞
1853	32⅛	34⅜	33	28⅞	32	28⅝	39⅞	38	37⅞	38¼	37⅛	35⅜
1857	43¾	48½	44¼	40⅛	30¾	28½	48¾	52⅝	47½	48	66⅝	63⅛
1861	35½	38⅝	33	29⅝	32⅜	30⅝	40⅜	42½	60⅞	60⅝	57¾	54⅜
1865	34½	39	35⅛	27¾	31¼	33¼	39⅛	41¼	44⅝	47½	46⅝	43⅜
1869	21⅜	24⅝	21	25⅝	25½	28¾	30⅛	33½	39¾	42⅞	38⅜	42¼
1873	20¾	23½	20⅞	22⅞	22⅛	20¾	27	29⅜	31½	31¾	47	45⅛
1877	23	23½	22⅛	23⅝	21	24¼	31⅜	38⅜	30¾	34¾	44⅝	49⅛
1881	29⅛	26¾	31⅜	25⅞	24¼	24½	28⅛	28¾	33⅜	35⅜	47⅞	50¼
1885	15½	12⅛	22¾	16	12⅞	19⅞	17⅛	32½	19	34¾	32¼	44¾
1889	15½	11	16⅛	12⅝	15⅛	21¾	19¼	29¾	20	26⅝	23½	25½
Av. 8 courses 1853–1881	30	32⅜	30⅛	28	27⅜	27⅜	35⅝	38	40¾	42⅜	48⅜	47⅞
Av. 2 courses 1885 & 1889	15½	11½	19¾	14⅜	14	20⅞	18¼	31⅛	19½	30¾	27⅞	35⅛
STRAW.												
	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.
1849	2,200	2,983	3,139	3,225	1,870	2,111	3,209	3,327	2,842	2,088	3,709	3,646
1853	2,187	2,430	2,210	2,077	2,003	1,873	2,729	2,756	2,595	2,604	3,323	2,981
1857	2,330	2,600	2,430	2,312	1,545	1,475	2,595	2,780	2,400	2,435	3,570	3,405
1861	2,190	2,522	2,018	1,970	1,954	2,000	2,475	2,553	3,920	3,940	4,175	3,940
1865	1,828	2,154	1,809	1,460	1,509	1,615	2,043	2,244	2,398	2,595	3,274	2,958
1869	1,628	1,948	1,648	1,944	1,873	2,025	2,265	2,401	3,064	3,309	3,244	3,229
1873	1,374	1,343	1,311	1,495	1,370	1,565	1,611	1,841	1,626	1,723	2,796	2,456
1877	1,244	1,291	1,275	1,341	1,054	1,174	1,706	1,994	1,625	1,918	2,646	3,126
1881	1,556	1,484	1,568	1,468	1,239	1,259	1,500	1,430	1,755	1,853	2,993	3,078
1885	1,518	1,270	1,768	1,379	1,043	1,441	1,480	2,358	1,528	2,461	2,778	3,386
1889	953	931	996	865	965	1,221	1,135	1,613	1,231	1,685	1,776	2,030
Av. 8 courses 1853–1881	1,792	1,971	1,784	1,758	1,568	1,623	2,116	2,250	2,423	2,547	3,253	3,146
Av. 2 courses 1885 & 1889	1,235	1,101	1,382	1,122	1,004	1,331	1,307	1,986	1,380	2,073	2,277	2,708
TOTAL PRODUCE.												
	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.
1849	4,149	5,656	5,785	6,046	3,575	3,841	5,708	5,885	5,026	3,794	6,344	6,206
1853	4,046	4,464	4,161	3,817	3,876	3,560	5,110	5,058	4,849	4,873	5,672	5,190
1857	4,777	5,337	4,912	4,558	3,272	3,076	5,326	5,741	5,091	5,168	7,261	6,930
1861	4,248	4,718	3,871	3,635	3,807	3,775	4,803	4,982	7,419	7,391	7,554	7,148
1865	3,659	4,182	3,695	2,961	3,170	3,394	4,122	4,457	4,799	5,148	5,753	5,308
1869	2,881	3,358	2,843	3,387	3,328	3,686	3,999	4,313	5,414	5,800	5,491	5,701
1873	2,596	2,717	2,536	2,814	2,713	2,875	3,209	3,575	3,412	3,573	5,478	5,018
1877	2,602	2,623	2,609	2,673	2,304	2,558	3,530	4,157	3,406	3,890	5,217	5,963
1881	3,170	2,922	3,297	2,929	2,576	2,641	3,083	3,051	3,651	3,857	5,720	5,964
1885	2,402	1,960	3,056	2,235	1,833	2,538	2,576	4,193	2,643	4,426	4,624	5,946
1889	1,789	1,510	1,898	1,530	1,775	2,402	2,248	3,250	2,362	3,134	3,045	3,409
Av. 8 courses 1853–1881	3,497	3,790	3,491	3,351	3,131	3,196	4,148	4,417	4,755	4,962	6,018	5,903
Av. 2 courses 1885 & 1889	2,095	1,735	2,477	1,882	1,804	2,470	2,412	3,722	2,503	3,780	3,835	4,677

assumed restorative crop—the roots—gave practically no produce at all without manure, the barley gave, on land unmanured for so many years, an average of rather over 30 bushels per acre. The truth is that the cultivation for the preceding roots kept the land clean, and as there was practically no produce of roots, the soil was, in point of fact, left almost fallow for the barley during the winter preceding the roots, during the root-crop period itself, and during the succeeding winter, before the sowing of the barley. There was, therefore, very good preparation for the barley. It will be seen further on that, when grown continuously without manure, both wheat and barley yield more in proportion to their respective averages under ordinary cultivation than do either of the fallow crops—the roots or the leguminous crops. Yet, the produce of barley in rotation without manure was much in excess of that when it is grown continuously; the explanation doubtless being, as above referred to, that the crop had been grown after well-cultivated bare fallow.

Next, it is to be observed that, there having been practically no crop of roots without manure, there was no material difference between the yield of the succeeding barley where the roots were carted off or where they were fed on the land.

Turning now to the produce on the four plots with superphosphate alone, it is seen that whilst the average yield of barley on the two portions from which the roots had been carted off was under 28 bushels, that on the portions where they had been fed on the land was, in one case more than 35½, and in the other 38 bushels. The effect, on the one hand of the removal of the larger crop of roots, and on the other of the retention on the land of the greater part of its constituents, is thus very evident. It is further to be remarked, that the produce of barley where the roots grown by superphosphate had been removed from the land, was even less than on the two corresponding portions of the unmanured plot. Thus, there is confirmation of the supposition that the higher crop of barley without manure was due to the previous preparation, and conservation of constituents, by fallow; and that the lower produce on the superphosphate plot where the roots had been removed was largely due to so much greater exhaustion, especially of the available nitrogen, of the surface soil.

Next it is seen that, on the plots where the mixed manure containing nitrogen had been applied for the preceding turnips, the produce of barley was on a much higher level; and it was much higher on the portions where the turnips had been fed on the land than on those from which they had been removed.

It may be observed, that the produce, even on the plots with superphosphate alone, was, where the roots had been fed on the land, about the average of the country at large under ordinary rotation—namely, from 36 to 38 bushels; whilst, on the full manured plot, the produce was much more than this—namely, in one case $40\frac{3}{4}$, and in the other $42\frac{5}{8}$ bushels, where the roots had been removed; and where they had been fed on the land, in one case $48\frac{3}{8}$, and in the other $47\frac{1}{8}$ bushels.

Thus, then, the effect on the succeeding barley of the full mineral and nitrogenous manure applied for the preceding turnips is very obvious; whilst the effect, on the one hand of the removal of the root-crop, and on the other of the retention on the land of most of its constituents, is also very marked. The experimental results relating to the second crop of the course—the barley—so far fully confirm, therefore, the explanations which have been given of the beneficial effects of root-crops grown under the ordinary conditions of manuring, on the succeeding cereal grown in alternation with them.

Examination of the results relating to the quantities of straw, and of total produce (grain and straw together), as given in the middle and lower divisions of the Table, will show that they fully bear out the general conclusions that have been drawn from a consideration of the produce of the grain alone.

The Leguminous Crops (or Fallow).

Table III. gives for the third element of the typical four-course rotation—the leguminous crops—the results obtained in each of the eleven years of the forty-four in which they were grown, in exactly the same form as those previously recorded for the turnips and for the barley. But, as in some of the years clover, and in others beans, were grown, the averages are here taken, not for the eight and for the two courses, as with the other crops, but, respectively, for the four years of the eleven in which clover was grown, and for the seven in which beans were grown.

A glance at the Table brings to view some of the difficulties connected with the growth of these crops. Thus, although the scheme of the four-course rotation supposes the growth of red clover as the third crop of each course, that is once in four years, it has in fact only been grown four times in the forty-four years—namely, in the first, seventh, ninth, and tenth courses; and when it failed beans were grown instead. It is, indeed, a matter of general knowledge and experience, that it is only on a few descriptions of soil that clover can be grown so frequently

Table III.—*Experiments on the Rotation of—Roots, Barley, Clover (or Beans), or Fallow, and Wheat; in Agdell Field, Rothamsted.* 11 *courses,* 44 *years,* 1848–1891.

3. CLOVER (OR BEANS), OR FALLOW.

Years	Unmanured				Courses 1–9 superphosphate only. Courses 10 and 11 mixed mineral manure				Mixed mineral and nitrogenous manure			
	Roots carted		Roots fed		Roots carted		Roots fed		Roots carted		Roots fed	
	Fallow	Beans or clover	Fallow	Beans or clover	Fallow	Beans or clover	Fallow	Beans or clover	Fallow	Beans or clover	Fallow	Beans or clover
BEANS; DRESSED CORN—1854, '58, '62, '66, '70, '78 and '90. (CLOVER, 1850, '74, '82 and '86.)												
		Bush.		Bush.		Bush.		Bush.		Bush.		Bush.
1850		(clover)		(clover)		(clover)		(clover)		(clover)		(clover)
1854		$5\frac{1}{8}$		$5\frac{1}{2}$		$5\frac{7}{8}$		$10\frac{5}{8}$		$9\frac{7}{8}$		$13\frac{3}{8}$
1858		$6\frac{1}{4}$		$5\frac{1}{8}$		$6\frac{1}{2}$		$8\frac{3}{8}$		$12\frac{3}{8}$		$14\frac{3}{4}$
1862		29		27		$29\frac{3}{4}$		30		$43\frac{3}{8}$		$41\frac{1}{8}$
1866		$10\frac{1}{4}$		$8\frac{3}{4}$		$7\frac{3}{8}$		10		$20\frac{3}{8}$		$24\frac{3}{4}$
1870		$13\frac{3}{8}$		$17\frac{5}{8}$		$15\frac{5}{8}$		$15\frac{3}{8}$		$24\frac{5}{8}$		$26\frac{3}{8}$
1874		(clover)		(clover)		(clover)		(clover)		(clover)		(clover)
1878		$8\frac{3}{4}$		$7\frac{3}{8}$		$7\frac{3}{4}$		$13\frac{7}{8}$		$20\frac{1}{4}$		$26\frac{5}{8}$
1882		(clover)		(clover)		(clover)		(clover)		(clover)		(clover)
1886		(clover)		(clover)		(clover)		(clover)		(clover)		(clover)
1890		7		$8\frac{1}{4}$		$24\frac{5}{8}$		24		$15\frac{1}{4}$		$16\frac{3}{4}$
Average 7 courses, beans, 1854, '58, '62, '66, '70, '78, and '90		$11\frac{3}{8}$		$11\frac{3}{8}$		$13\frac{7}{8}$		$16\frac{1}{8}$		$20\frac{7}{8}$		$23\frac{3}{8}$
BEANS; STRAW—1854, '58, '62, '66, 70, '78, and '90. (CLOVER, 1850, '74, '82, and '86.)												
		lb.		lb.		lb.		lb.		lb.		lb.
1850		(clover)		(clover)		(clover)		(clover)		(clover)		(clover)
1854		1,055		953		1,103		1,378		1,355		1,605
1858		1,100		965		1,155		1,320		1,520		1,760
1862		1,840		1,845		2,150		2,155		3,280		2,945
1866		1,013		905		978		1,835		1,990		2,155
1870		738		710		768		878		1,056		1,008
1874		(clover)		(clover)		(clover)		(clover)		(clover)		(clover)
1878		740		775		1,045		1,350		1,655		1,880
1882		(clover)		(clover)		(clover)		(clover)		(clover)		(clover)
1886		(clover)		(clover)		(clover)		(clover)		(clover)		(clover)
1890		603		633		1,764		1,630		1,102		1,059
Average 7 courses, beans, 1854, '58, '62, '66, '70, '78, and '90		1,013		969		1,280		1,507		1,708		1,773
CLOVER (AS HAY)—1850, '74, '82 and '86. BEANS (CORN and STRAW)—1854, '58, '62, '66, '70, '78 and '90.												
	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.
1850	(6,440)	(5,920)	(7,027)	(5,413)	(6,799)	(6,329)	(6,739)	(5,580)	(7,697)	(6,920)	(7,275)	(6,753)
1854		1,445		1,367		1,534		2,124		2,065		2,544
1858		1,515		1,307		1,605		1,895		2,357		2,754
1862		3,661		3,546		4,040		4,027		5,990		5,520
1866		1,689		1,485		1,463		2,481		3,343		3,782
1870		1,591		1,854		1,778		1,867		2,664		2,746
1874		(2,838)		(2,497)		(5,093)		(6,186)		(7,904)		(7,708)
1878		1,301		1,255		1,557		2,241		2,963		3,617
1882		(2,935)		(2,492)		(6,700)		(7,927)		(8,882)		(9,374)
1886		(1,285)		(1,305)		(4,925)		(4,695)		(3,255)		(3,645)
1890		1,079		1,197		3,441		3,269		2,145		2,195
Average 7 courses, beans, 1854, '58, '62, '66, '70, '78, and '90,		1,754		1,716		2,203		2,558		3,075		3,308
Average 4 courses, clover, 1850, '74, '82 and '86		3,245		2,927		5,762		6,097		6,740		6,870

as every fourth year; and in many cases it is not attempted to grow it more than once in eight years. The difficulty of growing red clover or beans frequently on ordinary arable land has been very fully illustrated in our experiments on the growth of leguminous crops. On the other hand, it has been found that red clover may be grown for many years in succession on rich garden soil; and, further, that on ordinary arable land where clover had entirely failed, some other Leguminosæ, having more extended root range, or more powerful root habit, grew luxuriantly, and yielded large crops, containing large amounts of nitrogen, for a number of years in succession. Lastly, in another field, where beans had frequently failed, red clover was afterwards sown, and gave unusually large crops.

Referring to the results in Table III. it is seen that when clover was grown in 1850, that is in the first course, and when it had not been grown on the same land for many years, large crops were obtained on all the plots; though the larger where the mixed manure including potash, and also nitrogen, had been applied for the root-crop three years previously. For the second, third, and fourth courses, clover was sown with the preceding barley, but in all three it failed in the winter, and beans were grown instead; that is, in 1854, 1858, and 1862. After these repeated failures, clover was not sown for the fifth and sixth courses, but beans were taken instead, in 1866 and in 1870. In the seventh course, clover was sown again, with the barley, and gave three cuttings in 1874; that is, twenty-four years since the last good crop. Without manure, the produce was, however, not much more than one ton per acre; with superphosphate it was much more; and with the mixed manure, including potash, much more still—corresponding to about 3½ tons of clover hay. For the eighth course clover was not sown, but beans were taken in 1878. For the ninth and tenth courses, however, clover was again sown, yielding in the ninth (1882) even more than in 1874; but in the tenth (1886) very much smaller crops, though more with mineral manure alone, now including potash, than with the mixed manure containing nitrogen also. Lastly, for the eleventh course, clover was again sown with the barley, but failed, and in 1890 beans were grown instead; the crops, as in the case of the clover in the tenth course, being greater with mineral manure alone (now including potash) than with the mixed manure containing nitrogen also.

Thus, in only four out of the eleven years in which clover should have been grown, was any crop obtained, and beans had to be taken in the other seven. The produce of clover is given in the lower division of the Table, side by side with the total produce (corn and straw) of the *beans*; and the results for the clover are entered in parentheses.

Briefly to summarise the results given in the Table, it may be stated that the average produce of clover, reckoned as hay, was, without manure, rather over 3,000 lb.; with the superphosphate (in the last year with potash, soda, and magnesia also) nearly 6,000 lb.; and with the mineral and nitrogenous manures together for each course, about 6,800 lb. With the mineral manure alone, therefore, there was about twice as much, and with the mineral and nitrogenous manures together, considerably more than twice as much, as without manure. Compared with these amounts of clover reckoned as hay, the seven bean crops (corn and straw together) gave an average of about 1,700 lb. without manure, of nearly 2,400 lb. with mineral manure alone, and about 3,200 lb. with the mineral and nitrogenous manures together.

Not only, therefore, was the average produce of the bean crop very much less than that of the clover, but in point of fact it was only in one year, 1862, that anything like a really good crop of beans was obtained. It may be added, though the point will be further illustrated presently, that the crops of the four years of clover contained, even without manure about as much nitrogen as, and with each of the two manures considerably more than, those of the seven years of beans. In fact, the average produce of the bean crop, and of nitrogen in it, was very much less than in the case of the clover. Nevertheless, even the average yield of nitrogen was much more in the beans than in either of the cereals with which they were grown in alternation. Thus, without manure, the four clover crops gave an average of 60·2 lb. of nitrogen per acre, and the seven bean crops 34·9 lb.; but over the eleven courses the barley gave an average of only 28·0 lb., and the wheat of only 31·7 lb. With mineral manure alone, the average yield of nitrogen was, in the clover 119·2 lb., in the beans 49·2 lb., in the barley only 27·7 lb., and in the wheat only 39·3 lb. Lastly, with mineral and nitrogenous manure together, the clover gave an average yield of nitrogen of 134·6 lb., the beans of 64·1 lb., the barley 41·2 lb., and the wheat 43·5 lb. There can, indeed, be no doubt, that the leguminous crops, and especially the clover, growing on land in the same condition, and similarly manured, have the power of taking up much more nitrogen over a given area from some source, than the cereals with which they are interpolated; and that the beneficial effects of the growth of such crops in rotation with the cereals are intimately connected with this capability.

Before passing from the results in Table III. it may be observed that, both with mineral manure alone, and with mineral and nitrogenous manure together, there is rather more produce, both of the clover and of the bean crop, where the roots had been fed upon the land, than where they had been carted off; that is the higher the condition of the land. Thus, then, the effects of the treatment of the first crop of the course —the roots—on the produce of the third or leguminous crop are clearly shown.

As already referred to, in the second and subsequent courses, when the third year came round each plot was divided, clover or beans being grown on one half, and the other half left fallow. We have, therefore, the means of comparing the effects on the other crops of the rotation—of fallow on the one hand, which of course removes nothing (though there may be the more loss by drainage), and of growing beans or clover on the other, a characteristic of which is the assimilation, and consequently the removal in the crops, especially of large amounts of nitrogen, but of other constituents also; at the same time, however, leaving in the land more or less of nitrogenous crop-residue. Such a comparison obviously has a special interest, since it is chiefly as a substitute for fallow that the growth of leguminous crops has been introduced into our rotations.

The Wheat Crops.

Table IV. records the results obtained with the fourth element of the rotation—the wheat—exactly in the same form as in the case of the other crops.

Looking first to the figures relating to the individual years, it is seen that, under each condition of manuring or other treatment, there is an enormous variation in the amount of produce in the different years, according to the seasons. Thus, taking for illustration the results in the first column under each of the three main conditions as to manuring, that is where the roots were carted from the land, and where in the third year of the course it was left fallow, there was, without manure, only $10\frac{1}{8}$ bushels of wheat in 1879, but 45 bushels in 1863; on the superphosphate plot there was in 1879 only $14\frac{3}{4}$ bushels, and 46 bushels in 1863; and on the mixed manure plot only $12\frac{3}{8}$ bushels in 1879, but $52\frac{5}{8}$ bushels in 1863. Or, comparing the quantities of total produce, corn and straw together, which more directly represent the amounts of growth, we have, on the same plots, without manure, 2,162 lb. per acre in 1879, and 7,446 lb. in 1863; on the superphosphate plot 2,905 lb. in 1879, and

TABLE IV.—*Experiments on the Rotation of—Roots, Barley, Clover (or Beans), or Fallow, and Wheat; in Agdell Field, Rothamsted.* 11 *courses,* 44 *years,* 1848–1891.

4. WHEAT.

Years	Unmanured				Courses 1–9 superphosphate only. Courses 10 and 11 mixed mineral manure				Mixed mineral and nitrogenous manure			
	Roots carted		Roots fed		Roots carted		Roots fed		Roots carted		Roots fed	
	Fallow	Beans or clover	Fallow	Beans or clover	Fallow	Beans or clover	Fallow	Beans or clover	Fallow	Beans or clover	Fallow	Beans or clover
	DRESSED GRAIN.											
	Bush.	Bush.	Bush.	Bush.	Bush.	Bush.	Bush.	Bush.	Bush.	Bush.	Bush.	Bush.
1851	30½	28½	31¼	30⅞	31⅜	28	32⅞	32	30⅛	28⅞	27⅛	31⅜
1855	37⅜	35¼	37¼	34¼	38⅞	35¼	37⅝	36⅜	38¼	37⅜	37⅜	40¾
1859	35¾	35¼	35½	30¼	37⅛	34¼	39⅝	37¼	42⅜	39¾	40½	38⅞
1863	45	34⅛	42	30½	46	34⅞	49⅛	41⅞	52⅝	46⅛	49	44⅝
1867	27⅛	21	23⅜	15½	26⅛	19¾	27⅛	25	22⅜	23¾	19⅞	21¼
1871	14½	20⅝	14½	21⅜	16⅛	23⅞	15⅜	23	17⅜	24	17¼	25½
1875	24⅜	21⅝	24⅛	19⅝	28⅞	28¼	30⅝	31¾	29⅛	31⅞	30	30⅛
1879	10⅛	10⅜	11¾	8⅞	14¾	14⅜	14⅛	15½	12⅜	13	10⅜	14
1883	33½	29⅜	34¼	25¾	38½	36½	40½	40	37½	45⅛	39¼	50½
1887	34¾	25⅝	33½	27¼	41⅝	42¼	40¼	44¾	39½	42¼	41	43¼
1891	32	29½	31¼	26½	36	42¼	40	50¼	41	44⅜	45¼	42
Av. 8 courses 1855 to 1883	28½	26	27⅞	23¼	30¾	28½	31¾	31⅜	31½	32⅝	30½	33¼
Av. 2 courses 1887 and 1891	33⅜	27½	32⅜	26⅞	38¾	42¼	40⅛	47½	40¼	43⅜	43⅛	42⅝
	STRAW.											
	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.
1851	3,273	3,431	3,498	3,760	3,497	3,371	3,834	4,014	3,610	3,552	3,969	4,036
1855	4,295	3,619	4,070	3,351	4,286	3,525	4,492	3,611	4,952	3,942	5,107	4,370
1859	4,315	4,030	4,045	3,355	4,310	3,930	4,720	4,320	5,330	4,610	5,545	4,965
1863	4,563	3,468	4,295	3,008	4,690	3,390	5,051	3,888	5,495	4,698	5,638	4,919
1867	2,654	2,143	2,598	1,524	2,774	1,966	2,989	2,648	2,850	3,003	2,905	1,654
1871	2,075	2,799	1,946	2,655	2,128	3,048	2,240	2,980	2,628	3,440	2,863	3,644
1875	2,833	2,430	2,851	2,353	3,230	3,536	3,525	3,928	3,623	4,685	4,085	4,385
1879	1,493	1,324	1,612	1,219	1,956	1,771	1,843	1,771	1,691	1,658	1,426	2,138
1883	2,994	2,280	3,231	2,060	3,686	3,021	4,110	3,275	3,689	4,024	4,028	4,505
1887	2,505	1,859	2,655	1,844	3,465	3,298	3,480	3,468	3,308	3,423	3,763	3,645
1891	2,941	2,698	2,898	2,318	3,586	3,995	4,103	5,017	4,288	4,575	4,938	4,309
Av. 8 courses 1855 to 1883	3,153	2,762	3,081	2,441	3,383	3,023	3,621	3,303	3,782	3,758	3,950	3,821
Av. 2 courses 1887 and 1891	2,723	2,229	2,777	2,081	3,526	3,647	3,792	4,243	3,798	3,999	4,350	3,977
	TOTAL PRODUCE.											
	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.
1851	5,290	5,389	5,584	5,855	5,617	5,253	6,062	6,176	5,642	5,500	5,801	6,169
1855	6,735	5,859	6,473	5,526	6,756	5,789	6,961	5,921	7,428	6,371	7,499	6,992
1859	6,582	6,262	6,270	5,265	6,671	6,120	7,242	6,689	8,066	7,154	8,136	7,417
1863	7,446	5,621	6,999	4,941	7,626	5,619	8,194	6,562	8,837	7,627	8,747	7,721
1867	4,330	3,473	4,126	2,506	4,420	3,222	4,702	4,242	4,328	4,567	4,180	3,023
1871	3,004	4,092	2,840	3,994	3,133	4,521	3,193	4,404	3,747	4,942	3,925	5,236
1875	4,412	3,784	4,396	3,642	5,065	5,328	5,443	5,954	5,448	6,699	5,942	6,292
1879	2,162	1,987	2,351	1,800	2,905	2,729	2,755	2,781	2,478	2,493	2,100	3,034
1883	5,140	4,175	5,445	3,741	6,208	5,400	6,778	5,901	6,132	6,921	6,536	7,743
1887	4,689	3,483	4,811	3,550	6,103	5,994	6,105	6,332	5,894	6,103	6,410	6,409
1891	4,868	4,371	4,763	3,921	5,742	6,546	6,509	8,034	6,748	7,250	7,610	6,811
Av. 8 courses 1855 to 1883	4,976	4,407	4,863	3,927	5,348	4,841	5,658	5,307	5,808	5,847	5,883	5,932
Av. 2 courses 1887 and 1891	4,779	3,927	4,787	3,736	5,923	6,270	6,307	7,183	6,321	6,677	7,010	6,610

7,626 lb. in 1863; and lastly, on the mixed manure plot, only 2,478 lb. in 1879, but 8,837 lb. in 1863.

The cases cited are those of the most extreme fluctuations due to season; but a glance at the columns will show that there were very considerable variations in other years, under each condition as to manuring, or other treatment; whilst the amounts of the variations differ more or less under the different soil conditions. It will be obvious, therefore, that if we would fairly compare with one another the effects of the varying conditions, it is important to take the average results of a sufficient number of years to eliminate the influence of the varying seasons. Most of our illustrations will, therefore, be drawn from the average results over the eight years of wheat in the second to the ninth courses; but some reference will also be made to the averages for the tenth and eleventh courses.

Let us first compare the average amounts of produce of grain under the three main conditions as to manuring, excluding, however, those obtained on the portion of the unmanured plot where the roots were fed on the land, and where beans or clover were grown in the third year of each course; as the crops, especially of the barley and of the wheat, were somewhat adversely affected by a dell on one side of the plot, the surface soil being in consequence comparatively shallow. The figures show that, on the three portions, the produce ranged, without manure, from 26 to $28\frac{1}{2}$ bushels; with superphosphate from $28\frac{1}{2}$ to $31\frac{3}{4}$; and with the mixed manure from $30\frac{1}{2}$ to $33\frac{1}{4}$ bushels. Or, taking the amounts of total produce (grain and straw together), the range of amounts is—without manure from 4,407 to 4,976 lb.; with superphosphate from 4,841 to 5,658 lb.; and with the mixed manure from 5,808 to 5,932 lb. There is, therefore, both in grain and in total produce of the fourth crop of the course, an obvious difference, but certainly less than might have been expected, due to the varying conditions as to manuring in the first year, separated from the fourth by the growth and removal of the intermediate crops.

Next, comparing the effects on the fourth crop—the wheat—of the removal of the first—the turnips—or the retention of them, or of most of their constituents, on the land, it is seen that without manure, under which conditions there were practically no roots grown, the difference of result from removal or otherwise is quite immaterial, and is probably accidental. With superphosphate alone, and more roots grown, the nitrogen of which was doubtless obtained from previous accumulations within the soil, the removal or the retention on the land of the constituents of the turnips should, therefore, more materially affect the condition of the soil for the growth of the succeeding crops. It was shown that the effect was very marked on the barley which immediately succeeded the roots. There was also somewhat less produce, both of clover and of beans, where the roots had been removed; and now, in the case of the fourth crop—the wheat—there is still distinct effect. Thus, taking the fallow portions, there was an average of $30\frac{3}{4}$ bushels of wheat where the roots had been removed, and $31\frac{3}{4}$ bushels where they were fed or retained on the land; the corresponding amounts of total produce being 5,348 lb. and 5,658 lb. Or, taking the produce on the bean and clover portions, there were $28\frac{1}{2}$ bushels of grain where the roots had been removed, and $31\frac{3}{8}$ bushels where they had not been removed; the corresponding amounts of total produce being 4,841 lb. and 5,307 lb. Lastly, with the mixed manure, including nitrogen, the average produce was, on the fallow portions, $31\frac{1}{2}$ bushels after the removal of the roots, but only $30\frac{1}{2}$ where they had not been removed; the amounts of total produce being, however, 5,808 lb. and 5,883 lb. On the bean or clover portions, the results were $32\frac{5}{8}$ bushels where the roots were carted, and $33\frac{1}{4}$ bushels where they were not removed; and the amounts of total produce were 5,847 and 5,932 lb.

Reference to the average produce of the last two courses, the tenth and eleventh, the wheat years of which were of more than average productiveness, shows, in the case of the manured plots, more striking difference in the amount of the fourth crop due to the removal or the retention on the land of the constituents of the first crop—the roots. The roots of those courses were, however, more than average in amount.

The results, both with superphosphate alone, and with the mixed manure, afford, therefore, distinct evidence of the effect of the removal or otherwise of the first crop of the course—the turnips—not only on the second and third crops, but on the fourth crop—the wheat—also.

The next point is to illustrate the difference of effect on the other crops of the rotation, on the one hand of the growth and removal of the highly nitrogenous leguminous crop, and on the other of fallowing which removes nothing; and first as to the wheat, which we are now specially considering, and which immediately succeeds the leguminous crop or the fallow.

A careful examination of the average results over the eight courses (second to ninth) will show that, both without manure, and with superphosphate alone, that is under conditions of exhaustion, especially of available nitrogen, the wheat crops were in every case higher after fallow, with its supposed accumulation, than after the leguminous crops, which removed much more nitrogen than the succeeding wheat would require. On the other hand, on the mixed manure plots, where the condition of the land, and especially its nitrogenous condition, was not exhausted, but fairly maintained, there was even rather more average produce of wheat after the removal of the highly nitrogenous leguminous crops than after the accumulations of the fallow.

It is unsafe to form general conclusions from the results of individual years, since the characters of the seasons may have so much influence. But it may be observed that, after the heavy crops of clover on the superphosphate plots in 1882, and more where the roots were fed than where they had been removed, the wheat crops of the next year, 1883, which were higher than average, were lower after the leguminous crop than after fallow; whilst, on the highly manured plot, they were much the higher after the leguminous crop. In the tenth course, however, after the use of potash as well as superphosphate, there were fair but by no means such heavy crops of clover as in the very favourable season of the preceding course, and there was less where there had then been the larger crop; and in the eleventh course also, there was less total produce of beans where the heavier crop of clover had been grown in the ninth course. The result was, that on the average of the last two courses, the wheat gave less instead of more total produce after fallow than after the leguminous crops; but more where the roots had been fed than where they had been carted; that is, more where the land was the less exhausted.

The general result is, that where there was not exhaustion, but accumulation due to manure and to increased crop residue, the growth and removal of the leguminous crops not only gave large amounts of nitrogen in the removed crops, whilst the fallow yielded none, but also left more available nitrogen for the succeeding wheat than was rendered available (and remained) from the resources of the soil after the fallow. In other words, not only were the nitrogen and other constituents obtained in the leguminous crops an entire gain compared with the result of fallow, but, on the average of years, a somewhat larger succeeding wheat crop was obtained as well.

Here, then, is a striking illustration of the advantages of the interpolation of leguminous crops instead of fallow with the cereals in our rotations; and it is seen that the benefit may be the greater if the land be not abnormally exhausted, as was the case on the continuously unmanured, and on the superphosphate plots.

Although there was thus great difference between the effects, on the one hand, of the growth and removal of a leguminous crop, and on the other of fallow, so far as the third year of the course is concerned; yet, where the manurial conditions were not defective, there was even more wheat succeeding the leguminous crop, than succeeding the fallow. The influence of the conditions of the third year of the course does not, however, seem to extend in any marked degree to the crops succeeding the wheat; that is, to the roots commencing the next course, and to the barley succeeding the roots.

So far as the roots are concerned, the average results over the eight courses show, both without manure and with superphosphate alone, that is on the most exhausted plots, that the advantage, if any, is more with the fallow than with the leguminous plots; whilst, with the full manure, there is scarcely any difference of result clearly traceable to the treatment of the land in the third year of the preceding courses. Over the last two courses, again, without manure no benefit accrued to the root-crop by the growth of the leguminous crop as compared with fallow. On the superphosphate plots, however, now with potash, soda, and magnesia, as well, and doubtless more leguminous produce accordingly, there were more roots on the leguminous than on the fallow plots; but, with the full manure, there was practically no difference in the produce of roots on the fallow compared with the leguminous crop plots. Obviously, the fact that there was not materially less produce of roots where the leguminous crops had been grown and removed, as compared with where the land had been fallow, is of itself evidence of the beneficial rather than exhausting effect of their growth and removal, so far as the requirements of the succeeding crops are concerned.

Nor is the effect of the growth and removal of a leguminous crop, compared with fallow, very definite on the barley succeeding the manured roots. It is, however, over the eight courses, in favour of the growth of the leguminous crops; and, though with very small crops, it is, excepting without manure, much more so over the last two courses.

From the results as a whole it may be concluded that, where the land was the most exhausted, the growth of the leguminous crop was correspondingly limited, and, being at the expense of the little accumulation that there was, its removal further exhausted the immediately available supplies; whilst, where the accumulations were greater, the growth was dependent on a more extended root-development, and therefore greater range of collection; the luxuriance was much greater, and the surface-soil at any rate, gained by an increased amount of highly nitrogenous leguminous crop-residue. It has further been seen, that the effects of the manuring and treatment of the first crop of the course—the turnips—were manifest in the produce of the fourth crop—the wheat; and also that the effects of fallowing, or of growing and removing a highly nitrogenous crop, in the third year, was clearly traceable on the crop of the fourth year, and to some extent, though in a much less degree, on the subsequent crops commencing the next course.

The Amounts of Produce Grown in Rotation, and in the Various Crops Grown continuously.

Obviously, when considering what are the benefits arising from rotation as distinguished from the growth of the individual crops continuously, it is desirable, as far as practicable, to compare the results of the two methods in regard to their yield per acre of some of the more important constituents of the crops. For the purposes of such a comparison, it will be of interest to illustrate the point by reference specially to the amounts of *dry matter*, *nitrogen*, *total mineral matter* (*ash*), *phosphoric acid*, and *potash* (and in some cases of lime), in the crops grown in rotation, and in those grown continuously, under as far as possible parallel conditions as to manuring. Accordingly, so far as results obtained under rotation are concerned, the amounts of each of the above constituents in the average produce per acre per annum over the eight courses (second to ninth), under each of the twelve different conditions as to manuring, or other treatment, are adopted; and these are compared with the amounts obtained when the individual crops are grown continuously; in each case when practicable in the same eight seasons as those in which the rotation crops were obtained, and under the same, or nearly parallel, conditions as to manuring.

The Amounts of Dry Matter produced in the Rotation, and in the Continuous Crops.

Table V. shows the average annual amount of *dry matter* produced per acre, in each of the four crops—roots, barley, leguminous crop, and wheat—grown in rotation, and continuously, as above described. It shows the amounts, separately in the roots, leaves, and total produce, of the turnips; in the grain, straw, and total produce, of the barley, and of the wheat; in the corn, straw, and total produce, of the beans; and in the clover. It will be seen that the arrangement and headings of the columns are exactly the same as in the Tables of produce already considered; and that, for each description of crop, or part of the crop, the

TABLE V.—*Experiments on the Rotation of—Roots, Barley, Clover (or Beans), or Fallow, and Wheat; in Agdell Field, Rothamsted.* 8 *courses,* 32 *years,* 1852-1883.

AVERAGE AMOUNTS OF *DRY MATTER* PER ACRE, GROWN IN ROTATION, COMPARED WITH THOSE IN THE CROPS GROWN CONTINUOUSLY.

		Unmanured				Superphosphate				Mixed mineral and nitrogenous manure			
		Roots carted		Roots fed		Roots carted		Roots fed		Roots carted		Roots fed	
		Fallow	Beans or clover	Fallow	Beans or clover	Fallow	Beans or clover	Fallow	Beans or clover	Fallow	Beans or clover	Fallow	Beans or clover
SWEDISH TURNIPS.													
		lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.
Roots	Rotation . . .	359	228	323	205	1,724	1,631	1,918	1,901	3,081	3,128	3,107	3,069
	Continuous [1] . .	236	236	236	236	945	945	945	945	1,876	1,876	1,876	1,876
	Rotn. + or − cont.	123	−8	87	−31	779	686	973	956	1,205	1,252	1,231	1,193
Leaves	Rotation . . .	56	49	52	45	161	176	179	200	310	355	333	354
	Continuous [1] . .	49	49	49	49	142	142	142	142	345	315	345	345
	Rotn. + or − cont.	7	0	3	−4	19	34	37	58	−35	10	−12	9
Total	Rotation . . .	415	277	375	250	1,885	1,807	2,097	2,101	3,391	3,483	3,440	3,423
	Continuous [1] . .	285	285	285	285	1,087	1,087	1,087	1,087	2,221	2,221	2,221	2,221
	Rotn. + or − cont.	130	−8	90	−35	798	720	1,010	1,014	1,170	1,262	1,219	1,202
BARLEY.													
Grain	Rotation . . .	1,396	1,489	1,399	1,307	1,284	1,294	1,665	1,780	1,917	1,987	2,262	2,273
	Continuous . .	875	875	875	875	1,128	1,128	1,128	1,128	2,298	2,298	2,298	2,298
	Rotn. + or − cont.	521	614	524	432	156	166	537	652	−381	−311	−36	−25
Straw	Rotation . . .	1,493	1,647	1,486	1,459	1,307	1,355	1,765	1,879	2,029	2,129	2,701	2,613
	Continuous . .	947	947	947	947	1,052	1,052	1,052	1,052	2,489	2,489	2,489	2,489
	Rotn. + or − cont.	546	700	539	512	255	303	713	827	−460	−360	212	124
Total	Rotation . . .	2,889	3,136	2,885	2,766	2,591	2,649	3,430	3,659	3,946	4,116	4,963	4,886
	Continuous . .	1,822	1,822	1,822	1,822	2,180	2,180	2,180	2,180	4,787	4,787	4,787	4,787
	Rotn. + or − cont.	1,067	1,314	1,063	944	411	469	1,250	1,479	−841	−671	176	99
BEANS (6 COURSES), CLOVER (2 COURSES), OR FALLOW.													
Corn	Rotation . . .		631		625		640		769		1,147		1,292
	Continuous . .		234		234		265		265		581		581
	Rotn. + or − cont.		397		391		375		504		566		711
Straw	Rotation . . .		879		835		978		1,213		1,487		1,540
	Continuous . .		422		422		524		524		799		799
	Rotn. + or − cont.		457		413		454		689		688		741
Total	Rotation . . .		1,510		1,460		1,618		1,982		2,634		2,832
	Continuous . .		656		656		789		789		1,380		1.380
	Rotn. + or − cont.		854		804		829		1,193		1,254		1,452
Clover	Rotation . . .		2,309		1,996		4,717		5,645		6,714		6,833
	Continuous . .		?		?		?		?		?		?
Average of 8 courses, beans and clover			1,710		1,594		2,393		2,897		3,654		3,832
WHEAT.													
Grain	Rotation . . .	1,516	1,368	1,483	1,235	1,636	1,514	1,702	1,668	1,685	1,740	1,599	1,752
	Continuous . .	647	647	647	647	766	766	766	766	1,238	1,238	1,238	1,238
	Rotn. + or − cont.	869	721	836	588	870	748	936	902	447	502	361	514
Straw	Rotation . . .	2,636	2,296	2,573	2,036	2,844	2,513	3,021	2,767	3,158	3,137	3,273	3,186
	Continuous . .	1,082	1,082	1,082	1,082	1,204	1,204	1,204	1,204	2,142	2,142	2,142	2,142
	Rotn. + or − cont.	1,554	1,214	1,491	954	1,640	1,309	1,817	1,563	1,016	995	1,131	1,044
Total	Rotation . . .	4,152	3,664	4,056	3,271	4,480	4,027	4,723	4,435	4,843	4,877	4,872	4,938
	Continuous . .	1,729	1,729	1,729	1,729	1,970	1,970	1,970	1,970	3,380	3,380	3,380	3.380
	Rotn. + or − cont.	2,423	1,935	2,327	1,542	2,510	2,057	2,753	2,465	1,463	1,497	1,492	1,558

[1] Average 19 years, 1849–1852 and 1856–1870.

first line shows the amounts obtained under rotation, the second those in the crop grown continuously, and the third the difference between the two :—

The Dry Matter in the Turnip Crops.—Referring first to the upper division of the Table, relating to the Swedish turnips, it should be stated that results for the crops grown continuously are not available for the same eight years as those grown in rotation; but for each of the three conditions as to manuring, the average for 19 years of growth is taken. So far as manuring is concerned, the unmanured and the superphosphate conditions were the same for the rotation and for the continuous crops. But, in the case of the mixed manure, the rotation plots received a larger amount of nitrogen for the roots; in fact, enough to carry the four crops of the course. The continuous plot, on the other hand, received a less amount each year; but, unlike the rotation plots, with no intermediate crops to use up any available residue from the previous application.

The figures show that—without manure—the difference in the amounts of dry matter produced in rotation and in continuous growth are immaterial. The utter failure in both cases without manure is confirmatory of the absolute dependence of this valuable rotation crop on supplies within the soil itself, either from accumulations, or from direct manuring.

The less produce of the continuous than of the rotation crops with superphosphate is also quite consistent with the supposition that, under such conditions, the crop greatly exhausts the available nitrogen of the soil, and especially of the surface soil.

With the mixed mineral and nitrogenous manure, again, there is also considerably less production of dry substance when the crop is grown continuously than when it is grown in rotation. The result is, however, due partly to the larger amount of nitrogen directly supplied by manure to the rotation crops as above referred to, but partly to the fact that when the same description of root-crop, with the same character and range of roots, is grown year after year on the same land, the surface-soil becomes close, and a somewhat impervious pan is formed below; conditions which are very unfavourable for a crop which pre-eminently requires a good tilth for great development of fibrous root within the soil. The results with the mixed manure are, of course, the most comparable with those of ordinary practice; and it is clear that, however explained, much more produce is obtained under rotation than with continuous growth. It need only further be remarked that, of the total dry matter produced, there are many times as much in the edible root as in the leaf which almost wholly remains only for manure again.

The Dry Matter in the Barley Crops.—The second division of Table V. compares the amounts of dry matter yielded in *barley*, grown, respectively, in rotation, and continuously—that is, year after year on the same land. The results for the continuously grown crops relate to the average produce of the same eight seasons as those in which the rotation crops were obtained. The unmanured and the superphosphate conditions were also quite parallel in the two series of experiments. In the case of the mixed manure results, it should be borne in mind that in the rotation experiments a quantity of manure was applied for the preceding crop—the turnips—which is supposed to carry the whole of the crops of the four years' course; whilst, in the continuous experiments, the quantity of nitrogen, for example, which is applied each year for the immediate crop, amounts to rather more than one-fourth of that applied for four years in the rotation experiments.

The figures show that—without manure—there was much less dry matter in grain, straw, and total produce, in the crops grown continuously than in those grown in rotation; in fact, in the total produce only about three-fifths as much. The much higher amount under rotation is quite consistent with the explanation that in the rotation experiments without manure, the roots having failed, the barley crop had, in point of fact, the benefit of the preparation which bare fallow is known to confer.

With superphosphate alone, the continuously grown barley crops yielded more dry matter in grain, straw, and in total produce, than those without manure; the excess being largely due to increased capability of utilising the available nitrogen of the surface soil, under the influence of the phosphatic manure. Both sets of the superphosphate rotation crops yielded more dry matter than the continuous ones, the excess being, however, much less where the rotation roots had been removed than where they had been consumed or spread upon the land. The effect of the growth and accumulation by the previous root-crop, and of the more or less available manurial residue left under the different conditions, as compared with the result when the barley is grown year after year on the same land, is thus very evident.

As already said, the amount of nitrogen annually applied on the mixed manure plot was, for the continuous crops, somewhat more than one-fourth of that applied for the preceding root-crops in the case of the rotation plots. Under these circumstances, the amounts of dry matter in grain, straw, and total produce, were considerably less in the barley grown in rotation where the roots and leaves of the turnips had been removed than in that grown continuously; but where in the case of the rotation barley the root-crops had been consumed or spread upon the land, the average yield of dry matter per acre was much more nearly identical under rotation and under continuous cropping; though upon the whole it was more under rotation. The effects on the second crop of the course, of the manurial and other treatment of the first crop, is here, then, further illustrated. Lastly, it is to be observed, that a larger proportion of the total dry matter of the crop is, on the average, accumulated in the straw which is generally retained on the farm, than in the grain which is, as a rule, exported from it.

Thus, both the actual and the comparative results clearly show, that the successful growth of the barley was directly dependent on the supplies within the soil, and that the object may be gained, either in a properly manured rotation, or by the direct application of suitable manures, including a liberal supply of nitrogen for the immediate crop. Having regard to the general economy of the farm, the former plan is as a rule the most advantageous; though, owing to the success with which the crop can be grown by direct artificial manures, such manures are often used as supplements; or, sometimes, a barley crop is taken after another cereal, by the aid of artificial manures alone.

The Dry Matter in the Leguminous Crops.—The third division of the Table (V.) shows the average amounts of dry matter per acre per annum in the corn, straw, and total produce, of the six crops of beans grown in rotation in the eight years; also the average amounts in the same six years when the crop was grown continuously in another field. Below the bean results are given the average amounts per acre per annum in the clover grown in rotation in the remaining two of the eight years; and there are also given the average amounts over the eight years, in the six crops of beans and two of clover. It will be seen, however, that there is no entry in the line for continuous crops of clover, for the simple reason that, as has been shown in various papers, it was found impossible to grow clover year after year on ordinary arable land.

The figures show that, meagre as was the average produce of dry matter in the crops of beans, even when grown in rotation, they were much less still when grown continuously. This was the case whether we look to the amounts in the corn, the straw, or the total produce. Indeed, the lines of total produce show that the average amounts in the continuously grown crops were, under each condition of manuring or other treatment, less than half as much as those grown in rotation. In both cases, there was somewhat more with superphosphate than without manure, and more still with the mixed manure, including both potash and nitrogen, but even under these conditions, and in rotation, the produce was very small.

Under each condition as to manuring, the produce of dry matter in the clover grown in rotation was more, and in some very much more, than in the beans so grown. Without manure, it averaged only about 1 ton per acre per annum; with superphosphate, in one case more than 2, and in the other more than $2\frac{1}{2}$ tons; and in each with the full manure, including potash and nitrogen, more than 3 tons.

Lastly, the average production of dry substance in the six crops of beans and two of clover taken together was—without manure only about $\frac{3}{4}$ ton; with superphosphate, in one case little more than 1 ton, and in the other rather more than $1\frac{1}{4}$ ton; and, with the mixed manure, in both cases less than $1\frac{3}{4}$ ton. These amounts in the leguminous crops with the mixed manure were, however, greater than those obtained in the turnip crops, but less than those in either the barley or the wheat grown in rotation. The significance of the amounts grown in the leguminous crops will, however, be the more clearly recognised when we come to consider the quantities of nitrogen in the different crops; and also the fact of the large proportion of the manurial constituents of the leguminous crops grown in rotation, that will generally be retained on the farm.

The Dry Matter in the Wheat Crops.—The bottom division ot the Table (V.) shows the average amounts of dry substance in the wheat—grain, straw, and total produce—grown in rotation, and those obtained in the same years in another field under as far as possible parallel conditions as to manuring, but grown continuously; that is, year after year on the same land.

A glance at the figures shows that, both without manure and with superphosphate alone, the amount of dry matter produced was, both in grain and straw, in each case considerably less than half as much in the crops grown continuously as in those grown in rotation; and that, even with the mixed manure, supplying both mineral constituents and nitrogen, it was considerably less in the continuous than in the rotation crops.

So far as the unmanured and the superphosphate crops are concerned, it is obvious that the growth year after year must be much more exhausting, both of nitrogen and of certain essential mineral constituents, in a condition of composition and of distribution within the soil and subsoil available to one particular crop, than when the crop is grown in alternation with others, of different requirements, habits, and root-ranges.

It has been explained that in the case of the mixed manure rotation plots there was applied for the first crop of the course, besides a full supply of mineral constituents, about 140 lb. ot nitrogen; at the average rate, therefore, of 35 lb. per acre per annum over the four years. But, in the case of the continuously grown wheat crops, not only a full supply of mineral manure, but 43 lb. of nitrogen as ammonium-salts, were directly applied every year. The fact of the greater amount of produce on the rotation plots would indicate, therefore, that notwithstanding the growth and removal of the intermediate crops since the application of the manure for the roots, there was more nitrogen, and more of other constituents also, in a condition of composition and of distribution available for the wheat, than in the case of the annual direct supply.

Of course, the proportion of grain and of straw in a wheat crop varies, as it also does in barley, according to variety, soil, season, and other circumstances. It is seen that, in the experimental crops, whether grown in rotation or continuously, there was always much more of the produced dry matter accumulated in the straw than in the grain. Indeed, there was in some cases nearly twice as much. On the assumption, therefore, that as a rule the grain will be sold, and the straw retained on the farm as food and litter, very much more than half of the produced dry matter will be so retained.

Comparing the amounts of dry matter accumulated in the different rotation crops, and taking as the most normal the quantities obtained under the influence of the mixed manure, including nitrogen, it is seen that, on the average, the two cereal crops—the barley and the wheat—produced approximately equal amounts; and each considerably more than either of the fallow crops—the roots or the Leguminosæ.

The Amounts of Nitrogen in the Rotation, and in the Continuous Crops.

Table VI. shows the average amounts of nitrogen per acre per annum, over the eight years, in the rotation, and in the continuous crops, respectively:—

The Nitrogen in the Root-crops.—Without manure, with extremely small crops, but very abnormally high percentage of nitrogen in them, the amounts per acre were, in the continuously grown crops only about twice as much as annually comes down as combined nitrogen in the rain and minor aqueous deposits from the atmosphere; whilst, even in the rotation crops, the amounts averaged but little more than in the continuous.

With superphosphate alone, much larger crops, but much lower percentages of nitrogen, there was very much more nitro-

Table VI.—*Experiments on the Rotation of—Roots, Barley, Clover (or Beans), or Fallow, and Wheat; in Agdell Field, Rothamsted. 8 courses, 32 years,* 1852–1883.

AVERAGE AMOUNTS OF *NITROGEN* PER ACRE IN THE ROTATION CROPS, COMPARED WITH THOSE IN THE CROPS GROWN CONTINUOUSLY.

—		Unmanured				Superphosphate				Mixed mineral and nitrogenous manure			
		Roots carted		Roots fed		Roots carted		Roots fed		Roots carted		Roots fed	
		Fallow	Beans or clover	Fallow	Beans or clover	Fallow	Beans or clover	Fallow	Beans or clover	Fallow	Beans or clover	Fallow	Beans or clover
SWEDISH TURNIPS.													
		lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.
Roots	Rotation	9·4	5·8	8·5	5·3	28·7	26·8	32·9	32·2	66·3	66·7	68·2	65·5
	Continuous [1]	6·8	6·8	6·8	6·8	13·6	13·6	13·6	13·6	40·1	40·1	40·1	40·1
	Rotn. + or − cont.	2·6	−1·0	1·7	−1·5	15·1	13·2	19·3	18·6	26·2	26·6	28·1	25·4
Leaves	Rotation	2·1	1·8	1·9	1·6	6·1	6·5	6·9	7·6	12·2	13·9	13·0	13·9
	Continuous [1]	2·0	2·0	2·0	2·0	5·8	5·8	5·8	5·8	14·1	14·1	14·1	14·1
	Rotn. + or − cont.	0·1	−0·2	−0·1	−0·4	0·3	0·7	1·1	1·8	−1·9	−0·2	−1·1	−0·2
Total	Rotation	11·5	7·6	10·4	6·9	34·8	33·3	39·8	39·8	78·5	80·6	81·2	79·4
	Continuous [1]	8·8	8·8	8·8	8·8	19·4	19·4	19·4	19·4	54·2	54·2	54·2	54·2
	Rotn. + or − cont.	2·7	−1·2	1·6	−1·9	15·4	13·9	20·4	20·4	24·3	26·4	27·0	25·2
BARLEY.													
Grain	Rotation	21·5	23·0	21·5	20·1	17·8	17·8	22·9	24·6	29·7	30·7	35·0	34·9
	Continuous	13·5	13·5	13·5	13·5	15·5	15·5	15·5	15·5	35·2	35·2	35·2	35·2
	Rotn. + or − cont.	8·0	9·5	8·0	6·6	2·3	2·3	7·4	9·1	−5·5	−4·5	−0·2	−0·3
Straw	Rotation	6·6	7·4	6·6	6·6	5·5	5·7	7·5	7·9	9·5	10·0	12·5	11·9
	Continuous	4·2	4·2	4·2	4·2	4·5	4·5	4·5	4·5	11·4	11·4	11·4	11·4
	Rotn. + or − cont.	2·4	3·2	2·4	2·4	1·0	1·2	3·0	3·4	−1·9	−1·4	1·1	0·5
Total	Rotation	28·1	30·4	28·1	26·7	23·3	23·5	30·4	32·5	39·2	40·7	47·5	46·8
	Continuous	17·7	17·7	17·7	17·7	20·0	20·0	20·0	20·0	46·6	46·6	46·6	46·6
	Rotn. + or − cont.	10·4	12·7	10·4	9·0	3·3	3·5	10·4	12·5	−7·4	−5·9	0·9	0·2
BEANS (6 COURSES), CLOVER (2 COURSES), OR FALLOW.													
Corn	Rotation		27·5		27·2		30·4		36·6		49·6		55·7
	Continuous		9·7		9·7		10·5		10·5		21·4		21·4
	Rotn. + or − cont.		17·8		17·5		19·9		26·1		28·2		34·3
Straw	Rotation		9·4		8·9		10·1		12·4		14·0		14·5
	Continuous		4·6		4·6		5·5		5·5		7·1		7·1
	Rotn. + or − cont.		4·8		4·3		4·6		6·9		6·9		7·4
Total	Rotation		36·9		36·1		40·5		49·0		63·6		70·2
	Continuous		14·3		14·3		16·0		16·0		28·5		28·5
	Rotn. + or − cont.		22·6		21·8		24·5		33·0		35·1		41·7
Clover	Rotation		55·0		47·0		124·5		144·6		167·0		168·4
	Continuous		?		?		?		?		?		?
Average of 8 courses, Beans and Clover			41·5		38·9		61·5		72·9		89·5		94·7
WHEAT.													
Grain	Rotation	26·2	23·7	25·5	21·5	27·2	25·4	28·6	28·2	28·9	30·1	27·7	30·1
	Continuous	11·6	11·6	11·6	11·6	13·9	13·9	13·9	13·9	23·9	23·9	23·9	23·9
	Rotn. + or − cont.	14·6	12·1	13·9	9·9	13·3	11·5	14·7	14·3	5·0	6·2	3·8	6·2
Straw	Rotation	10·4	9·1	9·9	8·2	11·8	10·5	12·3	11·7	13·2	13·6	13·8	13·1
	Continuous	5·4	5·4	5·4	5·4	5·9	5·9	5·9	5·9	10·1	10·1	10·1	10·1
	Rotn. + or − cont.	5·0	3·7	4·5	2·8	5·9	4·6	6·4	5·8	3·1	3·5	3·7	3·0
Total	Rotation	36·6	32·8	35·4	29·7	39·0	35·9	40·9	39·9	42·1	43·7	41·5	43·2
	Continuous	17·0	17·0	17·0	17·0	19·8	19·8	19·8	19·8	34·0	34·0	34·0	34·0
	Rotn. + or − cont.	19·6	15·8	18·4	12·7	19·2	16·1	21·1	20·1	8·1	9·7	7·5	9·2

[1] Average 19 years, 1849–52 and 1856–70.

gen taken up than without manure; in fact, when grown in rotation from three to four times as much, and when grown continuously more than twice as much. There was, too, very much more in the rotation than in the continuous crops. The detailed results published elsewhere, relating to the continuous growth of root-crops afford conclusive evidence that the increased amount of nitrogen taken up by the crop under the influence of phosphatic manures is derived from the resources of the soil itself, by the aid of the greatly enhanced development of fibrous feeding root induced by such manures.

With the mixed manure containing nitrogen there was, as with superphosphate alone, much more nitrogen taken up under rotation than with continuous growth. But, under rotation, there was about twice as much taken up with the mixed manure containing nitrogen as with superphosphate without nitrogen; and with continuous growth there was nearly three times as much taken up as with superphosphate without nitrogen. It is clear, therefore, that the crops, whether grown in rotation or continuously, took up much of the nitrogen supplied by the manure. Indeed, it cannot be doubted that, beyond the small amount of combined nitrogen annually coming down from the atmosphere in rain and the minor aqueous deposits, the source of the large amount of nitrogen of root-crops is the store of it within the soil, whether this be due to accumulations, or to direct supply by manure. On the other hand, the large amounts of produce obtained by the aid of nitrogenous manures on land to which no carbonaceous manure has been applied for about fifty years is evidence that the atmosphere is at any rate the chief, if not the exclusive, source of the carbon of the crops.

Lastly, as to the results in the Table relating to the Swedish turnips, it is seen that by far the greater part of the nitrogen of the crops was accumulated in the edible root.

The Nitrogen in the Barley Crops.—The second division of Table VI. shows the average amounts of nitrogen per acre per annum over the eight years in the rotation and in the continuous barley crops respectively.

Referring to the results chiefly in their bearing on the question of the position of the barley crop in rotation, and of its dependence, or otherwise, on the soil for its supplies of nitrogen, the amounts of it in the total crops, grain and straw together, are of most interest.

When considering similar results relating to the first crop of the course—the Swedish turnips, it was seen that the average amount of nitrogen per acre per annum in the total crops, roots, and leaves together, was only 10 or 11 lb., or even less, when grown without any manure. The results relating to the rotation barley crops show, however, that the average annual removal in them was without manure nearly 30 lb.; the conditions of growth being substantially equivalent to fallow, as practically no root-crop had been removed.

Consistently with other evidence on the point, the amounts of nitrogen removed in the barley crops grown on the superphosphate plots is seen to be even considerably less than without manure, where the increased crop of roots grown under the influence of the superphosphate had been removed from the land; but where the superphosphate turnips had been fed on the land, the amounts of nitrogen removed in the barley crops are more than under the parallel conditions without manure. In other words, an increased amount of nitrogen having been taken up from the soil by the turnips under the influence of the superphosphate, the land was left poorer in available nitrogen for the barley where the increased turnip crop had been removed from the land, but richer where it, or its manurial residue, was left upon it.

Again, under the influence of the mixed manure, supplying a liberal amount of nitrogen for the roots, which took up a considerable quantity of it, there was much less nitrogen in the succeeding barley, where the roots so grown had been removed, than where they or their manurial residue had been left on the land.

The actual quantities of nitrogen removed in the barley crops, where the roots had previously been removed, were—without manure nearly 30 lb., with superphosphate about 23½ lb., and with the mixed manure about 40 lb.; but where the roots had been fed or left on the land, they were, without manure about 28 lb., with superphosphate more than 30 lb., and with the mixed manure containing nitrogen about 47 lb.

Comparing the amounts of nitrogen taken up by the rotation, with those by the continuously grown barley, it is seen, as might be expected under the conditions described, that both without manure and with superphosphate, the rotation barley took up much more than the continuously grown. Where, however, nitrogenous manure had been applied for the roots, and they had been removed, the succeeding barley took up less nitrogen than the continuous crops which annually received nitrogenous manure; but where the roots had not been removed from the land, the nitrogen in the rotation and in the continuously grown barley were nearly the same—about 47 lb. per acre per annum.

The influence of the manuring, and of the amount and treatment of the previous root-crop, on the available supply of nitrogen within the soil for the succeeding barley is, therefore, throughout clearly traceable.

Lastly, in regard to the nitrogen statistics of the barley crops, it is to be observed that, under whatever conditions of manuring or other treatment, and whether grown in rotation or continuously, there was generally three-fourths or more of the total nitrogen of the crop accumulated in the grain, that is, in the portion which is as a rule sold off the farm; only about one-fourth, therefore, remaining in the straw which is supposed to be retained on the farm.

The Nitrogen in the Leguminous Crops.—The third division of the Table (VI.) gives the results relating to this point.

Referring first to the amounts of nitrogen in the total bean crops (corn and straw together), it is seen that, under each of the three conditions as to manuring, there was from twice to twice and a half as much in the rotation as in the continuously grown beans. The details further show that the advantage was proportionally greater in the corn than in the straw.

It is next to be observed that the amounts of nitrogen taken up by the rotation beans were—without manure about 36 lb. per acre per annum, and with superphosphate between 40 and 50 lb.; whilst with the mixed manure, containing nitrogen, there were in one case 63·6 lb., and in the other 70·2 lb. In fact, both without manure and with superphosphate, the amounts taken up in the beans were much greater than in either the preceding roots or the preceding barley. With the mixed manure supplying nitrogen, they were also much more than in the preceding barley, but less than in the root-crops, to which the mixed manure had been directly applied.

The point of greatest interest in the results is, however, that under each condition as to manuring, the clover took up very much more nitrogen than the beans, and very much more than either of the other crops of the rotation under parallel conditions. Thus, even without manure, the average amount of nitrogen in the two crops of clover was—in one case 55 lb. and in the other 47 lb.; with superphosphate it was 124·5 and 144·6 lb.; and with the mixed manure, containing both potash and nitrogen, in the one case 167 lb. and in the other 168·4 lb. Or, taking the average amount of nitrogen in the six bean and two clover crops, there were—without manure 41·5 and 38·9 lb.; with superphosphate 61·5 and 72·9 lb.; and with the mixed manure 89·5 and 94·7 lb. It is, indeed, to the occasional growth of clover, that the very large average amounts of nitrogen removed in the leguminous crops of the rotation are to be attributed; and it is these amounts that have to be taken into consideration in comparing the effects on the yield of the other crops of the rotation, and of the rotation as a whole, on the one hand of growing a leguminous crop, and on the other of fallowing, which of course neither yields nor removes nitrogen—unless by loss in drainage.

Further, the figures show that there was generally three or even more times as much of the total nitrogen of the bean crops accumulated in the corn as remained in the straw. Lastly, not only does the leguminous crop of the rotation yield the most nitrogen, but, unless in the case of some of the corn of the beans, the whole of it is supposed to be retained on the farm; and there is, in addition, more or less, and sometimes a considerable amount, of nitrogenous crop-residue left within the soil for succeeding crops.

The Nitrogen in the Wheat Crops.—The results on this head are recorded in the bottom division of Table VI.

Referring first to the amounts of nitrogen in the total produce (grain and straw together), it is seen that, both without manure and with superphosphate alone, that is with the greatest exhaustion, especially of nitrogen, there was generally about, or even more than, twice as much in the rotation as in the continuous crops. With the full manure, both mineral and nitrogenous, applied for the rotation crops only at the beginning of the course, but for the continuous ones each year for the wheat crop to be grown, the relative deficiency in the continuous crops was, however, very much less. Thus, the figures show that the average amounts of nitrogen in the total wheat crops were—without manure nearly 35 lb. per acre per annum in the rotation crops, and only 17 lb. in the continuous ones; with the superphosphate alone nearly 40 lb. under rotation, but in the continuous crops not 20 lb.; and lastly, with the full manure there was an average of more than 42 lb. in the rotation crops, and of 34 lb. in those grown continuously. There is direct evidence, therefore, that there was, under all conditions, more nitrogen available to the crops grown in rotation, than to those growing year after year on the same land; and the advantage is relatively much the greater where no nitrogen had been supplied in manure. The beneficial effect of the interpolation of other crops with the cereals is, therefore, very obvious.

In the case of the second crop of the course—the barley—it was shown that without manure the increased produce in rotation was due to scarcely any roots having been grown, so that the land was practically fallowed for the barley; and now in the case of the fourth crop—the wheat—there was the preparation either of the growth of a leguminous crop leaving a highly nitrogenous residue, or of fallowing. Then with superphosphate alone, the produce of barley, and the yield of nitrogen in it, were less than without manure where the turnips had been removed, but more where they had not, and where, therefore, there was an available nitrogenous residue from the roots ; and now in the wheat, the effects on the available supply of nitrogen, on the one hand of the growth and removal of a leguminous crop, and on the other of actual fallow, are observable. Lastly, with the mixed manure the influence of the direct supply of nitrogen for the first crop of the course is obvious. But, as the amounts of nitrogen taken up were not very much more than where none had been supplied, it is evident that in both cases much must have been due to the influence of the preceding leguminous crop or fallow.

Upon the whole there can be no question that, so far as nitrogen is concerned, the supply within the soil in a condition of combination and of distribution available to the wheat is increased, both by fallow, and by the growth of a leguminous crop, especially of clover; and, further, that such accumulation of available nitrogen by fallow, and of nitrogenous crop-residue by the growth of leguminous crops, is the greater when the soil and subsoil are not abnormally exhausted of organic nitrogen.

Lastly, it is to be observed that, under all conditions of manuring, or other treatment, there was, both in the rotation and in the continuous wheat crops, more than twice, and in some cases considerably more than twice, as much of the total nitrogen of the produce stored up in the grain as in the straw. Hence, in the sale of the grain, and the retention of the straw for home use, by far the greater part of the nitrogen of the crop is exported from the farm.

The Amounts of Total Mineral Matter (Ash) in the Rotation, and in the Continuous Crops.

The results are given in Table VII. for each of the four descriptions of crop, in exactly the same form as those for the total dry matter and the nitrogen, in Tables V. and VI. respectively.

The record is deserving of careful study, as showing the very various, and sometimes very large, amounts of mineral or ash-constituents taken up from the soil, and stored up in the different crops, or parts of the crops. But, it must suffice here to

TABLE VII.—*Experiments on the Rotation of—Roots, Barley, Clover (or Bean), or Fallow, and Wheat; in Agdell Field, Rothamsted.* 8 *courses,* 32 *years,* 1852–1883.

AVERAGE AMOUNTS OF *MINERAL MATTER (ASH)* PER ACRE IN THE ROTATION CROPS, COMPARED WITH THOSE IN THE CROPS GROWN CONTINUOUSLY.

—		Unmanured				Superphosphate				Mixed mineral and nitrogenous manure			
		Roots carted		Roots fed		Roots carted		Roots fed		Roots carted		Roots fed	
		Fallow	Beans or clover	Fallow	Beans or clover	Fallow	Beans or clover	Fallow	Beans or clover	Fallow	Beans or clover	Fallow	Beans or clover
SWEDISH TURNIPS.													
		lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.
Roots	Rotation . . .	15·7	9·5	13·8	8·8	74·1	71·3	82·5	81·9	167·8	171·2	182·4	172·3
	Continuous [1] . .	10·9	10·9	10·9	10·9	40·0	40·0	40·0	40·0	100·3	100·3	100·3	100·3
	Rotn. + or − cont.	4·8	−1·4	2·9	−2·1	34·1	31·3	42·5	41·9	67·5	70·9	82·1	72·0
Leaves	Rotation . . .	6·7	6·0	6·6	5·9	17·9	20·4	19·2	22·9	35·2	41·9	40·1	41·6
	Continuous [1] . .	5·9	5·9	5·9	5·9	16·4	16·4	16·4	16·4	40·5	40·5	40·5	40·5
	Rotn. + or − cont.	0·8	0·1	0·7	0·0	1·5	4·0	2·8	6·5	−5·3	1·4	−0·4	1·1
Total	Rotation . . .	22·4	15·5	20·4	[2]14·7	92·0	91·7	101·7	104·8	203·0	213·1	222·5	213·9
	Continuous [1] . .	16·8	16·8	16·8	16·8	56·4	56·4	56·4	56·4	140·8	140·8	140·8	140·8
	Rotn. + or − cont.	5·6	−1·3	3·6	−2·1	35·6	35·3	45·3	48·4	62·2	72·3	81·7	73·1
BARLEY.													
Grain	Rotation . . .	34·8	35·9	34·2	30·7	34·9	33·8	44·1	45·9	50·7	51·5	58·1	57·7
	Continuous . .	21·5	21·5	21·5	21·5	28·4	28·4	28·4	28·4	58·8	58·8	58·8	58·8
	Rotn. + or − cont.	13·3	14·4	12·7	9·2	6·5	5·4	15·7	17·5	−8·1	−7·3	−0·7	−1·1
Straw	Rotation . . .	81·3	87·5	79·2	76·1	75·6	77·7	96·9	99·8	113·5	116·8	145·6	144·9
	Continuous . .	47·3	47·3	47·3	47·3	55·6	55·6	55·6	55·6	130·6	130·6	130·6	130·6
	Rotn. + or − cont.	34·0	40·2	31·9	28·8	20·0	22·1	41·3	44·2	−17·1	−13·8	15·0	14·3
Total	Rotation . . .	116·1	123·4	113·4	[2]106·8	110·5	111·5	141·0	145·7	164·2	168·3	203·7	202·6
	Continuous . .	68·8	68·8	68·8	68·8	84·0	84·0	84·0	84·0	189·4	189·4	189·4	189·4
	Rotn. + or − cont.	47·3	54·6	44·6	38·0	26·5	27·5	57·0	61·7	−25·2	−21·1	14·3	13·2
BEANS (6 COURSES), CLOVER (2 COURSES), OR FALLOW.													
Corn	Rotation . . .		18·5		18·4		20·2		24·1		35·8		40·7
	Continuous . .		7.6		7·6		9·4		9·4		21·1		21·1
	Rotn. + or − cont.		10·9		10·8		10·8		14·7		14·7		19·6
Straw	Rotation . . .		53·1		53·3		65·8		72·5		87·7		90·8
	Continuous . .		28·5		28·5		35·1		35·1		54·2		54·2
	Rotn. + or − cont.		24·6		24·8		30·7		37·4		33·5		36·6
Total	Rotation . . .		71·6		71·7		86·0		96·6		123·5		131·5
	Continuous . .		36·1		36·1		44·5		44·5		75·3		75·3
	Rotn. + or − cont.		35·5		35·6		41·5		52·1		48·2		56·2
Clover	Rotation		198·3		[2]172·6		421·3		487·5		569·8		612·5
	Continuous . .		?		?		?		?		?		?
Average of 8 courses, Beans and Clover			103·3		[2]96·9		169·8		194·3		235·1		251·7
WHEAT.													
Grain	Rotation . . .	26·3	24·6	25·6	22·1	29·6	29·1	30·0	31·1	30·6	33·3	29·5	33·2
	Continuous . .	13·6	13·6	13·6	13·6	16·3	16·3	16·3	16·3	25·0	25·0	25·0	25·0
	Rotn. + or − cont.	12·7	11·0	12·0	8·5	13·3	12·8	13·7	14·8	5·6	8·3	4·5	8·2
Straw	Rotation . . .	167·9	157 9	160·9	143·5	181·4	172·4	182·5	182·0	187·9	198·9	190·7	196·7
	Continuous . .	74·4	74·4	74·4	74·4	89·3	89·3	89·3	89·3	136·7	136·7	136·7	136·7
	Rotn. + or − cont.	93·5	83·5	86·5	69·1	92·1	83·1	93·2	92·7	51·2	62·2	54·0	60·0
Total	Rotation . . .	194·2	182·5	186·5	[2]165·6	211·0	201·5	212·5	213·1	218·5	232·2	220·2	229·9
	Continuous . .	88·0	88·0	88·0	88·0	105·6	105·6	105·6	105·6	161·7	161·7	161·7	161·7
	Rotn. + or − cont.	106·2	94·5	98·5	77·6	105·4	95·9	106·9	107·5	56·8	70·5	58·5	68·2

[1] Average 19 years, 1849–52 and 1856–70.   [2] Probably crop too low owing to a dell.

direct attention to some of the points of chief interest brought to view, on the consideration of the amount, and of the distribution, of some of the more important individual mineral constituents in the respective crops; and for the purposes of such an illustration reference will chiefly be made to the amounts of phosphoric acid, and of potash, but in some cases to that of lime also, in the crops.

The Amounts of Phosphoric Acid in the Rotation, and in the Continuous Crops.

Table VIII. records the results relating to the amounts of phosphoric acid in the different crops or parts of crops:—

The Phosphoric Acid in the Root-crops.—The figures show that, without manure, the rotation turnip crops took up an extremely small amount of phosphoric acid, reaching in only one case to an average of 1½ lb. per acre per annum. By superphosphate alone the amount was increased to an average of about 10 lb.; and although this increase only represents about one-tenth of the phosphoric acid applied in manure it is very important, as it is directly connected with the greatly increased development of fibrous feeding root within the soil, which is a special effect of phosphatic manures when applied to turnips; and it is by virtue of this development that these crops so markedly exhaust the available nitrogen within the soil, and especially the surface soil. As has been shown, there is abundant evidence that the increased amount of nitrogen taken up under the influence of phosphates unaccompanied by any supply of nitrogen itself, is at the expense of the stores of the soil; and that it is not due to a capacity to take up either combined or free nitrogen from the atmosphere, by virtue of an increased development of leaf-surface, under the influence of the phosphatic manure.

With the mixed manure, supplying, besides superphosphate, salts of potash, soda, and magnesia, and a liberal amount of nitrogen as well, there was, although the supply of phosphoric acid by manure was exactly the same, now about twice as much of it taken up, as a coincident of the greatly increased growth, due partly to the other mineral constituents at the same time added, but especially to the influence of the increased available supply of nitrogen. Still, only a small proportion of the phosphoric acid applied was taken up, considering the recognised importance of its application for turnips, and its undoubted specific effects on their growth as above described.

Comparing the amounts of phosphoric acid in the rotation

TABLE VIII.—*Experiments on the Rotation of—Roots, Barley, Clover (or Beans), or Fallow, and Wheat; in Agdell Field, Rothamsted.* 8 *courses,* 32 *years,* 1852–1883.

AVERAGE AMOUNTS OF *PHOSPHORIC ACID* PER ACRE IN THE ROTATION CROPS, COMPARED WITH THOSE IN THE CROPS GROWN CONTINUOUSLY.

—	Unmanured				Superphosphate				Mixed mineral and nitrogenous manure			
	Roots carted		Roots fed		Roots carted		Roots fed		Roots carted		Roots fed	
	Fal-low	Beans or clover	Fal-low	Beans or clover	Fal-low	Beans or clover	Fal-low	Beans or clover	Fal-low	Beans or clover	Fal-low	Beans or clover
SWEDISH TURNIPS.												
	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.
Roots — Rotation	1·26	0·77	1·11	0·71	7·91	7·68	8·83	8·78	16·67	17·02	18·14	17·12
Roots — Continuous [1]	0·88	0·88	0·88	0·88	4·14	4·14	4·14	4·14	9·91	9·91	9·91	9·91
Roots — Rotn. + or − cont.	0·38	−0·11	0·23	−0·17	3·77	3·54	4·69	4·64	6·76	7·11	8·23	7·21
Leaves — Rotation	0·29	0·25	0·28	0·25	1·27	1·44	1·36	1·62	2·79	3·17	3·04	3·16
Leaves — Continuous [1]	0·25	0·25	0·25	0·25	1·16	1·16	1·16	1·16	3·07	3·07	3·07	3·07
Leaves — Rotn. + or − cont.	0·04	0·00	0·03	0·00	0·11	0·28	0·20	0·46	−0·28	0·10	−0·03	0·09
Total — Rotation	1·55	1·02	1·39	[2]0·96	9·18	9·12	10·19	10·40	19·46	20·19	21·18	20·28
Total — Continuous [1]	1·13	1·13	1·13	1·13	5·30	5·30	5·30	5·30	12·98	12·98	12·98	12·98
Total — Rotn. + or − cont.	0·42	−0·11	0·26	−0·17	3·88	3·82	4·89	5·10	6·48	7·21	8·20	7·30
BARLEY.												
Grain — Rotation	11·24	11·59	11·02	9·89	12·29	11·91	15·52	16·16	18·34	18·63	21·04	20·90
Grain — Continuous	6·95	6·95	6·95	6·95	10·00	10·00	10·00	10·00	21·31	21·31	21·31	21·31
Grain — Rotn. + or − cont.	4·29	4·64	4·07	2·94	2·29	1·91	5·52	6·16	−2·97	−2·68	−0·27	−0·41
Straw — Rotation	1·87	2·03	1·82	1·74	1·80	1·85	2·32	2·38	2·87	2·96	3·68	3·53
Straw — Continuous	1·10	1·10	1·10	1·10	1·33	1·33	1·33	1·33	3·30	3·30	3·30	3·30
Straw — Rotn. + or − cont.	0·77	0·93	0·72	0·64	0·47	0·52	0·99	1·05	−0·43	−0·34	0·38	0·23
Total — Rotation	13·11	13·62	12·84	[2]11·63	14·09	13·76	17·84	18·54	21·21	21·59	24·72	24·43
Total — Continuous	8·05	8·05	8·05	8·05	11·33	11·33	11·33	11·33	24·61	24·61	24·61	24·61
Total — Rotn. + or − cont.	5·06	5·57	4·79	3·58	2·76	2·43	6·51	7·21	−3·40	−3·02	0·11	−0·18
BEANS (6 COURSES), CLOVER (2 COURSES), OR FALLOW.												
Corn — Rotation		5·15		5·14		6·81		8·18		11·49		13·05
Corn — Continuous		2·11		2·11		3·16		3·16		6·75		6·75
Corn — Rotn. + or − cont.		3·04		3·03		3·65		5·02		4·74		6·30
Straw — Rotation		1·17		1·17		1·78		1·97		1·99		2·06
Straw — Continuous		0·63		0·63		0·95		0·95		1·24		1·24
Straw — Rotn. + or − cont.		0·54		0·54		0·83		1·02		0·75		0·82
Total — Rotation		6·32		6·31		8·59		10·15		13·48		15·11
Total — Continuous		2·74		2·74		4·11		4·11		7·99		7·99
Total — Rotn. + or − cont.		3·58		3·57		4·48		6·04		5·49		7·12
Clover — Rotation		8·04		[2]6·96		20·30		22·99		31·69		34·29
Clover — Continuous		?		?		?		?		?		?
Average of 8 courses, beans and clover		6·75		[2]6·48		11·52		13·36		18·03		19·90
WHEAT.												
Grain — Rotation	12·53	11·18	12·19	10·50	14·48	14·23	14·68	15·25	15·12	16·50	14·58	16·43
Grain — Continuous	6·45	6·45	6·45	6·45	7·99	7·99	7·99	7·99	12·40	12·40	12·40	12·40
Grain — Rotn. + or − cont.	6·08	4·73	5·74	4·05	6·49	6·24	6·69	7·26	2·72	4·10	2·18	4·03
Straw — Rotation	2·87	2·73	2·76	2·48	3·87	3·75	3·84	3·95	4·94	5·46	5·00	5·31
Straw — Continuous	1·27	1·27	1·27	1·27	1·88	1·88	1·88	1·88	3·62	3·62	3·62	3·62
Straw — Rotn. + or − cont.	1·60	1·46	1·49	1·21	1·99	1·87	1·96	2·07	1·32	1·84	1·38	1·69
Total — Rotation	15·40	13·91	14·95	[2]12·98	18·35	17·98	18·52	19·20	20·06	21·96	19·58	21·74
Total — Continuous	7·72	7·72	7·72	7·72	9·87	9·87	9·87	9·87	16·02	16·02	16·02	16·02
Total — Rotn. + or − cont.	7·68	6·19	7·23	5·26	8·48	8·11	8·65	9·33	4·04	5·94	3·56	5·72

[1] Average 19 years, 1849–52 and 1856–70.

[2] Probably crop too low owing to a dell.

crops with those in the continuous ones, the equally small, or even smaller, amount taken up without manure by the latter, is further confirmation of the incapability of this assumed restorative crop to yield any practical amount of produce without adequate soil supplies. With superphosphate alone, as also with the mixed manure, the continuous crops took up little more than half as much phosphoric acid as the rotation ones under the assumed fairly parallel conditions as to manuring. The deficiency is, however, obviously not due to any deficiency of supply within the soil, but is only a coincident of the less total growth, attributable to a great extent, as has been explained, to the unfavourable mechanical condition of the soil induced by the continuous growth of the crop.

Lastly in regard to the phosphoric acid in the turnip crops, it is to be observed that in all cases much more was accumulated in the edible roots than in the leaves which remain only for manure again; indeed, in the case of the most normal crops, those grown in rotation with the full mixed manure, there was five or six times as much accumulated in the roots as in the leaves.

The Phosphoric Acid in the Barley Crops.—Looking first to the amounts in the total produce, grain and straw together, and to the portions of the rotation plots from which the previous root-crops had been removed, it is seen that, without manure, rather more than 13 lb. of phosphoric acid was, on the average, annually removed in the barley crops; and where superphosphate had previously been applied for the roots, the succeeding barley took up only about 14 lb., that is scarcely any more than without the supply of it; but where the mixed manure, including nitrogen, had been applied for the roots, there was about one-and-a-half time as much, or rather over 21 lb. of phosphoric acid in the succeeding barley crops. Then, where the root-crops had not been removed from the land, the amounts of phosphoric acid in the succeeding barley crops were, without manure, about 12 lb. per acre, with superphosphate about 18 lb., and with the mixed manure nearly 25 lb. In the case of the phosphoric acid, therefore, as in that of the nitrogen, the influence of the manuring, and other treatment, of the preceding crop of the course, is clearly reflected in the amounts taken up in the succeeding barley.

Comparing the amounts of phosphoric acid in the rotation barley crops with those in the continuously grown ones, it is seen that, both without manure and with superphosphate, the rotation crops took up considerably the most phosphoric acid; and this was the case notwithstanding that the continuously grown crops were annually manured with superphosphate, whilst for those grown in rotation the application had only been for the preceding crop—the turnips. The less assimilation in the case of the continuous crops was doubtless due to the diminished total growth, which in its turn was due to the greater exhaustion of the available nitrogen of the soil with the annual growth. Consistently with this view, where the mixed manure supplying an abundance of nitrogen was applied, and the crops, both rotation and continuous, were pretty full averages for the particular soil and the seasons of growth, the amounts of phosphoric acid in the rotation crops where the roots had not been removed were almost identical with those in the continuous crops. Where, however, the rotation roots had been removed, carrying off therefore the whole of the nitrogen that had been taken up, the succeeding barley crops were accordingly not full for the seasons of their growth, and the amounts of phosphoric acid in them were less than in the continuously grown crops.

The figures relating to both the rotation and the continuous barley further show, that about six-sevenths of the total phosphoric acid of the crops is accumulated in the grain which is supposed to be sold off the farm. There was, indeed, even a somewhat higher proportion where phosphoric acid was supplied in the manure. Lastly, as in the cases of the total produce, the dry matter, and the nitrogen, there is much less difference between the amounts of phosphoric acid taken up under the three different conditions as to manuring than in the case of the turnips. That is, the assumed restorative crop is much more dependent on direct manuring to yield any crop at all than is the cereal crop, which is assumed to be benefited by the interpolation of it.

The Phosphoric Acid in the Leguminous Crops.—Referring to the third division of Table VIII., it is seen that the amounts of phosphoric acid in the total produce of beans, corn and straw together, was more where superphosphate was supplied than without manure, and more still under the influence of the mixed manure containing, besides superphosphate, salts of potash, soda, and magnesia, and nitrogen also. But, under all three conditions as to manuring, the continuously grown crops take up much less than those grown in rotation. Whether, however, grown in rotation or continuously, three, four, or more times, as much of the phosphoric acid is finally accumulated in the corn as remains in the straw. In reference to all the results with beans, however, it is to be borne in mind that under none of the conditions were good crops obtained.

The clover took up, without manure, little more phosphoric acid than the rotation beans; but, with superphosphate, the clover took up more than twice as much as the beans; and with the mixed manure it took up more still, and also more than twice as much as the beans grown under the same conditions.

Taking the average of the six crops of beans and two crops of clover grown in the eight courses, there was, both without manure and with superphosphate, much less phosphoric acid taken up than in either the preceding barley or the succeeding wheat; and even with the mixed manure, which gave the most normal crops, the average amount of phosphoric acid taken up in the beans and clover was less than in either of the two cereals under the same conditions.

The Phosphoric Acid in the Wheat Crops.—The bottom division of Table VIII. shows that the rotation wheat, as did the rotation barley, took up very much more phosphoric acid without manure than did either of the so-called fallow crops—the turnips or the leguminous crops. With superphosphate, again, both the wheat and barley took up more than either the turnips or the average of the leguminous crops. With the full mixed manure, however, when each of the four descriptions of crop grew more normally, the amount of phosphoric acid taken up was more nearly uniform in the four cases; the barley, however, then yielding more than the wheat, more than the turnips, more than the average of the leguminous crops, but all considerably less than the average of the two years of clover.

Comparing the amounts of phosphoric acid in the total produce of the rotation, with those in the continuously grown wheat, it is seen that there is, without manure, only about half as much taken up in the continuous as in the rotation crops; with superphosphate, again, only about half as much in the continuous as in the rotation; but with the more normal growth, when the full mixed manure was annually applied to the continuously grown crops, there was, with the fuller produce, proportionally much more phosphoric acid taken up—indeed, on the average, about three-fourths as much in the continuous as in the rotation crops.

Lastly the figures show, that by far the larger proportion of the total phosphoric acid in the wheat crops is stored up in the grain, which is assumed to be sold off the farm. Thus, without manure more than four-fifths, and with superphosphate nearly four-fifths, of the total phosphoric acid of the crops was in the grain. With the mixed manure, however, with rather larger total amounts taken up than with superphosphate alone, there was comparatively little more stored up in the grain, the excess for the most part remaining in the straw. The larger amount of total phosphoric acid taken up with the mixed manure than with superphosphate, the amount supplied by manure being the same in the two cases, is to be attributed to the coincident supply of other constituents in the mixed manure, inducing greater luxuriance, and with it greater activity of collection.

The Amounts of Potash in the Rotation, and in the Continuous Crops.

The results relating to the amount and distribution of potash in the rotation and in the continuous crops are recorded in Table IX.

The Potash in the Root-crops.—Before referring to the details on this point, attention should be recalled to the facts fully illustrated in other papers—that root-crops are essentially sugar crops; that the very characteristic effect which nitrogenous manures exert on their increased growth is mainly represented by a greatly increased production of the non-nitrogenous substance—sugar; that, however the action is to be explained, it is certain that the presence of potash is an important condition of the formation in plants of carbohydrates generally; and that, in the case of root-crops, the production of the carbohydrate—sugar—is greatly dependent on a liberal available supply of potash.

Referring to the upper division of the Table, and for the purpose of the first illustrations to the rotation results, it is seen that, without manure and very abnormally small crops, there were only three, four, or five, times as much potash in the roots as in the leaves; with superphosphate, on the other hand, and greatly increased root development, there were eight or nine times as much potash in the roots as in the leaves; and with the mixed manure (including potash), there were, with the further greatly increased actual amount of roots and of potash in them, seven or eight times as much in the roots as in the leaves. That is, there was the greatest accumulation of potash with the greatest accumulation of sugar.

Looking to the actual amounts of potash in the total produce, roots and leaves together, of the rotation crops, it is seen that, without manure there was only from 4 to 6 lb. of potash per acre per annum; but with superphosphate, without potash supply, from 25 to 28 lb. That is, without any supply by manure the plants were able to gather about 20 lb. more potash per acre per annum from the soil itself, by virtue of the

TABLE IX.—*Experiments on the Rotation of—Roots, Barley, Clover (or Beans), or Fallow, and Wheat; in Agdell Field, Rothamsted.* 8 *courses,* 32 *years,* 1852–1883.

AVERAGE AMOUNTS OF *POTASH* PER ACRE IN THE ROTATION CROPS, COMPARED WITH THOSE IN THE CROPS GROWN CONTINUOUSLY.

—		Unmanured				Superphosphate				Mixed mineral and nitrogenous manure			
		Roots carted		Roots fed		Roots carted		Roots fed		Roots carted		Roots fed	
		Fallow	Beans or clover	Fallow	Beans or clover	Fallow	Beans or clover	Fallow	Beans or clover	Fallow	Beans or clover	Fallow	Beans or clover
SWEDISH TURNIPS.													
		lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.
Roots	Rotation . . .	5·00	3·04	4·40	2·82	22·49	21·67	25·05	24·86	66·62	67·99	72·48	68·53
	Continuous [1] . .	3·48	3·48	3·48	3·48	12·08	12·08	12·08	12·08	39·51	39·51	39·51	39·51
	Rotn. + or − cont.	1·52	−0·44	0·92	−0·66	10·41	9·59	12·97	12·78	27·11	28·48	32·97	29·02
Leaves	Rotation . . .	1·07	0·95	1·04	0·93	2·60	2·96	2·77	3·31	8·66	10·32	9·89	10·25
	Continuous [1] . .	0·94	0·94	0·94	0·94	2·38	2·38	2·38	2·38	9·98	9·98	9·98	9·98
	Rotn. + or − cont.	0·13	0·01	0·10	−0·01	0·22	0·58	0·39	0·93	−1·32	0·34	−0·09	0·27
Total	Rotation . . .	6·07	3·99	5·44	[2] 3·75	25·09	24·63	27·82	28·17	75·28	78·31	82·37	78·78
	Continuous [1] . .	4·42	4·42	4·42	4·42	14·46	14·46	14·46	14·46	49·49	49·49	49·49	49·49
	Rotn. + or − cont.	1·65	−0·43	1·02	−0·67	10·63	10·17	13·36	13·71	25·79	28·82	32·88	29·29
BARLEY.													
Grain	Rotation . . .	8·13	8·38	7·97	7·15	8·09	7·85	10·23	10·65	12·33	12·52	14·14	14·04
	Continuous . .	5·03	5·03	5·03	5·03	6·59	6·59	6·59	6·59	14·32	14·32	14·32	14·32
	Rotn. + or − cont.	3·10	3·35	2·94	2·12	1·50	1·26	3·64	4·06	−1·99	−1·80	−0·18	−0·28
Straw	Rotation . . .	10·83	11·81	10·52	10·09	9·32	9·50	12·10	12·54	18·41	18·97	23·48	23·31
	Continuous . .	6·45	6·45	6·45	6·45	7·03	7·03	7·03	7·03	21·00	21·00	21·00	21·00
	Rotn. + or − cont.	4·38	5·36	4·07	3·64	2·29	2·47	5·07	5·51	−2·59	−2·03	2·48	2·31
Total	Rotation . . .	18·96	20·19	18·49	[2] 17·24	17·41	17·35	22·33	23·19	30·74	31·49	37·62	37·35
	Continuous . .	11·48	11·48	11·48	11·48	13·62	13·62	13·62	13·62	35·32	35·32	35·32	35·32
	Rotn. + or − cont.	7·48	8·71	7·01	5·76	3·79	3·73	8·71	9·57	−4·58	−3·83	2·30	2·03
BEANS (6 COURSES), CLOVER (2 COURSES), OR FALLOW.													
Corn	Rotation . . .		7·26		7·23		7·35		8·79		15·20		17·25
	Continuous . . .		2·98		2·98		3·46		3·46		8·94		8·94
	Rotn. + or − cont.		4·28		4·25		3·89		5·33		6·26		8·31
Straw	Rotation . . .		2·87		2·87		3·47		4·01		6·96		7·21
	Continuous . .		1·54		1·54		1·82		1·82		4·33		4·33
	Rotn. + or − cont.		1·33		1·33		1·65		2·19		2·63		2·88
Total	Rotation . . .		10·13		10·10		10·82		12·80		22·16		24·46
	Continuous . .		4·52		4·52		5·28		5·28		13·27		13·27
	Rotn. + or − cont.		5·61		5·58		5·54		7·52		8·89		11·19
Clover	Rotation . . .		34·18		[2] 29·67		57·63		65·48		123·12		132·62
	Continuous . .		?		?		?		?		?		?
Average of 8 courses, beans and clover			16·14		[2] 14·99		22·52		25·96		47·40		51·50
WHEAT.													
Grain	Rotation . . .	8·65	8·08	8·42	7·26	9·55	9·39	9·69	10·06	9·90	10·82	9·55	10·78
	Continuous . .	4·45	4·45	4·45	4·45	5·27	5·27	5·27	5·27	8·12	8·12	8·12	8·12
	Rotn. + or − cont.	4·20	3·63	3·97	2·81	4·28	4·12	4·42	4·79	1·78	2·70	1·43	2·66
Straw	Rotation . . .	19·12	17·94	18·30	16·31	20·25	19·14	20·45	20·21	25·85	27·47	26·21	27·12
	Continuous . .	8·49	8·49	8·49	8·49	10·00	10·00	10·00	10·00	18·81	18·81	18·81	18·81
	Rotn. + or − cont.	10·63	9·45	9·81	7·82	10·25	9·14	10·45	10·21	7·04	8·66	7·40	8·31
Total	Rotation . . .	27·77	26·02	26·72	[2] 23·57	29·80	28·53	30·14	30·27	35·75	38·29	35·76	37·90
	Continuous . .	12·94	12·94	12·94	12·94	15·27	15·27	15·27	15·27	26·93	26·93	26·93	26·93
	Rotn. + or − cont.	14·83	13·08	13·78	10·63	14·53	13·26	14·87	15·00	8·82	11·36	8·83	10·97

[1] Average 19 years, 1849–1852 and 1856–1870. [2] Probably crop too low owing to a dell.

greatly increased development of fibrous feeding root under the influence of the phosphatic manure. With the mixed manure, however, containing potash, there was about three times as much of it taken up as with superphosphate alone. But, with the supply of potash there was also a liberal supply of available nitrogen, to which the greatly increased growth is largely to be attributed; and with the increased luxuriance much more potash was of course required if there were to be a correspondingly increased formation of the characteristic non-nitrogenous product of the cultivated root-sugar. Thus, we have—without manure only 4 to 6 lb. of potash taken up, with superphosphate (without potash) from 25 to 28 lb., and with the mixed manure, supplying besides phosphoric acid both nitrogen and potash, nearly 80 lb. of potash per acre per annum in the crops.

Comparing the amounts of potash in the rotation crops with those in the continuously grown ones, it is seen that—without manure, and practically no growth, there was but little difference in the amounts taken up; with superphosphate there was little more than half as much taken up in the continuous as in the rotation crops; whilst with the mixed manure, with full supply of potash, and much larger amounts of it in both the rotation and continuous crops, there was rather less than two-thirds as much in the continuous as in the rotation crops. The deficient amounts in the continuous crops are, however, as in the case of the other constituents, coincidents of the less amounts of produce of the continuous crops; which, as has been pointed out, were, in the case of the superphosphate plot, due partly to the greater exhaustion of available nitrogen of the surface soil with the continuous growth, but partly also to the unfavourable mechanical condition of the soil induced by such growth; and this was probably the chief cause of the deficient produce in the case of the mixed manure crops also.

The Potash in the Barley Crops.—The second division of Table IX. records the results on this point.

In the case of the turnips it was found that much more potash was accumulated in the roots than in the leaves; and this fact was assumed to be connected with the greater amount of the carbohydrate—sugar—in the roots than in the leaves. The results relating to the barley show, however, that there was in every case more, and in some much more, potash in the straw than in the grain. On this point it is to be observed, not only that the root-crop is taken up when still in the vegetative stage, and its contents are still in the condition of reserve or migratory material, whilst in the case of the cereal the crop is ripened, and its constituents are, therefore, more fixed. Further, whilst in the turnip-crop there was several times as much dry substance in the roots as in the leaves, in the barley there was even more dry organic substance in the straw than in the grain. Again, in both crops, by far the larger proportion of the dry substance consists of carbohydrates—in the one chiefly sugar, and in the other almost exclusively starch and cellulose—the latter making up by far the greater portion of the dry substance of the straw. It is obviously quite consistent that under these circumstances there should be more of the total potash of the barley crop accumulated in the straw than in the grain. It must at the same time be observed that, whilst the potash in the grain is comparatively fixed and bears a fairly uniform relation to the amount of dry substance, the quantity which remains in the straw is subject to great variation in proportion to the dry matter, according to the variation in the supply of it within the soil—a great excess above the amount in other cases being sometimes found in the straw. Indeed, the figures show a considerably greater proportion of the total potash of the crop accumulated in the straw where there was a liberal supply of it in manure.

Referring to the amounts of potash taken up in the rotation barley crops on the different plots, according to the manuring or other treatment, the figures show that there was not much difference between the amounts without manure and with superphosphate alone. There was, however, distinctly more taken up on the portions of the superphosphate plot where the roots had not been removed than where they were; and where, therefore, there was conservation for the succeeding crop. With the mixed manure, however, with its supply of potash as well as of phosphoric acid and nitrogen, the amount of potash in the crops is greatly increased, the increase corresponding closely with the increased amount of produce.

Lastly in regard to the potash, whilst without manure and with superphosphate alone the rotation barley has gathered much more than the continuously grown, with the mixed manure and full supply of all constituents, the amounts of potash taken up were, as were those of nitrogen and phosphoric acid, nearly the same in the rotation and the continuous crops where in rotation the preceding roots had not been removed; but where they had been removed, the amounts of potash in the succeeding barley were less, as were the crops themselves.

The Potash in the Leguminous Crops.—Of all the mineral constituents of the crops, perhaps potash and lime are the most generally recognised as having some distinctive effects when applied as manure for leguminous crops. We have now to refer to the records relating to the potash in these crops, as given in the third division of Table IX.

The figures show that, in the case of the beans, unlike that of the cereals, there is much more potash in the corn than in the straw; indeed, more than twice as much of the potash of the crops was accumulated in the corn as in the straw; indicating, therefore, a special requirement of it for the formation of the final and most fixed product of the plant—the seed.

Looking to the amounts of potash per acre in the total produce, corn and straw together, of the rotation beans, it is seen that they take up very little more under the influence of the superphosphate than without manure; the quantities averaging about 10 lb. per acre without manure, and scarcely 12 lb. with superphosphate. With the mixed manure, however, directly supplying potash for the previous root-crop, the amounts of it taken up were, in the one case 22·16, and in the other 24·46 lb., or about twice as much as with the superphosphate alone. The influence of the previous supply of potash on the amounts of it taken up in the beans was, in fact, much greater than was that of the supply of phosphoric acid on the amounts of it taken up.

But, as in the case of the phosphoric acid, so also in that of the potash, the continuously grown beans took up only about half as much as those grown in rotation; proportionally more, however, where it had been supplied than where it had not. It will be remembered that, when discussing the amounts of produce of the bean crops, attention was called to the fact that throughout the experiments a really good agricultural crop was scarcely ever obtained; and this of course must be taken into account when considering the amounts of the several constituents of the crops.

Comparing the amounts of potash stored up in the rotation clover with those in the rotation beans, it is seen that, even without manure and with very small produce, the clover, with its greater root-range and longer period of growth, gathered up about three times as much potash as the beans—about 30 lb. against only about 10 lb. in the beans.

With superphosphate alone, whilst the bean crops contained only 10·82 and 12·80 lb. of potash, the clover contained 57·63 and 65·48 lb. That is, under the influence of the phosphatic manure, probably partly on the plant and partly on the soil, the clover had accumulated in the removed crop five or six times as much potash as the beans, from the soil itself; whilst, of the phosphoric acid itself, little more than twice as much was taken up in the clover as in the beans under the influence of the superphosphate without potash. It would thus appear that the beneficial effects of the phosphatic manure on the clover were largely connected with the increased capability of the plant to take up more potash.

With the mixed manure, supplying a large amount of potash, the amount of it found in the clover crops was, however, much greater still. Both in the beans and in the clover the amount of potash in the crops grown under the influence of the direct supply of it was about twice as much as those grown with superphosphate without potash. But whilst, under the influence of the supply of it, the shorter-lived, more meagrely rooting, and less successfully grown bean crops stored up only 22·16 and 24·46 lb. of potash, the clover crops contained in one case 123·12 lb., and in the other 132·62 lb.

The very much larger proportion of the total potash of the bean crops which is found in the corn than in the straw would seem to indicate its greater importance in connection with the maturing than with the merely vegetative and accumulating tendencies of growth; yet the increased amount of it taken up by the beans coincidently with increased growth, and the much larger amounts of it in the clover with its much greater amounts of growth and produce, and harvested as it is in the unripened condition, are on the other hand indications of a direct connection between potash supply and the luxuriance of growth or vegetative activity of these leguminous crops. Indeed, as already referred to, potash manures are well known to be frequently beneficial to such crops. To these points further reference will be made presently, when calling attention to the amount of lime taken up by leguminous crops.

The Potash in the Wheat Crops.—The results on this point are given in the bottom division of Table IX.

It has been seen that by far the larger proportion, both of the nitrogen and of the phosphoric acid of the wheat crops, was accumulated in the grain. But the figures relating to the potash show that of it there was very much more in the straw than in the grain. There was also much more, but not in so great a degree more, in the straw than in the grain of the other cereal —the barley. It has been pointed out that potash is at any rate essentially connected with the formation of the carbohydrates. Consistently with this it was found that by far the larger proportion of the potash of the turnip crop was in the roots, where was the great accumulation of sugar. Again, of the total potash of the barley crop, the larger proportion was found in the straw where there was the greatest accumulation of carbohydrate—as cellulose; and now, in the wheat, with a larger proportion of straw to grain, and a proportionally larger amount of the total carbohydrates accumulated in the straw, we have in it a still larger proportion of the total potash of the crop. It is, however, to be borne in mind, as has been pointed out, that the straw of both barley and wheat frequently contains, besides the mineral constituents actually essential for the organic formations and changes, a more or less surplus amount taken up as the result of liberal supply, and retained by the plant.

Although there is doubtless clear foundation in fact for the conclusion that the *rôle* of phosphoric acid is more in connection with the formation and activity of the nitrogenous bodies, and that of the potash with those of the non-nitrogenous compounds, yet it is obvious that in such a view we have only a partial and imperfect explanation of the function of these mineral constituents. Thus, in the case of the beans there was, consistently enough, much more phosphoric acid in the corn than in the straw—that is, the more where there was the more nitrogen; but there was also by far the larger proportion of the potash accumulated in the corn, although the greater part of the dry matter of the crop, and with this of its carbohydrates, was in the straw. Indeed, although the leguminous crops are pre-eminently highly nitrogenous, a liberal supply of potash is essential for their luxuriance; whilst they contain a higher proportion of it in their dry substance than do the cereals, with their higher proportion of carbohydrates.

Reference to the figures shows that the application of superphosphate, without potash, enabled the wheat plant, whether grown in rotation or continuously, to take up an increased, but not a much increased, amount of potash, compared with that in the unmanured crops; and that the direct application of it increased the assimilation of it still further, though the increased amount of it stored up represented only a small proportion of that supplied in the manure.

Without manure, the rotation wheat crops contained an average of about 27 lb. of potash, but the continuously grown ones scarcely 13 lb., or only about half as much. With superphosphate, without potash, the rotation crops gave an average of nearly 30 lb., and the continuously grown ones little more than 15 lb.; or, again, only about half as much. That is, when the growing crops had to rely for their potash exclusively on the stores of the soil itself, the rotation crops took up about twice as much as the continuous. Lastly, with the mixed manure supplying potash, the rotation wheat crops gathered nearly 36 lb. after fallow, but about 38 lb. after the leguminous crops; whilst the continuously grown ones yielded an average of only about

27 lb. That is, although in the case of the rotation wheat crops three other crops had been grown since the application of the manure, they took up more potash than the continuously grown ones for which potash was annually supplied.

So much for the results relating to the amounts of the two important and typical mineral constituents—phosphoric acid and potash—taken up by the different crops when grown, respectively, in rotation and continuously, under different conditions as to manuring, and other treatment. Similar results relating to other mineral constituents of the crops have been got out, and the discussion of some of them brings to view points of considerable interest, but neither time nor space will admit of their consideration here. It must suffice to refer briefly to the amounts of lime taken up by the leguminous crops under different conditions; a point which has an interesting relation to the results as to the potash taken up by those crops, and to the questions which arose in the discussion of them.

The Amounts of Lime in the Rotation, and in the Continuous Leguminous Crops.

The following Table (X.) gives, for the leguminous crops alone, the amounts of lime in the rotation and in the continuous crops, in the same form in which the phosphoric acid and potash have been given for each of the four crops of the rotation :—

Very different from what was found to be the case with the potash, it is seen that in the rotation bean-crops a very small proportion of the total amount of lime is accumulated in the corn; ten, twelve, or more times as much being found in the straw. Then, the amounts of lime in the total crops were—without manure between 15 and 16 lb.; with superphosphate, which of course supplied some lime, the quantity was raised to 18·68 and 20·71 lb.; and with the mixed manure, also supplying the same amount of lime in its superphosphate, it was further raised to 26·57 and 27·71 lb. It is further seen, that the continuously grown beans contained—in corn, straw, and total produce—in some cases only about, and in others not much more than, half as much lime as the rotation ones.

It is remarkable, however, that whilst without manure the rotation bean-crops contained only from 15 to 16 lb. of lime, the clover contained 67·8 and 59·1 lb.; with superphosphate the beans gave 18·68 and 20·71 lb., and the clover 158·62 and 184·52 lb., or about eight times as much as the beans; and lastly, with the mixed manure, the bean-crops contained 26·57 and 27·71 lb., and the clover 181·75 and 195·14 lb. of lime, or about seven times as much as the beans.

An increased amount of lime is, therefore, even more directly connected with increased luxuriance and increased production, than is an increased amount of potash taken up. Then, again, the increased amount of potash was apparently more or less directly connected with tendency to maturation or seed-formation; but the lime is found chiefly in the straw of the beans, and to be enormously increased in amount in the clover, which does not ripen, but is cut whilst still in the vegetative condition. The

TABLE X.—*Average amounts of Lime per acre in the Rotation, and in the continuously grown, Leguminous Crops.*

—	Unmanured				Superphosphate				Mixed mineral and nitrogenous manure			
	Roots carted		Roots fed		Roots carted		Roots fed		Roots carted		Roots fed	
	Fallow	Beans or clover	Fallow	Beans or clover	Fallow	Beans or clover	Fallow	Beans or clover	Fallow	Beans or clover	Fallow	Beans or clover
BEANS (6 COURSES), CLOVER (2 COURSES), OR FALLOW.												
		lb.		lb.		lb.		lb.		lb.		lb.
Corn: Rotation		1·15		1·14		1·10		1·32		2·10		2·38
Corn: Continuous		0·47		0·47		5·02		0·52		1·24		1·24
Corn: Rotn. + or – cont.		0·68		0·67		0·58		0·80		0·86		1·14
Straw: Rotation		14·61		14·66		17·58		19·39		24·47		25·33
Straw: Continuous		7·85		7·85		9·36		9·36		15·08		15·08
Straw: Rotn. + or – cont.		6·76		6·81		8·22		10·03		9·39		10·25
Total: Rotation		15·76		15·80		18·68		20·71		26·57		27·71
Total: Continuous		8·32		8·32		9·88		9·88		16·32		16·32
Total: Rotn. + or – cont.		7·44		7·48		8·80		10·83		10·25		11·39
Clover: Rotation		67·84		[1]59·10		158·62		184·52		181·75		195·14
Clover: Continuous		?		?		?		?		?		?
Average of 8 courses, Beans and clover		28·78		[1]26·63		53·67		61·66		65·36		69·57

[1] Probably crop too low owing to a dell.

indication is, therefore, that the lime is, both actually and as compared with the potash, much more directly connected with the accumulative or vegetative, as distinguished from the maturing processes of the plant. Certain it is, at any rate, that a largely increased accumulation of lime is a coincident of increased luxuriance in both crops; and it is especially so in the case of the crop the amount of which depends on the extension of the vegetative stages of development, and the production of a large amount of crude or unripened vegetable substance.

Thus, then, the actual and relative importance of potash and lime in the growth of the highly nitrogenous leguminous crops is clearly illustrated in the acreage amounts given, of potash in the third division of Table IX., and of lime in Table X. But the study of the percentage composition of the ashes of the crops, and especially of both the percentage composition of the ashes, and the amount of the constituents per acre, in the bean plant taken at different stages of its growth, and of somewhat similar results relating to the first, second, and third crops of clover, affords further confirmation of the conclusions which have been drawn from the results already considered. It will be impossible to go into any detail here in regard to these further results, and it must suffice to state very briefly their general indications.

The bean-plant ash analyses showed that, on the average, about 75 per cent., and at the time of pod formation nearly 80 per cent., of the total ash consisted of lime, potash, and carbonic acid. Compared with these results, those relating to the more highly nitrogenous clover, which is not allowed to ripen, but is cut when it reaches the blooming stage, so inducing re-growth and extension of the more specially vegetative stages, show that from about 80 to about 84 per cent. of the total ash consisted of lime, potash, and carbonic acid. But whilst in the ash of the ripened corn-yielding bean-crop there was about one-and-a-half time as much potash as lime, in that of the merely vegetating unripened clover there was twice or even three times as much lime as potash. Further, in the ash of the first and third crops of clover, which would be the most succulent and unripe, the relative excess of lime over potash is much greater than in that of the second crop, which develops at the period of the season when the seed-forming tendency is much the greater. Again, in the clover ashes there was about one-and-a-half time as much carbonic acid as in the ash of the ripened bean plant. It is thus further illustrated that a peculiarity of the composition ot these pre-eminently nitrogen-assimilating elements of rotation is, that their ashes consist chiefly of lime, potash, and carbonic acid; that the potash predominates in the ripened and less nitrogen-yielding bean-crop; and that the lime and carbonic acid predominate in the continuously vegetating and much more largely nitrogen-accumulating clover.

Referring to the probable or possible significance of these facts, it is obvious that, so far as the nitrogen of the plant is taken up as nitrate of a fixed base, that base, so far as it does not pass back into the roots, will remain in the above-ground parts of the plant, most probably in combination with an organic acid, which will be converted into carbonic acid in the incineration, and be found as such in the ash, if not expelled by an excess of fixed acid, or by silica.

In the case of the cereals of the rotation, it is probable that most if not all of their comparatively small amount of nitrogen is taken up as nitrate. Potash is by far the predominating base in the ash of the grain, straw, and total produce; lime is in much less amount, both actually and in equivalency; and magnesia is in less amount still, though it is a characteristic constituent of the grain-ashes. There is practically no carbonic acid in either wheat or barley grain-ash, and but little in the straw-ash; and if there have been organic acid salts formed with the base of the nitrate, the carbonic acid may have been expelled in the incineration, by the excess of fixed acid in the grain-ash, or by silica in the straw-ash.

Taking the produce by the mixed manure as the most normal, the root-crops of the rotation come next in amount of nitrogen assimilated over a given area. Potash and lime are the predominating bases. There is much more potash than lime in the more definite product—the root; but the proportion of lime to potash is much greater in the leaf-ash, as would be expected if the nitrogen had been taken up chiefly as calcium nitrate, and the nitric acid subjected to decomposition in the leaves.

Lastly come the Leguminosæ, with their much higher amounts of nitrogen assimilated. These plants also doubtless derive at any rate much nitrogen from nitrates in the soil and subsoil; and it has been shown that their great assimilation of nitrogen is associated with very large amounts of lime and carbonic acid in their ashes.

Referring to the results with the rotation beans grown by the mixed manure, calculation shows that, taking the total crop, corn and straw together, it contained very much less lime than would be required if the whole of its nitrogen had been taken up as calcium nitrate; so that, either part of the nitrogen must have been taken up as nitrate of some other base, or in some quite different state of combination, or as free nitrogen; or some of the lime must have been eliminated from the above-ground parts of the plant into the roots, and possibly some of it passed from them into the soil. Again, the amount of carbonic acid found in the ashes of the crop for 100 of nitrogen in it, would require about one-and-a-half time as much lime as was found in association with it; indicating the probability that part of the nitrogen taken up as nitric acid was as the nitrate of some other base—potash, and possibly to some extent soda also.

Turning to the results with the rotation clover grown by the mixed manure, calculation shows that in the case of this continuously vegetating, unripened, and much higher nitrogen-yielding crop, there was very much more of both lime and carbonic acid in the ash for 100 of nitrogen assimilated than in the total bean-crop. If, however, the whole of the nitrogen of the clover crops had been taken up as calcium nitrate it would have required nearly twice as much lime as the amount found, provided the whole of it remained; nor would the amounts of potash and soda found suffice to make up the balance. Again, the amount of carbonic acid found is little more than two-thirds as much as would be required to represent organic acid equivalent to the amount of nitric acid subjected to change. Either, therefore, fixed base, partly in combination with organic acid, must have been eliminated from the above-ground parts of the plant, and passed into the roots, and possibly into the soil, or a good deal of the nitrogen must have been taken up in some other form than as nitrate; possibly in part as organic nitrogen taken up from the soil by the agency of the acid sap; or, in part as free nitrogen, probably brought into combination under the influence of micro-organisms within the nodules found on the roots of leguminous plants, the resulting compound being either directly available as a source of nitrogen to the host, or it may be so only after it has itself suffered change.

However this may be, considering the very characteristic differences in the mineral composition of the different crops of rotation according to the amounts of nitrogen they assimilate, the fact that undoubtedly the highly nitrogenous Leguminosæ do take up at any rate a large proportion of their nitrogen as nitrate, and that the greater the amount of nitrogen assimilated the more is the ash characterised by containing fixed base, and especially lime, in combination with carbonic acid, it seems very probable, if not indeed established, that the office of the lime, and partly that of the other bases also, is that of carriers of nitric acid; which, when transformed, and the nitrogen assimilated, leaves the base as a residue, presumably in combination with organic acid. Further, the power of these plants to assimilate so very much more nitrogen over a given area than the other crops may, at any rate in part, be dependent on their being able, by virtue of the range and character of their roots, to gather up more nitrogen in the form supposed than the plants with which they are alternated. Such a view does not, however, exclude the supposition that some of their nitrogen is derived in other ways, as above referred to.

In connection with the foregoing results of direct experimental investigation into the mineral composition of leguminous crops, it may be observed—that clover at any rate grows more favourably on land that has recently been chalked or limed; that chalking or liming of the mixed herbage of grass land also favours the development of the leguminous herbage; and that the application of gypsum to clover has been found very effective on some lands, especially in America, though it has not proved to be at all generally useful when it has been so applied in this country. Indeed, the direct application of potash as manure is certainly more frequent, and is more generally recognised as effective for leguminous crops, than is that of lime, notwithstanding its obvious importance, and its great influence on the luxuriance of growth of such crops. This may perhaps be partly explained by the fact that, in many, if not in most, soils, the immediately available supply of potash within the root-range of the plant will probably be sooner exhausted than will that of lime.

Summary and General Conclusions.

It remains, in conclusion, very briefly to summarise the facts brought out in this extended inquiry on the subject of rotation, and to endeavour to draw from them an explanation of the benefits arising from the practice of it.

At the commencement it was pointed out, that although many different rotations are adopted, they may for the most part be considered as little more than local adaptations of the system of alternating root-crops and leguminous crops with the cereals. Thus, there are rotations of five, six, seven, or more years. But these variations are, in most cases, only adaptations of the principle to variations of soil, altitude, aspect, climate, markets, and other local conditions; and they consist chiefly in the variation in the description of the root-crop, and perhaps the introduction of potatoes; in growing a different cereal, or it may be more than one cereal consecutively; in the growth of some other leguminous crop than clover; or the intermixture with the clover of grass seeds; and perhaps the extension of the period allotted to this element of the rotation to two or more years.

It is true, also, that, under any specific rotation, there may be deviations from the plan of retaining the whole of the root-crop, the straw of the grain crops, and the leguminous fodder-crops, on the farm, for the production of meat or milk, and, coincidently, for that of manure to be returned to the land. But it is also true that, when under the influence of special local, or other demand—proximity to towns, easy railway or other communication, and so on—the products which would otherwise be retained on the farm are exported from it, the import of town or other manures is generally an essential condition of such practice. Indeed, this system of free sale very frequently involves full compensation by purchased manures of some kind. In our own country, such deviations from the practice of merely selling grain and meat have been much developed in recent years; and they will doubtless continue to increase under the altered conditions of our agriculture, dependent on very large imports of grain, increasing imports of meat and other products of feeding, and very large imports of cattle-food and other agricultural produce. Already much more attention is being devoted to dairy products, not only on grass farms, but on those that are mainly arable; and there will doubtless be some, but probably by no means so great an extension as some suppose, in the production of other smaller articles required by town populations.

It is further true, though the remark applies in a very limited degree to our own country, that there are other deviations which have more the character of exceptions to the general rule of rotation, such as the introduction of flax, hemp, tobacco, or other so-called *industrial* crops. But, in these cases, as with potatoes, the growth involves special expenditure for manure instead of conservation of it. Indeed, the inducement is the high price of the product, rather than the maintenance, or the improvement, of the condition of the land for future crops.

Still, as such deviations from regular rotation practice as have been referred to, do, as has been said, generally involve more or less, and frequently full, compensation by manure from external sources, we may, in endeavouring to explain the benefits which accrue from the practice of rotation, confine attention, for the purposes of illustration, to what may be called the self-supporting system, and to the simple four-course, one which has been selected for investigation at Rothamsted, and from the results relating to which the illustrations which have been brought forward have been drawn.

It will be well first briefly to refer to the evidence relating to some of the more important mineral constituents found in the different crops of the four-course rotation.

Of *phosphoric acid*, the cereal crops take up as much as, or more than, any of the other crops of the rotation, excepting clover; and the greater portion of what they take up is lost to the farm in the saleable product—the grain. The remainder, that in the straw, as well as that in the roots and the leguminous crops, is supposed to be retained on the farm, excepting the small amount exported in meat and milk.

Of *potash*, each of the crops takes up very much more than of phosphoric acid. But much less potash than phosphoric acid is exported in the cereal grains, much more being retained in the straw; whilst the other products of the rotation—the roots and the Leguminosæ—which are also supposed to be retained on the farm, contain very much more potash than the cereals, and comparatively little of it is exported in meat and milk. The general result is, that the whole of the crops of rotation take up very much more of potash than of phosphoric acid, whilst probably even less of it is eventually lost to the land.

Of *lime*, very little is taken up by the cereal crops, and by the roots much less than of potash; more by the Leguminosæ than by the other crops, and, by the clover especially, sometimes much more than by all the other crops of the rotation put together. Of the lime of the crops, however, very little goes in the saleable products of the farm under the conditions supposed of a self-supporting rotation. There is, however, frequently a considerable loss of lime in land-drainage.

Although the facts relating to other mineral constituents of the crops are not without significance, reference can be made here to only one other of these constituents—namely, the *silica*.

The interpolated crops of rotation—the Roots and the Leguminosæ—take up scarcely any silica; but the cereals take up a very large amount of it. Indeed, the large amount of silica taken up by these crops when grown under ordinary conditions, is as characteristic a chemical phenomenon of rotation as is the very large amount of lime taken up by clover and other Leguminosæ. Very little silica, however, is lost to the land in the assumed saleable products.

Thus, then, although different, and sometimes very large, amounts of these typical mineral constituents are taken up by the various crops constituting the rotation, there is no material export of any in the saleable products, excepting of phosphoric acid and of potash; and, so far at least as phosphoric acid is concerned, experience has shown that it may be advantageously supplied in purchased manures.

But, although the eventual loss to the land of mineral constituents is, in a self-supporting rotation, comparatively so small, the very fact that the different crops require for their growth, not only very different amounts of individual constituents, but require these to be available within the soil in very different conditions, both of combination and of distribution, points to the conclusion that, in any explanation of the benefits of an alternation of crops, the position, and the *rôle*, of the mineral constituents must not be overlooked; and the less can it be so, when their connection with the very important element—the nitrogen of the crops—is considered.

As to the *nitrogen*:—It has been seen that, although very characteristically benefited by nitrogenous manures, the cereal crops take up and retain much less nitrogen than any of the crops alternated with them. In fact, the root-crops may contain two, or more, times as much nitrogen as either of the cereals, and the leguminous crop, especially the clover, much more than the root-crops. The greater part of the nitrogen of the cereals is, however, sold off the farm; but perhaps not more than 10 or 15 per cent. of that of either the root-crop, or the clover, or other forage leguminous crop, is sold off in animal increase or milk. Thus, most of the nitrogen of the straw of the cereals, and a very large proportion of that of the much more highly nitrogen-yielding crops, returns to the land as manure, for the benefit of future cereals and other crops. Indeed, it is, as a rule, only a comparatively small proportion of the very much increased amount of nitrogen obtained in rotation compared with that in continuous cereal-cropping (chiefly due to the interpolated crops), that is lost to the land in the saleable products.

As to the source of the nitrogen of the so-called 'restorative crops,' it has been shown that certainly in the case of the roots it is not, as has sometimes been assumed, that such plants take up nitrogen from the air by virtue of their extended leaf-surface. Both common experience and direct experiment demonstrate, that they are as dependent as any crop that is grown, on available nitrogen within the soil, which is generally supplied by the direct application of nitrogenous manures—natural or artificial. Under such conditions of supply, however, the root-crops, so to speak gross feeders as they are, and distributing a very large amount of fibrous feeding root within the soil, avail themselves of a much greater quantity of the nitrogen supplied than the cereals would do under similar circumstances; this result being partly due to their period of accumulation and growth extending even months after the period of collection by the ripening cereals has terminated, and at the season when nitrification within the soil is the most active, and the accumulation of nitrates in it is the greatest. Lastly, full supply of both mineral constituents and nitrogen being at command, these crops assimilate a very large amount of carbon from the atmosphere, and produce, besides nitrogenous food-products, a very large amount of the carbohydrate—sugar, as respiratory and fat-forming food for the live-stock of the farm.

Very much the same may be said of maize as grown as a fodder-crop in America, as of roots as grown in rotation in other countries. Thus, there can be no doubt that the maize derives its nitrogen from the soil, collecting some time longer than wheat, and availing itself of the nitrates formed after the collection by the wheat has ceased. But, so far as the product is consumed on the farm, much of its nitrogen is recovered in the manure—the more when the food is used for growing or fattening stock, and the less when for the production of milk.

The still more highly nitrogenous leguminous crops, on the other hand, although not characteristically benefited by nitrogenous manures, nevertheless contribute much more nitrogen to the total produce of the rotation than any of the other crops comprised in it. It is also certain that, at any rate a large proportion of the nitrogen of these crops is obtained from the soil and subsoil; though recent investigations have proved that some of their nitrogen, and sometimes much of it, may be derived indirectly from the free nitrogen of the atmosphere, brought into combination under the influence of micro-organisms within the nodules on the roots of the plants.

It is the leguminous fodder crops, and among them especially clover, which has a much more extended period of growth, and much more extended range of collection within the soil and subsoil, than any of the other crops of the rotation, that yield in their produce the largest amount of nitrogen per acre. Much of this is doubtless taken up as nitrate; yet, the direct application of nitrate of soda has comparatively little beneficial influence on their growth. The nitric acid is probably taken up chiefly as nitrate of lime, but probably as nitrate of potash also, and it is not without significance that the high nitrogen-yielding clover takes up, or at least retains, very little soda. The general result is, then, that although undoubtedly the clover takes up a good deal of its nitrogen as nitrate, this would seem to be derived from accumulations within the soil, which are brought into suitable conditions of combination, and distributed through a wide range of soil and subsoil.

So much then for the benefits of rotation, so far as the requirements, the habits of growth, and the capabilities of gathering and assimilating the various mineral constituents, and the nitrogen, of the different crops, are concerned. It cannot be doubted that the difference in the amounts, in the conditions of combination, and in the distribution within the soil, of the various mineral constituents, is at least an element in the explanation of the benefits of alternation; nor, on the other hand, can there be any doubt that the facts relating to the amount, and to the sources, of the nitrogen of the different crops, are of still greater significance than are those in regard to the mineral constituents.

But, it is not only the conditions of growth, but the *uses* of the different crops when grown, that have to be taken into account. Thus, the cereals, when grown in rotation, yield more produce for sale in the season of growth than when grown continuously. Again, the crops alternated with them, accumulate very much more of mineral constituents and of nitrogen in their produce, than do the cereals themselves; and, by far the greater proportion of those constituents remains in circulation in the manure of the farm, whilst the remainder yields highly valuable products for sale in the forms of meat and milk.

Further, independently of the benefits arising from the difference in the requirements and results of growth of the different crops, of the increased amount of manure available, and of the increased sale of highly valuable animal products, there are other elements of advantage of considerable importance. For example, with a variety of crops, the mechanical operations of the farm, involving horse and hand labour, are better distributed over the year, and are therefore more economically performed. Last, but by no means least, the opportunities which alternate cropping afford for the cleaning of the land from weeds is a prominent element of advantage.

Thus, then, the benefits of rotation are very various; and the explanation of them, though largely dependent on the facts which have been ascertained by scientific investigation, also largely involves considerations connected with the general economy of the farm; and since, as has been seen, so large a proportion of the produce grown is retained on the farm, as stock-food or litter, it is obvious that the benefits cannot be fully appreciated without arriving at some definite idea of the importance to the farmer of the saleable animal products, and of the manure obtained. It is proposed to consider this subject in a future paper.

JOHN BENNET LAWES.
JOSEPH HENRY GILBERT.

Rothamsted, St. Albans.

LIGHT RAILWAYS

Now that the Board of Trade has held a Conference, and a committee has been nominated to inquire into the whole question of light railways, we may assume that the subject is fairly before the public, and that we shall hear a great deal of it in all directions in the immediate future. And, indeed, the more discussion the better, for at present the public ideas are distinctly hazy on the subject, and few people seem to have any idea of what a light railway is and does. For example, it is not uncommon to read in the press a complaint that no one defines what a light railway is, whereas such a definition is, in the nature of things, obviously impossible. You cannot define a slow train, except by reference, implicit or explicit, to a fast one, and a slow train in England would be an express in Bavaria. Similarly you can only define a light railway by reference to railways which are not light. A light railway must be something simpler and cheaper than an ordinary railway; but the simplest and cheapest railway, practically possible in an old, settled, and rich country like this, may well be found, necessarily and rightly, more expensive and more elaborate than a railway of normal type in Texas or Mexico.

One definition, then, of a light railway may be said to be a railway of second or third class standard. This is looking at the subject from the practical side; but there is also a legal and administrative point of view, and it is rather from this point of view that a definition would usually be given on the Continent. For example, in Belgium a *vicinal* railway, as it is there called, is a line belonging to, and worked by, the Société Nationale des Chemins-de-fer Vicinaux (National Light Railway Society), and not directly by the State or the great railway companies. In France a *chemin de fer d'intérêt local* (railway of local interest) is one which is exempt from the code of laws and regulations applying to ordinary lines, and the control of which is entrusted, not to the Staff of the Minister of Public Works, but to the Prefects of the several departments. In Prussia, again, the Kleinbahnen (literally, little railways) are lines belonging, not to the State, but to private companies or local authorities; controlled, not from Berlin, but from the county centre, and subsidised—if subsidised at all—not by the the nation, but by the local population directly concerned. Our definition, therefore, is a purely negative one. A light railway is one which, from whatever point of view it be regarded, whether of importance, of speed, of expense, or what not, is inferior to the ordinary railway.

Having settled what light railways are, the next point for inquiry is, Are such railways wanted here? If so, for what purpose? "Why," it may be asked, "have an inferior article? The English railways, as we know them to-day, are the best and most perfect in the world. For speed, for safety, for convenience, Continental lines cannot hold a candle to them. Why should we deliberately accept a lower standard?" The answer is simple; that, unless we do, we shall have no new railways at all in this country, except it be new main lines, affording an alternative route for an important wholesale traffic already in existence. Ten thousand pounds a mile—the lowest sum at which railways of the existing standard can be built at all—is a sum on which the traffic of an agricultural district can never hope to pay interest. Unless, therefore, they are prepared to put up with railways of a radically different type—simpler and cheaper in every way than the existing lines—the districts which are at present without railway communication must make up their minds to go without it to the end of time.

It may, however, be further asked, "Why should they not go without it? If these lines are to be inferior at all points to the existing railways, is it worth our while to have them at all?" It is difficult to give any positive reply based on actual experience in England, for practically we possess no light railways, and therefore have no experience of what they might do. We have, however, a few lines broadly comparable to what would be called light railways abroad. Take, for example, the Southwold Railway, which runs nine miles from the market town of Halesworth to the coast of Suffolk. Before this little line, which is on a 3-foot gauge, was open, there was an omnibus now and then between Halesworth and Southwold. Last year the railway carried 87,000 passengers and 9,000 tons of goods and minerals. Or take another and more modern instance. Easingwold is a little place of about 2,000 inhabitants, lying on the old main high road from York to Thirsk and the North. Till two or three years back its communication with the outside world was kept up by an omnibus that plied two or three times a day backwards and forwards to a station on the North Eastern main line, a couple of miles off, at Alne. Last year the railway carried 43,000 passengers and 12,500 tons of goods and minerals. It can hardly be that such lines have not met a real and serious want. Take, again, two other lines, which also would be classed as light railways in Continental countries, but which here are legally tramways, because they run along the high road, and were constructed under the provisions of the Tramways Act of 1870. The Wantage tramway, two and a half miles long, connects the town or village of Wantage with its railway station. It carried last year 36,000 passengers, and earned besides over 1,000*l.* from goods and parcels traffic—the Board of Trade returns do not give the tonnage. Or take another somewhat similar line, the Wisbech and Upwell, which runs eight miles along the road in a purely agricultural district. Last year it earned 1,500*l.* from parcels and goods, and carried over 100,000 passengers. In these instances, too, it will hardly be questioned that the traffic must have increased enormously beyond what it could have been had carts and omnibuses remained the only means of communication.

If we turn from England to the Continent the evidence is overwhelming that the extension of cheap railway communication into sparsely populated districts helps to promote agricultural prosperity. It was especially for the benefit of agriculture that the light railway system of Belgium—the best organised and most successful, on the whole, in Europe—was undertaken, ten years back, under the direct guidance of the Government. Below are extracts from documents showing the ideas that animated the Belgian authorities. The first of them is from a circular letter from the National Light Railway Society, which is, as I have said, practically, though not nominally, a State organisation. It runs as follows:—

> For years past the spirit of enterprise and progress has directed itself almost exclusively to the extension and improvement of main lines of railway. It is true that the number of roads and canals has been increased, and that their construction has been improved; but there have been no changes, or almost none, in the manner in which traffic is conducted on these lines of communication. Old-fashioned wagons continue to travel on the high roads, and whereas the price of carriage for long distances has enormously decreased, it costs as much as if not more than it did half a century back to cart a load of wheat.
>
> It is the function of light railways to improve this state of things. Constructed, as a general rule, on the existing roads, and in consequence more economically than main railway lines, operated with the utmost economy and by means of cheap rolling stock, they will furnish the people with the means of transporting their products at the lowest possible price. By means of their junctions with the main railway lines they will render access to them more convenient both for passengers and for goods. They will assist communication from village to village and from the village to the adjacent station. They will call into being new industries and increase the prosperity of existing industries by affording them new outlets for their products. Finally they will enable the farmer to procure at a cheap rate the fertilisers necessary to enable him to face foreign competition, and by the low cost of carriage will open to him the markets of his own country as well as those abroad. For many places, deprived as it seemed for all time of railway communication, these light lines will furnish an opportunity unhoped for and possibly the last of escaping from their fatal position of isolation.

This circular was originally sent out to the Governors of the various provinces of the Belgian kingdom, accompanied by a covering letter from the Minister of Agriculture and Public Works. In that letter the following passage occurs :—

> I beg to direct your special attention to the exceptional importance of the work that the National Society is charged to conduct to a successful end and to the great services which it can render the country. The Society comes at the precise moment in the middle of the serious crisis which weighs upon agriculture, industry, and commerce; in a word, on all the sources of the prosperity and wealth of the nation. It will be able to contribute largely to diminish the intensity of the crisis if it is well understood and wisely made use of. The Government will do everything in its power to encourage the construction of these new methods of communication.

The date of the above-quoted document is September 1885. Since then the National Society has constructed some seven hundred miles of light lines, and other smaller companies half as much more, making, therefore, a thousand miles of light railway, as against a mileage of not more than double of ordinary lines. And in Belgium to-day there is but one opinion as to whether light railways are or are not for the benefit of agriculture.

Subjoined is a table which speaks volumes on the subject, this time from Hungary, a very different country :—

Year	Average mileage of light railways open for traffic	Total gross receipts	
		For the year	Per mile per annum
		£	£
1888	1,144	280,537	245
1889	1,315	329,063	250
1890	1,540	385,113	250
1891	1,799	480,833	267
1892	2,138	573,188	268
1893	2,333	662,852	284

This table shows the development of light lines in Hungary in the half-dozen years that have elapsed since the Light Railway Law of 1888 was passed. It will be seen that while the mileage has increased about 104 per cent., the gross receipts have increased over 136 per cent., that is, 30 per cent. faster. In other words, though presumably the most profitable lines were undertaken first, the growth of traffic has been so rapid that the opening of less profitable lines has not availed to reduce the earnings per mile of the system as a whole.

As to the other, or Austrian, portion of the dual monarchy this much may be said. There has of late years been a rapid and successful development of light lines in various parts of the country, more especially in Bosnia and in Styria. The statesman who was mainly responsible for the adoption of a forward policy in Styria is now the Austrian Minister of Commerce. He has recently organised in his Ministry a separate and independent light railway department, and an important Light Railway Bill has been drafted for submission to the Austrian Parliament in the current winter session.

Evidence of a very different kind, this time from France, has been collected in an admirably written work, *L'Utilité des Chemins de fer d'Intérêt Local*, by M. Considère, an engineer occupying in the department of Finistère (the westernmost portion of Brittany) a position apparently somewhat analogous to that of an English county surveyor.[1] M. Considère has analysed in great detail the accounts of the traffic of a whole series of small lines. To take his first instance, this is what he found. From Morlaix to the coast at Roscoff, a distance of 28 kilometres (17 miles), a light railway was opened in 1883. Two years before the opening, in 1881, the traffic through the main line stations which then served Roscoff and its district amounted to 1,608,000 francs. Had the conditions remained undisturbed, natural growth would in four years have increased this sum to 1,672,000 francs. In fact, in 1885, two years after the opening, the takings on traffic dealt with at these stations had fallen to 1,362,000 francs. But against this loss of 310,000 francs at the old stations were to be set new takings of 701,000 francs on traffic dealt with on the new branch; a development of traffic therefore in the district amounting to 391,000 francs, or an increase of about 22 per cent. within two years. But the most remarkable point in the statistics has yet to be told. The actual earnings of the branch line proper were only 77,500 francs; the balance of 313,500 francs—four-fifths of the whole—was earned by traffic contributed to the main line, which it is evident the main line would not have obtained had the branch not been opened. I must not occupy space with all the sixteen other separate cases fully set out by M. Considère. Here it must suffice to say that in every case examined it was found that the opening of a new line led to an important increase in the traffic of the district, but that the importance of the increase might never have been noticed by those who looked only at the

[1] M. Considère's work on the value of light railways was originally published in the *Annales des Ponts et Chaussées*, and subsequently issued in book form (Paris, Dunod, 1892). It was criticised by M. Colson, then professor of railway economics at the Paris Ecole des Hautes Etudes Commerciales, now Directeur des Chemins-de-fer in the Ministry of Public Works (or, as we might say, railway secretary of the Board of Trade) in a pamphlet entitled *La Formule d'Exploitation de M. Considère* (same publisher and date). To this M. Considère replied in a further pamphlet (same publisher, 1893) bearing his original title. The three works taken together are perhaps the most valuable contribution to the study of the question that exists.

actual receipts of the light line proper, and closed their eyes to all that occurred beyond the main line junction.

To avoid elaborating too far the point that all Continental nations believe that light lines benefit agriculture, and are justified in so believing, let us quote the words of the Prussian Minister of Public Works, spoken in moving in the Legislature the third reading of the Light Railway Law of 1892, as to the position of affairs in Italy, and so, as it were, kill the two birds, Italy and Prussia, with one stone.

> Elsewhere the construction and working of similar light railways have proved a blessing to the country. A traveller to-day through North Italy, through Belgium, and through Holland, can satisfy himself what a blessing these light railways have been. It is as though irrigation canals had been carried through the fields, and everything was growing and flourishing under their fertilising streams. In North Italy, in particular, the blessing which they bring with them is so obvious that even the casual tourist can hardly fail to notice it.

It may therefore be taken as a fact that the conviction of all the leading Continental nations—a conviction, be it remembered, based, not on theories, but on practical experience extending over a series of years, which, moreover, is at the present moment finding its outcome in energetic action in almost every country in Europe—is that light railways are of great value in the development of agricultural districts. It may, of course, be the case that our circumstances in England are so different that a thing which has been useful in all Continental countries, even though so widely different in circumstances as Hungary and Flanders, will not be of use to us in England. But the burden of proving this to be a fact surely lies upon those who maintain a proposition which *primâ facie* seems improbable. In the absence of actual English experience showing that light lines are useless and unprofitable, we have a right to be guided by the analogy of other countries who are nearest to us in circumstances and geographical position; and this experience shows unmistakably that light lines are useful and profitable.

Assuming, therefore, that it is desirable to have such railways, if we can get them, the first question naturally arising is, Will they pay in the ordinary sense of the word? That is, can we trust to ordinary commercial enterprise to provide them? Is it likely that capitalists will build them as they have built the main railway lines, not out of philanthropy or even, in the general, to develop their own property, but simply in order to obtain a dividend on their investments? To this point Continental experience once more enables us to make a tolerably complete answer. In Holland these lines have, in the main, been constructed as private commercial enterprises, and they have paid a moderate

rate of interest, on the average something like 3 per cent. But Holland is the only country where the thing has been done by private enterprise. The Belgian Vicinal Company is practically, though not nominally, a State organisation; but it is worked in a commercial spirit, and attains a fair measure of commercial success. Recent dividends have been at the rate of about 3 per cent. per annum. The light lines in Germany have a very varied history: some of them, the little Felda line, for instance, or the lines in the Grand Duchy of Hesse, pay handsomely; others barely pay their working expenses; and lines may be found at all intermediate points between these two extremes. The same is the case in both portions of the Austrian Monarchy. In France the light railways are a heavy tax on the public funds of the districts and of the State. The same is notoriously true in Ireland. The French failure to earn a satisfactory income is, however, easily accounted for by special circumstances, more especially the extravagant prices that have been paid for land, and the unthrifty bargains that have been made with the operating companies. The Irish conditions must not be touched here, for it would be necessary to occupy space out of all proportion to the importance of Ireland as an economic example, and it would not be easy to avoid trenching on matters of current political controversy.

It will be seen, therefore, that experience shows that light railways may pay in the commercial sense; but it is on the whole more probable that they will not do so, and it is well to put this point in the plainest possible language as a difficulty which has got to be faced by those who advocate an active light-railway policy. When it is faced fairly the difficulty in great measure disappears, for even the countries where as dividend-paying undertakings the light railways do worst are still going steadily forward in the construction of new lines. One is therefore entitled to say, with some certainty, that public opinion in these countries regards the construction of such lines as a thing so desirable as to be worth some financial sacrifice. Put in another way, Continental public opinion is decided in holding that the indirect gain more than balances the direct loss. One of these indirect gains, not perhaps one of the most important, is so easily recognised that it should be mentioned at once. Perhaps it might almost be called a direct gain. It is in the economy of road maintenance when the bulk of the heavy traffic is diverted on to a railway or tramway alongside. Some of the Irish highway authorities have given figures showing that for a road which cost 6*s*. per rod for maintenance before the railway came, the cost is now at 1*s*. 5*d*.

But, even if we admit the necessity of facing the fact that light railways may not be paying enterprises in the ordinary sense of the word, yet the financial position requires the most serious consideration. There are all degrees of unprofitableness, just as there are all degrees of financial success. If we look at Ireland, for example, some of the light lines built under the Tramways and Public Companies Act of 1883 only make a very small claim on the guarantee, as they earn from their traffic sufficient to pay almost the whole of the interest on the capital involved. Others do not even earn enough to pay their working expenses, and the public authorities have not only to pay out of rates and taxes the whole of the interest on capital, but also to make up a considerable deficiency under the head of working expenses. Such a result as this is obviously a serious reflection on those who are responsible for the lines in question; either they are being badly worked, in other words are spending more or earning less (more probably both) than they ought to be doing, or it may be that the capital cost of construction was unduly inflated; or, again—which is also more than probable—the prospects of the line at the outset were so bad that it ought really never to have been built at all. The first thing then requisite is to see that no lines are built without reasonable prospects of being, if not quite, at least very nearly, self-supporting. Probably, on the whole, the best way to secure this result is to demand that the local population which asks for the line shall take a serious, not necessarily a preponderating, share in the risk. Another safeguard would be a careful report made on the authority of a Government Department, presumably the Board of Trade, in which the traffic potentialities of the district should be estimated exhaustively and in detail from the fullest data available.

Another thing of at least equal importance is that both the capital cost and the working expenses of the new lines should be rigidly kept down to the reducible minimum. Probably one would be justified, on the basis of all the statistics available both on the Continent and in this country, in putting this point in outline, somewhat as follows. Assume that the line can be made for 5,000*l.* per mile. Assume, further, that it earns 10*l.* per mile per week, or, say, 500*l.* per mile per annum. Assume, again, that it can be worked at 65 per cent. of the gross receipts. This will leave a surplus of 175*l.* per mile per annum, or in other words 3½ per cent. interest on the capital involved. Now it is perfectly obvious that outside capital will not go into the venture on the basis of a prospectus only promising 3½ per cent.; but it is equally obvious that a County Council could raise the money for this line on the security of the county rate without being one penny out of pocket by the transaction. It is obvious also that a landowner whose estate the new line was to develop would be wise if, even without a guarantee, he took the price of the land required in shares paying at this rate.

Of course, to assume that a railway ten miles long can be made in this country for 5,000*l.* per mile and worked at a cost of under 7*l.* per mile per week is a large assumption. It involves, let it be frankly confessed, a radical alteration in our existing ideas. Broadly speaking, it may be said that no railway can at this moment be built in England for less than 10,000*l.* a mile, that is, double the capital that we are assuming to be sufficient for the new lines. But the same might be said in any other country of main-line railways, and railways of main-line standard are the only lines that hitherto have been recognised by Parliament and the Board of Trade as possible in this country. In every other country it is admitted that, just as there are county roads and parish roads and occupation roads, and each of them has a different standard of construction and maintenance, so there should be main-line railways and branch railways and light railways, and the standard of construction must differ fundamentally for the three classes. Our Board of Trade—and I am far from blaming the Board of Trade, for it has only acted as a mouthpiece of a practically unanimous public opinion—has hitherto insisted on the same standard of requirements throughout, whether it be on the main line of the North Western between London and Rugby, or on a petty local branch with four or six trains a day in Cornwall, or Caithness, or Cardigan. Foreign Governments—and foreign Governments have always interfered in the construction and working of railways with a minuteness and constancy to which we are quite unaccustomed—would as soon think of enforcing block working and interlocking of signals and the use of continuous automatic brakes on lines such as the Ravenglass and Eskdale, or the Looe and Liskeard, as the Little Pedlington Highway Board would think of paving its parish roads with jarrah-wood blocks laid on six inches of concrete because this has been found most suitable for the traffic of Piccadilly.

The Journal of the Royal Agricultural Society is not the place to discuss technical details of railway construction or railway operation, but it may be well to give in outline a sketch of what is meant abroad by a light railway, in order that English agriculturists may understand the class of railway which alone can be built and worked at a paying price, and which they must be content to put up with if they want to have a railway at all.

Let us deal with railway construction to start with. First and foremost, railways of this class of course know nothing of the obligation to construct over or under bridges where they cross a road. They merely cross on the level, and at the crossing point, instead of our elaborate gatekeepers' houses and gates closing alternately across the road and across the line, and interlocked with signals from a neighbouring box, there is at most a simple barrier—a long pole balanced so as to fall across the road when a watchman, half a mile off it may be, pulls a string because he sees on the clock that a train is nearly due. This amount of protection may be provided on really important roads, but on the ordinary country lanes nothing of the kind is found necessary, and the train simply crosses without barriers of any sort. So, too, there may be fences along the line where they are obviously required ; as, for instance, in passing through enclosed fields in a grazing country. But fences are never erected as a matter of course, so that whenever the line passes through woods or moorland or unenclosed down, or, again, through market gardens, or allotments where cattle could never possibly be grazing at large, or, yet more important, whenever it passes along on the side of the high road, fences are habitually dispensed with. It goes without saying that the permanent way is also very different from main-line standard. The bridges are probably of timber instead of steel girders ; 85-lb. rails in 45-lb. chairs, packed with two feet of carefully broken ballast, are replaced by 45-lb. flat-footed rails spiked down straight on to the sleepers, which in their turn rest, almost if not quite directly, on the ordinary surface of the ground.

Then, too, the system of working is as rudimentary as the method of construction. Signals, except possibly at a junction with the main line, are unheard of. Interlocking of course vanishes, because there are no signals with which to interlock the points, and the facing-point locks and detector bars and so forth disappear along with them. Block working in the strict sense disappears also. In place of it the trains are timed to pass each other—for that these lines are single goes without saying—at certain fixed points, and if it is necessary to alter the working for any reason the arrangement is made by telephone between the staff concerned. For all that, the speed is maintained quite at a reasonable level. Fifteen to 20 miles an hour may be said to be the limit in the case of railways that run along the public road, while in the case of lines built on separate land of their own 25 miles an hour is something like the average. In the few cases in this country and in Ireland where lines analogous to Continental light railways exist, our Board of Trade has, in its exuberant anxiety for the public safety, usually imposed so very stringent a speed limit—it is, for example, eight miles an hour as a maximum on the Wisbech and Upwell—that the carrier's cart can beat the train in speed, though perhaps not in economy, and certainly not in comfort and safety.

Another point is of the very utmost importance. The staff obviously cannot be specialised to the same extent as on a main line. The tickets will perhaps be issued by the guard and collected by the fireman, or it may be by a platelayer's wife, at the road crossing at which the passenger alights. For, when we have light railways according to the Continental pattern, stations in our ordinary English sense, with buildings and platforms, will of course disappear, and station will come back to mean what it used to mean in England, and still does in most Continental languages —not a building, a *gare* or *Bahnhof*, but a mere stopping place. And not only must the staff turn their hands to all sorts of jobs, but they must be prepared to do work over very long hours. If the first train on the line is at six o'clock in the morning and the last at ten o'clock at night, it is absurd to imagine that the light railway earnings can possibly pay for a double staff. Anyone who has travelled as often as the present writer on the engine of an express train knows that main-line engine driving is extremely trying work, and that to expect a man to do such work for many hours on end is quite indefensible; but to argue from this that a driver on a branch eight miles long ought not to be required to work ten or a dozen times a day over it, taking half an hour on each journey, with long intervals between, even though his first journey be made at six o'clock in the morning and his last at nine or ten o'clock at night, is really not reasonable; and from gentlemen who maintain the contrary one has a right to ask whether, as a matter of fact, they have two shifts of housemaids in their own house, and duplicate the services of grooms and coachmen in their own stables.

One point in connexion with the modes of construction and working cannot here be left unnoticed—the question of gauge. But it can only be mentioned in order to say that it is far too complicated and, one might say, too thorny a subject—for English railwaymen have always been prepared to fight their neighbours upon it any time this last half-century—to be handled here. Probably the two strongest arguments in favour of a narrow gauge are—the first, that Continental opinion is steadily becoming more and more favourable to it; the second, that a break of gauge would give to all concerned notice in the most conspicuous possible manner that the new light lines had finally broken with the extravagant traditions of our English railway past. The strongest argument in the opposite direction is to be found in the fact that England is a small country, and therefore the new lines will all be short; that it is a country old, settled, and with highly specialised industries, and that the consignments will, under these circumstances, usually be small. For it needs no argument to prove that, the shorter the line, the larger percentage the cost of transhipment will bear to the total cost of carrying the traffic, and the smaller and the more miscellaneous the consignments, the greater the cost per ton of dealing with them, the longer the time the operation will take, and the greater the risk that the goods will be damaged in transhipment.

An excessively and inordinately high standard of construction and working is, however, not the only cause of the extravagant cost of our English railways. Everything about them has been done on the same lavish scale. The cost of obtaining a private Act of Parliament is a thing that has been grumbled at and acquiesced in any time these last seventy years. Evidently this is not the place to discuss a reform in Private Bill procedure in general, but a word or two in reference to light railways in particular will not be out of place. As far as they are concerned, there would seem to be two ways open for reducing the cost of obtaining authority to proceed. The one would be entrusting the whole matter to the discretion of some local body—presumably the County Council. The objections to this are sufficiently obvious. In the first place, most light railways would begin in a country district and end inside the jurisdiction of a municipal corporation, which, certainly if it were a county borough, and in all probability even if it were not, would refuse to submit to the authority of the rural County Council. In the second place, there would be very serious risk, not perhaps of jobbery, but at least of the suspicion of it. If a scheme were sanctioned by, still more if it obtained financial support from a County Council of which Lord X. was chairman, and the scheme was for a line running for some miles through Lord X.'s estate, it is perfectly obvious that things would be said that in the public interest are better left unspoken. There is a yet more serious objection. The management of railways is a subject on which the casual and anonymous newspaper correspondent is always prepared at a moment's notice to instruct the general manager of the North Western or the Great Western. But, for all that, railways are really a highly technical subject. Those who have been concerned with them for years have accumulated a fund of information under various heads, technical, legal, political, financial, and economical, of whose very existence the outside public has no conception. The bulk of that information is concentrated in and around Westminster. It has never been reduced to writing, but exists in floating shape in the heads of railway managers, engineers, Parliamentary agents, and especially the Private Bill authorities of the two Houses and a few habitual and experienced chairmen of Parliamentary Committees. To start out on a new development of a subject such as light railways, and commence by refusing to utilise the whole of this accumulated information and experience, would be nothing short of disastrous, even were it not for the fact that uniformity by itself is a thing much to be desired, and that uniformity cannot possibly be preserved if one locality is to go ahead in one direction, and another locality in quite another.

Assuming it, therefore, to be necessary to retain the control of light-railway undertakings at Westminster, as at present, what seems to be requisite is to simplify and cheapen, as far as possible, the method of procedure. A great deal in this direction can undoubtedly be done by a relaxation for the benefit of light lines of the very stringent and costly requirements of the Standing Orders in reference to advertisements, notices, the deposit of plans and sections, the preparation of books of reference, printing minutes of proceedings, &c. A great deal more can be done by the reduction of the quite unjustifiably heavy House fees. At the present moment the promoters of enterprises which need for their initiation the sanction of a Private Bill are fined in a sum, I believe, of something like 100,000*l.* per annum for the relief of the general taxation of the country. It needs no argument to show that it would be absurd, in the case of light railways, for the State with one hand to impose a heavy tax on the initiation of the enterprise, and with the other hand to subscribe to its funds because it did not show a prospect of ordinary commercial success. That the House fees should be either abolished or very largely reduced in the case of these light lines goes, therefore, without saying. Again, we have had a good deal of experience recently of Bills referred to a joint Committee of the two Houses, and needing, therefore, one inquiry instead of two. Light Railway Bills might unquestionably with great advantage be referred to such a joint Committee. If this Committee were fortunate enough to have a practically permanent chairman, and in great degree a permanent panel of members, there would undoubtedly be a great curtailment both in the length of the inquiries and in the expenses consequent thereon.

A further point may be taken. A "model" Light Railway Bill might well be put forward with Board of Trade authority, and only the special circumstances of each individual case considered separately. It would even be possible to treat the preamble of the Bill as proved—that is, to translate into non-technical language, to admit the desirability in the public interest of passing it—not by the evidence of hosts of witnesses brought up from distant parts of the country for the purpose, but on the faith of duly certified resolutions of the local authorities concerned. If some such procedure as is here sketched out were adopted, and if, further, the joint Committee of the two Houses could sit with the reasonable regularity of an ordinary law court, from eleven to four, four or even five days a week, it would be quite possible to bring the cost of Light Railway Acts within a very moderate compass.

There is another head under which the cost of our English railways has been equally large, that, namely, of the purchase of land. On this subject one thing may be said at the outset, that unless the average cost can be very largely reduced, any rapid extension of light railways is out of the question. There are evidently two ways in which this can be done. The one—the most satisfactory from all points of view—that everyone who has land to sell, or interests in land to be affected, should be moderate and reasonable in his demands. If this ideal state of things were to come to pass there would be no need for further discussion of the question. As that, however, is improbable in this workaday world, the question will have to be faced whether any, and if so what, modification of the code which has grown up under the Lands Clauses Act can reasonably be introduced. The subject is, of course, an exceedingly difficult one, and it may be that the Legislature will not be able to do much. Two things, perhaps, it might fairly do. It might specially provide, as has been done in the case of the Housing of the Working Classes Acts, that no extra allowance should be made for compulsory purchase; and, secondly, it might enact that a company taking land—or, at any rate, agricultural land—for a light railway should be allowed to set off against the value of the land and the injury to the adjoining land, by severance and so forth, the estimated benefit that the construction of the railway would be to the estate. If public opinion were prepared to go further and authorise a Government surveyor to decide right out the value of the land to be acquired, an even greater economy might be effected. But when all is said and done we may lay our account with this—that, unless public opinion in the locality is strongly in favour of the line, there will certainly be found enough opponents who will threaten litigation, and the consequent expenditure of money which the railway has not got to spare. From such a district promoters, if they are wise, will simply turn away to direct their energies and capital to other districts where their proposals meet with better acceptance.

Closely connected with the demands of the owners and occupiers of land are the demands made by public authorities of all kinds, both local and national. Mention was made in an earlier part of this paper of the remarkable development of light railways in Hungary, and in that country the main encouragement that has been given to light lines has cousisted in a systematic relaxation in their favour of all the burdens laid on ordinary railways. A Light Railway Bill providing for still larger concessions in the same direction is at the present moment before the Reichsrath in Austria. Instead of enumerating what the public authorities in Hungary and Austria have been and are doing, it will, perhaps, be more convenient to translate their concessions into their English equivalent. First and foremost, then, these lines would be exempted entirely from passenger duty. Secondly, the Post Office, instead of driving a hard bargain for the conveyance of the mails, would cheerfully pay to the railway company the whole sum that the mails would have cost had they continued to go across country by cart.[1] Thirdly, the companies' earnings would be exempted from income-tax, the dividend warrants would not need receipt stamps, and transfers of stocks and shares would not be subject to the present heavy duty of 10*s*. per cent. The local authorities from County down to Parish Council would either exempt the railway company from rates altogether, or at worst would rate them merely on the agricultural value of the land that they occupied, and not, like ordinary railways, on the entire net profits of their undertaking. Even without the example of Austria and Hungary before us, these exemptious from taxation are obviously justifiable as a question of principle, for it is most illogical that the State and

[1] Let me instance how our Post Office at present helps these small undertakings. The Clogher Valley is a small line in Ireland built under the provisions of the Tramways Act, 1883. Though it has done a good deal to develop its district it only just pays its working expenses. The Post Office, however, found its trains from the outset very convenient for the conveyance of parcel traffic. Accordingly it called upon the company to carry them under the provisions of the Postal Acts. The company of course complied, and in due time applied for payment for so doing. "No," said the Post Office, "you must not come to us, you must go to the Railway Clearing House, which apportions between the companies the receipts for railway-borne parcels." To the Clearing House accordingly the Clogher Valley Company went, only to be met by the statement that its line was a tramway, not a railway, and that there was nothing for it there. Back to the Post Office the company accordingly went, and was there met with the reply that the company was compelled to carry the traffic, and whether it got payment or not for it was a matter that concerned not her Majesty's Post Office. I tell this tale as I heard it on the spot in Ireland in 1890. Whether the Government has relented since then I cannot say.

the municipalities should with the one hand levy taxation on these undertakings, and with the other pay over to them money contributions because they are not able to exist unaided.

This, however, is not the only way in which these undertakings must be dependent for success on the goodwill of the local authorities; for, as has been said, when they have to cross roads and streets they must always do so on the level. In many cases they will need to be laid either on the road or on the waste at the side of it. When they come into a town they can only possibly enter it down the middle of the street, and, practically speaking, this will not come to pass if the local authority sets its face against it. Some managers of lines of this class on the Continent have recently, in reply to the question whether it is better to lay the rails along the public road or on separate land bought for the purpose, answered that it ought in the abstract to be more convenient and more economical to lay them along the road, but that the local authorities have made such exaggerated demands in reference to the repair of the road and other matters that it has been found in the end cheaper to purchase an independent right of way. This, however, is not all. Local populations will have to accept the fact that they cannot get in station buildings, or indeed in any other respect, the same accommodation as that to which we have grown accustomed on the existing lines. To put it in the plain, straightforward language recently used to the people of New South Wales by one of their own Government engineers, "the people of a district to be served must be content with slower speed, irregular running to time, less accommodation at stations and goods sheds, and, notwithstanding getting less, they must be prepared to pay more than those using the main lines to cover the extra cost of working."

Assuming that we have not now reached the point at which readers will say, "On these terms it is not worth having light lines at all, and, therefore, we need not further discuss the question," it remains to be considered by whom and on what terms these lines are to be constructed and worked. For construction by a public authority there is something, at least in the abstract, to be said. There is a considerable risk that small lines of this kind should be built, as it is commonly called, "for paper," and so heavily handicapped at the outset with an inflated capital account. Such a result would be most disastrous. Anyone who knows how seriously Wales has suffered, for a whole generation, because its railways in the years of inflation that preceded the collapse of 1866 were mainly built on a basis which made their nominal capital something like three times their actual cost, will appreciate the necessity for avoiding the recurrence of a similar state of affairs. The difficulty is as to what public authority should do the work. The State can hardly do it direct all over the country; on the other hand, the local authorities have no experience in work of the kind, have no trained staff for the purpose, and would be constantly in difficulties at the point where one jurisdiction ended and another began.

Assuming, then, that the disadvantages of construction by public authorities outweigh the advantages, the question arises, how best the work can be left in the hands of private enterprise, and yet the risk of what may be called "financing" avoided. In this matter, probably, we should do well to take a leaf out of the book of our neighbours in Belgium. In that country, as has already been stated, the power to construct a light line is almost invariably given to a single company, the Société Nationale des Chemins-de-fer Vicinaux. In this company the Government and the local authorities of different parts of the kingdom are practically almost the only shareholders. There is no need that private persons should be excluded from a similar society in England. The point is, that if the thing is to be properly done it must be done by a large and responsible organisation, which, on the one hand, will possess the public confidence, and on the other hand will be able to command the services of first-class men, and to treat on terms of equality, both of position and knowledge, with great landowners and their solicitors, with the existing railway companies, and with the great firms of contractors. Of course there would be no need to exclude existing railway companies as promoters and constructors of light lines. At the same time they would, probably, as a rule prefer to stand aside and leave others to do the work, and it would, perhaps, be easier for the Board of Trade, in the case of light lines which were distinct enterprises from ordinary railways, to permit them the ample relaxations which we have shown to be necessary if they are to be made at all, than if they were in the hands of companies possessing an existing system of normal type.

Turning from construction to working, the arguments against the task being undertaken by the State or the local authorities apply with tenfold greater strength in the latter case than in the former. Even in Prussia and Austria and Belgium, where the propriety of the State working the ordinary railways is almost an axiom, these light lines are regarded as fit only to be worked by private enterprise. But by what form of private enterprise is a difficult question. The Belgian National

Society does not as a rule work its own lines, but leases the working under carefully drawn contracts to private individuals or subordinate companies. In France, on the other hand, the light lines are mainly worked by two large companies, each of which has railways or groups of railways scattered all over the face of the country. A third way, of course, is to entrust the working to the great railway company with whose lines the light railway connects. There is a great deal to be said for all three methods, and also, it must be confessed, a great deal to be said against each of them. The subject is, however, too technical for discussion here.

Two or three main desiderata must, however, be just alluded to. In the first place, by some means or other, the services of first-class experts, whether as lawyers, as engineers, or as traffic managers, must be secured to each new line, however small, and, at the same time, at a cost which to the individual small undertaking shall not be prohibitory. This can, it seems evident, only be done by means of some central organisation. Then, further, the company or individual working the local lines must have an interest in the development of the traffic; and this in the main depends on the form in which the contract between owners and workers—supposing them to be different—is drawn up. In the case of many of the Irish light lines, it is not too much to say that those responsible for the working have no interest whatever in developing the traffic of the district. In France one may go further, and say, without fear of contradiction, that in many cases the interest of the working company is to reduce the traffic to the smallest possible dimensions. Now this state of things must be avoided here at all hazards. It might be thought, perhaps, that the persons on the whole most interested in the development of the traffic would be the main-line companies, to whose railways the new light lines should naturally act as feeders. And this would be so, undoubtedly, if it were not that in the past a policy of starving a small branch to death, and then buying the carcass at knacker's prices, has in some cases been practised with considerable success. Against this risk, too, security will need to be taken.

One point, and a most important one, which has been suggested, rather than positively raised in the preceding pages, must be dealt with in conclusion. A hard-headed man of business having read this article carefully might very naturally speak somewhat as follows: "You tell us that these new lines must be in all respects inferior to the railways to which we have hitherto been accustomed. Their accommodation and their speed will be inferior—even safety will be less absolutely secured. On the other hand, by blocking our streets and frightening our horses, they will cause us inconvenience of a kind to which we have hitherto in this country been strangers. Even so you say that it will only just be possible, under the most favourable circumstances, to make them return some 4 per cent. on the capital involved in them. And to do this they will need to charge rates and fares certainly not lower—very possibly higher—than those on the existing railways, which we regard as too high already. If this is all your light railways can do for us, is it clear that we should not be better without them altogether? After all, under no circumstances can you run a railway into every farmyard. The farmer, therefore, will still need to cart his produce to the station, and, if he has got to cart it at all, does it matter much whether he carts one mile or five? Assuming that the five miles of cartage costs 4*s.* a ton, and admitting that the five miles by train will only cost 1*s.*, to that we must add another shilling for taking the stuff to the station. There is, therefore, at the outside an economy of only 2*s.* per ton, and this is not, as it might be thought to be, a saving of 50 per cent., for when the produce reaches the junction between the light line and the existing railway it requires, as before, to be sent on by train to the great market centre. Suppose the railway rate for this service to be 10*s.*; the comparison is then really between an old charge of 14*s.* and a new charge of 12*s.*, a reduction, not of 50, but only of about 14 per cent. Is it reasonable to suppose that such a change as this can produce any serious effect on agricultural depression in this country?"

The objection is a serious and a perfectly fair one. Unfortunately the answer to it, though it really exists, written large by experience all over the face of Continental countries, can hardly be precisely set down in figures and percentages. Briefly the answer is, that the effect of these new lines is quite as much, if not more, moral than material; that man—and especially agricultural man—is rather an imitative and emotional than a reasoning animal. It is quite possible that it would have paid the farmer in a country village five miles from a train to collect his eggs every morning, and sell them as fresh at 2*s.* a dozen in London next day. But it never occurred to him to do so, and, in fact, he has gone on collecting them once a week, and selling them for 10*d.* or 1*s.* The opening of a new station half a mile off, with a printed time-table, showing plainly that the eggs which leave his station in the afternoon will be delivered in London that evening, comes as a fresh breeze into the stagnant air of village life, and braces his energy to face the new departure. The same thing is, of course, true of all other perishable produce, and agricultural authorities are, I believe, agreed in thinking that it is in the production of articles which deteriorate rapidly when carried, rather than in corn-growing, that the best hope for the future of English farming lies.

One may turn the matter the other way round, and point out that there must evidently in the near future be a considerable growth in what may be called home manufactures. The demand for home-spun linens, and woollens, and silks, for hand-printed rather than machine-printed calicoes and papers, for beaten brass and hammered iron, for originality and variety, rather than cheapness and million-multiplied monotony, the rapid development of electricity as a motive power—all these are on the side of village industries as against wholesale town factories. Now, for a village industry on any but the very smallest scale to establish itself in a place five miles from railway communication is practically out of the question. The producers must, in such case, be hopelessly out of touch with the consumers. The buyers from the great towns will not come down, while the master-workmen in their turn will hardly get up.

There is another point of view from which the advantages of light railways may be regarded—a point of view even less material. It is a commonplace that the best workmen, the men most capable of using both hands and heads, refuse to stay in the villages where they were born, and gravitate ever more and more to the great towns. It is not so much (so we are told by the best authorities) the higher wages of London that attract them as the want of opportunity, the narrowness of interest, the isolation of the life in a country village, that repel them. Against this sentiment of isolation even the lightest of light railways, provided it possesses a printed time-table showing through connexions to London, or other great centres, and issues cheap excursion tickets at Christmas time, should furnish a powerful antidote.

But, after all, these are questions that can mainly be left to settle themselves. The position at present is an exceedingly simple one. In every other country in the world it is possible to build cheap railways, and in every other country cheap railways are regarded as such valuable agencies of national life that the Governments are ready to spend public funds largely to secure their construction. Here it is impossible, owing to restrictions laid down by Parliament and its executive organ, the Board of Trade, to build cheap railways at all, though in consequence of the wealth of the population it is very probable that in many parts of the country cheap railways could be built so as to be a moderate financial success. The business at present before us is to induce Parliament and the Board of Trade so to modify the Acts and Orders affecting the subject that cheap railways shall, for the first time, become a possibility. When that is done the localities which think the experiment worth trying for themselves will try it, and we shall be able to see the results. It may be, of course, that the future of English agriculture is hopeless, and that the agricultural interest here will derive no benefit from that which undeniably has benefited it greatly in every country on the Continent. But, at least, those who hold a contrary belief are making no excessive and unreasonable demand when they ask that, at any rate, they shall be put in a position in which they can test the point.

47 St. George's Square, S.W. W. M. ACWORTH.

ANOMALIES OF THE GRAZING SEASON OF 1894.

THE anomalies of a grazing season can seldom have been so pronounced as were those of the season of 1894. In striking contrast to the state of affairs in the dry season of 1893, there was an abundance of grass, which was of good quality and of weight-producing nature, and yet to the grazier it proved a disappointing year. Second-class land has shown a decided advantage over land of higher feeding capacity, and dairying and store land has been productive to even a greater extent still. The period of the growth appears to be dependent on the altitude of the land; and I think it is undoubtedly a fact that the greater proportion of grass in the Midland counties this year has been grown upon land lying at an elevation of from 300 to 600 feet (Ordnance level), and the least amount on what is usually the most forward land, that is, on land lying at an elevation of from 150 to 300 feet.

There are, of course, considerations other than elevation which regulate the forwardness or backwardness of certain fields. Such are aspect, the nature of the subsoil, and the treatment the land receives; but, apparently on account of the fact that the weather was more propitious for growth at the period when the later land was growing than it was when what is termed the more forward land usually puts forth its greatest energies, the occupiers of land at an elevation of from 300 to

600 feet have this season had a decided advantage in the quantity of grass produced.

This, an anomaly in itself, partly accounts, then, for the further anomaly that the lower-priced cattle are accredited—as undoubtedly is the case—with having paid more per head, and considerably more, reckoning the percentage on outlay of capital, than the high-priced beasts.

But the grievance of the occupier of the land which can produce the very best article does not stop here. It has been a maxim of the Free-trader that quality can compete with quantity, and that the best can always hold its own; but the levelling taint of these latter days spareth not even the finest breeds of cattle, and the Hereford and the Devon are becoming rapidly reduced from their high estate of comparative value.

To produce the best-quality fat it is necessary to obtain the best-quality store, and year by year this has been more difficult to acquire in the spring, until the culminating point has been reached in the course of the present year, when 42*s.* per cwt. cannot have been an exceptional price for a store Hereford, Devon, or Runt.

Here, then, is the secret of the difficulty:—

	£	*s.*	*d.*
Buy an 80-stone (10-cwt.) bullock in the spring, say at 40*s.* per cwt.	20	0	0
The 80 stone originally bought, sold at 35*s.* (equals loss of 5*s.* per cwt. on 10 cwt.)	2	10	0
	17	10	0
Add 3 cwt., the increase of weight in grazing, at 35*s.* .	5	5	0
Amount realised . .	22	15	0

In presenting these figures, moreover, I venture to think that the majority of graziers of this class of cattle will bear me out when I say that I am setting forth too favourable an example for consideration.

Let us compare the case given with that of more ordinary cattle, such as could be bought at from 30*s.* to 35*s.* per cwt. in the spring.

	£	*s.*	*d.*
A bullock weighing 72 stone (9 cwt.), at 32*s.* per cwt. =	14	8	0
was probably worth when fat 30*s.* per cwt., or loss of 2*s.* per cwt. on original weight . . . . =		18	0
	13	10	0
Add 3 cwt., increase of weight in grazing, at 30*s.* .	4	10	0
Amount realised . .	18	0	0

The difference may not seem large in a, perhaps, too moderately stated case such as the foregoing, but the comparative rental value which is capable of feeding the two different classes of animal, and the consequent larger amount of rates, with the extra interest on the further outlay of capital, tell largely in favour of the land which, in addition, has this year grown so much more grass.

My assumption that the beast originally weighing 9 cwt., as well as the one of 10 cwt., should have both put on an increase of 3 cwt., may be open to criticism, yet in this, again, I have acted adversely to my own argument. I have before me the following weights which have come within my own experience during the season:—

Number of cattle	Original average weight in spring	Average increase of weight during summer
5	53 stones	36·8 stones
4	53 "	29 "
3	54 "	27·5 "
8	68·5 "	26 "
14	80 "	27·5 "

Here it will be seen those originally weighing least have put on most weight. Undoubtedly, the period of grazing affects the increase; but the land can only carry so many head of stock, and it matters little if the grass is there—as was the case this year, on land which would graze an animal of from 50 to 70 stones—whether the animal was grazing for four months or five. I have a further reason for omitting to compare the average weights per day, and that is, that the beast which is grazed for the shorter period puts on a much greater average weight per day than the beast grazed for a longer period.

I have made a comparison, which it may be convenient at this point to mention, of the average daily gain of from 40 to 60 head of stock for different periods of the grazing season, the beasts selected having been grazed on similar class of land, and kept under similar treatment:—

	Increase per head per day	
April 20 to May 30—40 days . .	3·492 lb.	} = 7·274 lb.
May 30 to June 28—29 days . .	3·782 "	
June 28 to August 1—34 days .	1·894 "	} = 3·639 lb.
August 1 to September 4—34 days .	1·745 "	

It will be seen that for the 69 days previous to June 28 these beasts put on almost exactly twice as much per head on the average as they did for the 68 days following—7·274 lb. against 3·639 lb.

I think it may be accepted as correct that feeding beasts bought in the spring in good store condition have increased their weight by an average of between 27 and 28 stones, live weight, during the season; and it is all the more disappointing, therefore, that, owing to the drop in price on the original weight bought, the profit on the increased weight should be so diminished.

It would be natural to infer that the increase of importations was accountable for this; but although greater than last year, the importations for the ten months January to October, as shown below, fall short of those of 1892, which were smaller than any for the like periods of ten months of the three preceding years:—

	1892	1893	1894
Cattle, number .	441,235	295,309	419,650
Beef (fresh), cwt.	1,639,309	1,512,000	1,771,347

Whereas in the case of sheep the imports for the same periods are:—

	1892	1893	1894
Sheep, number .	78,083	55,261	386,415
Mutton, cwt. .	1,427,615	1,679,024	1,907,959

And notwithstanding this enormous increase, the price of English mutton has been maintained at a level satisfactory to the breeder and grazier.

It would seem, then, that the consumer is losing his discriminating taste in beef, but not in mutton, and that it matters no longer to the housewife—if she can be assured that what hangs outside is English—whether the bullock her joint is cut from is Deptford-killed, or even imported dead meat.

If we are to learn a lesson from the recent season, it must be this:—Take care that what is bought when in store condition is weight for money. Study the question how the weight can be best increased, and see that the method of increasing it is the most economical.

The following experience during the late summer will serve to show how misdirected one's efforts may be in attempting to attain the best results.

At the end of May in this year, after having weighed all my cattle, I picked out those from the different lots which I thought least improving and most suitable for an early market, and proceeded to cake them. There were seven Runts and four Shorthorns—the latter weighed from a lot of twelve—which

From April 21 to May 30 had been treated alike;
from May 30 to June 14 had 3 lb. cotton-cake and 1 lb. linseed-cake; and
from June 14 to June 28 had 3 lb. linseed-cake and 2 lb. cotton-cake.

Of the twelve Shorthorns, four were not caked after May 30, but remained on my own land, and with the exception of not having cake were treated similarly to those that were caked. The four least beasts I sent away to a field of keeping, but had them back on June 28 to be weighed. The following table shows the comparison of the weight they put on at the different stages :—

TWELVE SHORTHORNS.

—	April 21 to May 30: All treated alike	May 30 to June 28: May 30 to June 14: 3 lb. cotton-cake, 1 lb. linseed-cake	May 30 to June 28: June 15 to 28: 3 lb. linseed-cake, 2 lb. cotton-cake	Total from May 30 to June 28
	st.	st.	st.	st.
Four afterwards caked . .	33½	16	9	25
Four not caked remaining on own land	32½	—	—	26
Four not caked sent to keeping	28½	—	—	25

The foregoing table shows how the four beasts did in comparison with their fellow-beasts. The next table shows how all my beasts were doing on cake from May 30 to June 28 :—

	May 30 to June 14, having 3 lb. cotton-cake and 1 lb. linseed-cake	June 14 to June 28, having 3 lb. linseed-cake and 2 lb. cotton-cake
	st. st.	st. st.
Seven Runts put on	29·5 = 4·214 each	14·5 = 2·071 each
Four Shorthorns put on	16·0 = 4·000 each	9·0 = 2·250 each

The cakes were analysed, and found to be of fair average quality, and not in any way injurious.

There appears from the foregoing figures to be sufficient confirmation of the suggestion that there must be something to account for these extraordinary results, and that they were not merely a matter of chance. During the period of caking the white clover was enormously predominant over other pasture plants, and the question arises whether, in such circumstances, and in these alone, it is that an expenditure upon cake is more than thrown away.

I am indebted to Dr. Voelcker for a visit he paid during the summer. To him I told my experience in this matter, and he was inclined to believe that, from the fact that white clover contains a larger proportion of nitrogen than any of the pasture grasses, and from the fact that the beasts did worse on linseed-cake—that is, on the cake containing most nitrogen—than when the larger proportion was cotton cake, the excess of nitrogen may have been the cause of the failure of the cake to produce beneficial results.

As a confirmation of the effect in live weight, I may mention an instance showing the influence on the percentage yielded of dead to live weight. I had the opportunity of weighing a bullock, which had received no cake out on grass, in the middle of July. It yielded 60 per cent. of its live weight, weighed direct out of the field and not fasted. I also sold two of a similar class, but which had been caked, from which 5 per cent. had to be deducted for fasting before dressing-out 57 per cent.

It has been my desire since to test the theory as to the clover and nitrogen. Accordingly, on September 26, I commenced to cake five beasts which, for the previous twenty-one days, from September 4 to September 25, had not collectively increased their average weight, two having put on four stones amongst them, and three having lost four stones amongst them. From September 26 to October 16, with 3 lb. linseed-cake and 3 lb. cotton-cake, their average weight increased 4·69 lb. each per day—a greater weight per day than had been put on at any period during the season by these or any other beasts.

This proves, at any rate, that at a period when the white clover was certainly not predominant the cake provided something which was essential, and which was absent in the food derived from the grass alone, but which was present in the cake, and effectually met the want.

I am convinced that there is a great deal yet to be learnt of immense value to the grazier. The weighing of cattle has opened up a wide field for the experimenter, and with the assistance of the chemist and botanist the art of grazing may, in the future, become reduced to a business of manufacturing meat rather than a process of natural increase.

It is only a matter of time to find out with greater certainty the average yield of dead weight to live weight under varying circumstances, the loss of weight in transit, and the capability of one class of land to put on weight as compared with that of another. In these matters we owe a debt of gratitude to Mr. Westley Richards, Mr. McJanet, and other pioneers of weighing, and may we not look to the Board of Agriculture for further assistance?

Such work is practical, but we also claim the aid of science in this direction. The energies of the Royal Agricultural Society may undoubtedly be devoted to work of inestimable value to future generations of graziers.

C. B. FISHER.

Market Harborough.

AGRICULTURAL DEPRESSION AT HOME AND ABROAD.

Three years ago, when I contributed to this Journal[1] an article on "The Future of Agricultural Competition," there were strong reasons for hoping that we had seen the worst of agricultural depression, especially in relation to the production of grain. It was shown that the wheat area of the world had not nearly kept pace with the population since 1880, the increase in the former having been extremely small between that year and 1890; or, in other words, that the ratio of wheat acres to bread-eaters was very much smaller in 1890 than it was in 1880. That ratio, however, had been excessive in 1880, owing to the enormous extension of the world's wheat area during the decade ending with that year, so that three or four years had been required to enable the population to overtake the supply. When that adjustment was apparently about to take place, however, calculations were upset by a series of abundant seasons, which kept the supply from a diminished acreage just about equal to the consumptive demand. Still, at the end of the cereal year 1890–91 the stocks of wheat in the world were low almost beyond record, while there was a famine in Russia, and France had an extremely small crop of wheat. Consequently the weekly average price of wheat in England rose from 32*s.* 7*d.* a quarter at the beginning of January to 41*s.* 8*d.* in the first week of September, and the average for the whole of 1891 was 37*s.*, or higher than it had been since 1883. But the crop in the United States turned out a phenomenal one, by far the greatest ever produced, and much in excess of the estimate of the Department of Agriculture.

An almost continuous fall in prices, therefore, took place in 1892, when there was another great crop in the United States, and in the world as a whole. In that year, too, the Argentine Republic, under the stimulus of a high gold premium, first became a considerable contributor to the wheat supplies of Europe, shipping over two million quarters. The year's average price in England was only 32*s.* a quarter. In 1893 there was a still greater production of wheat in the world (though the United States had only a moderate crop), and Argentina came out with an export surplus of about 4,600,000 quarters. Prices, therefore, fell to a lower point than they had ever before touched since the value of money was anywhere near its modern exchange value, the year's average in this country being 26*s.* 4*d.* The last harvest, so far as can be at present determined, has been

[1] Third Series, Vol. II. Part IV. 1891, p. 742.

the greatest of all, taking the whole world into account, and Argentina's export surplus from the crop of 1893–94 is expected to reach 7,000,000 quarters. Thus it has happened that, in spite of the deficiency of the world's wheat area to meet the consumptive requirements under what might have been regarded as average productiveness, there has been a superabundance of wheat in the world since the beginning of the cereal year 1891–92, in consequence of the extraordinary bounty of Nature.

A few figures in support of this explanation of results which no one could have anticipated are desirable; and as the United States have contributed most materially to these results, the wheat statistics for that country may well be given first, especially as they will show clearly that the excessive production has not been due to an increased area of wheat. Until 1891 the estimates of the United States Department of Agriculture, as tested by exports, reserve stocks, and estimated home consumption, appeared to be approximately accurate; but it is certain that the estimates of that year and the two succeeding years were greatly under the mark, and this year's crop is believed to be much greater than the figures of the Department, which has not yet given an actual total, appear to indicate. In the following table, then, the official figures for the four years ending with 1890 are given as approximately correct, and the best tested of commercial estimates of yield in the four following seasons, with official figures as to area, are presented in comparison:—

WHEAT CROPS IN THE UNITED STATES.

Year	Acres	Bushels	Year	Acres	Bushels
1887	37,641,783	456,329,000	1891	39,916,897	675,000,000
1888	37,336,138	415,868,000	1892	38,554,430	550,000,000
1889	38,123,859	490,560,000	1893	34,629,418	450,000,000
1890	36,087,154	399,262,000	1894	[1] 33,775,000	475,000,000
Four years' total.	149,188,934	1,762,019,000	Four y'rs' total.	146,875,745	2,150,000,000
Four years' average.	37,297,233	440,504,750	Four y'rs' average.	36,718,936	537,500,000

Indicated by official estimate of percentage reduction since 1893.

In round figures the excess in production during the last four years, comparing it with the total for the preceding four, is no less than 388,000,000 bushels, or 97,000,000 bushels per annum, in spite of a reduction in the mean acreage. It is obvious that so tremendous an addition to the wheat supply, in the absence of a corresponding deficiency elsewhere, was quite sufficient to depress the markets of the whole world; and there was not such a deficiency in any one of the four years in other countries taken together, although Europe had a short crop in 1891. In support of this statement the following estimates of the wheat crops of the world, derived mainly from official figures, are taken from *Beerbohm's List*:—

WHEAT CROPS OF THE WORLD.

Year	Bushels	Year	Bushels
1887	2,304,000,000	1891	2,367,280,000
1888	2,208,000,000	1892	2,391,120,000
1889	2,129,976,000	1893	2,420,480,000
1890	2,238,600,000	[1] 1894	2,427,200,000
Four years' total .	8,880,576,000	Four years' total .	9,606,080,000
Four years' average	2,220,144,000	Four years' average	2,401,520,000

[1] "Beerbohm" has recently added 25,000,000 bushels to the estimate of this year's American crop, making the total greater by that quantity; but this addition seems to me hardly warranted at present.

According to these estimates we have had a mean increase of 181,376,000 bushels per annum in the world during the last four years over the mean annual production of the previous four years. What the extra requirements of the increased population were it is impossible to state with any pretence to accuracy. The consumption is a greatly varying quantity, dependent as it is upon the production of rye and other food grains inferior to wheat, and, to a less extent, upon the production of potatoes. But no one would put the extra annual requirements of the last four years at more than about half the extra production shown above, as compared with that of the previous four years. At any rate, as stocks of wheat in the world have accumulated, it is certain that the production since 1890 has been in excess of the requirements, although the excess has been kept from becoming enormous by deficient crops of rye in some years. The acreage of rye in the world has certainly diminished in recent years; and this fact, in connexion with the almost stationary acreage of wheat, helps to show that the fall in the price of wheat since 1891 has been occasioned by extraordinary circumstances. The weekly average has been as low as 17*s.* 6*d.* a quarter; a price absolutely ruinous to growers who depend mainly upon wheat for a living, unless they possess some such enormous currency advantage as the farmers of the Argentine Republic, and they alone, now enjoy. I am as firmly convinced as ever that the supply of wheat will not be kept up to the requirements at less than double that price in this country; for, although Argentine growers may keep on extending their wheat area if they get only 20*s.* a quarter here, so long as their gold premium enables them to take at least three times as much in their paper money, which possesses nearly as much purchasing power per dollar for all that they require as ever it had, the acreage in other countries would be much more rapidly reduced at such a price.

The over-production of wheat during the last four years has thrown obscurity upon other causes of the fall in value. That other causes have helped materially to bring about so disastrous a decline, however, I have not the slightest doubt. Apart from the general fall in prices, references to Argentina and India explain why wheat has been affected more seriously by currency complications than anything else. Similarly wheat, in common with cotton, has been a commodity specially subjected to the depressing influence of the system of market gambling described in the Journal in 1893.[1] During the last four years of abundance the "bears" have had nothing to check their success in forcing prices lower and lower. At ordinary times they have an advantage over the "bulls," as explained in the article just alluded to; but when there is any doubt as to the available supplies of wheat being sufficient for the demands of the present or the near future, they are liable to be taught a lesson in caution occasionally if they presume too confidently upon their ability to "hammer down" the price; whereas, for some time past, they have pursued their mischievous course without check and in perfect safety. If there had been no gambling system to make prices in America and Liverpool, in all probability the price of wheat would not have fallen nearly as much as it has sunk.

From harvest, 1883, to the end of 1890, taking the period as a whole, there was no over-production of wheat in the world, and yet prices fell from 41*s.* a quarter in 1883 to 31*s.* 11*d.* in 1890. Nor was there any considerable change during that period, either in the expenses of production or in cost of transport, to account for the fall in price; which, therefore, I attribute to the general appreciation of gold, the particular currency advantages of exporters from certain countries, and the market gambling system. In 1891, when very favourable anticipations as to the prospects of wheat growers were published, the effect of the gold premium in the Argentine Republic was only just beginning to tell materially upon the growth of wheat in that country, as it was not until that year that the premium rose above 200 per cent. The average for the year rose from 40 per cent. in 1888 to 88 per cent. in 1889, to 161 per cent. in 1890, and to 277 per cent. in 1891; but time was needed for an increase in the area of the wheat crop, and it was not until 1891 that the exports exceeded 1,500,000 quarters. At that time, moreover, I had not become convinced of the inevitably depressing effect of the market gambling system. Three influences, then, combined to

[1] "Gambling in Farm Produce," Journal, 3rd Series, Vol. IV. Part II. 1893, p. 286.

falsify my hope of an improvement in the price of wheat: (1) the exceptional fruitfulness of the succeeding harvests in the world as a whole; (2) the enormous gold premium in the Argentine Republic, together with the steady fall in silver; and (3) the extension of operations under the "option" or "future" system.

The prices of other kinds of grain have fallen mainly from "sympathy" with wheat, though partly from one or more of the causes named above acting directly. The recent advance in the price of maize is due to a general deficiency in the production this year.

With respect to the other principal agricultural commodities, no general intensification of depression has taken place since 1891. There have been fluctuations in prices, due to exceptional circumstances in certain countries, such as drought in England, and there is some danger of an excessive production of butter for a time, while producers of meat in certain countries are injured by increasing supplies of beef and mutton. The probability of such developments of enterprise, however, was anticipated in 1891, not excepting the attempt of our Australian friends to send us meat in a chilled instead of a frozen condition. In relation to meat, it is to be borne in mind that the gold premium in Argentina tells in favour of exporters, just as it does in the case of wheat; and it may hereafter, if it lasts, develop an export trade in dairy products. But just now the circumstances of our own country are not specially under consideration. So far as the prices of meat and dairy produce throughout the world can be tested by those of this country, no such collapse as has taken place with respect to grain has to be recorded. Live stock and meat have lately sold better than in 1891, frozen meat excepted; and the average prices of imported butter and cheese were slightly higher in 1893 than in 1891. This year exporters of frozen meat and butter have felt the effect of their own over-production; but this has not prevented an advance in live stock and fresh meat, while the recent cheapness of milk and butter has been more due to a favourable season for dairy cows in this country than to any other cause. Still, in spite of what may prove to be only a temporary recovery in the prices of certain commodities, agriculturists in all parts of the world are suffering more or less seriously from depression, and most of them more severely than ever.

A good deal of evidence upon our subject has lately been presented. For England and Scotland we have some of the reports of the Assistant Commissioners to the Royal Commission on Agriculture, as well as the evidence of a good many witnesses examined by the Commission; while for Wales there is separate information of a similar character; and for our colonies and foreign countries evidence of various kinds has appeared in print, including some relating to European countries, collected by Mr. Drage for the Royal Commission on Labour. Some of the principal points in a great collection of evidence can be most conveniently noticed under the heads of the countries to which they severally relate; but it should be understood that extreme condensation is necessary in order to compress the information within the space at my disposal.

Great Britain.

The time has not yet come for a complete review of the information collected by the Royal Commission on Agriculture, only a small proportion of it being published up to the date of writing. Two or three of the reports of Assistant Commissioners which first appeared relate to parts of the country in which the depression is least severe; but even in these reports the description of the condition of agriculture is a lamentable one, while those of Dr. Fream and Mr. Hunter Pringle, which came out later, are distressing in the extreme. If any districts in England might be supposed to have escaped agricultural depression, the Garstang and Fylde districts of Lancashire, visited by Mr. Wilson Fox, and the Cheddar-cheese district, of which Frome is the centre, upon which Mr. Jabez Turner has reported, would certainly be placed among them. The former, consisting for the most part of land much above the average in fertility, are surrounded by populous towns, so that the small farmers, who hold nearly all the land, have the best of markets for their milk, cheese, butter, vegetables, fruit, poultry, and eggs, which are their principal productions. Yet many of the larger farmers informed Mr. Fox that they had lost capital in recent years, while a great number of the small occupiers declared that their financial position was worse than that of their labourers. When Mr. Fox wrote, at the end of 1893, reductions of rent had generally ranged from 5 to 16 per cent., and in some cases up to 30 per cent. No doubt the partial drought of 1892 and the complete one of 1893 were in great measure accountable for this state of affairs, which may be taken as representing very nearly the minimum of agricultural depression in England. In the Glendale district of Northumberland, which Mr. Fox next visited, we have as favourable an example of a large-farm tract of country as the Garstang union is of a small-farm district, as the land is very fertile, and its occupiers are, or have been, men of considerable capital, and are skilful farmers as a rule. There, however, depression has been felt since 1879, and it has been only by means of great and timely concessions on the part of landlords that the farmers have been able to hold on. Reductions of 20 to 30 per cent. in rents have been common, and on one estate the decline has been 50 per cent.

Mr. Turner found depression severe in the arable portions of the Frome district, and less marked in relation to the cheese-farms, although holders of the latter suffered in 1892 and 1893. Rents he found had been generally reduced by 25 to 40 per cent. In the district of Stratford-on-Avon the same Assistant Commissioner found the state of agriculture much worse than in his first district, rents having fallen 25 to 60 per cent., while changes of tenancy had been exceedingly numerous, and many farms were in the hands of their owners. If Mr. Turner had collected as many details as some of his fellow Assistant Commissioners have given, the report on this district would probably have been a very distressing one.

A bad picture of the state of affairs in the sheep-breeding and corn-growing district of Andover, in Hampshire, presented by Dr. Fream, is all the more remarkable on account of the fact that sheep had not long ceased to be remunerative at the time of his visit. This is a significant point, because it indicates that it is not enough, in an arable district, for live-stock to pay fairly, as a rule, taking a long series of years, if there is a loss on corn-growing. Sheep had paid fairly up to 1891, and yet, in 1893, depression in the Andover district was as general as it was intense. Reductions of rent up to 60 per cent., with temporary remissions besides in some years, have been allowed, and in some cases land was let at only a trifle over the tithe which the landlord had to pay. Yet large tracts of land had fallen into the owners' hands, and a good deal had gone out of cultivation, being used as sheep-runs. No farm on which rent had not been reduced came under the notice of the Assistant Commissioner; but he heard of many cases in which the rents, though reduced greatly, had not been paid for years. In the Maidstone district of Kent, apart from the hop and fruit farms, Dr. Fream found the state of affairs about as bad as it was in Hampshire.

In the Isle of Axholm, once the paradise of peasant proprietors, Mr. Hunter Pringle declares that in 90 per cent. of the cases in which the small holdings were mortgaged from fifteen to twenty years ago the owners have been either ruined and sold up, or are struggling on in a hopeless condition at the mercy of the mortgagors. The owners of holdings, as a class, he further declares, are much worse off than the tenants, and this shows that those persons who suppose that agriculture can be saved by making labourers owners of small farms would do well to reconsider their conclusions. As to Mr. Pringle's harrowing description of the ruinous state of agriculture in the Ongar, Chelmsford, Maldon, and Braintree districts of Essex, it has been made so familiar to all readers of newspapers that detailed reference to it is hardly necessary. It includes statements to the effect that rents have been reduced by 25 to 80 per cent. generally, while some have been entirely extinguished, many farms having been offered rent-free to any tenants who will pay tithes and rates. Great tracts of land have been thrown on the landlords' hands, and to a large extent have gone out of cultivation. The number of farmers who have given up their holdings, most of them after having been ruined, is said to be very great.

Although Scotland has suffered less severely than England from the fall in the prices of corn, Mr. James Hope found that "depression of a very acute kind" had prevailed in the counties of Perth, Fife, Forfar, and Aberdeen during the ten years ending with 1893. In a number of farm balance-sheets examined by him the balance in almost all cases was on the wrong side, except for two years out of the ten, although rents had been reduced by 10 to 50 per cent., or by about 30 per cent. on the average.

Mr. Hope's reports conclude the first batch; but reports from many other counties in England and Scotland will probably be in the hands of the public before this article is published.

In addition to the reports of the Assistant Commissioners a bulky volume of evidence, taken by the Commissioners themselves, has been issued, containing striking accounts of depression on the estates of the Crown, the Duchies of Lancaster and Cornwall, the Ecclesiastical Commissioners, and Guy's Hospital in several counties, and by other witnesses from the counties of Nottingham, Leicester, Stafford, Lincoln, York, Devon, Cornwall, Bucks, Dorset, Oxford, Essex, Suffolk, Kent, Sussex, Cambs, Berks, Hunts, Northampton, Derby, Gloucester, Hants, Wilts, Somerset, Lancaster, Chester, Cumberland, and Northumberland. In the space available to me it is impossible to give even the most condensed analysis of this voluminous evidence; but it may be interesting to readers to see a tabulated account of the reductions of rent which were mentioned by witnesses as having taken place in the several counties or parts of them, as a rule, since 1879 or some subsequent year. It will be understood that most of these percentages are only the estimates of individual men, and that some of them relate to limited districts; but a few are the generalisations of Assistant Commissioners :—

REDUCTIONS OF RENT.

County	Reduction per cent.	County	Reduction per cent.
Northumberland	20 to 25 (average)	Hereford	20 to 30
Cumberland	30 to 40	Somerset	20 to 40
York	10 to 50	Oxford	25 to 50
Lancaster	5 to 30	Berks	90 (one estate)
Stafford	10 to 25	Suffolk	Up to 70
Leicester	40 (average)	Essex	25 to 100
Nottingham	14 to 50	Kent	15 to 100
Warwick	25 to 60	Sussex	$42\frac{1}{2}$ (one estate)
Northampton	50 (one estate)	Hants	25 to 100
Huntingdon	40 to 50 (average)	Wilts	10 to 75
Derby	14 to 25	Devon	10 to 25
Gloucester	50 (one estate)	Cornwall	10 to 100

The cases in which a reduction of 100 per cent. is given are those in which there is more or less land let rent free, the tenants paying the amount of the tithe to the landlords, as well as the rates to the collectors. In addition to the permanent reductions named above there have been temporary remissions in certain years pretty generally.

Since the preceding remarks were written some fresh reports from Assistant Commissioners have become available. Mr. R. H. Rew, writing of the Salisbury Plain district of Wiltshire, mentions reductions of rent as having been made on a number of estates ranging from 10 to 75 per cent., with temporary remissions extra in some cases. He found that a good deal of land had gone out of cultivation, and that changes of tenancy had been numerous, while the losses of farmers who have not been obliged to quit their holdings have been heavy as a rule. With any further fall in price, or a series of bad seasons, he says he cannot see how it is possible for the greater part of the land in the Salisbury Plain district to be farmed even in the most economical fashion. There are thousands of acres just on the margin of cultivation, he adds, and a very slight further pressure would lead to their being turned into sheep-runs of "prairie value," as much of the hill land has been turned already.

In his general remarks on the condition of agriculture in the counties of Ayr, Wigtown, Kirkcudbright, and Dumfries Mr. John Speir, who visited those counties as Assistant Commissioner, found depression to a greater or less extent, landlords and tenants alike having felt the pinch of hard times. The value of land has fallen in each county, but there are no farms in the landlords' hands. The majority of the farmers are barely making ends meet, and many are living on past savings or their capital. Reductions of rent ranging from 4 to 27 per cent. are mentioned.

Scattered through the voluminous minutes of evidence taken by the Welsh Land Commission are many statements indicative of more or less severe agricultural depression; but the absence of marginal notes renders it extremely laborious to find them amongst the mass of details relating to land tenure, ancient history, and all kinds of other subjects, many entirely irrelevant to the real objects of the inquiry.

France.

In the course of a speech delivered in October the French Minister of Agriculture dwelt upon the severity of the agricultural crisis in France, although, as he put it, the rigour of the struggle to make farming pay had been alleviated to some extent by the increased duties imposed on imports. He pointed out the necessity, however, of further changes of a fiscal or administrative character to enable the cultivators of the soil to meet the serious difficulties of the times. According to Dr. Ménadier, President of the General Syndicate of Agricultural Societies in the Charente-Inférieure, wheat-growing does not pay, even with a duty of 12*s.* 3*d.* a quarter, as American wheat was selling in October at about 31*s.* 3*d.* a quarter, including the duty. Several of the French agricultural societies have recently complained that meat, as well as corn, has become too cheap to pay fairly for its production.

In his report to the Labour Commission on France Mr. Geoffrey Drage gives statistics showing the alarming extent of migration from the rural districts to the towns, the decrease of the rural population in some departments, for the latest period of five years given, ranging up to 27 per cent., with equally high or higher reductions for two earlier periods of five years each. In only twelve out of eighty-seven departments was there an increase in the latest period. In the year 1891 the total population (including that of the towns) decreased in fifty-three departments, and the *Chronique Agricole*, when publishing the figures early in 1893, stated that the agricultural crisis was undoubtedly one cause of the decrease. It is said that in the eight years ending with 1887 nearly half the arable land belonging to individual proprietors changed hands. The burdens on land and market dues are bitterly complained of by the farmers and small cultivators.

I have seen statements in various quarters to the effect that the value of land in France has fallen enormously in recent years; but the latest complete agricultural statistics of France, which are published only decennially, afford precise information upon this point for no later year than 1882, the statistics for 1892 being not yet available. Consular reports at various times have referred in general terms to the depression existing among the agriculturists of different parts of France, reductions of rent, and difficulty of obtaining payment of rent. Accounts of the state of agriculture in the French colony of Algeria, again, are far from satisfactory.

Spain and Portugal.

Almost every Consular report from Spain for years past has described depression in the agricultural districts of that country as very severe. Mr. Drage, in his report on Spain to the Labour Commission, refers to the gradual depopulation of many villages as evidence of general depression, and says that in Andalusia "the condition of the agricultural classes is specially wretched," owing to the exactions of local officials and money-lenders. The new tariff, framed in 1892, imposed extremely high duties on agricultural products; but the fall in grain has exceeded the highest tariff in the world. Although farming is much better done in Portugal than in Spain, and the farmers in some parts of the country are comparatively prosperous, as times go, there was an agricultural crisis in the country some years back, which led the Government to pass a new law in 1889 requiring millers to use twice as much native as imported wheat. The duty on wheat is a very high one, and other farm products are protected; yet depression is referred to as a familiar fact in reports to the Foreign Office.

Italy and Switzerland.

Probably no country in the world has suffered more from agricultural depression than Italy, where the taxation which falls upon the land is crushing. An immense amount of evidence upon this subject is available, but cannot be even summarised in this article. Much of it is given in Mr. Drage's report on Italy to the Labour Commission, one statement being that while the net agricultural income of the country is about 1,000,000,000 lire, the Government land tax and the provincial and commercial surtaxes on land amount to 239,000,000 lire, and in addition there are the income, cattle, and indirect taxes. In February last the duty on wheat was raised to 12*s.* 2*d.* a quarter, and yet the price of the best wheat in March was only 34*s.* 8*d.*, and by June it had fallen to 31*s.* 9*d.*, or less than it had been shortly before the advance of 40 per cent. in the duty. At a great agrarian congress held in Rome in April a resolution was passed declaring that wheat was grown at a dead loss when it sold at less than 25 lire per quintal, or 43*s.* 5*d.* a quarter. A further increase of 3*s.* 6*d.* per quarter in the duty was demanded. The fall in prices has swamped the high duties on agricultural imports generally; and, although much has been done for the improvement of agriculture by education, improved means of transport, co-operation, agricultural credit banks, and the improvement of live stock, the condition of the rural population is still miserably low, and emigration goes on extensively.

Perhaps Switzerland has suffered least from agricultural depression among the countries of Southern or Western Europe; but it has not escaped entirely. For some years before 1881 the condition of the agricultural class had attracted much attention, and excited uneasiness, emigration from the rural districts having rapidly increased, while the indebtedness of the peasant proprietors became serious. But a great deal has been done by the Cantonal Governments, Col. de Wattenwyl, and others in promoting the improvement of cattle-breeding and the dairy industry, while the extension of co-operation and the establishment of loan banks have greatly helped the small farmers. Depending largely upon her dairy industry, which is admirably managed by co-operating farmers, and helped by a good sale for milk, butter, cheese, and all the minor products of the land, for which there is an extensive demand for the numerous foreigners who visit the country, Switzerland is bearing the trial of the bad times with comparative impunity.

Germany.

The agrarian movement in Germany is familiar to all readers of newspapers, and it is evidence of wide discontent with the condition of agriculture in that country. High as the duties on grain are, prices have fallen to a serious extent, and a great deal of land has been laid down in grass, partly for that reason and partly from the difficulty of getting labour. For many years past migration from the rural districts to the towns and, still more, emigration have been on an extensive scale. In the ten years ending with 1890 over 1,342,000 people emigrated from Germany, and the exodus has been going on briskly since. The emigration is largely that of the agricultural population, who leave the country partly because they are dissatisfied with their wages as labourers, or cannot make their small holdings pay, and partly in order to escape military service. Thus, between the emigration and migration on the one hand, and the demands of the army on the other, farmers in many parts of Germany are sadly at a loss for workmen, and as they cannot afford to pay wages high enough to induce their fellow countrymen to stay with them, they depend more and more upon the services of Russians, Poles, and Austrians, who migrate to the eastern portions of the empire especially. Mr. Drage in his report on Germany says that "of late a large number of small German proprietors have found themselves forced by the continual depression of prices to give up their holdings and to emigrate." In some parts of the empire the plots of land on which families used to subsist are now too small to support them. In these congested districts migration and emigration are necessary as a relief to a population too large to be supported upon the meagre returns obtained from the land. Great benefit has resulted from the multiplication of agricultural credit banks, which have saved thousands of the peasant-farmers from the ruinous clutches of usurers; but still large and small cultivators alike are suffering severely from the fall in prices.

Holland, Belgium, and Scandinavia.

A Consular report written as long ago as 1888 stated that the profits derived from agriculture in the Netherlands during the preceding five years had been small, and that rents had been reduced by 30 per cent., if not more, while the value of land had fallen very considerably, and many farmers and small landowners had been obliged to abandon the struggle to make farming pay, and to emigrate. In a Foreign Office report written by Sir Horace Rumbold in October 1892, the recommendations of a Special Commission appointed to consider questions of land tenure and taxation were summarised. This Commission was the outcome of a General Agricultural Commission appointed in 1886, owing to the prevalence of depression. The Special Commission reported in 1892 in favour of the reduction or abolition of dues payable on transfers of land; the extension of the *Beklemrecht*, or renewable lease at a fixed rent, common in Groningen, to the country generally; increased facilities to farmers for obtaining credit, a State mortgage bank being suggested for one thing; and a few slight changes in the land-tenancy system.

In Belgium a Labour Commission was appointed in 1886 in consequence of the crisis in agricultural and other industries. According to Mr. Drage, the evidence showed that the crisis pressed more severely upon the farmers than upon their workmen. Still a large number of men could not obtain work in the rural districts, and were obliged to migrate to the towns. The principal causes of agricultural depression mentioned were the "bad times" affecting all industries, and free imports of live-stock, corn, and other products, while Belgian exports were taxed heavily. Recent Consular reports do not give information upon the subject; but the imports of grain have greatly increased, and the state of agriculture must be worse than it was in 1886 in consequence of the fall in prices that has taken place since that year.

Apart from those engaged in co-operative dairying, Mr. Drage reports, agriculturists of every class in Denmark are feeling the results of long-continued depression. Even this exception is a doubtful one at the present time, as the Danish butter-makers are now feeling seriously the rapidly extending competition of Australia and New Zealand in British markets. Some months ago a sum of money was voted by the Danish Government for opening up a butter trade in Paris, on account of the unsatisfactory prices current in England and the probability of further reduction. But the co-operative system of the Danish dairy-farmers, extended as it is to disposal of their produce in this country, enables them to reap a profit where makers who operate chiefly to the advantage of middlemen would fail. They are also helped greatly by the remarkably successful operation of their Margarine Act, passed in 1891, which is the best in the world; and in everything that can conduce to the advantage of agriculture the Danish Government has long shown an enlightened interest.

Sweden has probably suffered less from agricultural depression than most countries. About half of her four million acres of corn consists of oats, which, until this year, had fallen less in value than other cereals, while the area under wheat is only about 170,000 acres. The great advance in her dairy export trade, too, of which so much has been written, has helped to counteract the fall in the prices of grain. Like Denmark, however, Sweden felt the fall in the price of butter during last winter, occasioned by the great imports of that article from Australasia.

In Norway, according to Mr. Drage's report on that country, the present condition of the peasant proprietors gives rise to the gravest apprehensions. In a debate in the Storthing last year it was stated that the cultivators of the soil were falling more and more deeply into debt, their mortgage indebtedness having risen from nine or ten million pounds sterling in 1865 to nearly twenty-eight millions in 1893, while their total indebtedness was estimated in the latter year at thirty-six to thirty-nine millions—an enormous sum in so poor a country as Norway. In reality, it was said, the real owners of the soil were the Bank of

Norway, the Land Mortgage Bank, the savings banks, and the traders in towns, although nearly all the small farmers are nominally proprietors of their holdings.

Austria-Hungary.

There is no doubt that agricultural depression has been felt severely in Austria-Hungary. The decay of peasant-proprietorship in Austria and the generally depressed condition of the agricultural population have exercised the minds of statesmen and economists for years past, and many changes in the law have been advocated. "One hears everywhere of the distress of the small farmer," writes Dr. Hainisch, a high authority; "seldom of his prosperity." Deriving his information largely from this authority, Mr. Drage in his report on Austria-Hungary says: "Where the small independent farmer is not actually driven from the land by the pressure of competition and the burden of land taxation, which is said to fall comparatively more heavily on the small than on the large landed proprietors, he is often obliged to sink into the position of a tenant, or to see his estate broken up into small holdings." An Austrian paper, quoted by Mr. Drage, states that "the very conditions of existence of the smaller land proprietors seem to be threatened." The condition of the farm labourers, too, is unsatisfactory, their wages being low and their diet poor. A very full and interesting account of the conditions of land tenure and the causes of depression is given in Mr. Drage's report.

In Hungary the state of affairs is no better, the condition of the peasant proprietors being especially distressing. "The different views," says Dr. Hirsch, alluding to that condition, "lead to but one conclusion, that it is as bad as possible; that the peasant holdings are loaded with debt, and are growing into an ever closer dependence on capitalists. The sinking of the peasant proprietors into the position of an agricultural proletariat, and the growing emigration as a necessary consequence of this situation grow clearer day by day."

Russia.

Volumes have been written upon the miserable condition of the agricultural population in Russia, and the only difficulty in presenting evidence upon the subject lies in the vastness of the records from which it has to be selected. In 1889 Colonel Waghorn, then of Taganrog, forwarded a report to the Foreign Office, which consisted mainly of a condensed translation of a series of remarkable articles which had appeared in a Russian agricultural paper. These articles consisted of comments upon the appointment of a Special Commission to inquire into the causes of the agricultural crisis, with suggestions as to the remedies. The general lowering of grain prices was given as the first cause of the distress, and others were the want of an organised means of transport of grain, the high rail rates charged, exorbitant interest on Government and private loans, loss of capital among agriculturists and their hopeless indebtedness, heavy taxation, and bad harvests. The terrible famine of 1891 completed the impoverishment of millions of the occupiers of land. Writing in 1892, and referring mainly to the most fertile districts of Russia, the black soil region which formerly produced about 60 per cent. of the grain grown in the Empire, Mr. Howard, British representative at St. Petersburg, referred to the widespread distress, the steady deterioration of the soil, the exhaustion of the peasants' resources, and the crushing burden of taxation. Cattle rearing, he said, was being given up, and grass land was ploughed on the chance of a quick gain of money from a prolific harvest. This interesting report is full of information as to the sad state of the great bulk of the population and the impoverished condition of the large proprietors.

Later reports, written in the autumn of 1893 by acting Consul-General Woodhouse and Vice-Consuls Murray and Smith, from Odessa, Sebastopol, and Kief, refer to difficulties arising from the fall in prices, in spite of the great harvest of that year, and the last of the writers named gives an account showing a heavy loss on wheat growing on a large farm situated in a district where the harvest was not a good one. Again, Consul Talbot, of Taganrog, writing in April last, states that the harvest of 1893, though over the average, was not a lucrative one; and Vice-Consularr eports from different parts of his district state that the agriculturists were heavily in debt and behindhand with their taxes, and refer to the continued depression which had induced the Government to grant advances on grain to enable farmers to hold it. Similarly in Poland, according to Consul-General Grant, the great harvest of 1893 yielded no profit to the growers, the price of wheat being below the cost of production. "Were it not for the beetroot and potato crops," this writer says, "remunerative because they feed the sugar and spirit industries, the landed interest would be completely ruined."

The new Czar has recognised the deplorable condition of agriculturists of all classes by granting measures of relief from taxation and reduced interest on State loans.

The United States.

On previous occasions I have given a great quantity of evidence from American sources, official and otherwise, to show the severity of agricultural depression which has existed for many years in the United States. Some of it was summarised in the article which appeared in the Journal three years ago, mentioned already. In that article I pointed out that, even if no other evidence of the unremunerativeness of wheat-growing were available, the fact that in the ten years ending with 1890 the wheat area of the country had diminished, while the population had increased by 12½ millions, was sufficient proof. In the first part of the present article I have shown that there has been a further decrease in the wheat area since 1890 of more than 2,750,000 acres, in spite of a further increase of between five and six millions in the population. We think a great deal of the increase of grass land in this country as a proof of agricultural depression, and it certainly is so. But if the pasture of the United Kingdom has increased by about 2,500,000 acres since 1880, the hay crop alone in the United States has expanded to the extent of about 24,000,000 acres during the same period. In 1880 there were 25,863,955 acres devoted to the hay crop, and in 1893 the area had grown to 49,613,469 acres, while it is doubtless greater in 1894.

Although the last four wheat crops have been good ones, the crop of 1891 alone realised a price high enough to give a remunerative return per acre. Taking the commercial estimates of produce as bigger than the official reckonings, the yield per acre comes out at barely 17 bushels an acre for 1891, and 14·3, 13, and 14 bushels per acre for the three succeeding crops in the order given. At the official December farm price, returned annually by the Department of Agriculture, these yields come out at about fourteen, nine, seven, and probably a little over six dollars per acre. The price was comparatively high in 1891, and the yield quite extraordinary, so that it afforded a profit; but $9, or 37*s.* 6*d.*, for 1892 is not enough to pay the average American farmer, and of course 29*s.* 2*d.* for 1893 and about 25*s.* for 1894 are ruinous returns, or would be if long continued. It is not enough to show, even if it can be proved, that wheat can be grown at very low prices in certain limited tracts of country, or even in one whole State. Supposing that to be a fact, it would not disprove the existence of severe depression in the rest of the country, nor would it show that the American wheat supply could be kept up at the price. Early in the present year the U.S. Department of Agriculture obtained estimates of the cost of wheat-growing from 25,000 farmers, and the general average for the whole country was $11.69 an acre, or 48*s.* 8*d.* According to this reckoning there was a mean gain of nearly 10*s.* an acre in 1891, and mean losses of 11*s.* 2*d.*, 19*s.* 6*d.*, and about 23*s.* 8*d.* per acre occurred in the three following years. Where straw was sold there may have been little if any loss; but throughout all but a very small proportion of the acreage the straw is not sold, and on probably more than half the land it is not even made into manure, but is burnt, except the very long stubble left in some parts of the country, which is ploughed in. Unless sold, used as chaff, or made into manure charged to the next crop, the straw cannot be counted as bringing any return. The smallest estimate per acre for any State is $7.48 for North Dakota, or 31*s.* 2*d.*, the opposite extreme being $28.81 for Massachusetts. Apart from the question of the mere cost of wheat-growing, moreover, it is to be borne in mind that the American farmer, who is usually a small holder, must be considered depressed unless he gets a profit of 1*l.* an acre on his wheat crop, and as severely depressed if he gets less than 10*s.* profit. According to the Census, the average size of a farm in the United States, not including holdings under three acres, is only 136½ acres, and that of the improved portion (ploughed at least once) is no more than 78⅓ acres. Seeing that it is only the improved land which yields any appreciable return, it is obvious that a profit of 10*s.* an acre would be less than a labourer's earnings. Such returns as have been obtained since 1891 are ruinous, and must bring the American farmer to ruin if they are long repeated, supposing that he persists in growing wheat. But, with such returns, his wheat area will become "small by degrees and beautifully less." It will not need to become much less, however, before its contraction will inevitably raise the price.

Depression in the American cattle industry has long been notorious, and needs no demonstration. As for sheep, they never have been generally profitable, partly because they have been badly managed as a rule. Of late, too, there has been much complaint as to the prices obtained for horses. Pigs, on the other hand, have paid well during the last two or three years, on account of their scarcity and the extreme cheapness of grain.

Whenever the price of meat has been lower than usual in this country, accounts of heavy losses incurred by shippers of cattle and beef from the United States have appeared in American papers, in spite of the fact that cattle have sold in the country so badly in recent years that breeders and feeders have complained of their business being unremunerative. With respect to sheep, a statement published last August by a well-informed correspondent of the Albany *Country Gentleman* is to the effect that producers were getting only 2 cents a pound (live weight, no doubt) for mutton and 12 cents for unwashed wool, prices regarded as ruinous, and leading many flockmasters, it is said, to reduce the number of sheep, or to give up keeping them entirely. As in this country, the dairy industry in the United States is least depressed of all branches of farming; but in recent years that country has been falling behind in her exports of cheese, in consequence of the competition of Canada and other British colonies.

Any number of individual complaints of agricultural depression in the United States might be quoted; but it is necessary to conclude this division of my subject with a few statements derived from the Report of the Senate Committee on Agricultural Depression, appointed in April, 1892, the report having been issued last February. In the first place, some statistics of land values, as assessed for taxation, may be noticed. They are irregular in form for different States, and are for different series of years, while in some cases the values of improved and unimproved land are separately given, and in others the two classes are lumped together. In Illinois, it is stated, the average value of improved land fell from $20.81 per acre in 1874 to $11.18 in 1892; in Minnesota, from $8.08 in 1878 to $7.88 in 1892; in Nebraska, from $4.60 in 1885 to $3.72 in 1892; in Kansas a fall of about 15 per cent. since 1884 is recorded; in Pennsylvania, 25 to 30 per cent. depreciation in the last twenty years; in New York, over 33 per cent. within a few years; in New England, 30 per cent. since 1875. In Missouri alone among the States noticed has there been a rise since 1884. A complete account for all States could not be given when the Committee reported, the details of the Census not being available. The farm value of cattle, excepting milch cows, in the United States as a whole, is shown to have fallen from $23.52 each in 1884 to $15.24 in 1892; that of milch cows, from $31.37 to $21.75; and that of horses, from $74.64 to $61.22; while that of sheep advanced from $2.37 to $2.66, and that of pigs from $5.57 to $6.41. Figures for groups of years show declines in oxen, cows, horses, and pigs alike between 1868–72 and 1888–92, and no appreciable change in the value of sheep.

It is not necessary to quote from tables showing the great decline in the value of wheat, further than to state that, while the farm value of the crop per acre ranged from $10.86 to $15.27 during the ten years ending with 1880, it has only twice been as high as \$10 since 1883, but has been only a little over or a good deal under \$8 in seven of the ten years ending with 1893. By means of a table comparing the prices of groups of articles for a number of years, the Committee show that, whereas the fall in prices generally since 1883 had been about 10 per cent. up to 1893, the average fall in farm produce by itself was three times as great. Estimates of the cost of wheat-growing in several States quoted in the report are greatly in excess of returns in recent years. Among the causes of depression the Committee mention the competition of foreign countries and of "bonanza" farms in certain American States, the effect of the option system in lowering prices, the disproportionate taxation of land, the action of "rings" and "combines" of traders who deal in agricultural produce, the heavy indebtedness of American farmers and the high interest they have to pay, and excessive transport charges.

The Argentine Republic.

Although a high gold premium has enabled producers of wheat and meat in Argentina to increase their exports greatly, it must not be supposed that they have escaped depression altogether. There is but little evidence as to the condition of the great stockbreeders; but that they must have felt the very low prices of wool and frozen mutton in recent years needs no proof. In all probability, however, they have paid their way at the worst of times, and since the gold premium became enormous, it may have covered the fall in prices. They are liable, however, to terrible losses among their flocks and herds, and they have suffered severely in some recent years.

With respect to wheat production, the best Argentine authorities state that growers who are not too far from the seaboard or a railway can grow wheat with profit to sell in England at 20*s*. a quarter. Apparently they get the equivalent of 13*s*. to 14*s*. a quarter at the nearest station when the English price is 20*s*.; and, when the gold premium is over 200 per cent., that equivalent in paper money is more than three times 13*s*. to 14*s*. Seeing that their paper dollars go as far as ever in the purchase or rent of land, and nearly as far as ever in the payment of labour, they might be supposed to do well. But one authority states that it is only farmers who own the land they cultivate who can make a profit on wheat sold at 20*s*. a quarter in England, while the Buenos Ayres *Standard* of September 20 says it is only farmers in Santa Fé and parts of other provinces within a moderate distance of a port who can do it. There are, however, vast tracts of land within the limits thus prescribed. Besides, it was not until the autumn of the present year that any such low price as 20*s.* a quarter in England had to be accepted. Previous to the present year the great and rapid expansion of the wheat area proved that wheat-growing, with the help of the gold premium, paid satisfactorily. Therefore such agricultural depression as exists in Argentina may be regarded as of recent origin, and probably not destined to last long, provided that currency advantages continue. The worst that can be said of the comparative prosperity of farmers in that country is that it rests upon an insecure foundation.

British Colonies and India.

As the space at my disposal is nearly exhausted, only a few lines can be devoted to the Colonies. That severe depression has existed in Canada for many years is attested by complaints of it which have constantly appeared in Canadian papers—by the fall in the value of farm land and in the prices of its produce, and recently by the decrease in the wheat area. In 1891 there were 2,277,254 acres under wheat in Ontario and Manitoba, and in 1894 only 2,039,194 acres. The area has been declining in Ontario for many years, and it is only the settlement of new land in Manitoba and the North-West that has kept up the acreage for the Dominion as a whole. But this year the area in Manitoba was only 6,546 acres more than in 1893, and that of Ontario was much less; so that, together, the two provinces grew only 2,039,194 acres, against 2,274,315 acres in 1893. A report from Winnipeg in January last stated that great distress prevailed among the farmers of Manitoba, and that appeals were being made in many quarters for assistance. The President of the Patrons of Industry in his annual address said: "Never in our history have we experienced such a critical time. Men's hearts fail them, and many are in want."

In Australia and New Zealand alike it is admitted that wheat-growing at recent prices has not paid. The acreage of 1892–93 for all Australasia, including Tasmania, was 3,822,950 acres, as compared with 3,870,346 acres for 1889–90. In South Australia, the recent Census shows that the agricultural population had decreased in the ten years ending with 1891, the number of males employed in agricultural pursuits having fallen off by 1,140—an unanswerable proof of depression. The value of agricultural land has fallen in Australia generally, and in New Zealand also. A manifesto issued by the Landowners' Defence League of New South Wales in April last stated that throughout the colony "the last five years have been years of disaster to all public companies, private farms, and private individuals who were interested in land"; that "in both town and country many men who five years ago were accounted wealthy because of the land they owned are to-day absolutely penniless"; that "many land companies in which the savings of multitudes were invested have been swept out of existence"; while "from the north, the west, and the south of the colony has come one simultaneous cry of distress from the great pastoral industry." Yet New South Wales has a higher wheat yield than any other colony in Australia, and used to be regarded as more prosperous than any other. Depression is worse in South Australia, and probably at least as bad in Victoria. The latter colony has made a great spurt in butter exportation, aided by a bounty on every pound sold in Europe, rising in proportion to price; but now that the bounty has been withdrawn, farmers are being called upon to accept $2\frac{3}{4}d.$ a gallon for their milk, and at such terms the dairy export business cannot be of much advantage to them. When it started the price was $4d.$ to $5d.$ a gallon, and the reduction to $2\frac{1}{2}d.$ in some cases and $2\frac{3}{4}d.$ in others (in one case at least a factory pays $2\frac{5}{8}d.$) is quite enough depression for the dairy interest. In New Zealand, too, the price paid is now commonly $2\frac{3}{4}d.$ a gallon, as the butter-factory companies have lost money in recent years. The failure of the wheat-growing industry has driven farmers in Australia and New Zealand alike into increased efforts to export dairy produce and meat; but the refrigerating meat companies have lost heavily of late. In Victoria a proposal has been made to put a tax of $2s.$ a hundred on all sheep, in order to produce an endowment fund for the export meat trade, the argument for it being that, at present, flockmasters who do not export mutton benefit by the improvement in the colonial markets caused by the exports, while the men who ship the meat sometimes lose by their enterprise. Thus, without bounties, it appears that neither butter nor meat pays to export from Victoria.

South African prosperity depends on gold and diamonds rather than upon agriculture, which has never made much progress there, and is of so little importance that it is rarely mentioned in news from that quarter of the world. The quantities of corn grown even in Cape Colony, after a long period of settlement, are insignificant. Only 3,100,000 bushels of wheat were produced in 1893–94, and much less barley and oats; while cattle, sheep, and goats were all fewer than they were in the preceding year. This looks like evidence of depression.

Of the condition of the cultivators of the soil of India there is no recent evidence. It has always been too low to be depressed much. The decline in wheat exports in recent years, in spite of the growth of good crops, however, proves that the price in Europe has been too low to enable shippers to satisfy the growers. Presumably the latter have eaten the wheat, after storing it in pits in the vain hope of a better price. It is believed that they have a great deal stored up at present. The currency advantage of India mainly created the export wheat trade, and kept it up for many years; but of late the price in Europe has fallen too much to be covered by the virtual bounty on exports, which fell from 30,303,425 cwt. in 1891–92 to 14,973,453 cwt. in 1892–93, and were much smaller, judging from receipts in this country, in 1893–94.

"Chapter and verse" could be given for all these general statements relating to the Colonies and India, and it is only the lack of space which prevents the presentation of confirmatory evidence.

Conclusion.

The foregoing statements show that agricultural depression, varying in degree of intensity, has been felt recently in all the principal countries of the world, and in most of them for a number of years. Such general misfortune may be expected to create its own remedy sooner or later, but only, it is to be feared, by means of the ruin of millions engaged in the agricultural industry. It is for statesmen to devise, if possible, remedies which will involve less suffering than will be inevitable from the unaided operation of the barbarous law of the survival of the fittest as the outcome of a desperate struggle for existence. They have plenty of suggestions before them, but are too deeply occupied with party struggles to pay much heed to them, especially in our own country; for it is only fair to say that much has been done to alleviate agricultural distress in some of the Continental countries of Europe and in some of our colonies. Nothing effectual, however, has been done anywhere to arrest the fall in prices, which is the primary cause of depression in all branches of productive industry. On the contrary, much has been done to create and perpetuate the decline. While I have no doubt as to the principal remedies for the deplorable and world-wide catastrophe described with unavoidable inadequacy in this article, it is impossible to set them forth on the present occasion with the arguments essential to their recommendation; and as a bare programme would carry no conviction with it, this dismal article comes to an end without one.

William E. Bear.

Thorpe, Streatham, London, S.W.

THE TRIALS OF OIL ENGINES AT CAMBRIDGE.

It is now six years since there was first exhibited at a Country Meeting of the Royal Agricultural Society an oil engine which presented sufficient merit, especially as regards its adaptability to agricultural purposes, to warrant the award of one of the Silver Medals offered for new implements. A notice of this engine appeared in the Report on the Miscellaneous Implements exhibited at the Nottingham Meeting (Journal, Second Series, Vol. XXV., 1889, p. 94).

In the following year (1889) an engine, similar in principle, but of the portable type, was exhibited at the Windsor Show, and, upon trial, the improvements in the working of this engine, together with the modifications adapting it to the portable form, were judged sufficient to again merit the award of a Silver Medal.

In connexion with the Plymouth Meeting of 1890, it was arranged to offer special prizes for small motors not exceeding five brake horse-power, such as are used—more generally as fixed engines—for working dairies, or for chaff-cutting and similar operations. It was recognised that, for such purposes, the result already obtained by the petroleum engine had even then placed it in the position of a competitor with the steam engine, especially where the work to be done was of an intermittent nature.

It was consequently decided to divide the competition into two classes, the first for steam and hot-air engines, both of which would use coal or coke as fuel, and the second for engines using fuel other than coal: the latter class being instituted with the special view of providing a competitive trial, not only of the petroleum engine, but of such engines as manufactured their own gas, and worked as the ordinary gas engine of that date.

The entries justified the hope that a comparative trial might be made between the three types of engines referred to. When, however, the time arrived for trial, the solitary gas engine which had been entered for competition was withdrawn, and only two oil engines appeared. The relative performances of the latter are duly reported in the Journal (Third Series, Vol. I., 1890, p. 580), where it will be seen, from the results recorded by the winning engine, that there had been a very marked improvement in the efficiency obtainable as compared with the previous recorded performances—an improvement which fully merited the award offered.

Since 1890, at each Show of the Society, the petroleum engine has been forcing itself more prominently into notice, thereby proving that it had in effect passed the experimental stage, and was becoming an engine of commerce, for which there was a steadily increasing demand. In view of the large accession to the ranks of petroleum-engine makers, with varying types of engines which were being placed before the public, it was evident that the time had arrived when, in the interests of agriculturists, a competitive trial should be made of such engines. It was decided, therefore, to offer prizes to be awarded on the result of competitive trials at the Cambridge Meeting. Two classes were accordingly announced, one for fixed engines such as might be used for driving the machinery in a dairy, for chaff-cutting, for light grinding and for allied purposes, and one for portable engines capable of undertaking ordinary estate sawing and threshing.

As many as seventeen engines were entered in the fixed class and nine in the portable class, and of these only five had been withdrawn from competition up to within a few days of the trials. Consequently, preparations were made for the trials of no fewer than 21 engines, and it is to be regretted that retiring competitors did not send in their withdrawals earlier, and thus save the Society unnecessary expense.

The conditions of the competitions were drawn up specially with the view of avoiding what might be called a racing trial, the endeavour being to ascertain what engine would give the most economic results, not only in respect of oil consumption, but also as regards maintenance and facility of working, points which are fully dealt with in the following report. It may therefore be noted that the crucial full-power test was made after three days' previous working of the engine, without any intermediate cleaning out or adjustment. This condition was considered desirable, since it had been found, from previous trials, that freedom from fouling after prolonged running was not a virtue universally possessed by such engines. It is of great interest to note that none of the engines which went through their "full-load" trials revealed on subsequent examination the slightest trace of fouling, thus showing a most marked improvement in their more perfect combustion as compared with some of the earlier engines.

In order to facilitate comparison of the oil consumption of the engines in competition, it was decided that all should be tried with the same oil, and to carry the comparison further it was deemed advisable to use one of the oils which had been employed in already published trials. Of these, Russolene was selected, the right being conceded to the competitors to subsequently use a cheaper or heavier oil.

For the trial of the engines a large shed was erected in the only available space on the Show ground. The land was not, perhaps, such as might have been selected by choice, as, if there had been much rain, it would soon have become quite soft. In the case of all the fixed engines, the concrete foundations were made unusually large, and it fortunately happened that no inconvenience was suffered from rain.

Each engine was placed in a compartment or stall by itself, so that the attendant might not be interrupted or interfered with by anybody except the Judges.

Along the middle avenue of the trial-shed was laid a three-inch water main, from which branches were led into each compartment, where a water meter was fixed which recorded the amount of water consumed by each engine. The meters were lent by Messrs. Kent & Co., of Holborn, their readings were checked against a measured vessel, and their use very materially facilitated the record of the necessary observations. For the supply of oil, and in order to ensure uniformity of quality, two large tanks were provided in the shed, which were filled from one tank truck, and from these tanks the oil was weighed out to the exhibitors, Messrs. Avery and Messrs. Pooley having provided the necessary weighing machines for weighing both the oil fuel and the lubricating and lamp oils.

The Judges appointed by the Council for the trials of the engines were:—

Professor D. S. Capper, M.A., King's College, London.
Professor Ewing, M.A., F.R.S., Cambridge.
Mr. R. Neville Grenville, Butleigh, Glastonbury.

At the last moment Mr. Grenville was, through illness, unable to attend the trials, but at his suggestion Mr. J. B. Denison, of Balure, Bembridge, I.W., who for several years was identified with the building of high-speed launch engines, was appointed to take his place.

The descriptions of the several engines and the details of the trials are given at length in Professor Capper's report. In concluding these preliminary observations, attention may, however, be directed to the fact that though the conditions of the trials were not formulated with the object of attaining the lowest possible consumption of oil for any one engine, yet the results show that very satisfactory progress has been made in this direction as compared with the trials at Plymouth, where the winning engine had everything its own way. Not only has the oil consumption then recorded been lowered, but there were several engines which, throughout the Cambridge trials, kept very close to those which in the end gained the awards.

F. S. COURTNEY.

3 Whitehall Place, S.W.

Professor Capper's Report.

The first and second classes of Implements for which prizes were offered at the Cambridge Meeting were the following :—

CLASS I.—Fixed Oil Engines, of 4 to 8 brake horse-power. First Prize, 50*l.* Second Prize, 25*l.*

CLASS II.—Portable Oil Engines, of 9 to 16 brake horse-power. First Prize, 50*l.* Second Prize, 25*l.*

The conditions of trial were laid down thus :—

All the engines will be worked with the same sample of oil, which shall be one of the well-known brands—*e.g.*, Russolene oil—and, if considered desirable by the Judges, a further trial of the selected engines will be made with a cheaper oil selected by the exhibitor.

The adaptability cf each engine for general purposes on a farm will be considered, especially as regards simplicity of design, strength, durability, stability, and freedom from fouling.

The engines will have to run for three days—running at least ten hours per day on their declared brake-load—the petroleum and lubricating oil being weighed out. Each competitor will be allowed one attendant only in charge while the engine is running, such attendant to be under the direction of the Judges. At the end of the above run each engine will go—just as it stands—on to a full-load trial, during which indicator diagrams will be taken, brake-load recorded, and oil used weighed. This will be followed by a light and half-load trial under similar conditions.

The attention of the Judges and Engineers will be particularly directed to the following points:—

1. Simplicity, workmanship, and durability, combined with facilities for repairs.
2. Economy in getting to work and attendance.
3. Consumption of oil and circulating water.
4. Governing power and uniformity of speed.
5. Efficiency.
6. Cost;—and, in Class II. (portable engines) only, the following additional points:
7. Weight.
8. Facility of transport and stability.
9. Arrangement and capacity for carrying oil and circulating water.

In the first class thirteen and in the second class seven engines were entered ; but only the fifteen engines enumerated in the accompanying table actually competed.

Class I.—*Fixed Oil Engines, of* 4 *to* 8 *Brake Horse-Power.*

No. in Catalogue	Name and Address of Exhibitor	Description of Engine	Price as quoted in Catalogue
5729	Weyman & Hitchcock, Ltd., Guildford.	"Trusty"	£125.
5730	" "	Knight & Weyman's Patent	£140.
5759	Samuelson & Co., Ltd., Banbury.	Griffin's Patent	£167.
5763	Campbell Gas Engine Co., Ltd., Halifax.	"Campbell"	£110.
5780	Britannia Co., Colchester.	"Britannia"	£120.
5796	Tolch & Co., 146 Clerkenwell Road, E.C.	"Capitaine"	£118.
5800	Fielding & Platt, Gloucester.	—	£150.
5827	Crossley Bros., Ltd., Openshaw, Manchester.	—	£110.
5845	Wells Bros., Sandiacre, Nottingham.	"Premier"	£112.
5868	Clarke, Chapman & Co., Ltd., Gateshead-on-Tyne.	—	£150.
5972	R. Hornsby & Sons, Ltd., Grantham.	"Hornsby-Akroyd"	£160.

Class II.—*Portable Oil Engines, of* 9 *to* 16 *Brake Horse-Power.*

No. in Catalogue	Name and Address of Exhibitor	Description of Engine	Price as quoted in Catalogue
5764	Campbell Gas Engine Co., Ltd., Halifax.	"Campbell"	£180.
5828	Crossley Bros., Ltd., Openshaw, Manchester.	—	£200.
5869	Clarke, Chapman & Co., Ltd., Gateshead-on-Tyne.	—	£255.
5973	R. Hornsby & Sons, Ltd., Grantham.	"Hornsby-Akroyd"	£235.

Class I.—Fixed Engines.

The primary object of the trials was to determine how far oil engines could now be relied on as safe, efficient, and economical motors for farm purposes, where skilled mechanics are not available, and where liability to breakdown and the need for constant attendance are considerations of prohibitive importance.

It may be said at once that, although the Judges had no difficulty in deciding the order of merit from this standpoint, a much larger number of the competing engines satisfied these conditions than could have been expected.

Only one engine, that of Messrs. Samuelson, employs an air blast and separate sprayer for breaking up the oil. Messrs.

Hornsby's engine injects the oil into an unjacketed portion of the cylinder itself, where it is vaporised and ignited by the heat engendered by the previous explosion. All the other engines employ a separate vaporising chamber of some sort, into which the oil is pumped or flows by gravity, and from which, at the suction stroke, it passes as vapour into the cylinder, meeting there the additional supply of air required for its complete combustion.

It is somewhat remarkable that, with such varied methods of vaporisation, not one of the engines was found to be clogged or unduly fouled after the severe tests to which they were put. No tarry or sooty deposit was accumulated in any instance,

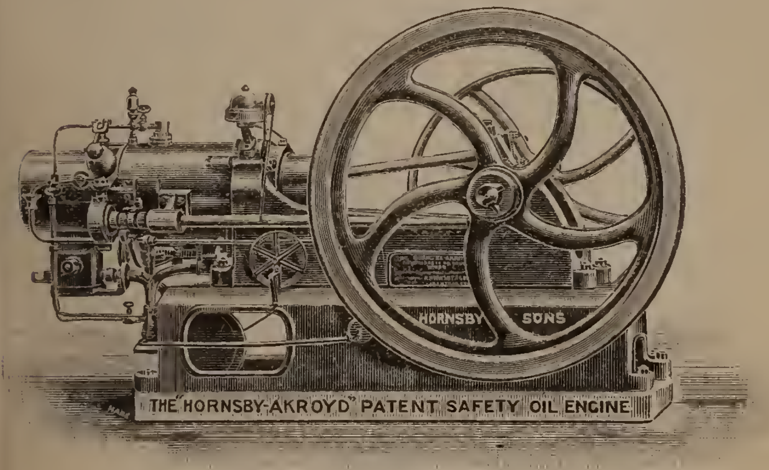


Fig. 1.—Hornsby's Fixed Oil Engine (First Prize).

and it may be fairly concluded that difficulties from this source are no longer to be feared in a well-designed oil engine. All the engines worked on the "Otto" or "Beau de Rochas" cycle.

General Description of the Engines.

Messrs. R. Hornsby & Sons, Ltd., Grantham.—In fig. 1 is given an external view, and in fig. 2 is shown a section through the cylinder and valve-box, of Messrs. Hornsby's engine (First Prize, 50*l*.). It is an 8 brake horse-power engine, costing 170*l*. complete. The vaporiser forms a prolongation of the cylinder of ⌓ shape, and is enclosed in a movable iron casing. The oil is injected into this chamber, with a little air, at the commencement of the suction stroke by an ordinary plunger pump having suction and delivery valves in duplicate for security against sticking. Neither ignition-tube nor lamp is required, as the explosion of the last stroke and heat of exhaust gases keep the vaporiser at the requisite temperature. At starting it is heated by an external duplicate cast-iron lamp, with hand blast, for about nine minutes. The governor acts upon the oil supply, intercepting some of it through a by-pass, when the speed is too high, and returning it to the tank. The oil-tank is in the bed-plate of the engine, but was replaced for the purposes of the trial by a temporary tank in which a measuring point gauge was inserted. The air and exhaust valves are driven by

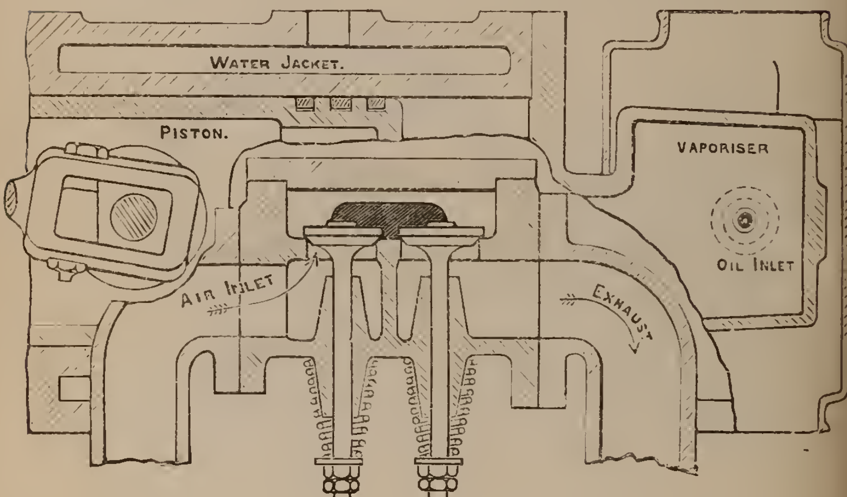


Fig. 2.—Section through cylinder and valves of the "Hornsby-Akroyd" Oil Engine.

cams on a lay shaft, and a water-jacketed back-pressure valve is provided between the valve-chamber and the vaporiser to prevent the possibility of pre-ignition at explosion. The amount of compression can be altered for oils of different specific gravity by inserting packing pieces in the connecting-rod end. The mean pressure and initial pressure of this engine are comparatively low, from which the makers claim the advantage that it reduces the leakage past the piston and diminishes the strain upon working parts. The size of engine for a given power is, however, proportionately large. For simplicity, neatness of design, workmanship, and general appearance this engine is admirable.

Messrs. Crossley Bros., Ltd., Openshaw, Manchester.—Messrs. Crossley's engine (Second Prize, 25*l.*) is very similar (fig. 3) to their "Otto" gas engine in general appearance and arrangement, and shows the same excellent workmanship. It is a 7½ brake horse-power engine costing 113*l.* A pump for injecting the oil into the vaporiser, a vaporiser, and vapour valve have been added; and the main air inlet, which is automatic, is placed above the exhaust valve.

There is an ignition tube heated by an external lamp which also heats the vaporiser. The oil for this lamp is supplied from a small reservoir by air pressure which requires recharging with air once or twice a day by a hand-pump provided for the purpose.

The governor is of the hit-and-miss rotary type, and, when the speed is too great, intercepts the link which opens the vapour valve and prevents its action. The vapour valve admits a new charge of oil to the vaporiser at the same time that it admits the vapour to the cylinder. There is thus always one charge in hand. The air valve opens by the suction of the piston, and the stream of air meets that of the vapour at right angles as it is drawn into the cylinder, and thus thoroughly mingles with it.

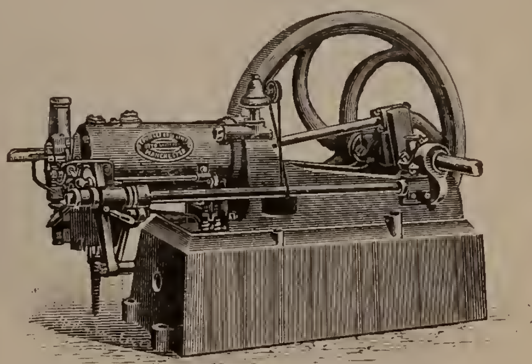


Fig. 3.—Crossley's Fixed Oil Engine (Second Prize).

Messrs. Wells Bros., Sandiacre, Nottingham.—Fig. 4 shows the valve and lever arrangement of Messrs. Wells Brothers' "Premier." There are original and ingenious points about this engine, and its extreme simplicity is admirable. It is a 4 nominal horse-power engine costing 117*l.*

There is but one rocking lever to actuate all the valves. It is driven by a cam on the lay shaft, in opposition to a powerful spiral spring. When running at normal speed the spring draws the lever home, closing the exhaust valve, and opening the vapour valve at the required moment. When running too fast, the horizontal catch, which has been lowered by the outward movement of the valve lever, has not time to rise clear under the weight of its inner end before the return of the vertical lever, which, therefore, is arrested, and no movement of the valves takes place. The exhaust valve is then kept open, and the vapour valve being closed an idle stroke occurs,

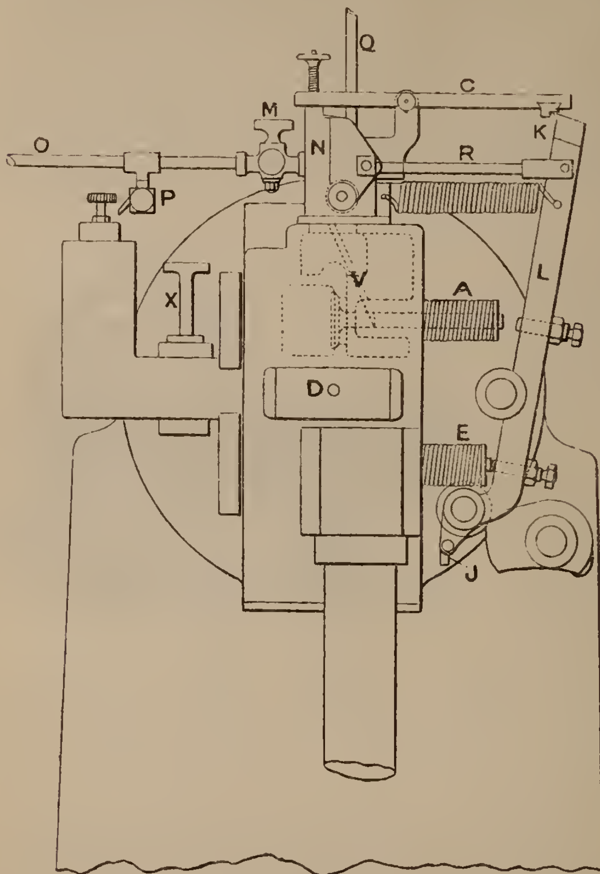


FIG. 4.—Arrangement of valves and levers in Wells Brothers' "Premier" Oil Engine.

A. Vapour valve.
C. Horizontal catch.
D. Vaporiser door.
E. Exhaust valve.
K. Trip.

L. Rocking lever.
M. Oil-supply cock.
N. ,, chamber.
O. ,, pipe.
P. ,, to lamp.

Q. Automatic explosion counter.
R. Link-working oil valve.
V. Vaporiser.

the oil valve at the same time emitting a charge from the vaporiser. The oil valve is a rotating taper plug driven by a link off the rocking lever. A cavity in this plug measures out a charge of oil at each vibration and drops it upon a heated diagonal plate, down which it runs and is vaporised. An adjustment is provided by which the quantity of oil at each charge can be regulated, and the valve-box is filled by gravity from a raised tank. This arrangement is secure against injury from dirt, as anything which is small enough to pass into the oil-plug would simply fall to the bottom of the vaporising chamber and there be retained. The lamp which heats the vaporiser is completely enclosed in a cast-iron combustion chamber, the blast being supplied by an air-pump.

This engine is substantially, even clumsily, constructed, of good material and workmanship, but would lose nothing by more refinement and outward finish of details.

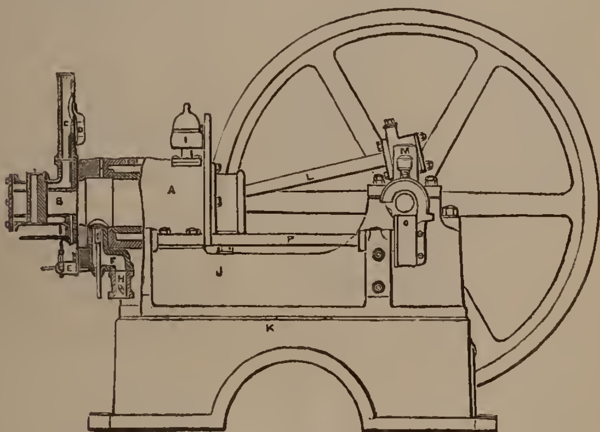


FIG. 5.—Section through cylinder and vaporiser of Weyman & Hitchcock's "Trusty" Oil Engine

A. Cylinder.
B. Combustion chamber.
C. Oil inlet.
D. Sight feed tube.
E. Pump.
F. Main air supply.
I. Lubricator.

The makers claim that little, if any, "gasification" takes place, as the vaporiser is water-jacketed, and so not overheated. This view is to some extent upheld by the fact that the cylinder works without lubrication, beyond that of the condensed oil vapour.

Messrs. Weyman & Hitchcock, Ltd., Guildford.—Messrs. Weyman & Hitchcock's engine, the "Trusty" (5 brake horse-power, 133*l*.), has a vaporiser which is heated by the explosion and exhaust products alone. But, unlike that of the Hornsby engine, it is a separate chamber within the combustion space. It is illustrated, in section, in fig. 5. At starting it requires to be heated by a temporary lamp, but the heat of explosion and exhaust subsequently maintains it at the required temperature.

Oil is pumped through a "sight feed tube" to the top of the vaporiser. It was originally fed by gravity, but this arrangement was discontinued from fear of accidental fire. The oil, with a small proportion of air, passes round the annular passage, is gradually vaporised as it falls to the bottom, rises through a series of holes into the central chamber, and passes down through the vapour valve into the cylinder, where it meets the additional air-supply required. The pumps and valves are all driven from a lay shaft, shown in fig. 6. A side lever, with a trip gear between it and the lay shaft, works the vapour valve, and an inertia governor upon the trip prevents contact when the speed is too great. There are adjustments upon the oil, vapour, and air valves for adapting to different oils; and the compression can be varied, as in the Hornsby engine, by packing pieces in the connecting-rod. The ignition tube is heated by an external lamp, across the flame of which a powerful blast of air is driven by an air-pump. The workmanship is good, but the design involves a considerable number of working parts, and the methods of adjustment are not quite as substantial as one would like for an engine which is to be placed in the hands of a farm-labourer. A pump to circulate the jacket water is provided, but was disconnected upon the trial, being replaced by gravity tanks.

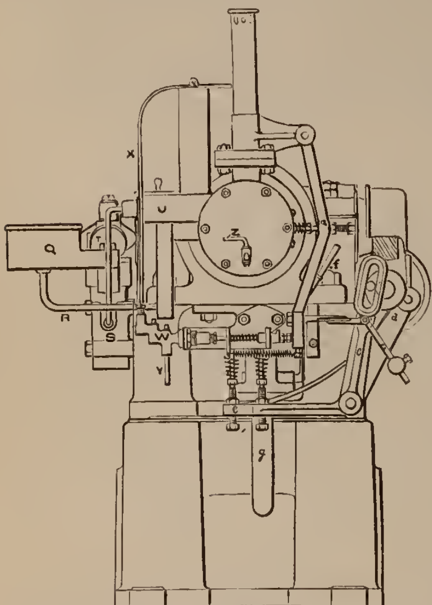


FIG. 6.—Arrangement of valves, levers, &c., in Weyman & Hitchcock's "Trusty" Oil Engine.

a. Side lever.
c. Governor.
d., *e.* Rocking levers working oil and air valves.
g. Air inlet pipe.
Q. Oil reservoir for lamp.
R. Oil supply pipe to lamp.
S. Air blast pipe.
T. Air-pump.
U. Lamp reservoir.
W. Oil pump.
X. " discharge.
Y. Oil supply pipe.
Z. Pet cock.

The second engine exhibited by this firm is of larger size (6 brake horse-power), and costs 149*l.* It is of precisely similar design, but has a Defries lamp in place of the air blast. It was withdrawn from trial after the three days' run.

Britannia Co., Colchester.—The Britannia Co.'s engine is of

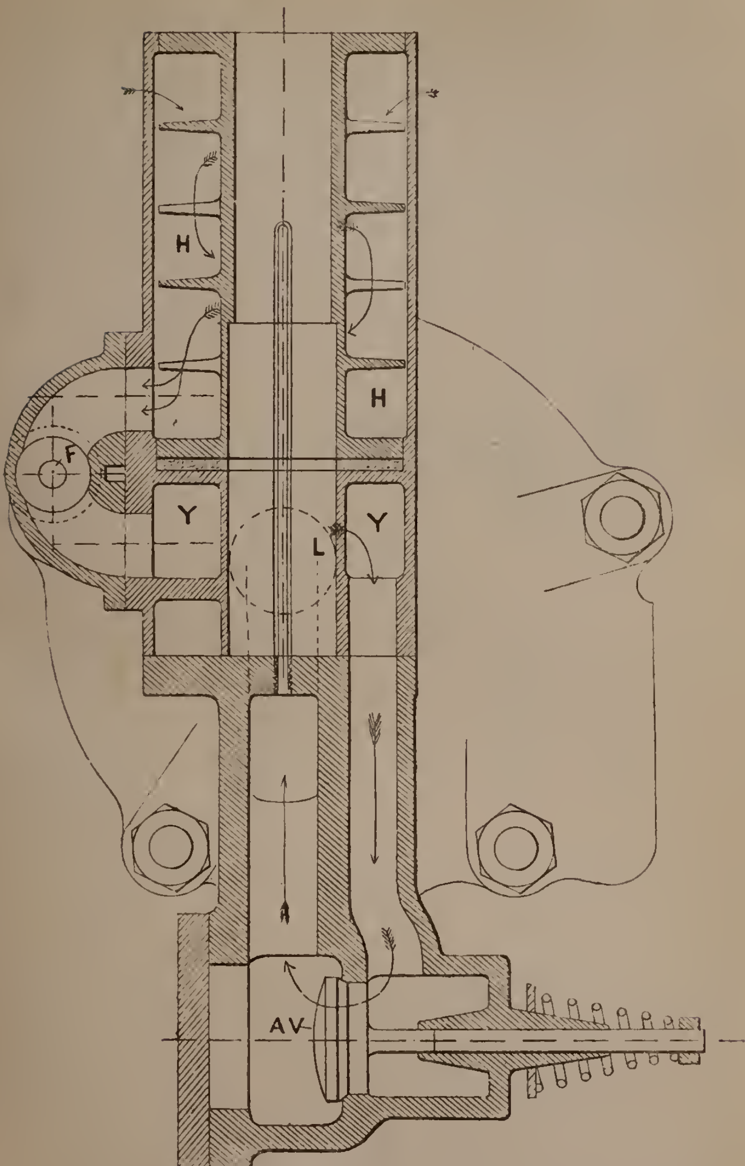


Fig. 7.—Section through the vaporiser of the "Britannia" Oil Engine. The arrows show the direction of flow of the air.

F. Spindle. Y. Vaporiser. A V. Air valve.
H. Spiral heater. L. Air inlet.

7 brake horse-power, and costs 120*l*. It embodies an application of Root's patent oil feed. A section of this is shown in fig. 7. A grooved spindle reciprocates in and out of an oil bath, past a port in the main air passage. The air, entering through a spiral heater, sucks the oil off the exposed grooves, and passing down through a prolongation of this heater, which forms the vaporiser, is admitted by the main air valve into the ignition passage. The governor, of the ordinary ball type, raises or lowers the end of a connecting-link, which drives the spindle upon a stepped

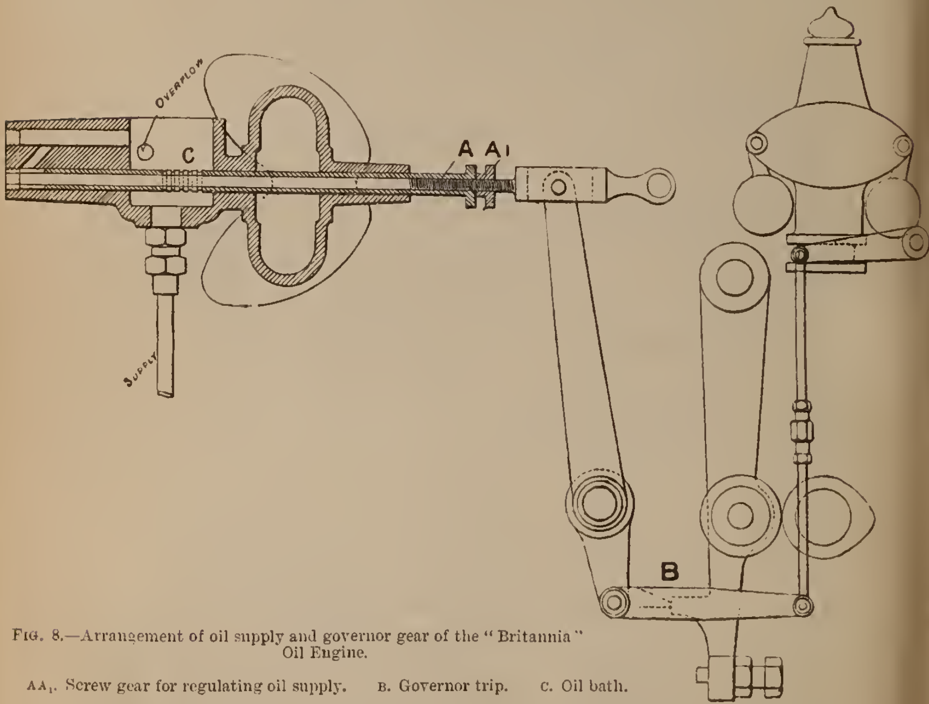


FIG. 8.—Arrangement of oil supply and governor gear of the "Britannia" Oil Engine.

AA$_1$. Screw gear for regulating oil supply. B. Governor trip. C. Oil bath.

distance piece, and so lengthens or shortens its stroke. This is shown in fig. 8. In this way the number of grooves which enter the oil bath and are filled is varied, and the richness of the vapour charge correspondingly modified. The vaporiser is heated by a central lamp, which also heats the ignition tube, and the lamp blast is supplied by a pump driven by the lay shaft. An oil-pump is also worked in the same manner for filling the oil bath from the main tank in the engine bed.

Three cams on the lay shaft are arranged to give no compression, half compression, and full compression, and a pin fitting into a worm on the shaft is made to automatically introduce the three cams in succession. The exhaust valve cannot therefore be left open after the first revolution has been made.

The workmanship and general arrangement of this engine are of a good and substantial character.

Campbell Gas Engine Co., Ltd., Halifax.—In the "Campbell" engine, which is of 6 nominal horse-power and costs 145*l.* complete, there are no oil-pumps, the feed being by gravity to both engine and lamp. In this respect it resembles the "Premier." The air inlet is automatic, and there are only two valves—the inlet and exhaust. The governor acts upon the latter, keeping it open when the speed is too great, and so

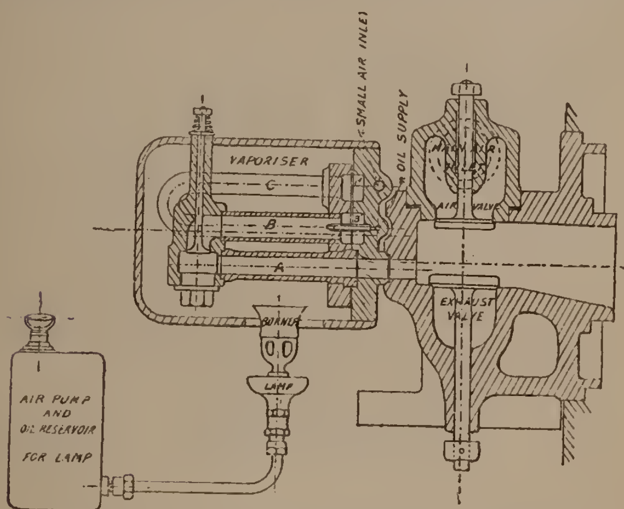


FIG. 9.—Section through vaporiser and valves of Fielding & Platt's Oil Engine.

A. Ignition-tube. B. Vaporiser tube. C. Air heating tube.

preventing the suction of the piston from opening the air valve. The air and oil meet each other at right angles, and are thus sprayed into the vaporiser, which is heated together with the ignition tube by an external lamp. There are few working parts, and little to get out of order. The workmanship is good, though the oil-tank arrangements of the trial engine were primitive and would form a source of danger.

Messrs. Fielding & Platt, Gloucester.—The engine of 8 brake horse-power exhibited by Messrs. Fielding & Platt costs 150*l.* complete. It has a tubular vaporiser connected with the ignition tube by a small valve.

Air is drawn through the heating tube C (fig. 9), and mingles with the oil jet in the chamber B′. It then passes on through the vaporising tube B and ignition tube A, and thence into the combustion chamber, where it meets the main air supply. On the compression stroke the valve between A and B is closed, and firing takes place in the usual manner. The ignition tube is kept free from all chance of fouling by the current passing through it, and the arrangement ensures very complete vaporisation of the oil. A lamp enclosed in an iron casing maintains the vaporiser and ignition tube at the proper temperature. The oil is injected by a small suction pump, and the lamp is supplied from a separate reservoir kept under air

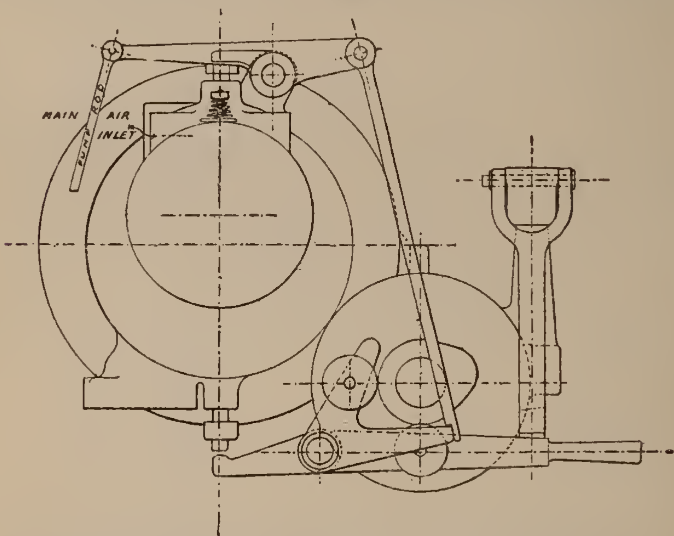


FIG. 10.—Elevation showing arrangement of valve levers and trip gear of Fielding & Platt's Oil Engine.

pressure by a hand-pump. There is an arrangement by which this pressure is maintained during working through a by-pass and valve, which open communication with the cylinder at the end of the exhaust stroke. The valves—air, vapour, and exhaust—are all driven (fig. 10) from one cam, and the governor, of the hit-and-miss type, cuts out explosions when the engine runs too fast, holding the exhaust valve open and the air and vapour valves closed.

The whole engine, with the exception perhaps of the main oil reservoir, which is flimsy and might prove dangerous, is very compact and simple, and of handsome appearance. The workmanship is also good.

On the trials the lamp burned very badly, and it was impossible to keep the vaporiser hot enough. The diagrams obtained were, consequently, late in ignition, and the oil consumption was considerably higher than that of the other engines. There is little doubt that this defect could be easily cured and that the engine is a good one, but it was withdrawn from trial after the half-power run. It ran very steadily during the three days' trial, and required little attention, starting readily with one attendant only after about twenty-two minutes' warming up.

Messrs. Tolch & Co., 146 Clerkenwell Road, London, E.C.—

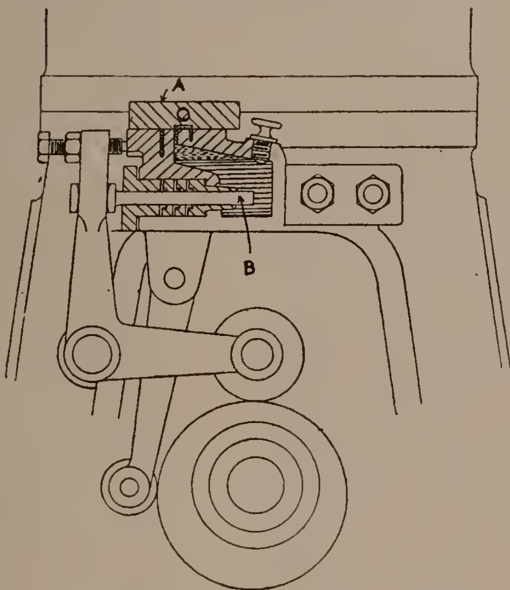


FIG. 11.—Glycerin pump of Tolch & Co.'s "Capitaine" Engine.
A. Slide valve. B. Pump plunger.

Messrs. Tolch & Co. entered a vertical engine on the "Capitaine" principle. It is of 5 brake horse-power and costs 118*l*. It does not use water-circulating tanks.

The distinguishing features are a small conical vaporiser encased in non-conducting material and placed within the explosion chamber, and a very ingenious oil distribution by a slide valve and glycerin pump (fig. 11).

At each alternate stroke of an ordinary plunger pump the slide valve opens communication to suction or discharge. The pump chamber is partially filled with glycerin, upon which the oil floats so that the supply is uniform and very easily regulated.

The vaporiser is shown at C in fig. 12. Oil is supplied from the pump through the pipe A to the centre of the large air valve B. A portion of the air enters with the oil into the centre of the vaporiser, while the greater portion passes outside a non-conducting casing D and through the combustion chamber, cooling the latter so as to prevent pre-ignition, and mingles with the mixed air and vapour as it enters the cylinder. On the return compression stroke the vapour ignites against the hot vaporiser. At the commencement of exhaust a small valve opens and discharges the hottest portion of the exhaust through the vaporiser, thus heating it afresh. This then closes, and a second, larger valve discharges the remainder through the combustion chamber.

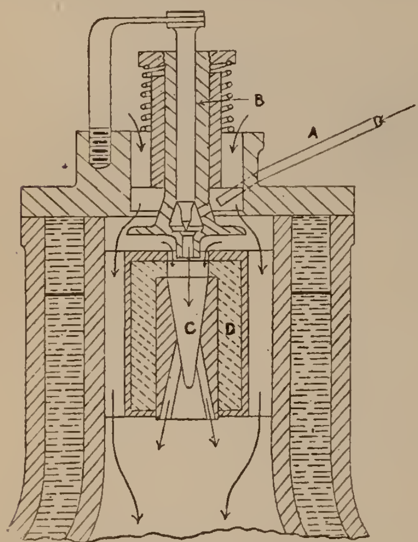


FIG. 12.—Section through vaporiser and combustion chamber of Tolch & Co.'s "Capitaine" Engine.

The air valve is opened automatically on the suction stroke. The inertia governor acts upon the exhaust valve, keeping it open, whereby the air valve fails to act and a charge is missed.

The engine is extremely compact and neat, and runs at 286 to 300 revolutions per minute, developing $4\frac{1}{2}$ brake horse-power.

At starting, the vaporiser is heated by a hand spirit-lamp for five to ten minutes, and starts away very easily.

The circulation through the water jacket is produced by a pump driven off the crank shaft. The oil ordinarily used in this engine is Tea Rose oil, and the adjustments not being suitable for Russolene oil, difficulty was experienced in keeping the vaporiser hot enough. The engine was therefore withdrawn at the end of the second day's run. Experience with the use of Russolene oil may be expected to overcome these difficulties, and the engine certainly deserves praise for its particularly quiet running and for the ingenuity as well as simplicity of its working parts. This is obtained partly at the expense of accessibility, and one would perhaps hesitate before placing it in the hands of a farm-labourer. But where a mechanic is available no difficulty is likely to be encountered on this account.

Messrs. Clarke, Chapman & Co., Ltd., Gateshead-on-Tyne.—Messrs. Clarke, Chapman & Co.'s engine (6 horse-power, 150*l.*) was the only competing engine in which electric ignition is used. The arrangements are illustrated in fig. 13, p. 714.

The air supply is, as in the last case, by an automatic inlet valve opened by the suction of the piston. A charge of petroleum mixed with a small volume of air enters at the back of this valve under a constant head, and passes on into the vaporiser through a throttle valve controlled by the governor. The vaporiser is heated by the exhaust, and discharges its contents through a rotating 4-chamber valve which acts both as vapour and exhaust valve. This is driven at a quarter of the speed of the engine by a lay shaft. The governor is of the flywheel type, and opens or closes the throttle valve so as to admit a larger or smaller charge of unvarying richness. The charge is exploded at the end of the compression stroke by an electric spark, from an induction coil excited by a bichromate battery. The battery is charged about every second day with $1\frac{1}{4}$ lb. of acid mixture in the form of a damp red paste. This costs 4*d.* a pound.

At starting, a small quantity of benzoline is used, which explodes at atmospheric temperature, and so starts the engine without the aid of an external lamp, and with exceptional quickness and ease.

The single valve can be removed and cleaned in a very few minutes, and the simplicity and compactness of the engine are remarkable. The use of benzoline and the electric ignition are objectionable for farm purposes, where the storage of supplies for a long period is often necessary, and would in this case be attended with a certain amount of risk.

The quantity of benzoline required is, however, so exceedingly small, and the ease with which it starts the engine so great, that its use is a distinct advantage under other circumstances.

The engine only ran for two days satisfactorily. On the third day, after a considerable amount of trouble had been experienced and the engine had stopped a number of times, it was finally withdrawn. On opening up, a leak was found in the vaporiser casting, which was sufficient to account for the stoppage.

There seems no reason to doubt that this engine can be made a successful and fairly economical one. Its consumption for the period for which it ran was high, and there were distinct signs of unburnt oil vapour issuing from the exhaust pipe. The speed was about 260 per minute, but varied a good deal. In fewness of working parts, silent running, and workmanship, the engine leaves little to be desired.

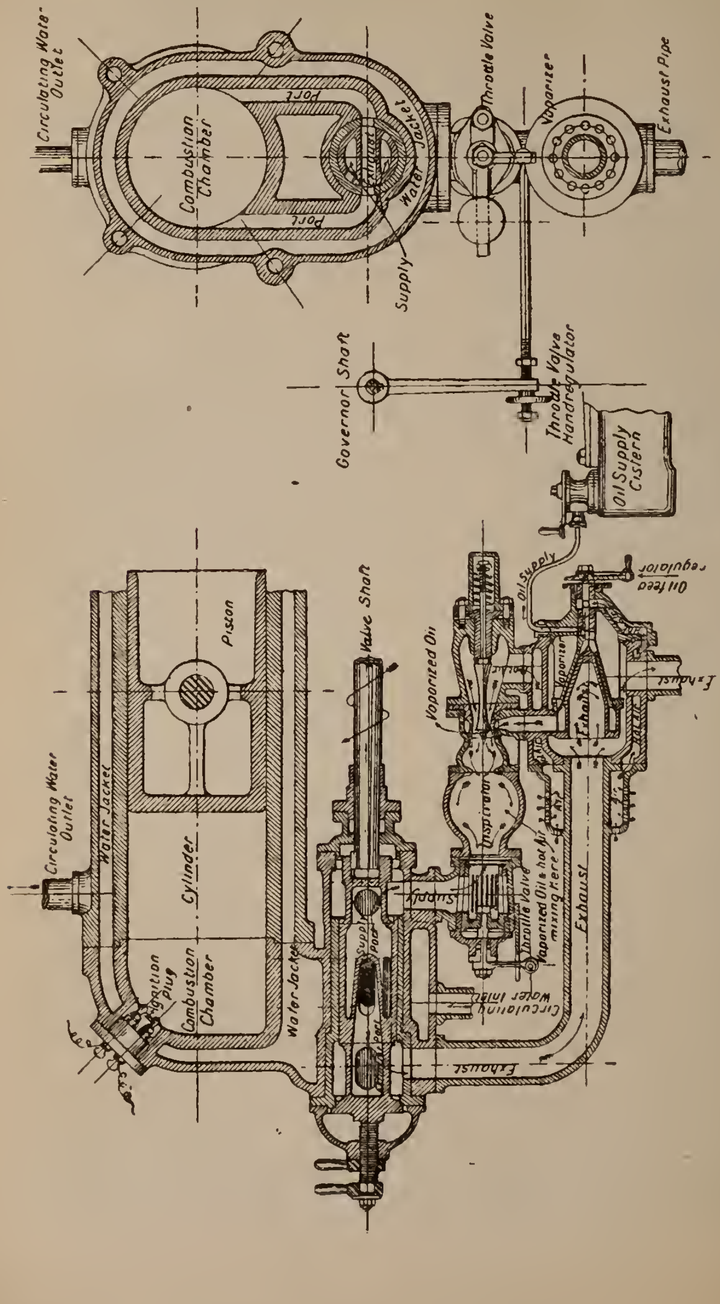


FIG. 13.—Section showing arrangements of parts of Clarke, Chapman & Co.'s Oil Engine.

Messrs. Samuelson & Co , Ltd., Banbury.—Messrs. Samuelson's engine (8 brake horse-power, 167*l.*) embodies the Griffin patents. This was the only competing engine using a sprayer, which is illustrated in fig. 14. A central plunger is driven down by air pressure from a tank under the bed of the engine and opens the oil valve. Oil is then sucked up the diagonal tube by induction from the horizontal air-jet, and is driven in the form of a fine spray into the vaporiser.

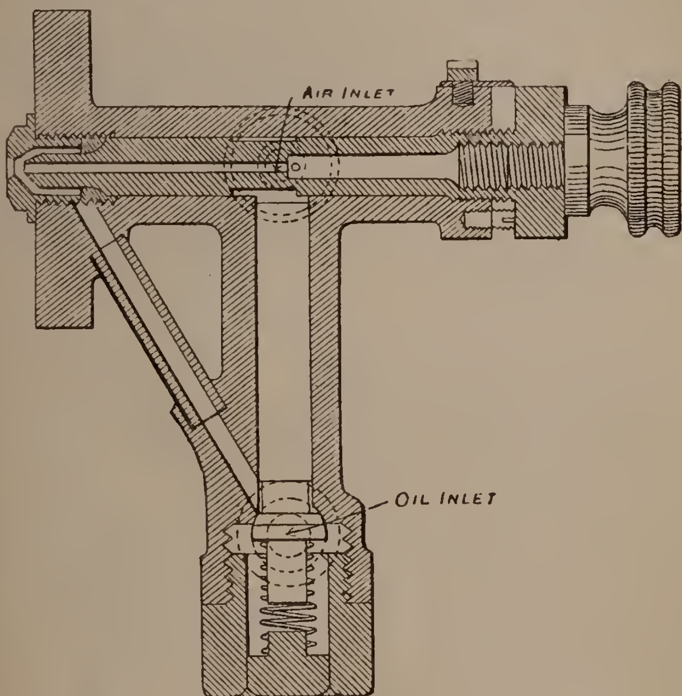


FIG. 14.—Griffin Patent Oil Sprayer.

The air pressure is maintained at 12 to 15 lb. above the atmosphere, by a pump driven by an eccentric on the lay shaft.

The vaporiser (fig. 15) is a long chamber of corrugated section placed at right angles to the cylinder in the bed-plate. It is heated by the exhaust gases which pass round it as they escape. The supplementary air-supply is admitted through an inlet valve, and, after being likewise heated by the exhaust gases, enters the vaporiser at the sprayer end and mixes with the spray.

The governor is of the ordinary ball pattern, and when the speed becomes too high cuts off the air-supply and prevents the

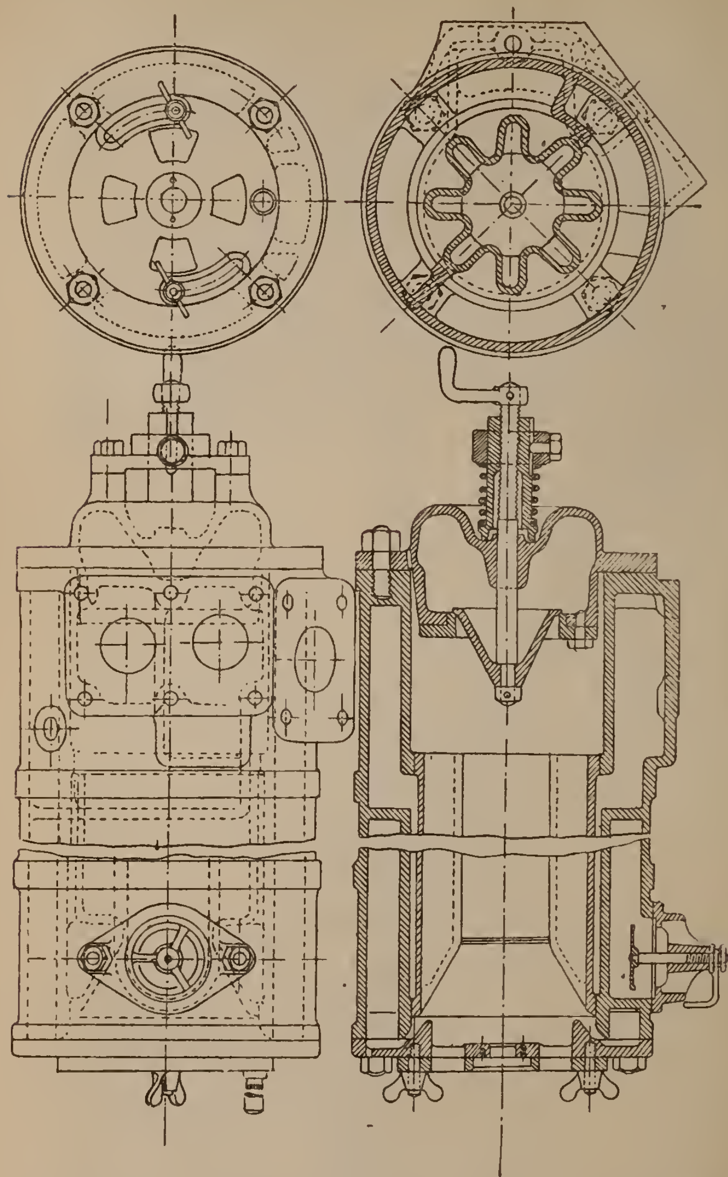


FIG. 15.—Vaporiser of Samuelson's Oil Engine.

opening of the admission and exhaust valves by an ingenious arrangement of vibrating knife-edges and plungers. The

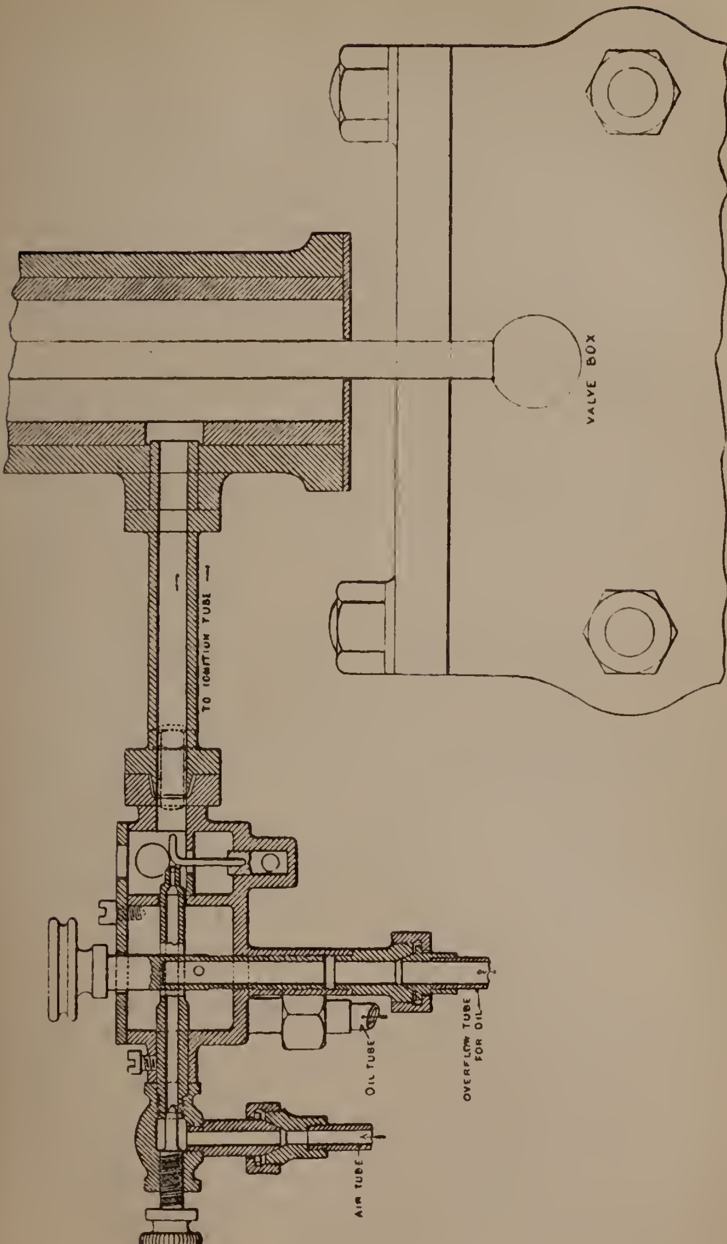


FIG. 16.—Patent Ignition Lamp of Samuelson's Oil Engine.

exhaust valve closes after the last exploded charge has escaped. At the same time a spiral spring shuts the oil valve in the sprayer, and no oil is therefore injected.

The ignition tube is heated by an oil flame produced in a very simple manner. A small jet of oil is made to strike upon a bent wire, which dips into an oil bath kept at constant level. A thin film of oil is thus drawn up and carried forward with the blast, and, being lighted, strikes against the ignition tube as an intense blue flame. The arrangement of this lamp is shown in fig. 16.

Oil is supplied to the reservoir by a small pump from the main oil-tank which is formed in the engine-bed.

At starting, the air-pump is worked by hand until the required pressure is obtained. The air is then turned on to the sprayer and the spray lighted. By this means the vaporiser is heated for about 10 minutes, the smoke being discharged through a special valve into the exhaust. When the vaporiser is hot enough the valve is closed and the oil-supply turned off. The engine should then start without difficulty. At the trials great trouble was found in starting, several attempts being generally necessary. On the first day the sprayer was opened, and a piece of waste found in it. As difficulty was again experienced on the second and third days, and on the 2 hours' full-power trial, the engine was withdrawn, and a longer ignition tube tried. This made a marked improvement, and indicator diagrams subsequently taken showed sharp and good ignition.

This was decidedly the most complicated engine competing, the parts and attachments being more numerous than in any other—a consequence, probably, of the method of vaporising adopted. Each part is in itself simple and ingenious, and the whole is constructed in a substantial and workmanlike manner. Its oil consumption exceeded the average, a result to which the frequent stoppages must have in no small measure contributed.

Three Days' Run at Full Load.

According to the conditions each engine was first subjected to a three days' run, during which no opening up or cleaning was permitted, so as to test the endurance, liability to fouling, consumption, steadiness of running, and attendance required, over a continuous period. It was found impossible to restrict the number of attendants to one only in all cases. One or two of the engines could not have started at all if this regulation had been rigorously enforced. It was thought better, therefore. to note the number of attendants required, and take this into consideration in making the awards.

The flywheels had all been turned flat in accordance with the instructions of the Society's engineers, and the brake horse-power was measured by a double rope brake completely encircling the wheel and loaded with a dead weight at one end and a spring balance at the other. The weight was kept constant throughout the trials, and the spring balance was read every hour. The oil was weighed into the engine tanks at the commencement, and the surplus weighed back at the end of the run. Where the tanks could not be drained dry, a point gauge was inserted, and the oil adjusted to the same level at the beginning and end of the run. An error of less than a quarter of a pound could in all cases be clearly detected.

The engines having been started, and the brake-load adjusted to give as nearly as possible the power which the exhibitor thought best, the time was noted, and the trial commenced. The general dimensions and declared speed of the fixed engines were as stated in the table on p. 720.

The oil used was a Russian oil, known as "Russolene," the price of which, delivered at Cambridge, was at the rate of $3\frac{3}{4}d.$ per gallon. It was analysed by Mr. Charles J. Wilson, F.C.S., who had made the analysis of the oil used on the Plymouth trials of 1890. He reports as follows:—

"I have made an examination of the sample of Russolene oil received from Mr. F. S. Courtney on July 2, 1894, with the following results:—

"Specific gravity at 60° F. = 0·8239.

"Flash point (Abel test) = 86° F.

"*Calorific value.*—To determine this the oil was completely burned in a closed bomb with compressed oxygen (a modification of Berthelot's apparatus), and the heat produced carefully measured. Calculated to calories per gramme of oil, the mean of two concordant experiments is 11·055. This figure includes all heat obtained by condensation of produced water, and cooling this and the gaseous products to 28°C. In order to obtain a correction for the water produced by combustion, the percentage of hydrogen in the oil was determined and found to be 14·05 per cent.; the produced water will, therefore, be 1·2645 times the weight of the oil. Taking the latent heat of water at 28°C. as 587 gives 0·742 calories per gramme, and deducting this from 11·055 gives 10·313 calories as the heat of combustion of one gramme of the oil; products of combustion in the gaseous state at 28°C.

"This Russolene oil seems very constant in composition, for a sample which I examined more than a year ago gave 14·07 per cent. of hydrogen and a calorific value of 10·3 calories—practically identical figures with those yielded by the present sample.

"CHARLES J. WILSON."

The heat value is therefore nearly 18,600 B. thermal units per lb. Comparing this with Welsh steam coal with a calorific value of 14,500 thermal units per lb., 1 lb. of oil will, in heating value, be equivalent to 1·28 lb. of coal, and with London gas, having a calorific value of 19,200 B. thermal units per lb., it would be equivalent to 0·97 lb. of gas.

General Dimensions and Declared Speed of the Fixed Engines.

Engine.	Britannia Co. "Britannia"	Campbell Gas-Engine Co., Ltd. "Campbell"	Clarke, Chapman & Co., Ltd.	Crossley Brothers, Ltd.	Fielding & Platt	Hornsby & Sons, Ltd. "Hornsby-Akroyd"	Samuelson & Co., Ltd.	Tolch & Co. "Capitaine"	Wells Brothers. "Premier"	Weyman & Hitchcock, Ltd. "Trusty"	Weyman & Hitchcock, Ltd. Knight & Weyman's Patent
Catalogue No.	5780	5763	5868	5827	5800	5972	5759	793	5845	5729	5730
Declared Brake Horse-Power	7	6 nominal	6	7½	8	8	8	5	4 nominal	5	6
Weights in cwts. empty	33	27	35	32½	53	40	40	17	36½	26	38
Price complete	£120	£145	£150	£163	£150	£170	£167	£118	£112	£133	£149
Floor space occupied	7 ft. × 3 ft. 6 ins.	6 ft. 9 ins. × 3 ft. 6 ins.	4 ft. × 7 ft. 6 ins.	8 ft. 6 ins. × 3 ft. 3 ins.	8 ft. × 2 ft. 6 ins.	9 ft. 2 ins. × 3 ft. 6 ins.	6 ft. 4 ins. × 3 ft. 8 ins.	3 ft. 4 ins. × 3 ft 8 ins.	7 ft. 6 ins. × 3 ft. 6 ins.	7 ft. × 4 ft. 3 ins.	7 ft. 6 ins. × 4 ft. 9 ins.
Diameter of cylinder, inches	7½	7½	7½	7	8¼	10	8	7¼	8¼	6¾	7½
Stroke, inches	13	12	12½	15	16	15	12	7½	15	13	14
Clearance vol., cubic inches	260	—	—	225·9	—	638	—	—	360·8	214·7	—
Diameter of fly-wheel	4 ft. 3 ins.	4 ft. 6 ins.	3 ft. 9 ins.	5 ft.	5 ft.	4 ft. 9 ins.	4 ft.	3 ft. 10 ins.	5 ft. 2 ins.	4 ft. 7½ ins.	5 ft. 4 ins.
Width of flywheel, inches	6	4½	4½	5	5½	7	6	3½	5¾	4	6
Revolutions per minute declared	235	240	350	210	170	230	240	300	165	250	250

BEHAVIOUR OF THE ENGINES DURING THE THREE DAYS' RUN.

Messrs. Hornsby's engine ran without hitch of any kind from start to finish. Its action was faultless. One attendant only was employed all through the trials, and started the engine easily and with certainty after working the hand blast to the lamp for 8 minutes. The longest time taken to start was 9 minutes, and the shortest 7. When the engine stopped each day the bearings were cool, and the piston was moist and well lubricated. The revolutions were very constant, and the power developed did not vary one quarter of a brake horse-power from day to day. The oil consumption, reckoned on the average of the three days' run, was 0·919 lb. per brake horse-power per hour. This is equivalent to a consumption of 1·18 lb. of coal, and would, at the above price of oil, mean an expenditure of 0·42*d.* per brake or effective horse-power per hour. This includes the oil used for the starting lamps.

Messrs. Crossley's engine had one stoppage for about a minute on the second day, due to carelessness in letting the oil-supply run too low. It started away again without difficulty when this had been renewed. Otherwise, the engine ran admirably, and required very little attention. The average time taken to start was 16 minutes, the maximum being 19, and the minimum 13; one attendant only was required. The oil consumption was rather less than Messrs. Hornsby's—namely, 0·90 lb. of oil per brake horse-power per hour. The speed and power developed were uniform and the governing was good.

Messrs. Wells Brothers' engine was started, worked, and attended by one man alone throughout the trials. The large and heavy flywheel made this a somewhat awkward job, but except for one day, when the attempt was made before the vaporiser was warm enough, the engine started and ran in a very satisfactory manner. The average time taken to start was 21 minutes. It had as little attention as any on the ground, the attendant frequently leaving it entirely for considerable intervals and generally finding plenty of time for sleep and recreation. The mean revolutions for the three days do not differ by more than 1 per minute, and the power developed was very constant. The consumption was somewhat higher than the Hornsby engine—namely, 1·06 lb. per brake horse-power per hour.

Messrs. Weyman & Hitchcock's engine, the "Trusty," also ran well. The tube was removed and cleaned before the last day's run, but the engine finished in good condition. One man only was required at starting, the average time taken being 13 minutes, and little attention was required. The oil consumption was decidedly higher than that of the engines just named—namely, 1·157 lb. per brake horse-power per hour—the speed varying between 253 and 256 revolutions per minute, the power remaining very constant.

The other engine exhibited by this firm also ran well, but back explosions were noticed at intervals and necessitated an adjustment of the pump. The ignition tube was cleaned in this engine also, and at the end of the third day, on stopping the engine, the piston was dry and unlubricated. This engine ran with a rather smaller consumption of oil—namely, 1·13 lb. per brake horse-power per hour—probably on account of its larger size. The speed was constant, as was the power developed, and, apart from the difficulties mentioned, the engine ran with little attention. It was subsequently withdrawn, Messrs. Weyman and Hitchcock electing to rely upon the "Trusty."

Messrs. Campbell's engine gave considerable trouble at starting on the third day. On the first and second days it took 13 and 19 minutes respectively, but on the third two attempts with one man, seven with two men, and one with three were recorded before the engine finally got away, 33 minutes in all being occupied. The governing of the engine was not entirely satisfactory, a good deal of thumping and irregularity of speed being noticeable at times. When the vaporiser is hot enough the engine can be worked without the lamp, and ran so on the trials for short periods. The consumption was 1·15 lb. of oil per brake horse-power per hour.

The *Britannia Co.'s* engine stopped once or twice on the first day from various causes, chiefly accidental. On the second and third days it settled down to its work and gave little or no trouble. The average revolutions per minute on the three days did not vary greatly, but there was a good deal of racing, the speed being by no means so steady as one would expect from the method of governing. The oil consumption was comparatively high—namely, 1·49 lb. per brake horse-power per hour. The table opposite gives the mean results for the seven engines just enumerated.

Consumption and Efficiency Trials.

Subsequent trials were carried out with the engines just as they were when the three days' run was completed, no cleaning or opening up of any kind being permitted.

The arrangements were precisely the same as on the three days' test, but, in addition, indicator diagrams were taken, and

MEAN RESULTS OF THREE DAYS' TRIALS.

Engine	Hornsby & Sons, Ltd. "Hornsby-Akroyd"	Crossley Brothers, Ltd.	Wells Brothers. "Premier"	Weyman & Hitchcock, Ltd. Knight & Weyman's Patent	Weyman & Hitchcock, Ltd. "Trusty"	Campbell Co., Ltd. "Campbell"	Britannia Co. "Britannia"
Duration of trial, hrs.	27·61	28·26	25·8	24·71	25·56	27·72	27·65
Time taken to start, mins.: 18th	7	15	36	17	15	13	13
19th	9	19	17	14	12	19	24·5
20th	8	13	10	15	12·5	33	12
Brake horse-power							
Circumference of wheel (effective), ft.	14·958	15·75	16·281	15·865	14·323	14·27	13·594
Wheel constant per rev. per lb.	·0004535	·0004775	·0004935	·000481	·000434	·0004325	·0004121
Nett weight on brake in pounds (mean): 18th	80·5	63·5	69·9	52·5	41·7	52·4	63·7
19th	77·3	63·1	76·6	51·5	41·5	45·7	64·1
20th	78·6	63·6	75·8	51·5	42·4	49	62·5
B.H.P.: 18th	8·48	6·36	5·68	6·24	4·61	5·26	6·09
19th	8·23	6·21	6·10	6·17	4·56	4 67	6·28
20th	8·34	6·27	6·11	6·21	4·71	4 33	6·08
Mean. do. for three days	8·35	6·28	5·96	6·21	4·63	4·75	6·15
Oil consumption, lb.: Lamp	Taken from main supply	27·75	18·25	Taken from main supply	Taken from main supply	Taken from main supply	19·75
Engine	—	132·25	145·75	—	—	—	235
Total	212	160	164	173·5	137	150·75	254·75
Oil per B.H.P. per hr.	·919	·90	1·06	1·13	1·157	1·15	1·49

the quantity of water passed through the jackets, with its inlet and outlet temperatures, was noted.

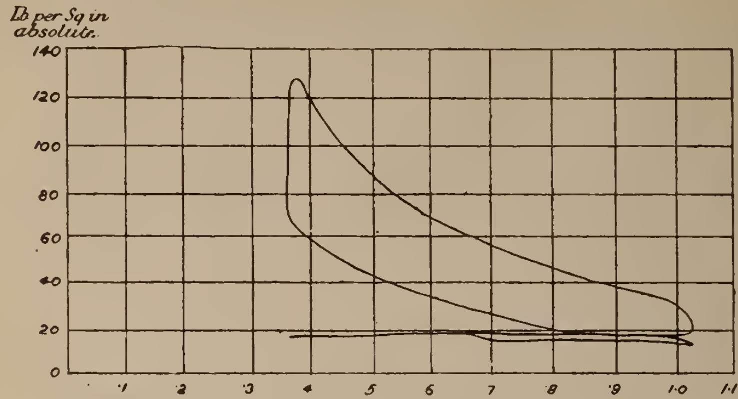


FIG. 17.—Hornsby & Sons' Fixed Engine—Mean Card two hours' full power trial.
Cylinder Volume in cubic feet.

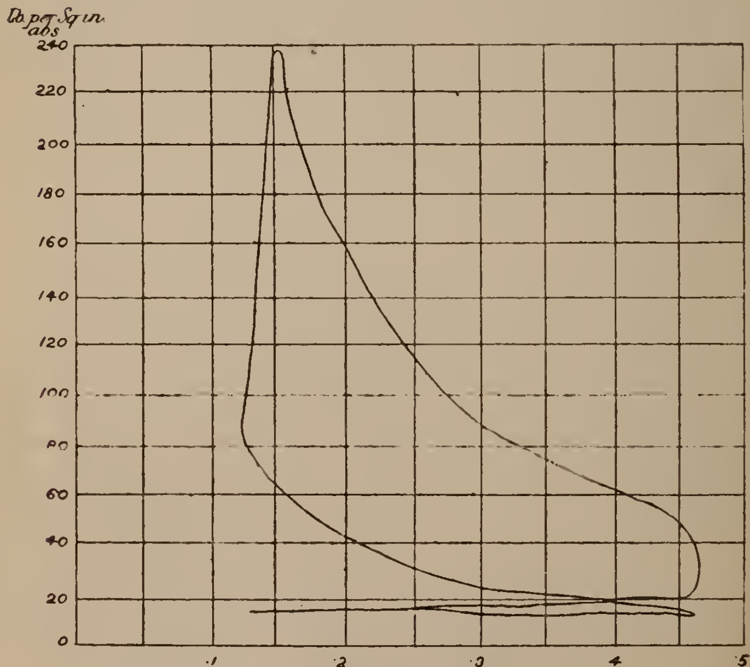


FIG. 18. Crossley Brothers' Fixed Engine—Mean Card two hours' full power trial.
Cylinder Volume in cubic feet.

A two hours' full-power trial was followed by a two hours' half-power trial and a four hours' consumption trial running light.

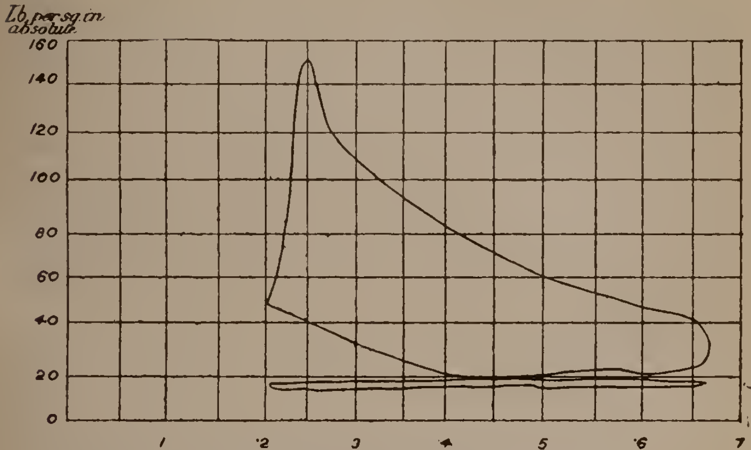


FIG. 19.—Wells Brothers' Fixed Engine—Mean Card two hours' full power trial. Cylinder Volume in cubic feet.

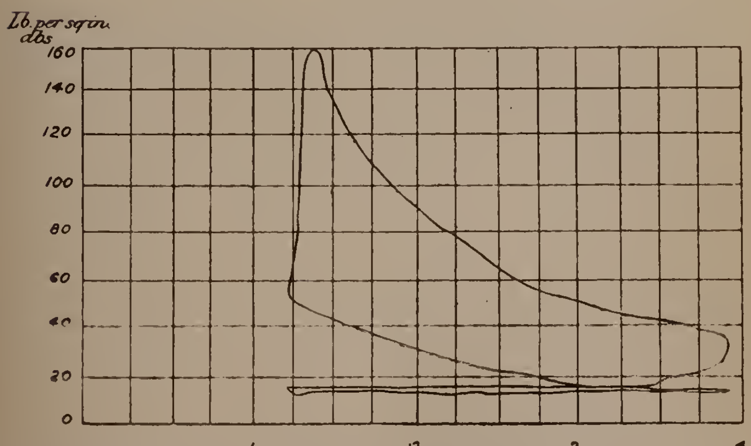


FIG. 20.—Weyman & Hitchcock's "Trusty" Engine—Mean Card two hours' full power trial. Cylinder Volume in cubic feet.

Indicator diagrams.—These were taken as nearly as possible every fifteen minutes on Crosby indicators. In three cases, where Crosby's were unsuitable, a Wayne indicator was tried. This gave very good and reliable cards and was found subsequently to be remarkably free from backlash errors. The indicators were well and frequently lubricated with Russian tallow, which was found to work very satisfactorily. They were all afterwards tested under steam on a mercury column in the engineering laboratory at King's College, London, and correction curves plotted. The errors were not beyond average indicator errors, but were in no case to be disregarded, and the true spring scales have in all cases been employed.

In the half-power and light trials, half-minute cards in most cases showed such constant and wide changes in mean pressure from explosion to explosion that no reliable determination of the indicated power could be made without an integrating indicator. The only half-power diagrams which could be worked out with accuracy were those of Messrs. Crossley, which were very constant.

On the full-power trial, the diagrams obtained from the Britannia Co.'s engine showed considerable fluctuations, due to the method of governing. But a comparison of half-minute diagrams with a number of double cards taken at successive intervals shows mean results within 1 per cent. of one another. The indicated power given in the table may therefore be relied upon as correct within those limits.

The water was measured as it was discharged from the jackets into standard thirty-gallon tanks, which had been previously calibrated. The mean rate of filling these was ascertained and the discharge per minute calculated. Readings for temperature were taken every quarter of an hour.

In the tables on pp. 728–729 will be found the mean quantities for all three trials of the six engines which completed them.

Oil consumption.—Five engines used less than a pound of oil per indicated horse-power per hour, and two, Messrs. Crossley's and Messrs. Hornsby's engines, developed a brake horse-power on 0·82 lb. and 0·977 lb. per hour respectively.

In the short two hours' trial Messrs. Hornsby's engine necessarily appears less economical than over a longer run, because the starting lamp consumes an appreciable fraction of the whole supply. Where much stopping and starting again are required this larger consumption would, however, show itself.

The record of consumption of Messrs. Crossley's engine is remarkable: 0·82 lb. of oil represents a cost for fuel of 0·37*d.* per brake horse-power per hour, or the equivalent of 3 lb. of Welsh coal. Few condensing steam-engines of equal size work on a less amount.

Reckoned on the three days' run, the cost per brake horse-

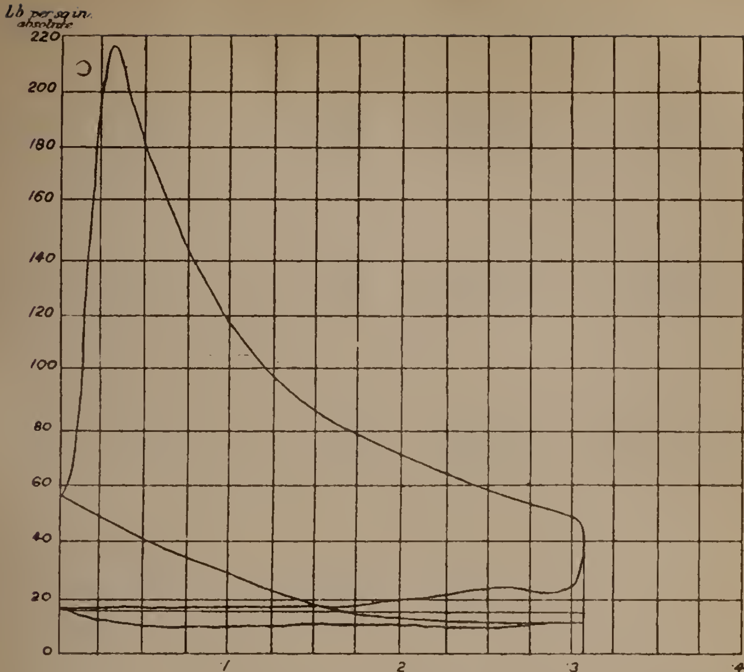


FIG. 21.—Campbell Co.'s Fixed Engine—Mean Card two hours' full power trial. Cylinder Volume in cubic feet.

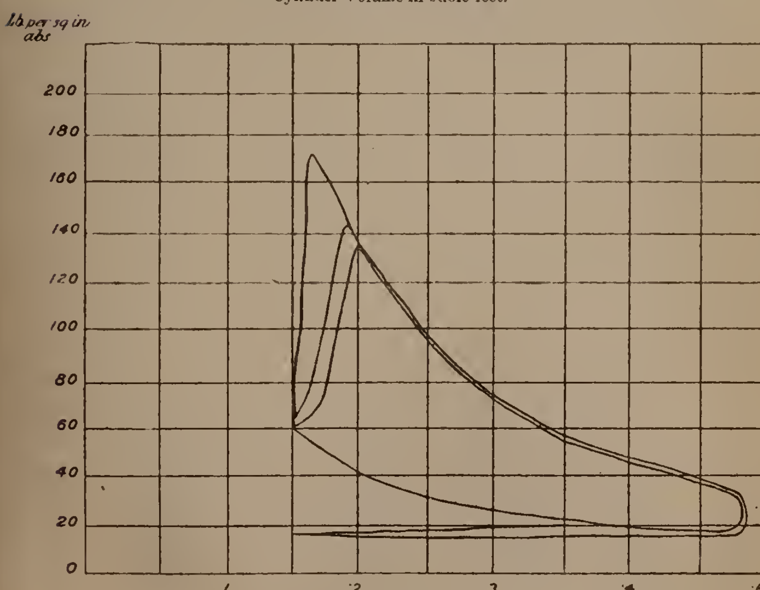


FIG. 22.—Britannia Co.'s Fixed Engine—Mean Card two hours' full power trial. Cylinder Volume in cubic feet.

Full-Power Trial of Fixed Engines. June 21, 1894.

Engines	Hornsby & Sons. Ltd. "Hornsby-Akroyd"	Crossley Brothers, Ltd.	Wells Brothers. "Premier"	Weyman & Hitchcock. "Trusty"	The Campbell Gas Engine Co., Lim. "Campbell"	Britannia Co. "Britannia"
Duration of trial, mins.	120	120	136	120	120	115
Brake horse-power						
Wheel constant per revolution per lb.	·0004535	·0004775	·0004934	·000434	·0004325	·000412
Dead load, lb	87	78	91	46·75	76·5	70·9
Spring balance reading, lb.	7·95	4·9	9·3	4·75	22·9	8·1
Nett load on brake, lb.	79·05	73·1	81·7	42	53·6	62·8
Revolutions, total during trial	28,720	24,110	19,205	31,170	24,930	27,601
" mean per minute	239·66	200·9	160·4	259·7	207·7	240
Brake horse-power	8·57	7·01	6·46	4·73	4·81	6·21
Indicated power						
Cylinder constant, per explosion per lb.	·002975	·001458	·00203	·001175	·001339	·00145
Mean effective pressure, lb. per sq. in.	28·9	72·2	49·6	46·1	65·5	47·3
Explosions per minute, mean	119·83	75·3	72·18	119·3	67·7	122
Indicated horse-power	10·3	7·9	7·3	6·5	5·9	8·4
Mechanical efficiency	·83	·88	·89	·73	·80	·74
Oil used						
Lamp oil used, total, lb.	—	1·75	1·5	1·5	—	2
Engine oil used, total, lb.	16·75	9·75	13·75	9·75	10·75	18
Total lamp and engine, lb.	16·75	11·5	15·25	11·25	10·75	20
Oil per I.H.P. per hour, lb.	·81	·73	·93	·87	·93	1·25
Oil per B.H.P. per hour, lb.	·977	·82	1·04	1·19	1·12	1·68
Jacket water						
Jacket water mean per minute, lb.	10·9	10·1	10	9·2	16·6	17·3
Temperature, initial mean, Fahr.	73°	73°	73°	73°	77°	63°
" final mean, Fahr.	143°	115°	153°	115°	110°	101°
Rise of temperature, Fahr. degrees	70°	42°	80°	42°	33°	38°

Nature of Trial.	Half-Power Brake						Light					
Engines	Hornsby & Sons, Ltd. "Hornsby-Akroyd"	Crossley Bros., Ltd.	Wells Bros. "Premier"	Weyman & Hitch-cock, Ltd. "Trusty"	Campbell Gas Engine Co., Ltd. "Camp-bll"	The Britannia Co. "Bri-tannia"	Hornsby & Sons, Ltd. "Hornsby-Akroyd"	Crossley Bros., Ltd.	Wells Bros. "Premier"	Weyman & Hitch-cock, Ltd. "Trusty"	Campbell Gas Engine Co., Ltd. "Camp-bell"	Britannia Co. "Bri-tannia"
Duration of trial, hours	1·99	2	2	1·99	2	2	4	4·24	4·08	4	4·1	4
Brake power												
Wheel constant, per lb., per rev.	·0004535	·0004775	·0004935	·000434	·0004325	·0004121	—	—	—	—	—	—
Dead load, lb.	47·6	42	49	23·75	43	42	—	—	—	—	—	—
Spring balance reading, mean, lb.	4·9	2·7	4·3	1·67	11·11	3	—	—	—	—	—	—
Nett load on brake	42·7	39·3	44·7	22·08	31·89	39	—	—	—	—	—	—
Revolutions, total during trial	28,195	23,800	19,120	31,464	25,073	—	—	—	—	—	—	—
" mean per minute	235·9	198·4	159·4	263·3	208·9	246·6	240	190	165	270	211	256
Brake horse-power	4·57	3·72	3·52	2·58	2·88	3·96	—	—	—	—	—	—
Oil used												
Lamp oil, total, lb.	—	2·12	1·5	1·125	—	1·25	3·25	4·5	2	2·5	—	2
Engine oil, " "	13·56	7·8	9·73	6·75	—	12	13·7	6·25	6	7·25	—	3·75
Total oil used, lb.	13·56	9·92	11·23	7·875	7·5	13·25	16·95	10·75	8	9·75	9·5	5·75
Oil per B.H.P. per hour	1·49	1·33	1·59	1·57	1·30	1·67	—	—	—	—	—	—
Oil used per hour	6·81	4·96	5·615	3·957	3·75	6·625	4·23	2·53	1·96	2·14	2·32	1·44

power per hour would be for Messrs. Hornsby's engine 0·42*d.* and for Messrs. Crossley's 0·41*d.* There is therefore little difference between them on a continuous run.

Indicator diagrams for the six engines are given in figs. 17 to 22 (pp. 724, 725, 727). They are copies of the indicator cards which approach nearest to the mean during the full-power run, and have all been plotted to the same vertical scale. They all closely resemble the diagram from an "Otto" gas engine, and the most marked difference between them is in the initial and mean pressures. Messrs. Crossley's diagram (fig. 18) has an initial pressure of 240 lb. per square inch and a mean of 72 lb., while Messrs. Hornsby's (fig. 17) has an initial pressure of 125 lb., and a mean of 29 lb. On the Britannia Co.'s card (fig. 22) only three diagrams have been shown, for the sake of clearness. A half-minute card has the whole space between maximum and minimum filled with a succession of diagrams varying in sharpness of ignition.

On the half-power trials the engine which showed itself the most economical was the "Campbell," using 1·3 lb. of oil per brake horse-power hour, to Messrs. Crossley's 1·33 lb. and Messrs. Hornsby's 1·49 lb. In steadiness, however, the "Campbell" left much to be desired, and on the light trial raced badly.

Messrs. Weyman's engine was run twice on the half-load trial, the lamp and engine oil having been accidentally mixed on the first run. The results were very closely concordant, and those given are for the second run. For steadiness at half-power and running light this engine is to be commended, its action being very regular and uniform.

The engines of Messrs. Hornsby, Messrs. Crossley, and Messrs. Wells, behaved also admirably in this respect.

The Britannia Co.'s engine showed a considerable tendency to race, though to a less extent than the "Campbell." On the light trial it used less oil per hour than any other engine, but in comparing the relative economies due account must be taken of the sizes of the different engines.

Not one of these engines can be pronounced a bad engine. With one exception they all proved more economical on their full-power efficiency trial than the oil engines tried at Plymouth in 1890. But the two which in all-round excellence for farm purposes showed themselves throughout these trials superior to all the others were undoubtedly those of Messrs. Hornsby and Messrs. Crossley.

For simplicity, reliability, steadiness, minimum of attendance, and ease of starting, Messrs. Hornsby's engine leaves little to be desired. In economy over short periods and at light loads it is scarcely equal to some others, but at full load over longer periods it is by very little surpassed by any.

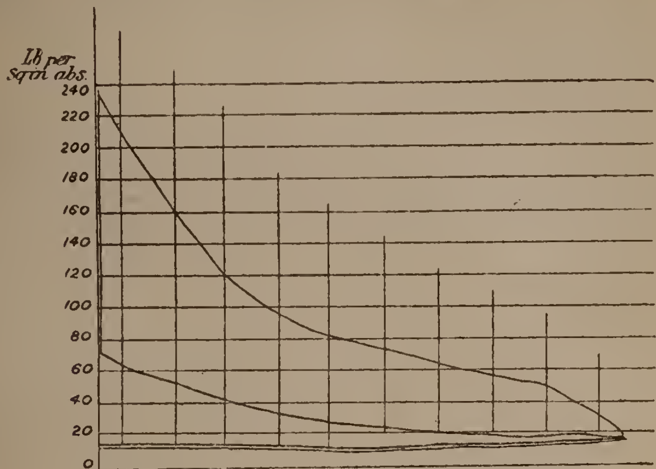


FIG. 23.—Crossley Brothers' Fixed Engine. Trial with Broxbourne Oil. Volume swept through by Piston. Vertical Scale $\frac{1}{125}$.

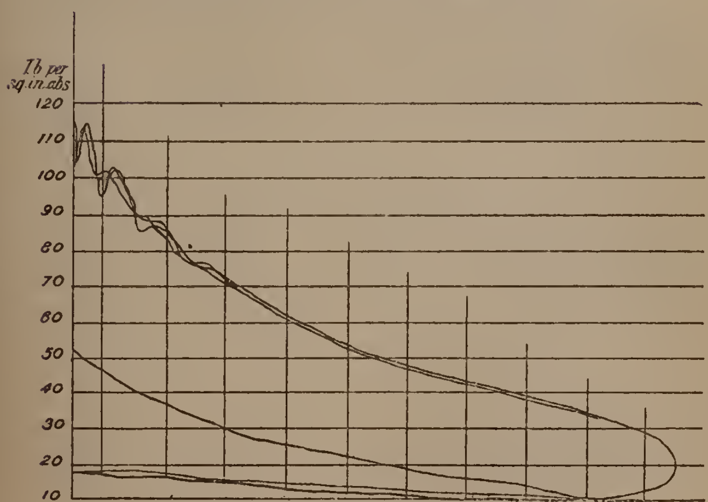


FIG. 24.—Hornsby's Fixed Engine. Trial with Broxbourne Oil. Volume swept through by Piston. Vertical Scale $\frac{1}{80}$.

Messrs. Crossley's engine has surpassed all others in economy at full power. It has also a very low consumption for longer periods and lighter loads. In regularity and steadiness of running it did not show itself quite equal to the Hornsby, and it required greater and more skilled attention.

These two engines were put upon a further trial for three hours with Broxbourne oil. The calorific value of this oil was certified by Mr. Charles J. Wilson as follows:—

"Specific gravity at 60° F. = ·8118.
"Flash point (Abel test) = 155° F.
"*Calorific value of Broxbourne oil.*—The mean of two concordant experiments in the compressed oxygen calorimeter gives 11·019 calories per gramme, all produced water being condensed. The correction calculated from the hydrogen percentage is 742 calories, giving as the heat value 10·277 calories, all products of combustion in the gaseous state at 24° C.

"CHARLES J. WILSON."

This corresponds to a thermal value of 18,500 B.T.U. per lb.

Broxbourne Oil Trials.

Engines	Hornsby & Sons, Ltd.	Crossley Brothers, Ltd.
Duration, minutes	180	180
Brake power		
Wheel constant per revolution per lb.	·0004535	·0004775
Dead load, lb., mean	78	85
Spring balance reading, mean	6·1	5
Nett load on brake, lb.	71·9	80
Revolutions, total during trial	42,921	35,972
,, mean per min.	238·5	199·84
Brake horse-power	8·27	7·63
Indicated power		
Cylinder constant per explosion per lb.	·002975	·001458
Mean effective pressure, lbs. per sq. in.	30·2	63·6
Explosions per min., mean	110	90·3
Indicated horse-power	9·9	8·4
Mechanical efficiency	·84	·91
Oil used		
Lamp oil used, lb.	—	1·75 × 1·5 = 2·625
Engine oil used, lb.	28·5	15·375
Total (lamp and engine), lb.	28·5	18
Oil per I.H.P. per hr., lb.	·96	·72
,, B.H.P. ,, ,,	1·15	·785
Jacket water		
Jacket water per min., lb.	18·6	8
Temperature, initial mean, Fahr.	63·3°	64°
,, final ,,	111°	111·7°
Rise in degrees Fahr.	47·7	47·7

The cost of this oil was 8½*d.* per gallon, delivered at Cambridge, from which has to be deducted the value of the cask, which would reduce the price to about 7*d.* a gallon, or nearly twice the price of the Russolene. Indicator cards taken upon this run are copied in figs. 23 and 24 (p. 731), and show that in the Crossley engine a much sharper and straighter explosion line is obtained with this oil, while the mean pressure is much lower—namely, 63·6 lb. per square inch. In the Hornsby engine there is little difference, but the initial pressure is lower than with Russolene.

The engines had been previously cleaned, which would account for their rather higher mechanical efficiency upon this trial.

The results are given in the table on p. 732. The economy of the Crossley engine was still greater with this oil than with Russolene.

The trial was made with a flying start, and the lamp oil could not, therefore, be measured in the case of the Crossley engine. It has been allowed for at the same rate as on the full-power Russolene trial. This is no doubt more, rather than less, than it would actually use, as in that quantity will be included the oil burnt during the ten minutes required to start.

An approximate heat balance would stand as follows for the two full-power trials for the two engines in question :—

Full-Power Trials.

Expenditure of Heat, B.T.U.'s per min.

—	Russolene				Broxbourne			
	Hornsby	Per-centage	Crossley	Per-centage	Hornsby	Per-centage	Crossley	Per-centage
Thermal value of oil used per min.	B.T.U. 2,580	100·0	B.T.U. 1,770	100·0	B.T.U. 2,930	100·0	B.T.U. 1,850	100·0
Heat expended in useful work = B.H.P.	363	14	297	16·7	351	12·0	324	17·5
Heat lost by friction .	74	2·9	39	2·2	67	2·3	31	1·7
Heat shewn on indicator diagram (I.H.P.)	437	16·9	336	18·9	418	14·3	355	19·2
Heat rejected in jackets	763	29·5	424	24	887	30·3	382	20·7
Heat rejected in exhaust and other losses . . .	1,380	53·6	1,010	57·1	1,625	55·4	1,113	60·1

Class II.—Portable Engines.

General Description of the Engines.

Messrs. Hornsby's engine (First Prize, 50*l.*) is illustrated in fig. 25. It is in all respects an admirable portable engine. The general arrangement of working parts is precisely the same as that of the fixed engine and will need no further description. It is mounted on a light and stable carriage running on four wheels. The oil-tank is beneath the framework and the box-platform contains about 20 gallons of water. A circulating pump passes the jacket water from this tank through the jackets and over vertical boards in a casing very closely resembling in appearance a small vertical boiler. The exhaust passes up through the centre of this cooler and draws a current of air between the boards in the contrary direction to the flow of water. This forms a simple and compact arrangement, and answered admirably on the trials. Over the three days' run, only 80 gallons of cooling water were required, a very small quantity compared with that needed by a steam-engine of similar power. A very efficient steam-engine, using, say, 20 lb. of water per indicated horse-power per hour would in the same time have consumed upwards of 670 gallons.

At one projecting end of the crank shaft is mounted a fly-wheel, at the other a 3 ft. 10½ in. belt pulley. Upon both of these brakes were run during the trial to prevent the excessive heating of the flywheel.

The arrangements for driving are good, there being clearance both ahead and astern, though in the latter direction only when the lower side of the belt is led at a considerable angle above the horizontal. A horizontal belt would not clear the following axle.

The weight of the engine, which is of 12½ brake horse-power, is 81 cwts. empty. The width over axles is 5 ft. 8 ins. and the length 13 ft. 6 ins. The starting and running of this engine were faultless, and the oil consumption was low, though necessarily greater, reckoned on the brake horse-power, than that of the fixed engine, on account of the pump duty. It was 1·09 lb. per brake horse-power hour on the three days' run and 1·08 lb. on the 2 hours' full-power trial. Per indicated horse-power, however, it compares very favourably with the fixed engine, consuming only 0·75 lb. per indicated horse-power hour on the full-power run. The mechanical efficiency was lower from the same cause—namely, 69 per cent., as compared with 83 per cent. in the fixed engine.

The main consideration about a portable engine is not necessarily its consumption. Provided that is reasonably good, convenience of transit, lightness, steadiness of running, quantity of water required, and reliability without undue attention, are of relatively greater importance. In the "Hornsby" engine all

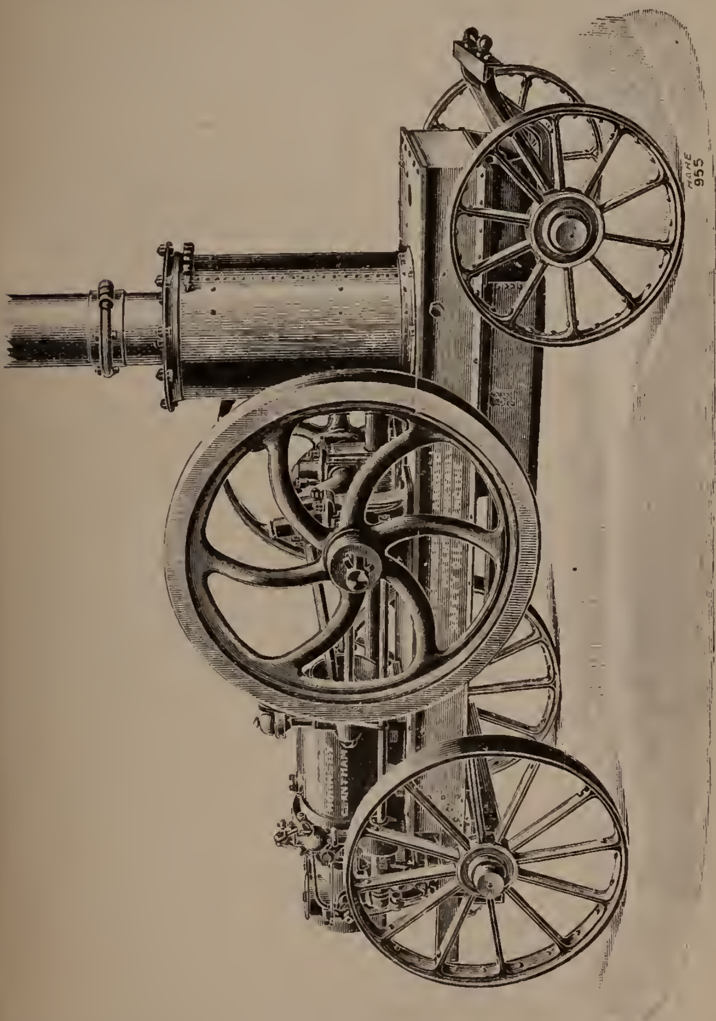


Fig. 25.—Hornsby's Portable Oil Engine (First Prize).

these qualities are found to a high degree of perfection, and a very economical rate of consumption as well.

As far as the engine goes, *Messrs. Crossley's* 12 brake horse-power portable is satisfactory in design. Its general arrangement is precisely like that of the fixed engine, and it is mounted on a three-wheeled platform of neat appearance. The clearance space beneath, however, is too small, and the single front wheel must render the engine unstable in turning a sharp corner.

There are two flywheels, one at either end of the crank shaft, and the clearance in front is all that can be desired. Astern, however, there is little possibility of getting a lead clear of the wheel axles and gearing.

Details of Portable Engines. Class II.

Engine	Hornsby & Sons, Ltd.	Crossley Bros., Ltd.	The Campbell Gas Engine Co., Ltd.	Clarke, Chapman & Co., Ltd.
Catalogue No.	5,973	5,828	5,764	5,869
Declared B.H.P.	$12\frac{1}{2}$	12	$10\frac{1}{2}$	12
Weight in cwts. (empty)	81	62	—	—
Capacity of water-tank	20 gallons	67 gallons, working supply 30 gallons	165 gallons	—
Price complete	£285	£200	£190	£275
Over-all dimensions	13 ft. 6 in. × 5 ft. 8 in.	12 ft. 9 in. × 6 ft. 3 in.	12 ft. 6 in. × 5 ft. 3 in.	11 ft. × 6 ft. 1 in.
Diameter of cylinder, inches	12	$8\frac{1}{2}$	$8\frac{1}{2}$	$10\frac{1}{8}$
Stroke, inches	16	18	16	16
Diameter of flywheel	5 ft.	2 of 5 ft.	4 ft. 6 in.	2 of 5 ft.
Width of flywheel, inches	6	5	$6\frac{1}{2}$	6
Revolutions per min. declared	200	210	180	230

The oil- and water-tanks are arranged below the platform, the water-tank being capable of holding about 60 gallons. A draught of air is maintained through the water so as to cool it, and does this so efficiently that during the trials the maximum temperature of the jacket water was below 120° Fahr. The total weight of the engine is 62 cwts. empty, its breadth over all being 6 ft.

Summary of Trials of Portable Engines.

Nature of Trial	Three days full form				Full power				Half power				Light			
Engine	Hornsby	Cross-ley	Camp-bell	Clarke Chap-man	Hornsby	Cross-ley	Camp-bell	Clarke Chap-man	Hornsby	Cross-ley	Camp-bell	Clarke Chap-man	Hornsby	Cross-ley	Camp-bell	Clarke Chap-man
Duration of Trial	21·48 hrs.	21·66hrs.	23·43hrs.	15·7hrs	2 hrs.	2 hrs.	2 hrs.	2·03hrs.	2 hrs.	2 hrs.	2 hrs.	2 hrs.	4 hrs.	4 hrs.	4 hrs.	4 hrs.
Brake Power.																
Wheel constant per lb. per rev.	R. 0004795 L. 000369	·000477	·0004245	·00048		—	—	—		—	—	—	—	—	—	—
Dead load, lb., mean	R. 84 L. 56	103·2	112	135	R. 84 L. 56	109·5	140·75	168	67	56	71	85	—	—	—	—
Spring balance reading, mean	R. 5 L. 6·75	4·1	14·9	13·5	R. 3·5 L. 6	8·1	15·3	17·8	4·2	6·6	8	8·3	—	—	—	—
Nett load on brake, lb.	R. 79 L. 49·25	99·1	97·1	121·5	R. 80·5 L. ·50	101·4	125·45	150·2	62·8	49·4	63	76·7	—	—	—	—
Revolutions per min., mean	196·6	205·5	180·9	188·7	196·3	206·6	180·5	194	199	206·7	185·8	186·5	202·6	201	190·7	187·2
Brake horse-power, mean	11·1	9·69	7·45	11·01	11·19	9·99	9·61	13·98	5·99	4·86	4·96	6·86	—	—	—	—
Indicated power.																
Cylinder constant per lb. per explosion	·00457	·002579	·002293	—	—	—			—	—	—	—	—	—	—	—
Explosions per min., mean	—	—	—	—	96·5	taken at 102·3	72·3	—	—	—	—	—	—	—	—	—
Mean effective pressure, lb. per sq. in.	—	—	—	—	33·2	54·4	66·4	—	—	—	—	—	—	—	—	—
Indicated horse-power	—	—	—	—	16·1	14·5	11·0	—	—	—	—	—	—	—	—	—
Mechanical efficiency	—	—	—	—	·69	·69	·87	—	—	—	—	—	—	—	—	—
Oil used.																
Lamp oil used, lb.	7	18·75	—	benzoline 3 hrs.	1·5	2	—	benzoline 1·25	1·7	2·25	—	—	2·25	5·5	—	benzoline 3
Engine oil used, lb.	240·75	188	—	212·5	22·75	16	—	34·18	14·5	17·5	—	—	17·5	12·5	—	28·42
Total lamp and engine, lb.	247·75	206·75	158·25	215·5	24·25	18	19	35·43	16·25	19·75	11·25	18·75	19·75	18	12·06	31·42
Oil per I. H.P. per hr., lb.	—	—	—	—	·75	·62	1·72	—	—		—	—	—	—	—	—
Oil per B. H.P. per hr., lb.	1·09	·98	·94	1·25	1·08	·98	·99	1·25	1·36	2·03	1·13	1·36	—	—	—	—
Oil total per hr., lb.	11·53	9·5	7·0	13·7	12·125	9·0	9·5	17·44	8·125	9·87	5·62	9·37	4·94	4·5	3·01	7·85
Jacket water.																
Total during trial by meter, lb	80	120	1187	456	—	—	—	—	—	—	—	—	—	—	—	—
Time taken to start, mins.	9	15·5	8·5	frequent stops	—	—	—	—	—	—	—	—	—	—	—	—

3 ins., and its extreme length 12 ft. 9 ins. The running of the engine was not altogether satisfactory. The explosions were irregular and at times extremely violent, especially on the half-power consumption trial. This was probably owing to preventable causes, and was greatly relieved by a temporary slow down.

The consumption was less than that of the "Hornsby" engine—namely, 0·98 lb. per brake horse-power hour on the three days' run, and 0·90 lb. on the 2 hours' full-power trial.

There was no explosion-counter fitted, but no missed explosions were observed, and they have been taken as equal to half the number of revolutions. The consumption on the 2 hours' full-power trial was 0·62 lb. per indicated horse-power hour. The mechanical efficiency was 69 per cent. In its present condition the Judges felt that the engine did not merit the distinction which would be given to it by the award of the second prize.

The "*Campbell*," $10\frac{1}{2}$ brake horse-power engine, can scarcely be called a portable engine. It is an excellent fixed engine upon a platform, but the only fact which could recommend its mounting is its clearance below, which is certainly a good point. The platform itself is a roughly-constructed tank filled with 165 gallons of water, with no provision for cooling except conduction and radiation through the sides, and on the trial the water rapidly got hot and had to be renewed. On the three days' trial, 1188 gallons of water were required for the $22\frac{1}{2}$ hours' run, which contrasts unfavourably with the 80 gallons of the "Hornsby" and 120 gallons of the "Crossley" engine on the same trial. The engine itself ran well except on the third day, when there was a large number of exhaust explosions. Its consumption was the lowest of any of the portables on the three days' run, namely, 0·94 lb. per brake horse-power hour, and on the full-power trial it was second with 0·99 lb. per brake horse-power hour. The belt lead was not good and could only prove satisfactory over a very limited range.

The *Clarke-Chapman* portable engine of 12 brake horse-power as exhibited was crude and unwieldy in design, though manifestly capable of improvement. It was scarcely in running trim till close upon the finish of the trials, and was evidently in no condition to do itself or its makers justice.

The leading particulars of these engines and a brief summary of the results of the trials are given in the tables on the two preceding pages.

King's College, London, W.C. D. S. Capper.

Official Reports.

REPORT OF THE COUNCIL

TO THE

HALF-YEARLY GENERAL MEETING OF GOVERNORS AND MEMBERS

HELD AT THE SOCIETY'S HOUSE,

13 *Hanover Square, W.*,

ON THURSDAY, DECEMBER 13, 1894,

SIR JOHN H. THOROLD, Bart. (President), in the Chair.

THE Council have to report that the List of Governors and Members has undergone the following changes during the half-year which has elapsed since the Anniversary General Meeting on May 22 last:—7 new Governors and 235 Members have joined the Society, 5 have been re-instated as Members under Bye-Law 12, and 6 Members have qualified as Governors; whilst the deaths of 5 Governors, 46 Life-Members, and 79 Annual Members have been reported. A total of 12 Members have been struck off the books under Bye-Law 10, owing to absence of addresses; 23 under Bye-Law 11, for arrears of subscriptions; and 64 have resigned.

2. The death of Mr. James Rawlence, at the great age of eighty-four, has deprived the Council of an active and valued colleague. Mr. Rawlence became a Member of the Society so long ago as 1844, and was elected to a seat on the Council in 1871.

3. The Council have elected as an Honorary Member of the Society Professor Wilhelm Fleischmann, Director of the Agricultural Institute of the Royal University of Königsberg, in recognition of his distinguished services to European Agriculture, and especially to the industry of dairying; and they have appointed Professor G. T. Brown, C.B., as Consulting Veterinary Surgeon to the Society, in conjunction with Professor Simonds.

4. Amongst other Governors and Members whose loss by death the Society has had to deplore since the Anniversary Meeting in May last are Earl Grey, K.G., one of the original founders of the Society, and its oldest member since the death of Sir Harry Verney; the Marquess of Headfort, Earl Sondes, Viscount Hardinge

the Rev. Lord Forester, Lord Charles J. F. Russell (a Foundation Life Governor, elected in 1838), Lord Swansea (a Member of the Council from 1884 to 1886), the Hon. Elton Gifford, the Hon. Edward Kenyon, Sir John D. Astley, Bart., Sir W. R. C. Cooke, Bart., Sir John Cowell, Bart., Sir J. Errington, Bart., Sir Gilbert Greenall, Bart. (a Member since 1841), Sir C. H. Tempest, Bart., Gen. Sir George Maude, Col. the Rt. Hon. J. S. North (a Foundation Life Governor, elected in 1839), Mr. J. S. Bankes (a Member since 1847), Mr. Manfred Biddell, Col. Ireland Blackburne, Mr. R. Bamford Hesketh, Mr. R. Archer-Houblon (a Foundation Life Governor, elected in 1840), Mr. F. D. Johnson, of Aykley-heads, Durham (a Member since 1844), Mr. John Morton, of West Rudham, Mr. John Prout, of Sawbridgeworth, Mr. N. P. Stilgoe, of Adderbury, Banbury, Mr. John Walter, of Bearwood, Mr. James Weatherby, and Gen. E. L. Wynne, of Coed Coch, Abergele.

5. These and other changes bring the total number of Governors and Members now on the Register to 11,247, divided as follows :—

17 Foundation Life Governors (Members elected before the granting of the Charter on March 26, 1840) ;
77 Governors paying an annual subscription of 5*l.* ;
96 Life Governors ;
7250 Members paying an annual subscription of 1*l.* ;
3682 Life Members ;
102 Life Members by Examination ;
23 Honorary Members ;
11,247 Total number of Governors and Members ;

or a net increase of 28 Members since the same period last year.

6. It is with great pleasure that the Council congratulate the Governors and Members upon the first General Meeting in the Society's new house, and upon the satisfactory completion of an enterprise which has engaged the constant attention of the House Committee for the past two years. It is only fitting that acknowledgment should here be made, as in previous reports, of the Society's deep indebtedness to the Duke of Westminster and Sir Walter Gilbey, without whose timely and generous help it would have been impossible for the Society to become possessed of a permanent home so commodious and so centrally situated. The large room on the ground floor has been fitted up as a reading and writing room for the convenience of Members, and it is now open and ready for use.

7. By the acquisition of these new premises the Council will be able through their Committees and Executive Staff to carry on the multifarious operations of the Society under greatly improved conditions ; and there is every reason to hope that the work of the Society may continue to develop in many useful directions. At the same time it must be borne in mind that the maintenance and extension of the Society's operations depend upon a continued flow of new subscribers. At least 500 new Members need to be elected

every year to take the place of those who die or retire. The Council desire, therefore, particularly to invite each Member to interest himself in obtaining new subscribers to the Society, and to suggest the names of any farmers, or others interested in agriculture in his district or of his acquaintance, who would be likely to become Members. The Secretary will, upon receipt of instructions, either write direct to the gentleman named, or will forward a supply of application forms to the nominating Member. A form of nomination is printed in each number of the Journal.

8. The Society's Fifty-fifth annual Country Meeting was held last June at Cambridge. Many circumstances combined to render it memorable. The rare event of the Society's Meeting taking place at a university town, coupled with the fact that the previous Cambridge Meeting of 1840 took place in the year of the Society's incorporation by Royal Charter, gave exceptional interest to the occasion. Nothing could have surpassed the cordiality with which the Society was welcomed by both the municipal and the university authorities. Owing to the comparatively small and scattered population of East Anglia, it was feared that the attendance would fall below the average. Fortunately this was not the case. Favoured by superb weather throughout the Show week, the number of paying visitors reached a total of 111,658, and the financial result was a profit of the satisfactory amount of 1,096*l.* 1*s.* 7*d.* To this gratifying result the active exertions of the Local Committee very materially contributed. Besides dispensing its traditional hospitalities during the Meeting, the University of Cambridge paid a graceful compliment to the Society by conferring Honorary Degrees upon selected representatives of Agriculture, including H.R.H. the Duke of York, a Governor of the Society, and Members of the Council and Executive. The ceremony, at which the Chancellor of the University conferred these degrees in person, took place in the Senate House on the Wednesday of the Meeting.

9. The Council have decided that the Darlington Meeting shall open on Monday, June 24, 1895, and close on the following Friday evening. The Implement Yard and the Dairy will be open to Members of the Society and the public on the previous Saturday, June 22. The last day for making entries in the Implement Department will be Monday, April 1; but post-entries of agricultural implements only will be received up to Monday, April 8. For Stock, Poultry, and Produce the entries will close on Wednesday, May 1, with post-entries at extra fees up to Saturday, May 11; but provision will be made for enabling exhibitors who have entered animals in due time to substitute for them entries of other animals in the same class up to Friday, May 31.

10. The Council have already reported their decision to offer in connection with the Darlington Meeting prizes amounting to 60*l.* for Hay- and Clover-making Machines. The detailed regulations for the trials have now been issued. The entries will close on Monday, April 1, 1895. Each competitor will be required to deposit

5*l.* at the time of making his entry for each implement entered, which will be forfeited in the event of the implement being subsequently withdrawn, or not duly submitted to competition. The trials will take place, shortly after the Darlington Meeting, on land in the neighbourhood selected by the Society.

11. The Prize-sheet for Stock, Poultry, and Produce has now been definitely settled, and will be issued immediately. The prizes offered in all departments (exclusive of Champion Prizes and Medals offered by various Breed Societies) amount in all to 6035*l.*, of which 948*l.* are provided by the Darlington Local Committee.

12. The Special Prizes offered by the Darlington Local Committee for Live Stock include seven classes for Hunters, three for Cleveland Bays, three for Coach Horses, four for Hackneys, one for Ponies, two for Shetland Ponies, two for Pit Ponies, two for Harness Horses, two for Agricultural Geldings, and one for Rulley Horses ; one class for Aberdeen Angus Cattle, one for Galloways, and two classes for Dairy Cows ; one class for Wensleydale and one for Border Leicester Ewes and Lambs. The Local Committee also offer three prizes in each of five classes for Stilton, Cotherstone, Wensleydale and Swaledale, and Cleveland Cheeses made in 1894, with a champion prize of £20 for the best exhibit in these classes ; and they provide prizes amounting to 16*l.* for a competition of local dairymaids and others.

13. The classes for Horses offered by the Society itself will include Hunters, Cleveland Bays, Coach Horses, Hackneys, Ponies, Shires, Clydesdales, and Suffolks. In the Cattle Classes prizes will be offered by the Society for the Shorthorn, Hereford, Devon, Sussex, Welsh, Red Polled, Aberdeen Angus, Galloway, Highland, Ayrshire, Jersey, Guernsey, Kerry, and Dexter Kerry breeds, as well as two Classes for Dairy Cows yielding the largest quantity of milk, and the greatest weight of butter fat. The classes for Sheep will include Leicesters, Cotswolds, Lincolns, Oxford Downs, Shropshires, Southdowns, Hampshire Downs, Suffolks, Wensleydales, Border Leicesters, Somerset and Dorset Horned, Kentish or Romney Marsh, Cheviots, Black-faced Mountain, Lonks, Herdwicks, and Welsh Mountain. Those for Pigs will include the Large White, Middle White, Small White, Berkshire, Black, and Tamworth breeds ; but it will, of course, depend upon the regulations of the Board of Agriculture in force at the time whether any exhibition of Pigs can take place at the Darlington Meeting. Prizes will also be given for useful descriptions of Poultry, including Table Fowls and Ducks ; for Butter ; for Cheeses of 1895 make ; for Cider and Perry ; and for Whole Fruit Jams and Bottled Fruits made in 1894. The British Beekeepers' Association will continue their Prizes for Hives, Honey, and Bee Appliances.

14. Butter-making Competitions will be continued at Darlington in four classes, including the class offered by the Local Committee, with a Champion class for the Society's Silver Medal and a prize of 5*l*. There will also be a competition of Shoeing Smiths practising in the district of the Show, comprising the counties of Northumberland, Cumberland, Durham, and Westmorland. The competition will be in two classes, viz. for Cart Horses and Hunters, and Prizes amounting to 16*l*. will be offered in each class. The Worshipful Company of Farriers have offered to present the Freedom of their Guild, free of cost, to the winner of the First Prize in each Class, provided the Judges consider that sufficient ability has been displayed. The Registration Committee of the Farriers' Company will also admit the First Prize winners in these Competitions to the Official Register of Farriers or Shoeing Smiths free of charge, and (on payment of the usual fees) all other competitors who shall duly satisfy the Judges of their efficiency.

15. The Council have decided to publish the list of the Veterinary Inspectors of Stallions and Brood Mares, with the names of the Judges, in the March number of the Journal, and to furnish owners of rejected animals, upon their application in due form, with a copy of the Veterinary Inspector's certificate.

16. Memorials having been received from the authorities of Leicester and Northampton, inviting the Society to hold its Country Meeting of 1896 in their respective localities, the question as to which of the two boroughs should be selected came up for final decision on November 7 last, when influential deputations attended from both places. After duly considering the arguments advanced on behalf of each town, as well as the report presented by the Committee of Inspection appointed to visit and examine the sites and other accommodation offered, the Council decided in favour of Leicester, where the Country Meeting of 1896 will accordingly be held. Leicester's central position renders it easily accessible from all parts of the kingdom, as well as from those Midland counties in the immediate district of the Show ; and the Council anticipate, therefore, a successful Country Meeting for the year 1896.

17. The Special Committee appointed by the Council to inquire into the nature and causes of abortion in cattle have presented their report. This report, which is printed in Part II. of the Journal for 1894, recommends that, for practical purposes and with a view to the adoption of the necessary precautions, the disease should be deemed to be contagious, and states that the evidence laid before the Committee justifies the adoption of the antiseptic treatment described in the leaflet issued by the Society, to which reference was made by the Council in their last report. Scientific investigations into the causes of abortion in cattle are now proceeding at the Royal Veterinary College, under a special grant of 200*l*. made by the Council for this purpose.

18. In view of the spreading of Anthrax, caused by the neglect of precautions in the disposal of Anthrax carcases, and of the danger to those handling them unskilfully, the Council issued in August last a leaflet summarising important facts from the article by Professors Brown and McFadyean in Part II. of the Journal for 1894, and giving simple directions for the effective disposal of the carcases of animals which have died from this disease.

19. In the last report allusion was made to the success which had attended the efforts of the Board of Agriculture to stamp out Pleuro-pneumonia, only eight outbreaks having occurred in the course of the year (1893) as compared with thirty-five in 1892 and 192 in 1891. The record of this year is still more satisfactory, as only two outbreaks were reported—one in May, in Kent, near Margate, and a second at Hendon in July. In each case the slaughter of the infected herd arrested the further progress of the disease. Swine Fever has continued to prevail in various parts of the kingdom, in spite of the measures which have been applied for its repression. Recently, however, there has been a considerable decrease in the number of outbreaks in Great Britain. An outbreak of Foot-and-Mouth Disease was reported in the last week of October in a small herd of cattle on a marsh at Rainham, Essex. All the animals were immediately slaughtered and buried, and other precautions were adopted. Since then two outbreaks have occurred—one in Cambridgeshire and one near Sittingbourne, Kent. In both cases the precautions adopted were successful in arresting the spread of the disease. The restrictions on the movement and sale of animals have been removed, except in small areas round the infected places. The Council regret to observe that a considerable number of cases of Rabies have been reported in Lancashire and Yorkshire (West Riding).

20. In the Department of Comparative Pathology and Bacteriology, established at the Royal Veterinary College by the aid of a grant from the Society, the work in the Research Laboratory has taken a wide range, including investigations on Tuberculosis, Diphtheria, Anthrax, Swine Fever, and allied diseases of swine, Ring-worm in calves, diseases of the joints of foals, and the use of Mallein and Tuberculin for the detection of Glanders and Tubercle in the earliest stage. The further experiments which have been made have materially strengthened the evidence in favour of both agents as aids to diagnosis in doubtful cases of disease. On all these subjects articles have appeared in, or are being prepared for, the Society's Journal.

21. The number of samples sent to the Consulting Chemist by Members of the Society during the past seven months has been 506, making a total for the twelve months, December 1, 1893, to November 30, 1894, of 1,148. Although the Fertilisers and Feeding Stuffs Act has now been in force for nearly a year, the Chemical Committee have reason to believe that but few samples have been sent for analysis under it, and that the advantages which this Society offers to its Members, together with the simpler procedure involved in sending samples to the Consulting Chemist, will be found much more generally useful to the farming community.

22. An especially abundant harvest has been this year experienced at the Woburn Experimental Farm. A continuation of previous experiments on the prevention of Potato Disease by the application of "Bouillie Bordelaise" (sulphate of copper, lime, and water) has again resulted in showing the benefit to be derived from this treatment of the potato crop. A change in the resident managership of the Experimental Farm was necessitated in October by the resignation of Mr. A. E. Elliott. Mr. Elliott had been manager at the farm for over five years, and during his tenure of the office both the farm and the experiments have been maintained in a very efficient state. The vacancy has been filled up by the appointment of Mr. C. H. B. Cane, late of Dunchurch, Rugby. During the forthcoming winter season feeding experiments will be conducted at the farm, both with bullocks and with sheep. The main object of the experiments will be to ascertain the value of home-grown wheat and barley for feeding purposes, and especially their possible effect in reducing the cost of the cake bill on the farm.

23. During the past year more than 270 applications have been made to the Consulting Botanist. The majority of these have been samples of grass for examination. The grass-seeds were on the whole pure and free from weeds, though Yorkshire fog still continues in a large proportion of the samples of ryegrass, from which it can be easily separated. Dodder was present in a very few of the clovers. The seeds of sorrel often occur in considerable quantity in white clover, otherwise the clovers were very free from impurity. Inquiries as to the names and properties of weeds and seeds were more numerous than before, and many cases of plants supposed to be injurious or poisonous to stock were reported upon. Mixtures for permanent pasture are still purchased, and some that were reported upon were most unsatisfactory. Many inquiries as to diseases of cereals, fruit trees, root crops, and garden plants were received and investigated.

24. The disease of Anbury, or Finger-and-Toe, in Turnips continues to engage the attention of the Botanical and Zoological Committee, and a report by Dr. Voelcker on the results of the inquiry, so far as it has proceeded, appeared in the June number of the Journal.

25. Among the insect pests which have been reported to the Zoologist during the last six months, the grub of the cockchafer holds a prominent place, and has been one of the principal subjects of investigation. Inquirics have been received with regard to many well-known injurious insects, such as the oak tortrix, root-flies, slug-worms, surface caterpillars, and grain-weevils; but in most cases the attacks have not assumed any great proportions, and the year as a whole seems to have been more than usually free from important insect depredations. One application had reference to Hessian fly, but the attack was so slight as to escape notice until the barley had been cut.

26. As the result of the Examination for the Society's Senior Prizes and Certificates, which took place on May 8–12 last, fifteen of the twenty-eight competitors satisfied the Examiners ; and the following competitors, placed in order of merit, gained First Class Certificates, the first six receiving additional rewards as stated below :—

1. John Dronsfield Whittaker, Royal Agricultural College, Cirencester. *First Prize of* 25*l. and Life Membership of the Society.*
2. Alexander Clark Welch, 5 West Newington Place, Edinburgh. *Second Prize of* 15*l. and Life Membership of the Society.*
3. Charles J. R. Tipper, The Agricultural College, Aspatria. *Third Prize of* 10*l. and Life Membership of the Society.*
4. Herbert Simpson Daine, Woolfall Hall Farm, Huyton, Liverpool. *Fourth Prize of* 5*l. and Life Membership of the Society.*
5. John Waugh Paterson, 14 Brunstane Road, Portobello, N.B. *Life Membership of the Society.*
6. Grosvenor Berry, Fairseat, Wrotham, Kent. *Life Membership of the Society.*
7. Joseph Terrence de La Mothe, The Agricultural College, Aspatria.
8. Albert A. Dixon, The Agricultural College, Aspatria.
9. Alfred George Scorer, Abercorn Lodge, Upper Hamilton Terrace, N.W.
10. George Lloyd Pain, Woodhay, Silverdale, Carnforth.

The following candidates, having passed in Agriculture and in three of the four other compulsory subjects, received Second Class Certificates :—

11. Frederick Victor Dutton, University College of North Wales, Bangor.
12. Richard Henry Evans, Llecheiddior Mill, Garn, R.S.O., Carnarvon.
13. Alexander George Gibson, University College of Wales, Aberystwyth.
14. William George Rumbold, 22 Great George Street, Westminster, S.W.
15. Thomas Whiting, University College of Wales, Aberystwyth.

27. Having further considered the question of the rewards to be offered to successful candidates at the Society's Senior Examination, the Council have resolved to place annually at the disposal of the Education Committee five Life Memberships of the Society, to be awarded to the five candidates who stand highest on the list of winners of first-class certificates, and who obtain not less than two-thirds of the maximum number of marks. In lieu of the money prizes heretofore offered, the Council propose to bestow the Gold Medal of the Society upon the candidate who stands highest on the list of winners of Life Memberships, provided that he has obtained not less than three-fourths of the maximum number of marks, and Silver Medals upon the other winners of Life Memberships (including the candidate at the head of the list, if he does not reach the standard required for a Gold Medal).

The next Senior Examination will be held from May 7 to 11, 1895.

28. The Annual Examination for the Society's ten Junior Scholarships of 20*l*. each took place on November 13 and 14, when thirty-two candidates competed. Of these, twenty passed in all four subjects (Agriculture, Chemistry, Mechanics, and Land Surveying), and obtained the number of marks necessary to qualify them for the Society's Scholarships and Certificates, in the event of their complying, during the forthcoming year, with the conditions of the Examination. Two other boys passed in each of the four subjects, but, not having obtained the minimum aggregate of marks, are ineligible for Certificates. Of the ten other unsuccessful candidates, four failed in one subject, four in two subjects, and two in three subjects. There were two failures in Agriculture, eight in Chemistry, six in Mechanics, and two in Land Surveying. Of the twenty successful candidates, the first ten in the following list will receive Scholarships upon complying with the Society's regulations, and the remainder will receive Certificates :—

1. Charles Elmhirst Duckering, Sedgebrook School, near Grantham.
2. Charles Edgar Nathaniel Reed, Ashburton Grammar School.
3. Frederick Hawkins, Ashburton Grammar School.
4. John Satterly, Ashburton Grammar School.
5. Edward Sawdye, Ashburton Grammar School.
6. John W. W. Armstrong, North-Eastern County School, Barnard Castle.
7. Ernest French, Ashburton Grammar School.
8. Sydney George Bell, Aspatria Agricultural College.
9. Joseph Henry Thomas, Sexey's Trade School, Bruton, Som.
10. William Stradling, Devon County School.

11. Arthur Pedlar Endacott, Ashburton Grammar School.
12. Percy Stutville Isaacson, Ashburton Grammar School.
13. Geoffry Sowerby, North-Eastern County School, Barnard Castle.
14. Harry Russell, Aspatria Agricultural College.
15. Ernest John Price, Sexey's Trade School, Bruton, Som.
16. Charles Jones Lockyer, Sexey's Trade School, Bruton, Som.
17. James Barron, Aspatria Agricultural College.
18. Thomas Bertrand Abell, Devon County School.
19. John Luker, Aspatria Agricultural College.
20. Frederick Soul, Pine House School, Wincanton, Som.

By Order of the Council,

ERNEST CLARKE,

Secretary.

13 Hanover Square, London, W.
December 12, 1894.

QUARTERLY REPORT OF THE CHEMICAL COMMITTEE, DECEMBER 1894.

"Roasted Nitrate of Soda."

The Committee think it desirable to call special attention to the fact that under the names of "Damaged Nitrate of Soda," or "Roasted Nitrate of Soda," a practically worthless material is in some parts being sold to farmers as a fertiliser. This material is in reality the residue obtained from the nitre pots used in oil of vitriol manufacture, and has been almost entirely deprived of the nitrate it contained, so that it has hardly any manurial value at all.

It is believed that farmers are induced to purchase this refuse under the idea that they are getting a cheap manure containing an appreciable quantity of nitrate of soda. A case exemplifying this was set out in the Report of the Committee for July, 1894 (Journal R.A.S.E., Third Series, Vol. V., Part III., No. 19, p. 546), and the following forms another instance in point :—

1. Mr. W. H. Glossop, of Forest House, Babworth, near Retford, sent on September 11, 1894, for analysis, a sample of what, he said, purported to be "damaged nitrate of soda."

Dr. Voelcker's analysis and report were :—

	September 19, 1894	
Water	·25	100·00
Common salt	·29	
Nitrate of soda	·05	
Free sulphuric acid	14·05	
Sulphate of soda, &c.	85·36	

This is not nitrate of soda at all, but probably the refuse from nitre pots used in the manufacture of sulphuric acid. It has no manurial value.

One ton 5 cwt. of the material had been purchased from Mr. William Hammond, sand and manure merchant, of 63 Weedon Street, Carbrook, Sheffield, at 30*s.* per ton ; but Mr. Glossop stated that though at the time of purchase the manure was represented to him to be damaged nitrate of soda, yet when the invoice came the description it bore was merely "tillage." The invoice, further, contained no statement (such as is required by the Fertilisers and Feeding Stuffs Act) of the fertilising ingredients guaranteed to be present in the manure.

Nitrate of Soda Adulterated with Salt.

2. Mr. William J. Graham, of Crepping Hall, Stutton, Suffolk, sent for analysis on July 20 a sample of nitrate of soda.

The report on this sample was :—

	July 25, 1894.	
Moisture	6·60	100·00
Chloride of sodium (common salt)	30·78	
Other impurities	1·09	
Pure nitrate of soda	61·53	

An adulterated sample, containing over 30 per cent. of common salt.

Mr. Graham stated that he had purchased 5 tons of the manure, at 10*l.* per ton, and that on the invoice was gummed a label as follows :—

Analysis of Nit. Soda ; sample taken from bulk in —— Works.

Nit. soda	95·28	100 00
Sulphate soda	·17	
Chloride sodium	2·15	
Insoluble matter	·20	
Moisture	2 20	
Refraction	4·35	

N.B.—Minimum percentage guaranteed under the Act of 1893 is 15 per cent. nitrogen.

The amount of nitrogen shown in Dr. Voelcker's analysis was only 10·1 per cent.

Ultimately Mr. Graham said that he received an allowance of 10*l.* on the quantity purchased ; but he declined to give the name of the vendors, as he said that the samples were not taken in a proper manner. He added, however, that the merchants, when they made him the full allowance he claimed, stated that they would get it allowed them by the importers of whom they purchased.

IMPURE SULPHATE OF AMMONIA.

3. Mr. H. J. Overy, of Mascall's Court, Paddock Wood, Kent, sent on July 19 a sample of 1 ton of sulphate of ammonia which he had purchased on July 12, at 15*l.* 5*s.* per ton delivered (payment in October). The order given was for 1 ton sulphate of ammonia guaranteed to contain 24 per cent. of ammonia. The invoice, however, bore in a footnote the following :—

Fertilisers sold by us contain (except where stated to the contrary) at least

Nitrogen . . . 1 per cent.

Dr. Voelcker's analysis of the sample showed :—

	July 23, 1894.	
Moisture	4·15	100·00
[1] Sulphate of ammonia	86·84	
Ash and other impurities	9·01	
[1] containing nitrogen	18·42	
equal to ammonia	22·37	

This is not a pure sample. Genuine sulphate of ammonia should have at least 24 per cent. of ammonia. This is adulterated with mineral matter (ash).

The vendors have agreed to deduct 25*s.* per ton for the deficiency of quality.

Horn Waste.

4. Mr. Geo. Brown, of Gaysham Hall, Barkingside, Ilford, Essex, brought for analysis on September 13 two samples of horn waste. The one was a sample stated to have been given to Mr. Brown at the time he ordered about 3 tons of horn waste, the delivery to be as per sample. The other was a sample which Mr. Brown said he took after delivery of the bulk had been made. The price was 5*l.* 15*s.* per ton, delivered to wagon in Covent Garden Market, and the vendors were Messrs. F. A. Reeves & Co., 56 Hinton Road, Camberwell, S.E. The analyses of the two lots came out as follows:—

Percentage of	Sample	Bulk delivered
Nitrogen	10·07	5·22
equal to ammonia	12·23	6·34

In a letter from the vendors to Mr. Brown, pressing him for prompt payment, they said: "It [the manure] was delivered to your wagon in a dry condition, and the bulk exactly the same as sample shown you."

Ultimately Mr. Brown took the delivery, paying 10*l.* instead of the original charge of 16*l.* 10*s.* 3*d.* in full discharge.

Linseed Cake.

5. Mr. E. H. Loyd, of Langleybury, King's Langley, Herts, forwarded for analysis on August 13 a sample of 1 ton of linseed cake sold to him, at 6*l.* 15*s.* per ton, by Messrs. F. G. King & Co., Mill Granary, High Street, Watford.

Dr. Voelcker's analysis showed:—

	August 25, 1894.	
Moisture	11·45	100·00
Oil	7·23	
[1] Albuminous compounds (flesh-forming matters)	29·06	
Mucilage, sugar, and digestible fibre	35·57	
Woody fibre (cellulose)	8·89	
[2] Mineral matter (ash)	7·80	
[1] containing nitrogen	4·65	
[2] including sand	2·80	

A grossly impure cake, of low quality, containing much rape, polygonum, *platykop*, and other weed seeds, besides nearly 3 per cent. of sand.

The cake was invoiced to Mr. Loyd as "* * * L Cake," but, in the course of the inquiries subsequently made, it was elicited that the makers had only invoiced it to Messrs. King & Co. as "* * * Oilcake."

6. Mr. H. Tallent, of West Acre, Swaffham, sent on August 2 a sample of linseed cake for analysis, on which the following report was given by Dr. Voelcker:—

	August 9, 1894.	
Moisture	11·35	100·00
Oil	8·86	
[1] Albuminous compounds (flesh-forming matters)	28·87	
Mucilage, sugar, and digestible fibre	40·86	
Woody fibre (cellulose)	4·81	
Mineral matter (ash)	5·25	
[1] containing nitrogen	4·62	

A cake largely adulterated with foreign seeds.

In reply to inquiries, Mr. Tallent said that the cake was one of foreign make, and 60 tons had been sold to him for forward delivery by friends of his, though under a guarantee of purity.

The contract was, in consequence, cancelled.

Poisoning by Castor-oil Bean.

The following case shows the great risk run in buying sweepings of mills, floors, &c., and using them as food for stock.

7. Mr. S. Skinner, of Leeds, Maidstone, sent for analysis on August 13 a sample of what he described as "mixed cake," adding that he had lost several sheep after feeding with it. The sample in question was taken direct from the feeding-troughs.

Dr. Voelcker's report was :—

August 22, 1894.

Dear Sir,—I beg to report to you that I have examined the sample of mixed cake sent by you, and that I find present in it *castor-oil bean husks*. These, I need hardly point out, are of poisonous nature. It is a most risky proceeding to purchase sweepings of wharves, warehouses, mills, &c., and to use these as food for cattle.

I take it you purchased without any guarantee as to the fitness of the material as food.—Yours faithfully, J. Augustus Voelcker.

S. Skinner, Esq.

It appeared that out of a flock of ninety-six sheep, twenty-five died, and all the rest were more or less affected. The veterinary examination quite coincided with Dr. Voelcker's analysis. About 10 tons of the cake were bought, at *5l.* *15s.* per ton. It was supposed to be a mixture of linseed cake, common cotton cake, and decorticated cotton cake, and was collected from wharves, warehouses, and landing-stages. The cake having been purchased from a friend, more particulars could not be obtained, except that full compensation was made for the losses sustained.

Emlyn,
Chairman.

13 Hanover Square, London, W.
December 11, 1894.

REPORT OF THE EDUCATION COMMITTEE ON THE SOCIETY'S SENIOR EXAMINATION.

In view of the discussions which have of late taken place in the Council as to the continuance of the Life Memberships which have heretofore been granted to winners of First Class Certificates at the Society's Senior Examination, the Education Committee think there may be advantage in placing upon record, for the information of the Council and the general body of Members, the facts as to the origin and growth of the system of what is now known as the Society's Senior Examination.

1. This examination was first held in 1868, a previous system,[1]

[1] For particulars of this system, see Mr. S. B. L. Druce's paper in Vol. II. 2nd series (1866), page 209.

commenced in 1865, of prizes and scholarships offered at the Oxford and Cambridge Local Examinations not having proved satisfactory. A proposal made in April 1867 by the Earl of Powis, on behalf of the Education Committee of that time, for the allocation of the Education Grant of 1867 in scholarships and prizes at the University Local Examinations, led to an animated debate, in which Mr. Dent, M.P., the President (Mr. Thompson), Lord Walsingham, Mr. Holland, M.P., Major-General the Hon. A. N. Hood, Mr. Randell, and Mr. Jabez Turner took part, and the motion was eventually negatived by 16 votes to 6.

2. The Council held a special meeting on May 2, 1867, to decide what should be done in the matter; and as the result it was resolved to have an examination of the Society's own, to include "the science and practice of Agriculture, Book-keeping, and one or more of the following subjects: Mechanics and their adaptation to Agriculture, Chemistry, Botany, Geology, Veterinary Science, Field Engineering, and Surveying."

3. At a meeting of the Council held on June 5, 1867, a committee, consisting of the Earl of Powis, Major-General the Hon. A. N. Hood, Mr. Acland, M.P., Mr. Dent, M.P., Mr. Holland, M.P., Colonel Kingscote, M.P., Mr. Wren Hoskyns, Dr. Voelcker, Mr. Wells, Professor Wilson, and Mr. Frere, was appointed to carry out this scheme; and in July 1867 Mr. Holland brought up a report containing the following recommendations, which are reprinted as showing the original regulations of the Senior Examination:—

1. That the first examination shall take place at the Society's House in Hanover Square during the week commencing April 20, 1868.

2. That forms of entry be prepared, which are to be duly filled up and returned to the Secretary [together with a certificate of general education],[1] on or before February 29, 1868.

3. That the examinations shall be conducted by means of written papers, and by a *vivâ voce* examination [at which any member of the Society may be present].

4. That every candidate be required to satisfy the examiners in the science and practice of Agriculture and in Book-keeping, and also in one of the two following subjects: Land Surveying, and Mechanics as applied to Agriculture.

5. That the successful candidates be placed in two classes, and be arranged in order of merit.

6. That candidates, in order to be placed in the first class, must satisfy the examiners in both the above-named subjects—Land Surveying, and Mechanics applied to Agriculture, and also in Chemistry.

7. That any candidate may offer himself for examination in one or more of the following subjects: Botany, Geology, and Veterinary Science. Any knowledge which he may show of these subjects will be counted to his credit in the general classification, provided that he has fulfilled the foregoing conditions, and provided that the knowledge of these subjects does not fall below the standard fixed as a minimum in each of these optional subjects.

8. Each successful candidate obtaining a first-class certificate shall thereby become a life member of the Society.

[1] The words in brackets do not appear in the more recent regulations.

9. That the following prizes be awarded to successful candidates placed in the first class for aggregate merit: First prize 30*l.*, second prize 20*l.*, third prize 10*l.*

10. That the following additional prizes be awarded to the candidate who shall show the highest merit in each subject respectively :—

Science and Practice of Agriculture .	Money or books	to value of	10*l.*
Mechanics	"	"	10*l.*
Chemistry	"	"	10*l.*
Botany	"	"	10*l.*
Geology	"	"	5*l.*
Veterinary Science	"	"	10*l.*
Land Surveying.	"	"	5*l.*
Book-keeping	"	"	5*l.*

11. That certificates, to be termed first and second class certificates, be granted to candidates placed in the first and second classes, such certificates to specify the subjects in which the candidate shall have satisfied the examiners.

4. With certain changes in detail, this scheme has remained in force ever since ; and the modifications in it that have from time to time been made may perhaps be most conveniently grouped under the following headings :—

Limit of Age.—The original resolution of the Special Council held on May 2, 1867, contemplated a limitation of the age of candidates to from 18 to 25 years of age ; but the examinations of 1868 and 1869 were held without any such limitation. An experiment tried in 1870 of limiting the age of all candidates to 21 years resulted in only two candidates (neither of whom passed) presenting themselves that year. In 1871 and 1872 only candidates under 21 years of age were eligible for prizes ; but the certificates were granted irrespective of age. All restrictions as to age were, however, abolished in December 1872, and none have since been imposed.

Compulsory Subjects for First-Class Certificate.—These subjects have always remained the same, except that Agricultural Engineering was substituted for "Mechanics" in June 1888.

Compulsory Subjects for Second-Class Certificate.—Originally a candidate had to satisfy the examiners in the science (Chemistry) and the practice of Agriculture and in Book-keeping, and in either Land Surveying or Mechanics. In June 1888 this was modified so as to make Agriculture the only obligatory subject ; but a candidate was required to *bonâ fide* attempt all the four others (Book-keeping, Chemistry, Land Surveying, and Agricultural Engineering), and to pass in three of them.

Rewards to Winners of First-Class Certificates.—The *Life Membership* of the Society has been offered throughout to winners of the first-class certificates—except that in 1894 the number of such life memberships was limited to five. The *money prizes* from 1868 to 1870 were 30*l.*, 20*l.*, and 10*l.* for the three best candidates placed in the first class in order of merit. In 1871 the prizes offered were 25*l.*, 10*l.*, and 5*l.*, and the first prize has remained at 25*l.* ever since. In 1873, 25*l.*, 10*l.*, and 5*l.* were awarded to the three candidates who won first-class certificates; in 1874, 25*l.*; in 1875, 1876, and 1877, 25*l.* and 15*l.*; in 1878, 25*l.*; in 1879, 25*l.*, 15*l.*, and 10*l.*; and in 1880, when, for the first time, there were four winners of first-class certificates eligible for prizes, 25*l.*, 15*l.*, 10*l.*, and 5*l.*—which amounts have since been annually offered.

Prizes for Proficiency in Particular Subjects.—From 1868 to 1872 separate prizes of 10*l.* or 5*l.* (amounting in all to 65*l.*) were offered for the candidates who obtained the highest marks in particular subjects; but these were discontinued after 1872, the Education Committee reporting on December 10, 1872, that they saw "no necessity for supplementary rewards to candidates already successful."

Subjects of Examination and Marks allotted.—The marks allotted for Agriculture, originally (like the other compulsory subjects) 200, were increased to 300 in November 1887. Agricultural Engineering was substituted for the vaguer title of Mechanics in June 1888, when also the marks for Land Surveying were increased from 100 to 200. Agricultural Entomology was added as an optional subject in November 1889.

5. The Table appended to this Report [see page 757] gives in columns 2, 3, 4, and 5 the number of candidates actually examined in each year from 1868 to 1894, the number of life memberships granted, the number of first-class certificates, and the number of second-class certificates.

From this Table it appears that during the twenty-seven years that the Senior Examinations have been held a total of 338 candidates have been examined. Of these, 108 have gained first-class certificates and 106 (viz. all the winners of first-class certificates but the last four of the ten successful candidates in 1894, and two candidates who were granted special certificates in 1888) have been granted life memberships of the Society.

6. With four exceptions (viz. one candidate elected in 1880 and one in 1881, who are dead; and two elected in 1888, ruled out owing to absence of addresses), all these 106 Education Life Members remain on the Society's registers. Their average age on admission to the life membership was as nearly as possible twenty-five years: forty of them were under age (the youngest fifteen years old), sixty-two were over age (the eldest sixty-five years old), and the ages of the remaining four are unknown.

7. For the first twenty years the number of life memberships granted annually was very small; but in 1889, 10 were granted; in 1890, 6: in 1891 and 1892, 8 each year; and in 1893, the large number of 14. It was this last result which caused the Education Committee to consider the question of some limitations being placed on the number of life memberships, and which has given rise to the discussions in the Council on the general question of the rewards offered at the Society's Senior Examination.

8. It is abundantly clear, from the communications which have reached the Society since this matter has been under consideration, that the candidates who enter for the Senior Examination attach far greater value to the education life membership of the Society than to the money prizes; and the Committee themselves would prefer that the rewards given to the successful candidates should be of a nature to connect them with agricultural matters in their after-life. The association with the Society of a body of men who have proved, by examination, their skill in the science and practice of Agriculture is alike creditable to the Society and honourable to the students. Those who have won life memberships through their own efforts are proud of the Society and of their connexion with it; and this *esprit de corps* is eminently deserving of encouragement. Obviously, however, the honour will be all the greater if it be bestowed, not merely as the result of a comparative trial of strength, but as the reward of a certain positive as well as comparative degree of merit.

9. Under the original regulations, any candidate who (by gaining half the marks) passed in all the compulsory subjects received, not only a first-class certificate, but also the life membership of the Society. Now that the number of candidates has increased, and the general standard of success has been raised, the Committee recognise that the unlimited granting of life memberships may not only impose a serious burden upon the Society's finances without commensurate advantage, but may tend to diminish the distinction of the reward itself. Accordingly, they propose that the life membership of the Society shall in future only be conferred upon the five candidates who are placed at the head of the list of the winners of first-class certificates, and who win not less than two-thirds of the maximum number of marks.

10. The Committee have fixed upon this standard after consideration of the results of the examinations during the twenty-seven years that have elapsed since it was first started. It appears from the Table that the 106 life memberships actually granted would have been reduced to forty-three if they had been limited to candidates who obtained two-thirds of the total number of marks, and to twelve if to those who gained three-fourths of the marks. The Table shows a distinct improvement in the quality of candidates during the last few years; and for this the facilities for the higher agricultural education now obtainable, and the demand for lectures under the Technical Education Committees of County Councils are doubtless, to a considerable extent, responsible. Whether the standard of candidates will continue to improve is, of course, a question which cannot be answered now; but the point as to the variations in the marking of papers by different examiners in different years must not be omitted from consideration.

11. If three-fourths of the maximum marks were required as a condition of giving a first-class certificate, it is to be feared that it would—taking the question of examiners' markings into

account—be the exception for a candidate to reach such a standard; although it is true that this year (1894) four out of the ten winners of first-class certificates would have done so. Previous years show, however, less favourable results; in nineteen years out of the twenty-seven there would have been no life memberships at all; in six, only one; in one year (1889), two; and in only one year (1894), so many as four (see column 7 of Table).

12. Intermediate between the high maximum of three-fourths marks and the general giving of life memberships to winners of first-class certificates (*i.e.* candidates who satisfy the examiners in the compulsory subjects) is the giving of memberships to those who, obtaining a first-class certificate, obtain two-thirds of the total number of marks. If this plan had been adopted since the commencement, there would have been twelve years with no memberships, six years with one membership, four with two, two with four (1890 and 1892), one with six (1894), one with seven (1889), and one with eight (1893) (see column 6 of Table). Under such a system as this, the average of the last ten years would have been a little over three and a half memberships per annum, as against the average of seven life memberships under the old system; or, in other words, the life memberships would have been reduced by one-half. It is only since 1889 that the number of life memberships granted annually has attained noticeable proportions. The 52 memberships granted in these six years would have been reduced to 31 if the two-thirds limit, and to 9 if the three-fourths limit, had been in operation.

13. It is of course impossible to say how many candidates will come up for the Society's examinations in the future. It might happen that there was a large influx of good candidates, and the Society might be called upon to give away an indefinitely large number of life memberships to those who obtained high marks. This difficulty the Committee propose to meet, as mentioned in paragraph 9, by asking the Council to place at their disposal a maximum of five life memberships per annum, to be awarded to those candidates who stand highest on the list, and obtain not less than two-thirds of the maximum number of marks. The largest annual expense to the Society under this arrangement would be 75*l.* (*i.e.* five life memberships at 15*l.* each); and, as it happens, 15*l.* is just about the sum which represents the net cost to the Society of providing a member aged twenty-five with his privileges during his life.

14. The five life memberships may be regarded as taking the place, to a large extent, of the money prizes heretofore offered to the four candidates highest on the list, as it is doubtless the desire of the Council to discourage candidates from coming up for examination for the mere purpose of obtaining monetary rewards. The prizes heretofore offered have been 25*l.*, 15*l.*, 10*l.*, and 5*l.*, or 55*l.* in all; and the Committee are of opinion that it would be preferable to substitute for these, as incentives to the students to strive for the highest place in the Examination, the Medal of the Society, to be awarded in gold to the candidate placed first of those gaining the five life memberships,[1] and in silver to each of the remaining four, provided, of course, they reach the standard prescribed for life membership. The cost of these five medals would be about 22*l.* per annum; hence the total rewards for the Senior Examination would not in future years cost more than 100*l.* per annum, against 55*l.* in prizes and an indefinite sum for life memberships under the old system.

(Signed) MORETON,
Chairman.

13 Hanover Square, London, W.
December 11, 1894.

TABLE SHOWING RESULTS OF THE SOCIETY'S SENIOR EXAMINATIONS FROM 1868 TO 1894.

Year	Number of candidates actually examined	Number of life memberships granted	Number gaining first-class certificates	Number gaining second-class certificates	Number of candidates who gained of the maximum marks	
					Two-thirds and over	Three-fourths and over
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1868	12	—	No award	No award	—	—
1869	18	2	2	8	No record	No record
1870	2	—	No award	No award	—	—
1871	4	2	2	1	No record	No record
1872	8	5	5	—	No record	No record
1873	9	3	3	—	—	—
1874	10	1	1	—	—	—
1875	6	2	2	—	1	—
1876	4	2	2	2	1	—
1877		2	2	1	—	—
1878	6	1	1	—	—	—
1879	12	3	3	—	—	—
1880	9	4	4	1	2	—
1881	10	3	3	1	2	1
1882	9	1	1	—	—	—
1883	19	6	6	—	1	—
1884	7	2	2	1	—	—
1885	12	3	3	1	1	1
1886	22	4	4	1	1	—
1887	7	3	3	1	2	1
1888	13	5	3	5	1	—
1889	24	10	10	6	7	2
1890	16	6	6	5	4	1
1891	13	8	8	1	2	—
1892	20	8	8	2	4	1
1893	30	14	14	8	8	1
1894	28	6	10	5	6	4
Summary	338 candidates	106 life memberships	108 first-class certificates	50 second-class certificates	43 who gained two-thirds total marks	12 who gained three-fourths total marks

[1] As will be seen from the discussion in Council on this report (see Appendix, page clxxix.), the award of a Gold Medal to the candidate placed highest on the list has been made conditional on his earning at least three-fourths of the maximum number of marks.

REGULATIONS AS TO THE SOCIETY'S SENIOR EXAMINATION.

(*As approved by the Council on December* 12, 1894.)

1. An Examination of Candidates for the Society's Senior Certificates is held annually, in the month of May, at the Society's House, 13 Hanover Square, London, W. The next Examination will take place from Tuesday, May 7, to Saturday, May 11, 1895.

2. Forms of entry may be obtained of the Secretary, and must be returned to him duly filled up on or before March 31 preceding the Examination.

3. A Deposit of 1*l.* must be paid by each candidate at the time of making his entry. This Deposit will be returned to all candidates attending for examination at the proper time, but will in other cases be forfeited, unless an explanation satisfactory to the Council be received before the first day of the Examination.

4. The Examinations will be conducted by means of written papers, and by a *vivâ voce* examination.

5. The successful candidates will be placed in order of merit in two classes—First Class and Second Class.

6. Certificates, to be termed first- and second-class certificates, will be granted to candidates placed in the first and second classes: such certificates will specify the subjects in which the candidates shall have satisfied the Examiners.

7. In order to obtain a *first-class* certificate a candidate must satisfy the Examiners in the Practice of Agriculture, Book-keeping, Chemistry, Land Surveying, and Agricultural Engineering.

8. In order to obtain a *second-class* certificate a candidate must satisfy the Examiners in the Practice of Agriculture, and also in three of the four following subjects, all of which must be *bonâ fide* attempted :—Book-keeping, Chemistry, Land Surveying, and Agricultural Engineering.

9. A candidate may offer himself for examination in one or more of the following subjects, viz. :—Geology, Botany, Veterinary Science, and Agricultural Entomology. Any knowledge which he may show of these subjects will be counted to his credit in the general classification, provided that he shall have fulfilled the foregoing conditions, and provided that the knowledge of these *optional* subjects does not fall below the standard fixed as a minimum in each of such subjects.

10. A candidate who does not obtain half the maximum number of marks in any of the subjects in which he is examined will be considered as failing in that subject. The maximum number of marks obtainable in each subject is as follows :—

		Optional Subjects.	
AGRICULTURE	300	GEOLOGY	100
BOOK-KEEPING	200	BOTANY	100
CHEMISTRY	200	VETERINARY SCIENCE	100
LAND SURVEYING	200	AGRICULTURAL ENTOMOLOGY	100
AGRICULTURAL ENGINEERING	200		

11. The Society offers the following rewards to candidates who are placed in the first class, and obtain not less than two-thirds of the maximum number of marks in the examination (1,500) :—

To the candidate placed *First* in order of merit—

The Life Membership of the Society, and (if he obtains not less than three-fourths of the maximum number of marks) the Society's GOLD MEDAL: otherwise the Society's SILVER MEDAL.

To each of the candidates placed *Second*, *Third*, *Fourth*, and *Fifth* in order of merit—

The Life Membership of the Society, and the Society's SILVER MEDAL.

12. The winner of a Gold Medal will be permitted to style himself "Gold Medallist of the Royal Agricultural Society of England"; and the winner of a Silver Medal, "Silver Medallist of the Royal Agricultural Society of England."

13. A candidate who gains a first-class certificate, but is not amongst the first five successful candidates in order of merit, may compete again in either of the two following years for the life membership and medal of the Society.

By Order of the Council,

ERNEST CLARKE,

Secretary.

13 Hanover Square, London, W.
December 12, 1894.

REPORT OF THE EDUCATION COMMITTEE

On the Results of the Junior Examination of November, 1894.

THE Committee have to report that the Examination for the Society's ten Junior Scholarships of 20*l.* each, for boys between the ages of 14 and 18, took place on November 13 and 14, 1894. Of thirty-five candidates who originally entered, thirty-two actually competed from the following eight schools :—

The Ashburton Grammar School; the Aspatria Agricultural College; the Devon County School; the Sedgebrook School, Grantham; the North-Eastern County School, Barnard Castle; Sexey's Trade School, Bruton, Somerset; Wellingore Hall, Lincoln; and the Pine House School, Wincanton.

2. Of the thirty-two competitors, twenty have passed in all four subjects (Agriculture, Chemistry, Mechanics, and Land Surveying), and have obtained the number of marks necessary to qualify them for the Society's Scholarships and Certificates. These will, in accordance with the regulations, be retained until the winners of the Scholarships shall have spent the ensuing year at school or college, or with a practical agriculturist upon a farm. Two candidates passed in all four subjects, but failed to obtain the minimum total marks necessary to qualify for Certificates. Of the ten other unsuccessful competitors, four failed in one subject, four in two subjects, and two in three subjects. There were two failures in Agriculture, eight in Chemistry, six in Mechanics, and two in Land Surveying.

3. The names of the successful candidates, with the number of marks gained by each, are given in the following Table :—

No. in order of merit	Candidate	Age	School or College	Agriculture, 400 ; Pass, 150	Chemistry, 200 ; Pass, 75	Mechanics, 200 ; Pass, 75	Land Surveying, 100 ; Pass, 40	Total, 900 ; Pass, 450
1	Duckering, C. E.	16	Sedgebrook, Grantham	300	124	175	75	674
2	Reed, C. E. N.	17	Ashburton Grammar School	320	132	95	100	647
3	Hawkins, F.	15	Ashburton Grammar School	295	144	105	100	644
4	Satterly, J.	14	Ashburton Grammar School	250	143	160	82	635
5	Sawdye, E.	16	Ashburton Grammar School	300	141	100	90	631
6	Armstrong, J. W. W.	16	North-Eastern County School	350	100	105	73	628
7	French, E.	16	Ashburton Grammar School	265	137	140	80	622
8	Bell, S. G.	17	Aspatria Agricultural College	220	127	165	85	597
9	Thomas, J. H.	15	Sexey's Trade School, Bruton	260	126	150	60	596
10	Stradling, W.	15	Devon County School	185	150	145	90	570
11	Endacott, A. P.	15	Ashburton Grammar School	195	151	130	70	546
12	Isaacson, P. S.	16	Ashburton Grammar School	285	84	120	47	536
13	Sowerby, G.	14	North-Eastern County School	250	75	120	87	532
14	Russell, H.	17	Aspatria Agricultural College	270	97	90	50	507
15	Price, E. J.	15	Sexey's Trade School, Bruton	195	104	125	72	496
16	Lockyer, C. J.	16	Sexey's Trade School, Bruton	200	106	105	75	486
17	Barron, J.	17	Aspatria Agricultural College	210	108	95	70	483
18	Abell, T. B.	14	Devon County School	150	143	105	75	473
19	Luker, J.	16	Aspatria Agricultural College	195	113	115	47	470
20	Soul, F.	16	Pine House, Wincanton	170	89	125	75	459

4. The Examiner in Agriculture (Mr. Primrose McConnell, B.Sc.) reports that "whilst the number examined is the same as last year, the average results are rather better, as there is the lowest proportion of failures I have hitherto had. The questions were all well answered, with the exception of No. 6, that relating to warble-flies ; and this is rather surprising, considering how much is common knowledge regarding this pest, and that a somewhat similar question was asked in a recent year."

5. The Examiner in Chemistry (Dr. J. Augustus Voelcker, M.A., B.Sc.) remarks that "the chief point brought out is that the candidates run much in groups, evidently as the teaching in a school is good or indifferent. As the marks show, no one has exhibited any special excellence, and, taking it all round, the result is only moderate. The question in which least concise knowledge was shown was that relating to wood charcoal and animal charcoal."

6. The Examiner in Mechanics and Natural Philosophy (the Rev. Professor Twisden, M.A.) reports that "a good deal of the work was very fairly well done, and a few of the boys sent up very good papers. Want of exactness, which one always expects to find

prevalent in answers to questions on this subject, was shown, except in some of the best papers. Question 2 and the latter part of Question 7 were seldom well answered. The answers to Question 10 were never quite satisfactory, and in nearly all cases showed that the 'parallel motion' is not understood." The same examiner also reports that "the questions in Mensuration and Surveying were well answered," and adds that, "looking back to the work that was sent up a few years ago, I cannot help thinking that there is a very distinct improvement. Speaking generally, the boys have now a better understanding of how to draw to scale, and how to treat such questions as Question 5, than was then common."

7. Taken as a whole, the results of the Examination are eminently satisfactory, and compare favourably with previous years. The attention paid to Practical Agriculture is gratifying, there being only two failures in this subject. In one of the schools, however, where the whole of the six candidates passed creditably in Agriculture, as many as four failed in Chemistry; which apparently indicates a lack of uniformity in the study devoted to each subject. The success of the Ashburton Grammar School is remarkable. All the seven candidates from this school passed, and five succeeded in gaining scholarships, *i.e.* half of the number offered.

MORETON,
Chairman.

13 Hanover Square, London, W.
December 11, 1894.

EXAMINATION IN AGRICULTURE.

MAXIMUM NUMBER OF MARKS, 400. PASS NUMBER, 150.

Tuesday, November 13, 1894.

(*Three hours allowed.*)

1. On which geological formations in this country would you expect to find the best soils, and on which do inferior soils occur? Give any explanation you can of the reasons for these differences.

2. Taking six different grades of soil, varying from stiff clay up to coarse gravel, construct a table giving approximately the depth of the drains, and the width apart suitable to each in draining the land.

3. Explain some of the differences in quality between oats grown in different localities, and state what are the conditions of soil and climate necessary to grow a good sample of both grain and straw.

4. Describe the work of raising potatoes by hand, or by the potato-digger, specifying the number of men, boys, and horses required, with all details.

5. Describe the making of meadow hay as practised in your district, and point out the precautions to be observed.

6. State how you would deal with cattle to prevent attacks of the warble fly, and also how you would treat them after they were affected with this pest.

7. What effect have good and inferior foods respectively on the growth of wool, and what benefits accrue from dipping sheep?

8. Enumerate all the British breeds of sheep you know, and classify into mountain and low-country breeds.

9. State some of the ways in which milk may be productive of disease in human beings, and the precautions to be observed to keep it pure and wholesome.

10. Given that the temperature of the atmosphere varies from 55° to 65° Fah., give approximately the corresponding temperatures at intermediate degrees suitable for churning ripe cream. Would you make any difference in the case of sweet cream and of whole milk?

EXAMINATION IN ELEMENTARY CHEMISTRY.

MAXIMUM NUMBER OF MARKS, 200. PASS NUMBER, 75.

Tuesday, November 13, 1894.

(*Three hours allowed.*)

1. What is, speaking generally, the chemical composition of the atmosphere, and which are the constituents found in it that take part in the processes of vegetation?
2. Mention the principal uses to which oil of vitriol is put in agriculture.
3. Which are the chief gases composing coal gas? Name their leading properties. Which are the common impurities of coal gas?
4. What is alumina? Mention its use in the Arts.
5. Describe the properties and uses of wood charcoal and animal charcoal. How would you distinguish them from one another?
6. In what form is lead chiefly found in nature? How is the metal prepared from its ore?
7. How many different sets of compounds does copper form? How could the presence of a copper salt in a solution be detected?

EXAMINATION IN MECHANICS AND NATURAL PHILOSOPHY.

MAXIMUM NUMBER OF MARKS, 200. PASS NUMBER, 75.

Wednesday, November 14, 1894.

(*Three hours allowed.*)

1. What is the centre of gravity of a body? Mention one property of the centre of gravity. If a body were hung up by a piece of string fastened to point of it, in what position would it come to rest?
2. Draw a triangle ABC, with C vertically over A, and make AC two and a half inches long; take O the middle point of BC. Let AB represent a uniform rod, weighing 20 lb., which can turn freely round a hinge at A, and is supported by a string fastened to B and to a fixed point at C; show that AOC is a triangle for the forces that keep AB at rest; and find from it the tension of the string, and the pressure on the hinge.
3. Define a lever and its fulcrum. Give an example of a lever.

   What relation holds good between the power and weight in a lever?

   There is a lever 10 ft. long with a fulcrum at one end; if it be required to support a weight of one ton by a force equal to 70 lb. weight acting at the other end of the lever, at what point of the lever must the weight of one ton be applied?
4. A body whose weight is 50 lb. is just drawn along a horizontal plane by a force acting horizontally and equal to 7·5 lb. weight; what is the coefficient of friction between the body and the plane?

   Define the coefficient of friction and state the laws of friction.
5. Define a foot pound of work.

   If the ton weight in question 3 were raised a quarter of an inch, how many foot pounds of work must be done by the force of 70 lb., and through what distance must the point of application of that force be moved?
6. Write down a formula for finding the distance through which a body would fall freely in a given time, and state in words the meaning of the formula.

   If a body fell freely from rest through 90 ft. in a certain time, through what distance would it fall from rest in a third part of that time?
7. State how to find the specific gravity of a body by the balance.

A body weighs 12 lb. in vacuo and 8 lb. 12 oz. in water; what is its specific gravity?

A body, whose specific gravity is 6, weighs 10 lb.; it is tied to a piece of wood, whose specific gravity is 0·84, and just sinks it; what is the weight of the piece of wood?

8. Describe a barometer.

What does a barometer measure?

What effect would be produced if a hole were made in the longer branch of a barometer-tube? And what, if the hole were made in the shorter branch?

9. Explain what is meant by air being saturated with vapour.

If saturated air is inclosed in (say) a glass vessel at a temperature of 60°, what will be the effect of taking the vessel into a room where the temperature is (say) 40°? And what of taking it into a room where the temperature is (say) 80°?

If there are no fires in a house, why do the walls commonly get damp when a thaw comes?

10. Describe the contrivance called a "parallel motion," and explain how it is applied in the ordinary stationary steam engine, and in what way it is useful.

EXAMINATION IN MENSURATION AND LAND SURVEYING.

MAXIMUM NUMBER OF MARKS, 100. PASS NUMBER, 40.

Wednesday, November 14, 1894.

(*Two hours allowed.*)

1. A side of a triangle is 920 ft. long; the angle opposite to the side is 43°, and the angle at one end of the side is 57°; draw the triangle to the scale of 1 inch equal to 180 ft., note the lengths of the other two sides, and find the area of the triangle.

2. Of two rectangular areas one is 500 ft. long by 60 ft. wide, the other is 1,200 ft. long by 700 ft. wide; find (*a*) the ratio of the larger area to the smaller, (*b*) the larger area in acres, with the odd roods and poles.

3. There is a long pond or canal; 500,000 cubic feet of water flow into it daily, over a cascade at one end; and in like manner the same number of cubic feet flow out daily at the other end; the cross section of the water in the canal, near the middle, is triangular, the width of the water being 80 ft. and the greatest depth 5 ft.; with what velocity—say, in feet per minute—does the water flow through this section?

4. A circle is 150 ft. in diameter; find its area to the nearest tenth of a square foot by taking 3·14159 as the value of π.

If $\frac{22}{7}$ were taken as the value of π, what would be the error in the area to the nearest square foot?

5. A plan or map is drawn to the scale of 16 in. equal to one mile, what area in acres is represented by a square inch on the plan?

Draw a square which would represent on the plan an area of 20 acres,

6. A, B, C, D, E, F, G, are points in succession along a road; their distances from A are successively 0, 270, 510, 810, 1060, 1300, 1620 ft.; a levelling staff is placed successively at the points A, B, &c., and the readings of the level are as follows: between A and B, backsight 11·3, foresight, 2·5; between B and C, backsight 10·8, foresight 4·8; between C and D, backsight 12·1, foresight 4·1; between D and E, backsight 6·5, foresight 2·7; between E and F, backsight 3·1, foresight 7·9; between F and G, backsight 4·7, foresight 7·8. Arrange these data in the form of entries in a field-book, and draw a section of the road, taking the point A to be 70 ft. above the datum line, and using a vertical scale of 2 in. equal to 100 ft., and a horizontal scale of 1 in. equal to 300 ft.

ANNUAL REPORT FOR 1894 OF THE CONSULTING CHEMIST.

In the past year 1,148 samples have been sent to me by members of the Society for analysis. A classified list of these is given at the end of the present report. The Society's Chemical Department has been further employed in carrying out analyses in connexion with the Woburn Experiments and other agricultural investigations, as also with work arising out of the Country Meeting held at Cambridge. In all, 1,259 samples have this year passed through my hands.

As regards the samples sent for analysis by members of the Society, it may be remarked that about the same number and kinds of *oilcakes* have been sent as in 1893, though in the matter of compound cakes, feeding meals, &c., there has been a not unwelcome reduction. I say "not unwelcome," because in these times of agricultural depression and of extremely low prices for home-grown corn, farmers cannot afford to pay the "fancy" prices which are not unfrequently asked for meals, &c., made up from materials which they could quite well purchase for themselves far more moderately, or, at all events, substitute others with quite as good results. I do not by any means say that there are not to be had mixed feeding meals made up of perfectly sound and good materials and charged at reasonable prices. But, at the same time, there are a great many that are the reverse of this; and the farmer, it is feared, is too often led to believe that there is in them some particular "virtue" which does not attach to the simpler and cheaper mixture which experience and market considerations would lead him to use on his farm. A little fenugreek or other spice, a little locust-bean meal or other sweetening material, may be made to go a long way in producing a "tasty" article which cattle will readily eat; but it does not follow from this that the feed is an economical one. Not unfrequently, too, does it happen that the "flavouring" is made to cover the defects of ingredients originally not of the best or soundest description; and it is no exaggeration to say that compound cakes and feeding materials are often the media for using up screenings, mill-sweepings, and impurities which have to be removed from the oil seeds employed in the manufacture of linseed and other cakes sold under a designation implying that they are "pure."

The point brought out that although home-grown wheat and barley were very cheap, yet linseed and other cakes seem to have been used to about an equal extent as previously, may be due to the fact of the dry season and short crops of 1893. But in view of the abundant harvest of 1894, there can be little doubt that both wheat and barley will be more extensively used as feeding materials this present winter; and, already, the low prices for them are having a marked influence in keeping down the prices of linseed, cotton, and other oilcakes. The question of the extent to which home-grown produce can be profitably used to replace cake acquires, consequently, greater significance, and with this view it has been decided to carry out at the Society's Experimental Farm at Woburn further feeding experiments, both with bullocks and with sheep, on the use of wheat and barley, with the view of throwing more light on this subject.

There has been a diminution in the number of *manures* of different kinds submitted for analysis ; markedly so in the case of bone meals. Basic slag, however, continues (chiefly, I think, on account of its cheapness) to be fairly extensively used, and its quality has been found throughout satisfactory.

Nor has there been the large number (228) of *waters* that were submitted in 1893. This, however, is fully accounted for by the difference of the two seasons, the prolonged drought of 1893 calling for the utilisation of many a fresh source of supply, often of questionable character. Neverthelesss, the considerable number of 169 samples has this year been forwarded.

Perhaps the most important event to chronicle in connexion with the chemical work of the Society has been the coming into force of the Fertilisers and Feeding Stuffs Act of 1893. It was thought by some possible that the machinery set up by the new Act would practically take the place of the existing organisations of agricultural societies and similar bodies, and provide all over the country ready means for the farmer to ensure, at small cost to himself, the quality of whatever he purchased in the way of food stuffs for his cattle or of manure for his land, and that there would be no longer need for him to subscribe to such associations for the purpose of obtaining analyses and advice regarding his purchases ; while, so far as the trade was concerned, the insertion in the Act of certain penal clauses would make adulteration and misrepresentation impossible, and encourage the honest trader to the exclusion of the dishonest one. The first year's experience, however, has very far from shown any such result ; and, though undoubtedly, good has been done by the passing of the Act, the Quarterly Reports of the Chemical Committee of this Society have pointed only too clearly to there being as much need as ever for the continued vigilance and action of the Chemical Department in securing to the members the purity and good quality of what they purchase, and for the exercise, by the members, of the privileges of chemical analysis which are afforded to them.

Perhaps the chief advantage to the consumer from the Act of 1893 is that now, for the first time, there has been a definite pronouncement as to certain terms such as "linseed cake," "cotton cake," "rape cake," &c., being applicable only to cakes made from the seeds denoted by those terms, and being thus "pure" cakes. A second great gain has been in the obligation enforced on a vendor to *give an invoice*, and one that has to set out, in the case of a feeding stuff, whether it is a pure or a mixed one, and, in the case of a fertiliser, what its essential ingredients are. Further advantages exist in the obligation imposed on manufacturers to omit all deleterious, and to declare all worthless, ingredients in mixed feeding cakes. Of course vendors have found numerous ways of practically evading the Act, and, by using such qualifying phrases as "made from linseed with natural impurity" or by guaranteeing manures to contain "at least one per cent." of the valuable ingredients, they have secured themselves from the severer penalties of the Act; but, on the whole, the tendency of legislation has been to improve the prospects of the better class of dealers.

A review of the Quarterly Reports of the Chemical Committee issued during the year will call attention to the most prominent adulterations that have come under notice. Among these and other points may be mentioned the finding, in several instances, of castor-oil bean in linseed and other cakes; the presence of the vetchling *Lathyrus sativus* in compound cakes; the "woolly" character of cotton cake; and the sale, under the name of "damaged" or "roasted" nitrate of soda, of a refuse material from oil of vitriol manufacture, which has next to no nitrate of soda at all left in it. These will be severally noticed in their places. Other features of interest are an improvement in "pure" linseed cakes, and the general good quality of the standard manures sold by manufacturers, including the more recently introduced basic slag.

Linseed Cakes.

Although several cases have been published in the Quarterly Reports of the Chemical Committee wherein cakes have not been in accordance with the descriptions given of them on the invoices, it is only fair to say that, taken as a whole, the result of my examinations has been to show that where care has been taken to stipulate for "linseed cake, *i.e.* "pure" linseed cake (the Act laying down that the description "linseed cake" must only apply to linseed cakes that are "pure"), this is generally supplied. Nor can I say that there has been any real difficulty experienced as to what is meant by "pure" linseed cake, the definition laid down in the Journal, vol. xxiv. (1888), pp. 300, 301, having, as I mentioned last year, proved a satisfactory solution of any question on this point. If farmers would but insist on having cakes invoiced to them simply as "linseed cake," without any further description or subsequent qualification, they would find, in this alone, a great protection against being imposed on.

The following analyses may be of interest as showing that high price and high quality do not always go together:—

	A	B	C
Moisture	9·67	12·61	10·75
Oil	6·32	11·67	12·01
[1] Albuminous compounds .	37·62	33·44	27·95
Mucilage, sugar, and digestible fibre	32·96	30·40	34·38
Woody fibre	8·25	6·20	8·90
Mineral matter (ash) . .	5·18	5·68	6·01
	100·00	100·00	100·00
[1] containing nitrogen . .	6·02	5·35	4·47

A was a very hard-pressed American cake, extremely low in oil. Despite this, it cost, in April 1894, 8*l.* 12*s.* 6*d.* per ton delivered, near Worcester.

B cost, in October 1894, 7*l.* 5*s.* per ton delivered, the carriage alone costing 11*s.* 8*d.* per ton.

C cost, in October 1894, 5*l.* 15*s.* per ton, *ex* ship, or 6*l.* 2*s.* 6*d.* per ton delivered.

All three cakes, it may be added, were pure ones.

Castor-oil Bean in Linseed Cakes.

The occurrence of castor-oil bean in linseed cake is, in my experience, almost confined to the case of foreign-made cakes, and especially those that come from Marseilles. At the latter port a good deal of castor bean is crushed, and care is not always taken to thoroughly clean the mills of it before putting them on to linseed or other seed crushing. This constitutes one of the chief risks run by farmers who purchase cheap foreign-made cakes. In one instance that came under my notice a delivery of cake, sold as "Round Italian Linseed Cake," was found to contain castor-oil bean, and over thirty lambs died from eating it. In another case a farmer had been unwise enough to purchase the sweepings of wharves, floors, &c., and into these some castor-oil bean had found its way. On giving it to a flock of 96 sheep 25 of them died, and all the others were more or less affected. It need hardly be said how great is the risk run in using as food for stock such materials as the sweepings of mills, floors, &c.

In reference to the occurrence of castor-oil bean in linseed and other cakes, it is well to point out that a difficulty may exist in subsequently tracing the actual presence of the poisonous seed, for, inasmuch as it is seldom or never put in purposely, but finds its way in by some means such as that described in the crushing of linseed immediately after castor seed has been used in the same mill, it is quite possible that only the first lot of cakes of a delivery may contain the castor seed, while others may be free from it. An examination of a single cake may thus, presumably, lead to the conclusion that no castor is present. In all such cases several cakes from different parts of the delivery should be separately examined for the presence of the poisonous seed.

Cotton Cakes.

Perhaps in no recent year has cotton seed come over to this country more "woolly" and dirty than during the past season. Nor has there often been less trouble taken generally in cleaning it. Sand, as noticed in my last Annual Report, has again been prominent by its quantity, and, taking it all round, the common or undecorticated cotton cake has been singularly poor in quality this year.

In one case in which I had reported that a sample of cotton cake was "very woolly in character, the seed not having been properly cleaned from wool," it was ascertained that three bullocks that had been feeding on the cake had to be slaughtered. The vendors of the cake admitted its bad condition, and the liability incurred.

In a second case, the cake again being full of wool, animals to which it was given refused to eat it.

In a third instance, though the cake was sold as "Pure Egyptian cotton cake," it was found not only to contain a great deal of wool, but also actual pieces of rope crushed along with the cake.

The presence of an excessive quantity of wool, owing to imperfect cleaning of the seed, constitutes, in my opinion, ample ground for considering such a cake "impure," and I shall, in future, report accordingly.

Decorticated Cotton Cake.

Decorticated cotton cake has been very free from adulteration, and though generally not nearly as soft as one would like to have it, the demand for any that comes over to this country is very great, and the deliveries are rapidly snapped up. At this I am not at all surprised, after the experience gained in the Woburn Feeding Experiments on the economical value of this kind of cake. One sample of cake analysed by me I found to contain no less than 8·42 per cent. of nitrogen. The high manurial value of such a cake, as compared with other foods used on the farm, must be very apparent. The unfortunately often corresponding hardness can be met by exposing the cake to the air for some time before using, and then breaking it up finely.

Compound Cakes, Feeding Meals, &c.

I have already commented on several points regarding the relatively high prices at which these mixed foods are frequently sold, and on certain disadvantages that may attend their use.

In one recent instance I found castor-oil bean present in a compound feeding cake, and after careful investigation this was proved to have come in by the use, as one of the ingredients, of foreign cake, good in itself, but which had been crushed in a mill in which castor seed had previously been ground. Several valuable bullocks died from eating the cake in question.

Lathyrus sativus as an Ingredient of Mixed Feeding Cakes.

I have on several previous occasions referred to cases in which I have traced injury caused to stock to the occurrence in some of the food given to them of seeds of the vetchling *Lathyrus sativus*, a seed known in India to frequently produce harmful effects, and giving rise to a particular condition called "lathyrismus." When I was in India in 1889-90 I inquired carefully into this matter, and during the past year have come across several fresh cases of poisoning through the use of this particular seed. In the spring of this year I collected the information on the subject in the form of a paper which I read before the Society of Public Analysts, and which is published in the *Analyst* for May 1894. In one instance two milk cows died and four others exhibited signs of paralysis after eating a feeding meal in which this bean figured largely ; in another case an entire flock of pure Shropshire sheep was affected, many of them dying after eating a compound cake in which I subsequently found *Lathyrus sativus* present. Lastly, matters were brought to a decided conclusion by an important legal case which was tried at Bristol in the autumn, and in which it was clearly established that the use of *Lathyrus sativus*, under the name of "Indian Peas," had caused the death of a number of horses.

Miscellaneous Feeding Stuffs.

The following analyses, made by me, of materials used for feeding purposes may be found useful :—

—	A	B	C	D	E	F
	Bullock fattener	Oat shellings	Sunflower seed	Malted acorns	Coffee husks	Bean cake from Newchong, China
Moisture . .	10·71	10·25	10·97	18·45	11·17	19·52
Oil . . .	·63	·56	24·50	3 98	·60	8·22
[1] Albuminous componnds .	1·31	2·94	15·37	5·25	4·00	39·25
Starch, digestible fibre, &c.	53·27	49·78	16 99	60·96	56·91	23·32
Woody fibre .	30·50	32·34	28·63	9·02	26·33	4·75
[2] Mineral matter (ash) . .	3·58	4·13	3·54	2·34	1·09	4 94
	100·00	100·00	100·00	100·00	100·00	100·00
[1] containing nitrogen .	·21	·47	2·46	·84	·64	6·28
[2] including silica	3·08	3·24	·24	·54	—	·19

A and B were very similar materials both in appearance and analysis, though the former was sold as a "fattening food for bullocks," and the latter under its right name, and costing 32*s.* 6*d.* per ton. It is hardly worth the name of "food," while the value of E (coffee husks) is very little more. As a contrast, the bean cake from Newchong, China, is a decidedly good quality food, and not dear at 6*l.* per ton delivered. The sunflower seed (analysis C) was home-grown, and the malted acorns (analysis D) were treated in this way in order to prevent, if possible, any risk of acorn-poisoning.

Manures.

About these there is not much that need be said. Mineral superphosphate has been generally of good quality and up to the stated guarantees. Dissolved bones have at times been procurable at very low prices, of which the following is an example :—

Dissolved Bones.

Moisture	11·68
[1] Organic matter and water of combination	30·57
Monobasic phosphate of lime	15·89
equal to tribasic phosphate of lime rendered soluble by acid	(24·89)
Insoluble phosphates	11·04
Sulphate of lime, &c.	30·31
Insoluble siliceous matter	·51
	100·00

[1] containing nitrogen . . . . 3·09
equal to ammonia . . . . 3·75

This manure (a perfectly genuine one) cost only 5*l.* per ton, and was sold in the neighbourhood of Lincoln.

Basic Slag.

Though, as has been remarked, basic slag has generally been of good quality, it is still necessary to warn farmers against purchasing what is merely known as "slag," under the impression that they are buying "basic slag." Such a material is the following, which a member of the Society told me he was sending as a sample of "basic slag":—

Lime	19·71
Insoluble siliceous matter	56·05
Oxide of iron, alkalies, &c.	24·24
	100·00

This sample contained no phosphoric acid whatever, and was not basic slag at all. In reply to inquiries I heard that it was offered in the neighbourhood of Worcester as a new manufacture.

Shoddy.

In several samples of shoddy and wool waste which I have examined I have found a quantity of weed-seeds, still of full germinating power. The presence of these seeds in such a manure must be a decided objection, on account of their liability to foul the land to which the manure is applied. The vitality of all such seeds should be destroyed before the material is dug in the ground.

Damaged Nitrate of Soda.

Warnings have been given this year in the Quarterly Reports against the sale, under the name of "damaged" or "roasted" nitrate of soda, of a material which is nothing more than the residue left in the nitre pots after the manufacture of oil of vitriol. Not only is there hardly any nitrate of soda left in the material, but a large proportion of the latter consists of the acid sulphate of soda, a substance which can have no beneficial action on vegetation, and may even be harmful. The following is an analysis of such a sample :—

Moisture	3·89
Nitrate of soda	·39
Potash	2·03
Insoluble siliceous matter	3·79
Sulphate of soda, &c.	89 90
	100·00

Another sample examined gave the following results :—

Moisture	·25
Common salt	·29
Nitrate of soda	·05
Free sulphuric acid	14·05
Sulphate of soda, &c.	85·36
	100·00

Milk.

Two cases were brought to my notice in which there had been great complaints as to the milk becoming tainted by some means which could not be discovered. In all such cases the best plan is to draw some milk from each cow separately into glass vessels, and set the milk aside. In this way it can be ascertained if the evil attaches to one cow alone or to all equally. It can also be found out whether the fault may not lie with the pails or other vessels employed. In the first case under notice it was, at my suggestion, ultimately ascertained that the tin lining was worn off the pipes inside the refrigerator through which the milk passed, thus exposing the copper and tainting the milk.

In the second case the "mystery" of the bad taste imparted to the milk was not solved until I had one of the pails used sent up to me, when I found that, though it had been thoroughly scalded before use, yet, being an ordinary tinned-iron one, the tinning had in time worn away at the bottom of the pail, and not merely milk but even water, after standing in it for only a few minutes, acquired a decidedly ferruginous taste, iron being quickly dissolved out and tainting the liquid. Water became, after a short time, quite reddish-coloured (owing to iron), and the bottom of the pail rapidly rusted.

Action of a Lime Soil on Lead Pipes.

A member of the Society complained to me that a mile length of lead waterpipes, which he had laid down six years previously, constantly leaked, and that the lead seemed to be perishing. On sending me a part of the piping I found it to be spotted in places and being gradually eaten into. There were on it white scales, which examination proved to consist of carbonate of lead, and on analysing the soil in which the pipes lay I found it to contain lime equal to more than 10 per cent. of carbonate of lime, and to be alkaline. To this was due the action upon the lead pipes.

Scientific Investigations.

In the last Annual Report mention was made of a series of experiments, which, with the assistance of the Society, is being made by Mr. James Mason of Eynsham, in reference to the question of the enrichment of the soil by the growth of leguminous crops. During the year these experiments have been continued, and they promise to lead to important and interesting results. Among other points, Mr. Mason is endeavouring to ascertain, to a depth of as much as 26 feet below the surface, the amount of nitrogen contained in the different layers of the soil on which he is experimenting. It may be here mentioned, in reference to the analysis of soils, that considerable importance is likely to attach to Dr. Bernard Dyer's recent investigations upon the "availability" of the mineral plant food in soils. It has long been felt that the determination of the "total" amount of mineral food in a soil was not always a guide to the soil's "active fertility" in these respects, and that something more was needed, or some further process required, to enable one to say what amount of that food could be reckoned upon to take its part in the processes of crop production. Dr. Dyer, by using as a solvent of the soil a 1 per cent. solution of citric acid, has been able to obtain results which, so far as regards potash and phosphoric acid, have, in the case of the well-known Rothamsted wheat soils, given results which bring very fairly together the analytical results and those obtained in the actual crop returns. The solvent employed, it may be said, was decided upon after numerous determinations of the amount of acidity contained in the root sap of various plants belonging to the natural orders represented by our common field crops, and the action of the solvent (1 per cent. solution of citric acid) was intended to represent, as it were, the action of the acid sap of the rootlets on the particles of soil with which these came in contact.

Arrangements have been recently concluded by which it is hoped that greater opportunities will be given than in the past for the carrying out by the Society's chemical staff of investigations on agricultural problems in which the aid of chemical science can be usefully employed.

The following is the list of analyses made in the Society's laboratory during the past year :—

List of Analyses made for Members of the Society from December 1, 1893, *to November* 30, 1894.

Linseed cakes	184
Undecorticated cotton cakes	79
Decorticated cotton cakes	42
Compound feeding cakes and meals	52
Rice meals	11
Cereals	15
Dried grains	8
Silage and hay	16
Roots	18
Butter, milk, and cream	14

List of Analyses—continued.

Waters	169
Superphosphates	107
Dissolved bones and compound artificial manures . .	102
Bones and bone-meals	64
Peruvian guano	8
Fish guano	29
Shoddy	23
Soot	6
Basic slag	51
Sulphate of ammonia	1
Nitrate of soda	36
Potash salts	15
Lime	6
Refuse materials	25
Soils	49
Creosote	5
Miscellaneous	13
	1,148
Analyses in connection with the Annual Country Meeting	22
Analyses in connection with the Woburn experiments and other agricultural investigations . . .	89
Total	1,259

J. Augustus Voelcker.

13 Hanover Square, London, W.

ANNUAL REPORT FOR 1894 OF THE CONSULTING BOTANIST.

The Grass seeds examined and tested showed a high degree of purity and a satisfactory germination. Cocksfoot was generally free from weeds : only 6 per cent. had any other seeds present, which were small quantities of Yorkshire Fog. The average germination was 88 per cent. Meadow Fescue was quite pure, and had an average germination of 94 per cent. Meadow Foxtail was also practically free from weeds ; the Tussock Grass, formerly so frequently present, was not found in any of this year's samples : the average germination was 81 per cent. Timothy was, as is generally the case, free from weeds ; excluding a single sample which contained 50 per cent. of old seeds that had lost their vitality, the average germination reached 97 per cent. Meadow Grass was free from weeds, and had an average germination of 84 per cent. The Rye-grasses are the least free from impurities of all the grasses. Over two-thirds of the samples examined contained more or less Yorkshire Fog—in several cases 8 per cent., and in one case 10 per cent., of this weed being present : the average germination amounted to 91 per cent.

There is a remarkable change in the kinds of grasses used by the members of the Society in laying down pastures. Some inferior and second-rate grasses are apparently disappearing from use, such as Vernal Grass, Dogstail, Sheep's Fescue, and Hard Fescue. On the other hand, it seems strange that the Meadow Grasses are not so largely used as their feeding value, persistence, and price would lead one to expect.

White Clover often contained seeds of Sorrel. In one sample these amounted to 14 per cent. The average germination was 91 per cent. Alsike also had a considerable amount of Sorrel in some samples, and 15 per cent. contained seeds of Dodder. The average germination was 94 per cent. The samples of Red Clover were all free from Dodder, the only impurity that was present in any quantity being Rib Grass : the germination had an average of over 91 per cent.

Yarrow is being more largely used in laying down pastures. The samples have been singularly free from weeds, and have germinated 80 per cent.

The mixtures of pasture seeds which were analysed testified to the importance of the farmer buying his seeds separately and mixing them for himself. Too great a variety of seeds is often employed, many of them being grasses of an inferior quality. Thus a mixture was composed of no less than sixteen different species of grass and some weeds. Some mixtures were so bad that it would have paid the farmer better to have destroyed them than to have sown them. For instance, the last mixture examined had more than half its bulk made up of chaff, and the seeds consisted of 35 per cent. Ryegrass, 27 per cent. Yorkshire Fog, 15 per cent. Meadow Grass, 9 per cent. Hard Fescue, and 1 per cent. each of Buttercup, Rib Grass, and Wood Rush.

Fungal diseases, attacking Turnips, French Beans, Potatoes, Tomatoes, leaves of Vine, Sycamore, Hop, Maythorn, and Shepherd's Purse, the roots of Asparagus and Oats, and the stem of the Peach, have been investigated and reported upon.

Thirty-four different weeds were identified and their properties, were reported on.

WILLIAM CARRUTHERS.

44 Central Hill, Norwood, S.E.

ANNUAL REPORT FOR 1894 OF THE ZOOLOGIST.

INTRODUCTION.

THE applications received by the Zoologist during 1894 have, as in the preceding year, had reference to about thirty different pests. Most inquiries have related to insects, though in some cases information has been sought with regard to parasitic worms.

As a whole, the year appears to have been more than usually free from important insect attacks. Hessian fly was reported in one instance from Baldock, but the attack was not severe enough to attract attention till the barley came to be cut.

The cockchafer grub is becoming increasingly troublesome in some localities, and has received special consideration in the present Report.

The oak tortrix flourished exceedingly last summer, and stripped the oaks in Windsor Forest, and in many districts in the South of England.

Various members of the weevil tribe have been the subjects of complaint, and one species (*Phyllobius calcaratus*), usually too rare to be greatly injurious, did considerable harm to black currants near Bewdley.

Mortality among Ducklings.

On several occasions serious mortality among ducklings has been complained of, and specimens have been sent with inquiries as to the cause of death.

In no case was any organic disease discoverable, and in most instances the disaster was referable, with very little doubt, to a species of cramp induced by too great exposure to inclement weather.

The symptoms were very similar in all the cases. The ducklings became unsteady on their legs, twisted their heads back over their backs, and very soon died, having been, to all appearance, perfectly well a few hours previously.

From duck-breeders on the large scale it was ascertained that such experiences are by no means uncommon, unless extreme care is taken with the young birds. Before they have attained their full plumage they are quite insufficiently protected from the wet, and if allowed to swim, or wander in wet grass too freely, they are never properly dry, and cramp frequently ensues.

If anything of the kind is observed, the ducklings should be kept from water entirely for a time, and not allowed to roam at large for more than about four hours each day.

It is, further, important to add to their regular food a quantity of chopped cooked meat, or gravy.

"Tulip-root" in Oats.

Tylenchus devastatrix.

Specimens of tulip-rooted oat plants were forwarded in July from a crop near Watford, Herts. The roots contained great numbers of the characteristic eelworm, *Tylenchus devastatrix*, which is also believed to be the cause of clover sickness.

When this pest appears it is clearly advisable to avoid the sowing of any crop liable to attack on the infested ground. In the present case, unfortunately, the common practice of putting in clover with the oats had been adopted, so that the *Tylenchus* was provided with a supply of food exactly to its taste after the removal of the oats.

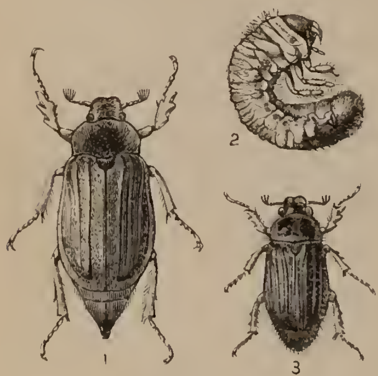
Under such circumstances, the best plan is probably to sacrifice the clover, which is almost sure to go "sick" during the winter. It should be completely fed off during the autumn, and then treated as stubble. After thorough scarifying, a crop of rape might be put in as a makeshift.

The application found most effective in the case of crops affected by eelworm is a top-dressing of nitrate of soda, or sulphate of ammonia.

The Cockchafer.

Melolontha vulgaris.

There are indications that the damage wrought by this pest in Great Britain is on the increase. It is reported from various localities in South Wales, while the neighbourhood of Godalming, in Surrey, and parts of Ross-shire, N.B., have suffered from its ravages. In one case turnips were the crop affected, but most complaints have reference to grass land; and as in such cases the cause of injury is by no means so obvious, it is extremely likely that much damage to grass put down to the score of the wireworm is in reality attributable to this pest. In any case, the injury actually traced to the grub of the cockchafer is sufficiently considerable to make it worth while to inquire into the measures adopted to combat it by agriculturists on the Continent, where it has long been known as an extremely formidable foe. Some idea of the magnitude of the operations undertaken against it may be gathered from the statement that in the year 1868, under the directions of Stadelmann, one hundred and twenty thousand pounds weight of cockchafers were collected in the province of Saxony, and converted into manure by the admixture of lime.



1. *Melolontha vulgaris*, female. 2. Larva, half-grown. 3. *Rhizotrogus solstitialis*, female. From life.

Life-history.—The beetles make their appearance in May, and in infested districts are to be found in great numbers during three to six weeks. The males, distinguishable by their antennæ being 7- instead of 6-leaved, preponderate, especially during the first part of the swarming period. They fly chiefly in the evening, and remain concealed during daylight, but in wooded land their presence is indicated by the litter of leaves they knock or bite off, and by their excrement, with which the ground is covered. In this stage of their life they feed upon the leaves of foliage trees. Their favourite is the oak, but they also attack the horse-chestnut maple, birch, willow, mountain ash, beech, and hornbeam. After pairing, the female seeks suitable ground for laying her eggs, and for this purpose comes out into the open. The ground preferred is untilled, tolerably loose, and dry, and the eggs are laid at a depth of about 10 inches. In all, each insect lays sixty or seventy eggs, about fifteen at a time.

In four to six weeks the larvæ hatch out, but during the first summer they do little harm, feeding for the most part upon decaying vegetable matter in the soil. During the following year they begin to attack the tender rootlets of various crops, and enter definitely upon their career of destruction. In winter they avoid the severe frosts and get beyond the reach of the agriculturist by burrowing very deeply in the ground. They are whitish, fleshy, wrinkled, grubs with yellow heads, and of the shape figured above.

The duration of larval life is probably three years. Pupation then takes place in July or August, and in the following May the mature beetle appears.

On the Continent the life-cycle is found to occupy three or four years, according to the climate. The period is four years in North Germany, three years in South Germany and in Switzerland. These periods are emphasised by the appearance every third or fourth year, as the case may be, of swarms of cockchafers, very much more numerous than those observed in the intervening years, and such "swarming-years" (Flugjahre) are, of course, known in advance, and special means taken to destroy the beetles. In Dresden, for example, the swarming years correspond with the leap-years, while in other districts they may fall on the years preceding or the years following leap-years.

It is very important that information of this nature should be obtained with regard to infested districts in the British Islands. From the size of the larvæ sent me this year from Godalming and from Glamorganshire, I should judge that the present year is a "swarm-year" for those districts; but I have no information as to the numbers in which the cockchafer occurred there last May. The grubs received from Ross-shire in September appeared to be of two years' growth, and would indicate 1893 as a "swarm-year."

The slight damage done by the grubs *in their first year* often induces the farmer to think that he has got rid of the pest. Quantities of the young grubs were found this year in Surrey and in Glamorganshire at the roots of flourishing grass-crops.

Treatment.—When it is considered that in this country grass-crops principally suffer from the cockchafer, it is clear that the usual methods of grub destruction during tillage operations are not available. It is in the *beetle* stage that the pest is most subject to attack, and hence the importance of accurate observations in the directions indicated above.

In infested districts farmers should act in concert in attempting to destroy the beetles wholesale during May. The insects never travel far to lay their eggs, so that a district is benefited by the *local* destruction of the cockchafers. The following points should be noted :—

1. The best time for collecting the beetles is early in the morning, on a dry day, not in very hot weather.

2. They are best sought on *isolated* trees and shrubs, as they only go into the woods in bad weather.

3. The trees should not be shaken too vigorously, or the beetles fly away instead of simply falling down.

A convenient plan is for the workers to proceed in gangs of one man and five or six boys. The man can shake the smaller trees by kicking the trunks, and he carries a pole with which to strike the lower branches of the bigger trees. The boys are engaged in gathering up or destroying the beetles as they fall, and in climbing the trees when it is wished to shake the higher branches.

The cockchafers may be shaken down upon tarred boards or cloths, or collected into any convenient vessels. A very satisfactory receptacle for the beetles is made thus :—A hole is made in the bottom of a sack, and the neck of a bottle tied into it. The mouth of the sack is tied up, and the beetles, as they are gathered, are inserted by way of the bottle-neck. This contrivance is easily carried over the shoulder, and is emptied, when desired, by simply untying the sack mouth.

Cogho recommends the lighting of fires in the evening during the swarming-time, as numbers of the cockchafers are attracted by the light, and perish in the flames.

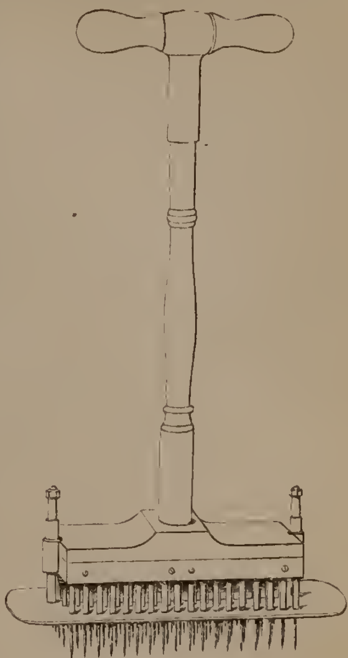
Attempts have been made, with considerable success, to entice the beetle to lay its eggs in specially prepared trap-holes or trenches. These are made, at the beginning of May, in districts where attack is anticipated. They are about a foot deep, partly filled with damp moss, which is covered with the loose, dry soil which the cockchafers prefer for egg-laying purposes. In the summer they are cleared out and the larvæ destroyed.

It is difficult to find any satisfactory method of destroying the grub when the crop is of such a nature as to prevent any thorough disturbance of the ground. On the small scale a solution of ammonia is found to be very efficacious as a dressing, and on a larger scale the ammoniacal liquor from the gasworks is deserving of a trial. It should be used in the spring, when the grub comes up into the surface soil. In the winter the pest is too deeply buried for any insecticide to be employed with effect.

With regard to gas-lime, Mr. R. W. Llewellyn, of Briton Ferry reports : "In one field I gave a heavy top-dressing of gas lime in August 1893. The result was, it quite destroyed both the grub and the grass, but this year the grass has grown tremendously, almost too strong. In a field of a neighbour that was well limed the grub is not nearly as bad ; and I can say the same of a field to which I gave about 5 cwt. of basic slag per acre. No other steps were taken against the grub, except rolling, which did no good."

Special instruments have been devised for clearing the ground, under certain circumstances, from this troublesome grub. That of

Witte is both simple and cheap, the cost being 15*s*. Its nature can be gathered from the accompanying figure. It is stamped into the ground by the foot, spade-fashion, and the four rows of about twenty needles with which the soil is pierced are fitted with a spring arrangement, which allows them to give way if too great a resistance is met with. Such implements can, of course, only be used in certain cases, and where the soil is free from stones. Where the grubs are at work, crows and other birds should be encouraged to the utmost, though they appear to do damage by plucking up the grass.[1]



Witte's Implement. After Judeich and Nitsche.

A beetle somewhat like a small cockchafer, and known scientifically as *Rhizotrogus solstitialis*, is so extremely common in certain localities that it is by no means unlikely that its grubs are often mistaken for half-grown specimens of *Melolontha* larvæ which they very closely resemble.

If this surmise be correct, the life-history of this beetle, about which little seems to be known at present, becomes of importance from an economic point of view.

The Mustard Beetle.

Phædon betulæ.

The literature on the subject of the mustard beetle has by this time assumed quite formidable proportions. In 1886, an inquiry into the pest was instituted by the Royal Agricultural Society, and a full and interesting report was published by the Consulting Entomologist in the Journal for 1887.[2]

Since compiling that report Miss Ormerod has written frequently on the subject, and lately Messrs. J. & J. Colman, of Norwich, have published a leaflet containing an excellent *résumé* of the practical

[1] For many of the above suggestions the writer is indebted to the works of Judeich, and Nitsche, and Taschenberg.

[2] Vol. xxiii. Part i., S.S., pp. 273 *et seq.*

suggestions which have from time to time been brought forward. As this leaflet is probably in the hands of all those interested in the growth of mustard, it is unnecessary to repeat here the substance of numerous previous reports, and I shall confine my observations to certain modifications of treatment which many visits to infested districts and much conversation with mustard growers have suggested to me.

It is very doubtful whether the plan, sometimes advocated, of burning damp straw, or filling trenches with tar, to arrest the march of the beetle, is of any real utility, as the beetles readily travel over very much greater obstacles. Nor does the method of using dressings, other than forcing manures, seem to be justified by results.

It would be well to tar the fences in the early spring, for the double purpose of preserving the timber and of destroying the beetles, which are hibernating in the chinks and crannies of the wood.

A suggestion which seems to be worthy of more attention than it has hitherto received is the deliberate stocking of the mustard field with chickens or ducklings.

The fowls selected should be of the most active breed procurable, and free from feathers on the legs. It will probably be necessary to purchase in the ordinary market; but if such active fowls as Leghorns, or the cross between Plymouth Rock and Dorking, can be obtained, so much the better. The birds should be quite young, about the size of starlings, and should be stocked at the rate of about twelve to the acre, as soon as the mustard plant appears.

They must be furnished with waterproof houses with raised wooden floors, each house to shelter about twenty-five chickens. At first they must be fed twice a day; but when insects become more numerous the morning feed must be discontinued, but a full meal given in the evening.

Common chickens suitable for the purpose will probably cost about sevenpence, and will fetch two shillings in the autumn, having in the meantime freed the crop from various insect pests.

Young ducklings are, perhaps, even more satisfactory, as they are better able to pick the larvæ off the under side of the leaves.

The ingenious beetle-catching machine devised by Mr. Cole Ambrose, of which I have examined a model, seems well calculated to destroy great numbers of the various mustard beetles in case of a bad attack. Its cost may prevent the smaller growers from availing themselves of its services, unless they overcome the customary reluctance to combine in purchasing one. It seems worth while considering whether some less costly adaptation of the same principle could not be devised for fixing to the framework of some implement, such as a horse-hoe, already possessed by the farmers, though in this case the somewhat low axle would prevent its use, except in the earlier stages of the crop.

I am greatly indebted to Messrs. James and Samuel Egar, of Thorney, near Peterborough, for advice with regard to this pest.

The Grain Weevil.

Calandra granaria.

This insect continues to do great damage to stored grain, especially to foreign barley imported for malting purposes.

Some of the beetles survive the winter and hibernate in chinks and crannies in the walls of the granary, and in the spring the female seeks the heaps of corn, in the grains of which she deposits her eggs, after piercing a hole with her rostrum. The grubs feed in the interior of the grain, where they also pupate, and the mature beetle emerges.

Infested grain has no characteristic appearance, but is lighter than ordinary grain, and will float when thrown into water.

Treatment.—When the storehouse is comparatively empty, the opportunity should be taken of washing the walls with whitewash to which some carbolic acid is added, and of filling up all crevices with cowhair and quicklime, or cement.

The methods of destruction usually advocated depend on the sensitiveness of the weevil to extremes of temperature. It cannot stand severe cold, and is kept in check by the simple expedient of leaving the windows of the granary open on frosty nights. Frequent turning over of the heaps of grain, so as to admit air freely, is also said to be beneficial, though, on the other hand, some affirm that they can keep the pest more in check when the grain is stored in sacks.

If infested grain is exposed, by means of hot air or some form of roasting mill, to a temperature of 130° Fahr. the weevils are said to be killed without injury to the germinating power or malting properties of the barley.

From experiments recently made by Mr. H. E. Weed in Mississippi, U.S.A., it appears that bisulphide of carbon, long ago recommended (1879) by Professor Riley, is a most satisfactory cure for this pest. Maltsters hesitate to use it in this country, on account of its inflammatory properties, but if due caution be observed there is no danger, and it is an excellent insecticide.

It was at first placed in shallow trays on the surface of grain in a closed bin. The vapour is heavy, and soon permeates the corn beneath.

It has been found, however, that actual contact with the grain has no ill effects, so that it can be applied by fixing a mass of tow or cotton waste to the end of a stick, saturating it with carbon bisulphide, and thrusting it into the middle of the barley; or it may be simply poured on the top of the grain.

No light must be brought near until the odour has entirely passed off.

The granary may be thoroughly dosed with carbon bisulphide on Saturday afternoon, and work resumed as usual on Monday morning, a watchman being employed to prevent the possibility of any light being introduced. The treatment should commence at the *bottom* of the building, as otherwise the descending fumes are too powerful while the lower rooms are being treated. The fluid is sprinkled wherever the weevil is known to be, and particularly on waste heaps, and the building is closed as tightly as possible.

It is also recommended that a "quarantine" bin be erected for the treatment of grain as soon as it arrives, after which it can be transferred to other cribs.

One pound of the bi-sulphide is found to be sufficient for 100 bushels of grain. The best results were obtained with "Fuma" bi-sulphide, manufactured by E. R. Taylor, Cleveland, Ohio, the cost of which was 5*d.* a pound.

A New Black-Currant Weevil.

Phyllobius calcaratus, Fabr.; *glaucus*, Scop.

On May 12 specimens were sent of a weevil which was said to be doing serious damage to black-currant bushes near Bewdley. On examination they proved to be *Phyllobius calcaratus*, Fabr. (*glaucus*, Scop.), a species closely allied to the handsome green weevils with a metallic sheen which are so commonly to be seen upon nettles.

Phyllobius calcaratus, enlarged and natural size. From life.

In 1889 Miss Ormerod reported another species of Phyllobius (*P. maculicornis*), as injurious to fruit-trees near Sittingbourne.

The present beetle can in general be distinguished from the common nettle weevil (*P. alneti*) by its reddish legs and antennæ. For a more accurate account of the differences we may quote Walton, *Annals*, and *Magazine of Nat. Hist.* vol. xvii. :—

P. calcaratus differs from *P. alneti* in the scales being setaceous-lanceolate; the antennæ and their articulations longer and more slender, the scape reaching beyond the base of the head; the third and fourth joints of the funiculus distinctly longer; the thorax less impressed, and constricted anteriorly; the scutellum of the form of an isosceles triangle, having the apex deeply truncated and rounded, the legs and antennæ rufous, rufo-ferruginous, or rufo-castaneous.

No observations are on record with regard to the life-history of this particular species, but in all probability it lives in the larval and pupal condition at the roots of the bushes, which the mature beetle attacks. If this is the case, the chance of the pest recurring would be greatly lessened by removing the surface earth during the winter, and either burying it deeply, or destroying the contained pupæ by mixing it with lime; or lime might be simply dug in under the infested bushes.

There is no better remedy when the beetle is at work than the one usually adopted in similar cases, namely, the shaking of the bushes over cloths or boards smeared with tar. This operation is most successful early in the morning, and upon dull days.

It is quite possible that no great importance is to be attached to the occasional occurrence of this insect in considerable numbers. On the other hand, it is at present by no means so rare as the older entomologists appear to have found it, and measures should be taken to combat it as soon as it appears.

The Elm-bark Beetle.

Scolytus destructor.

An avenue of elms near Droitwich was reported, in July last, to be suffering from beetle attack, and though the material sent for identification was very meagre, there could be little doubt that *Scolytus destructor* was the insect at work.

The female burrows under the elm-bark in June, and having formed a tunnel some three or four inches long, lays her eggs along its sides. The main injury results from the borings of the larvæ, which hatch out from the eggs towards the end of June. They burrow under the bark in all directions, often causing large portions to flake off, and, in cases of bad attack, killing the tree.

When such an attack is noticed, it is of the greatest importance to at once cut down the trees which are plainly killed, and to rip off and burn the bark, with the contained grubs. Otherwise the dead tree acts as a nursery for the beetles, and is a standing menace to the sound trees near it.

On the large scale, the treatment proposed by M. Robert, and described by Miss Ormerod in her *Manual*, has been tried in France, with very satisfactory results. This consists in shaving off all the rough outer bark of the elm-trees with an implement of the nature of a spokeshave, going especially deep in portions of the tree where the attack is most severe. Many grubs are actually destroyed by the operation, and, moreover, a copious flow of sap is induced in the soft inner bark, which appears to be fatal to the insects.

In cases where a tree is but slightly attacked, or where its value makes the extra labour involved a matter of little importance, it may be saved by the following treatment. The worker is furnished with a ladder, a bradawl, a syringe with narrow, pointed nozzle, and some suitable insecticide fluid, such as Gishurst Compound. The beetle-holes are sought upon the trunk, and cleared with the bradawl, and some of the fluid forcibly injected. It travels along the burrows of the larvæ and kills them. The best time for this operation is July or August, but it may be performed later. It is a good plan to leave the bark from felled elm-trees for a time as *decoys* for the beetle, but in this case it must be destroyed without fail early in May, before the insects emerge.

Ground Beetles.

Once more complaints have been received of injury being done by beetles which are usually thought to be carnivorous, and therefore useful. A strawberry crop was alleged to have been destroyed near Nottingham by beetles which proved on examination to be *Pterostichus madidus*, *Harpalus ruficornis*, and *Calathus cisteloides*. Unfortunately, when the case was reported the attack was already over, and it was too late to make any inquiry into the facts.

There are many possible sources of error in the observations. The beetles in question are very common, and would be much more conspicuous than the strawberry weevil, for example (*Otiorhynchus sulcatus*), which may possibly have been the true culprit. Again, the ground beetles may have attacked the strawberries, but only such as contained minute larvæ, which were the real objects of their search.

If these beetles are really injurious, it is hard to understand how any strawberry crop can escape a pest which is always present in such large numbers.

The Oak Tortrix.

Tortrix viridana.

This pest occurred in vast numbers last June in the South of England, and its caterpillars entirely stripped the oak-trees in Windsor Forest. It is very erratic in its occurrence, often being scarcely discoverable where it abounded the previous year. This sudden disappearance is, no doubt, due to the immense increase, during the year of its abundance, of the insects which prey upon it.

Unfortunately, on account of the impossibility of predicting a serious attack, and of the very large area generally involved, it seems impossible to suggest any practical method of combating it. It does not, luckily, do much permanent harm.

The oak has great powers of recuperation, and will generally put forth a second leafage, and I am not aware that it ever actually succumbs to this pest, though it may undergo some amount of disfigurement. Many birds prey upon the caterpillars, including the common house-sparrow. Lord Vernon has suggested that this fact might be utilised, and considerable numbers of sparrows introduced into an infested district. The experiment is worth a trial when the caterpillar begins to be troublesome, though it is exceedingly doubtful whether the birds would remain in the woods.

Miscellaneous.

Among other pests about which inquiry has been received, but which do not call for any special report, are clover weevil, strawberry weevil, turnip-gall weevil, red spider, snowy fly, goat moth, red maggot, root maggots, celery fly, various aphides, pear sawfly, and several species of caterpillars.

In March a correspondent recommended formic aldehyde as an insecticide especially suitable for greenhouse use, but careful experiments made with this substance on various infested hothouse plants do not appear to justify the adoption of the treatment.

Cecil Warburton.

Zoological Laboratory, Cambridge.

Notes, Communications, and Reviews.

NOTES ON FRENCH AGRICULTURE.

THE *Bulletin de la Société des Agriculteurs de France* of September 15, 1894, contains so many subjects of importance to English agriculturists that a sketch of its contents may be of interest. Its obituary notices include an article from the pen of M. R. Lavolée on the loss the society has suffered from the death of the Comte de Paris, who had been a member since 1873, and was himself a practical agriculturist. A report of the Permanent Commission on Agricultural Industries highly commends a simple machine for spraying flour mills with an insecticide. In an address by M. Le Trésor de la Rocque to the National Congress of Agricultural Syndicates the author maintains that cheap labour or cheap land has more to do with the fall in the price of cereals than the decline in the value of silver, and shows that if a bimetallic agreement were arrived at among the principal States of the world it would have no permanent effect on the price of silver unless the production of silver were restricted by all silver-mining countries. He gives an interesting table intended to show that the labouring man would be the principal sufferer if foreign corn and foreign wine caused all land to be laid down to grass or turned to woodland, for whilst per hectare (=2a. 1r. 35p.) wine-growing occupied a man 57 days,

Sugar beet .	occupied 42 days	Hay meadows .	occupied 6 days
Corn	„ 22 „	Grazing land . . .	„ 2 „

He quotes figures to show how serious the emigration from rural districts to towns in France has become. The mortality in the towns is 27 or 28 per 1,000, as against 20 per 1,000 in the country, and this with the emigration to foreign lands is a serious cause of depopulation. Out of 30,000 town-born conscripts 20,000 are rejected for the army, though the standard is only five feet; moreover, few of those who have served in the army return to country life. He complains that the education given in the schools is unsuited to country children, and suggests that instead of being taught from classical writers they should learn by heart from a catechism of rural life and of farming practice (a favourite idea of our colleague the late M. Faunce de Laune). He points out the effect of the new Socialistic programme, emanating from the Congress at

Dijon, in which it is proposed that the State should at once resume possession of all landed property, both above and under the ground, and thinks that if it is brought to the notice of peasant proprietors it will be enough, as they are by no means desirous of sharing their goods with outsiders. He laments the want of the spirit of association amongst farmers which enables the middleman to thrive upon them, and finally asks for freedom from internal and external enemies (anarchy and foreign produce).

The next article I notice is upon the harvest of 1894, many of the details of which have appeared in our newspapers. The result, so far as the farmers of France are concerned, appears to be that they have had the best crop of wheat they have ever grown excepting that of 1874, and that they will have a surplus of over two million hectolitres (or about 700,000 qrs.) to sell, or to carry over to next season. Hence, they are not likely to compete with us for foreign wheat.

The resolutions of the Conseils Généraux on agricultural questions are interesting. They relate to adulteration and frauds in produce, and to taxation, protection, and migration from country to town. A homestead law is proposed that would ensure 240*l.* to 480*l.* per farming family, with freedom from seizure. There are also resolutions against drunkenness, several against tramps, and one in favour of co-operative dairies, and it is proposed that the law against tuberculous animals should not be enforced until money for compensation is voted. There is a quotation from a speech of M. Leygues, referring to the universal complaint of the depopulation of the country districts and the increased competition with the workmen in the towns, which the reviewer suggests is caused by the want of agricultural teaching.

Notice is taken of a special branch of the Pasteur Institute, which is to investigate the destruction of hurtful animals and parasites. Under the heading of Importation of Cattle into France it is stated that from January 1 to July 31 of this year 63,784 foreign beasts have entered, against 3,442 of the corresponding period in 1893, and 12,353 in 1892. These principally came from Algeria, 41,878, against 2,337 and 9,867, and from the United States 6,725, against 1 and 170, showing that the States have found a new market for their cattle. The problem of reaping by steam-power appears to be coming again to the front, and is said to have been successfully solved by Mr. Miller, of Dawson, Minnesota, U.S.A., who, by attaching three binders to a traction engine, was able to cut twenty hectares (about 50 acres) a day at a cost of 3 francs 45 centimes per hectare (or 1*s.* 2*d.* per acre); as, however, he appears to have paid the men working his binders 3 francs per diem, he must have been fortunate in finding very cheap harvest-men.

In a later issue of the *Bulletin* (October 15) M. A. de More has written to the National Agricultural Society of France upon feeding horses with bread. He was in the habit of giving 72 litres of oats to six horses per diem (*i.e.* about $2\frac{1}{2}$ gallons per horse), of the value of 21 francs for 2 hectolitres, the total cost being 7 francs 35 centimes, or 1·23 francs (or about 1*s.*) per horse per day. For the last four months M. de More has given his horses 5 litres (5 lb.) of bread, instead of 12 litres of oats, with a substantial saving in cost. He has a sack of wheat worth 32 francs (1*l.* 6*s.* 8*d.*) ground by his miller, who returns 37·5 kilos (82 lb.) of bran, and 106 kilos (233 lb.) of flour; with the latter he bakes 127 kilos (280 lb.) of bread, the baking costing 2 francs (1*s.* 8*d.*). Reckoning the bran to be worth 6 francs, the 127 kilos of bread cost 28 francs (1*l.* 3*s.* 4*d.*). Giving 2·5 kilos ($5\frac{1}{2}$ lb.) of bread instead of 12 litres of oats, his expenditure is 85 centimes ($8\frac{1}{2}$*d.*) instead of 1 franc 25 centimes (about 1*s.*) per horse, or a saving of 40 centimes (nearly 4*d.*) a day per head, and he finds the horses to thrive equally as well.

M. le Marquis de Dampierre has fed fifteen horses upon a bread made from wheat-flour and bran. He substitutes 1 kilo (2·2 lb.) of bread for 3 kilos (6·6 lb.) of hay and 2 litres ($3\frac{1}{2}$ pints) of oats, with satisfactory results.

M. Lavaland does not think it possible to work horses that have been fed upon bread alone. He has tried it with the horses belonging to the Omnibus Company of the City of Paris, and at the end of nine months had to give it up. He thinks that bread for horses should not contain more water than oats, or about 10 to 14 per cent., and that bread can only be given in addition to the ordinary food. In answer to this, it is said that there was no question of giving bread to other than farm horses.

M. Pluchet substituted 5 kilos (11 lb.) of bread for 4 kilos (8·8 lb.) of oats, showing a saving of 33 centimes (3*d.*) per head per day. This bread was made from rye and barley costing 11 centimes the kilo ($\frac{1}{2}$*d.* per lb.). The same experiment has also been tried upon cattle, substituting 5 kilos (11 lb.) of bread for 4 kilos (8·8 lb.) of cake, with a saving of 17 centimes ($1\frac{1}{2}$*d.*) per head per day.

M. Schribaux, the Director of the Seed Trial Station of the Institut National Agronomique, states that for several years the stations have received wheat from England, and that from the first he has been much struck with the exceptional behaviour of these samples when germinating. Whilst those harvested in France germinated completely in three to five days, and those from Algeria in less, the English samples took three to four weeks to germinate completely. These are the figures for 1892, per 100 :—

Number of Days—	2	3	5	7	9	12	14	16	19	21	24
French Wheat . .	3	86	100	—	—	—	—	—	—	—	—
English Wheat . .	—	—	1	16	33	50	67	72	84	95	—

The English wheats take up water and swell as quickly as the French wheats, but the breaking-up of the store of the kernel by the diastase is slow, due to the want, or rather insufficiency, of nourishment which in the case of English wheat delays the development of the germ, its physiological ripeness being still incomplete.

English wheats, like all wheats grown in climates affected by the sea, are more or less damp, and it is the excess of moisture that hinders the formation of diastase and delays germination. The following experiment proves this :—

English wheats of the harvest of 1892 were germinated in October of that year. The subjoined table shows the result.

Number of grains germinated per 100 after—

Number of Days—	5	7	9	12	14	16	19	21	24
Wheat No. 1 (17·85 per cent. of water)	1	16	33	50	67	72	84	95	99
Wheat No. 2 (17·23 „ „)	25	81	96	96	99	—	—	—	—

Part of this same wheat was left for eight days in an oven at a temperature of 30° Cent. (86° Fahr.). The speed of germination was quite altered, as is shown by the following table :—

Number of Days—	3	5	7	9
Wheat No. 1 (13·76 per cent. of water) . .	4	64	88	99
Wheat No. 2 (13·45 „ „) . .	72	99	—	—

The duration of germination is reduced from twenty-four days to nine days for Wheat No. 1, and from fourteen days to five days for Wheat No. 2. By drying grain and depriving it of part of its water germination is much accelerated. M. Schribaux strongly recommends this practice, not only for wheat, but for all seeds.

The remaining parts of the reviews are taken up with market fluctuations and quotations, to which are added the average prices of all articles used or produced by farmers. Being published fortnightly, these quotations are of much value.

J. H. Thorold.

Syston Park, Grantham.

THE ASSESSMENT OF AGRICULTURAL LAND.

There is perhaps no subject so uninteresting to the ordinary individual as the assessment of property for rating and taxation. All of us have to pay rates and taxes, but few of us take the trouble to find out how or on what principle our property is assessed for them. For the most part we pay and grumble ; we look upon the delivery of those wretched scraps of blue or white paper, called "demand notes," as necessary evils ; we know that the tax gatherer or rate collector will inevitably call upon us ; that he will knock at our doors, whether we live in the humble farmhouse or the landlord's mansion. Occasionally, however, some, or a certain class of us, feel the payment to be such a serious matter—so heavy a burden—that we are driven to consider the matter closely in order to find out, if we can, whether the payments demanded from us are no more than what they ought to be, or it may be to find out some mode by which we can escape them altogether. And this has now happened to the occupiers of agricultural land in many parts of England, whose gross takings from the land they occupy are so small that the relief from payments which in more prosperous times were considered to be but trifles is of great moment. With wheat under one pound a quarter, and with many of the other crops that he grows at similarly low prices, the farmer of arable land in England has been driven to see how he can reduce his expenditure ; and in looking around him with that intent many such a farmer finds that he is unfairly assessed for rating purposes, and, as he contends, on an altogether wrong principle. Putting aside on the present occasion the wider question, whether land, houses, and other real property ought to bear the entire burden of rates for what are called local purposes to the exoneration of other classes of property, let us endeavour to ascertain what is the principle upon which agricultural and other land is assessed for rating purposes, and whether such principle is fair and right. The principle, I need hardly say, is laid down by Parliament. The Parochial Assessment Act of 1836 (6 & 7 Wm. IV. c. 96) enacts in its first section that no rate for the relief of the poor shall be of any force which shall not be made "upon an estimate of the net annual value of the hereditaments rated thereunto ; that is to say, of the rent at which the same might reasonably be expected to let from year to year, free of all usual tenant's rates and taxes, and tithe commutation rent charge (if any), and deducting therefrom the probable average annual cost of the repairs, insurance, and other expenses (if any) necessary to maintain them in a state to command such rent." And the principle is affirmed in the Union Assessment Act 1862, which constituted Union Assessment Committees, and which, after directing that the overseers of each parish in the union should make a list of all ratable hereditaments within such parish with the annual value thereof in a particular form scheduled to the Act, to be called "The Valuation List," enacted that the gross estimated rental for the purposes of the list should be "the rent at which the hereditament might reasonably be expected to let from year to year free of all usual tenant's rates and taxes, and tithe commutation rent charge (if any)," and expressly provided that "the provisions of the earlier Act defining the net annual value of the hereditaments to be rated should not be repealed or interfered with."

Now there would seem to be two modes by which, without contravening the principle laid down by Parliament, the annual value may be determined. The one, by taking the actual rent paid ; for how can land reasonably be expected to be let for more than it actually does let ? And the other, by what has been called "comparative value," that is to say, taking a certain farm as worth so much per acre and estimating other farms at more or less per acre according as in the opinion of the committee they are better or worse farms than the, so to say, standard farm. It is the latter course that is adopted by almost all assessment committees. To quote from Mr. Pringle's recent report on parts of the county of Essex to the present Royal Commission on Agriculture :—

> In arriving at their valuation, the members of the assessment committees, although they take the actual value of land as determined by rent and tithe as a guide, do not by any means accept it as a basis for assessment.

They endeavour to obtain, so far as possible, an equality of rating, not between individuals, but between the several parishes of which the union is made up. This mode is no doubt legal according to the principle laid down in the Acts of Parliament I have cited; for the Acts say that the annual value is to be, not the rent at which the land is actually let, but at what "it may reasonably be expected to let from year to year"—in other words, not at the rent which the actual tenant pays, but at that which a hypothetical tenant from year to year would pay.

The arguments usually adduced in support of this principle are that as land is sometimes let below and sometimes above its proper or legitimate annual value, you would, if you took the actual rent paid as a basis, ease the burden of the rates from the shoulders of him who is lightly rented, and add an additional weight on the shoulders of him who is already overweighted with a high rent; and that, as Mr. Pringle reports was adduced in Essex, the fact that a farm being held for one shilling an acre does not prevent the farmer from keeping horses which are constantly using the roads, nor from employing ploughmen and other labourers whose children must be educated and poor relieved; and also that there were certain parts of Essex where, if assessments were based upon actual annual rent, the rates would be so increased upon occupiers of land still in fair condition that the burden would be almost ruinous to them. But against these arguments it is contended that this principle of "comparative value" operates far more unjustly than the principle of taking the actual rent as a basis would, as well on the individual ratepayer as on the land rated, because the ratepayer has to pay on a higher rent than that which he actually pays, and because too large a share of the burden is placed upon agricultural land as distinguished from house property, shops, manufactories, tithes, and other ratable property in the same parish or union. The latter properties, which, as a rule, can more easily bear the burden, are exonerated from their fair share of it at the cost of agricultural land which is less able to bear it; and thus a double injustice, so to say, is perpetrated.

This subject has recently been brought very prominently before the public in some letters that appeared in *The Times* last October and since in reference to the incidence of rates on many farms in those parts of Essex reported on by Mr. Pringle, which have suffered from the depression so extremely acutely. And indeed in several instances in that county the principle of "comparative value" has been reduced to almost an absurdity, for when farms have been offered to intending tenants at a rent equivalent to the annual value at which they are assessed for rating purposes the intending tenants have simply laughed at the offers, so very much higher are the assessments than the rents which intending tenants could possibly give. This appears very clearly from the table on p. 792, which I extract from the appendix to Mr. Pringle's report, and of which the following is a summary:—

SUMMARY.

	s.	d.
Rent, paid and estimated per acre	7	11
Assessment per acre	12	$3\frac{1065}{4749}$
Excess of assessment over rent paid and estimated per acre	4	4
Excess of assessment over rent paid and estimated per cent.	—	54·7
Tithe per acre, present value	4	$0\frac{1}{2}$
Proportion of tithe to rent paid and estimated per cent.	—	50·5
Rates per acre. (Note.—On some of these farms there is no school board rate) . .	2	$1\frac{1}{2}$
Rates in the £ of rent paid and estimated . .	5	$4\frac{1}{4}$
Rates in the £ of assessment	3	$5\frac{1}{2}$

Take farm No. 1, for instance: the actual rent paid is 15*l.* 7*s.* 2*d.*, whereas the farm is assessed at 67*l.* 18*s.*, or 52*l.* 10*s.* 10*d.* more than the actual rent paid. And so farm No. 12: the rent offered was 55*l.*, while the assessment was 141*l.*, or 86*l.* more than the rent offered.

The fifteen farms mentioned in the table are not special or exceptional cases, but comprise every farm of which the firm of estate agents, a partner in which prepared the table, has the management in the three unions named, except one which is let on an old lease, and so not applicable to the present situation. Every farm was taken, whether it hindered or helped the view that the present method is seriously injuring the occupiers and owners of the land. The total rents of the fifteen farms amount to 1,882*l.*, and the total assessment to 2,913*l.*, which, as noted above, makes the assessment over 50 per cent. beyond the rent.

The first of the letters which recently appeared in *The Times* on the subject was from the Rt. Hon. G. Shaw-Lefevre, M.P., to the Hon. E. G. Strutt, and as the writer now occupies the highly influential position of President of the Local Government Board the readers of the Journal will probably like to have it before them in full. It runs thus:—

Local Government Board, Whitehall, S.W.
October 22, 1894.

DEAR MR. STRUTT,—During my recent visit to Essex my attention was frequently directed by owners and occupiers of land to the very serious burthen of rates, tithe, and land tax, which are all greatly in excess of what they are in most other parts of the country.

With respect to rates it was the general subject of complaint that occupiers of farms are assessed at much higher values than the actual rents or the real annual value of the land, and that the assessment committees have refused to lower the assessments in proportion to the fall of rent.

On one farm which I visited, held under a lease for seven years, at a rent of 70*l.*, the assessment was maintained at 150*l.*

On another, where the rent was 150*l.* for 320 acres, the tithe being paid

STATEMENT SHOWING EXCESS OF ASSESSMENT FOR RATING PURPOSES OVER THE PRESENT RENTAL OF FIFTEEN FARMS IN ESSEX.

Farm	Name of union	Area of farm	Rent			Assessment			Tithe, present values			Rates			Excess of assessment over rent			Rates in the pound of actual rent		Remarks
		acres	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.	s.	d.	
1	Maldon .	265	15	7	2	67	18	0	48	0	8	18	0	0	52	10	10	23	5	Farm hired. Rent actually paid.
2	Maldon .	580	250	0	0	370	19	6	116	13	1	65	12	6	120	19	6	5	3	Estimated rent, 100*l.* higher than highest offer for the farm two years ago.
3	Maldon .	500	160	0	0	261	16	6	133	16	6	45	7	8	101	16	6	5	8	Rent calculated 4% on purchase money.
4	Maldon .	346	130	0	0	238	10	0	70	0	0	37	4	4	108	10	0	5	$8\frac{1}{2}$	Farm hired. Actual rent paid.
5	Maldon .	306	190	0	0	227	0	0	34	5	6	44	8	8	37	0	0	4	8	Estimated rent, very full.
6	Maldon .	111	25	0	0	38	0	0	19	2	8	8	18	5	13	0	0	7	$1\frac{1}{2}$	Estimated rent, full.
7	Dunmow .	260	150	0	0	170	0	0	49	0	0	26	4	8	20	0	0	3	$5\frac{3}{4}$	Same rent as paid by last tenant.
8	Dunmow .	320	95	0	0	166	0	0	54	0	0	29	11	2	71	0	0	6	$2\frac{1}{2}$	Same rent as paid by last tenant.
9	Dunmow .	365	60	0	0	129	0	0	67	0	0	28		2	69	0	0	9	$5\frac{1}{2}$	Rent 60*l.* more than paid by last tenant.
10	Dunmow and Chelmsford	725	330	0	0	557	0	0	169	0	0	98	14	8	227	0	0	5	$11\frac{3}{4}$	Estimated rent, very full.
11	Chelmsford	370	210	0	0	284	0	0	97	0	0	40	12	0	74	0	0	3	$10\frac{1}{4}$	Estimated rent, full.
12	Chelmsford	169	110	0	0	141	0	0	36	10	0	20	12	5	31	0	0	3	$8\frac{3}{4}$	Estimated rent, 50% higher than the only offer received.
13	Chelmsford	282	100	0	0	151	0	0	48	6	0	22	7	8	51	3	0	4	$5\frac{1}{2}$	Estimated rent, very full.
14	Chelmsford	32	16	0	0	30	0	0	6	10	0	4	4	0	14	0	0	5	3	Estimated rent, very full.
15	Chelmsford	119	41	0	0	81	0	0	13	12	0	14	5	1	40	0	0	6	$11\frac{1}{4}$	Estimated rent, very full.
	Total . .	4,749	1,882	7	2	2,913	4	0	962	16	5	504	12	5	1,030	16	10	5	$4\frac{1}{4}$	

by the owner, and amounting to 70*l.* per acre, the assessment on which the tenant paid rates was 150*l*, and no deduction was allowed in respect of the tithe, for which the owner was separately assessed.

In many cases of the worst land in Essex the rent now paid is only a few pounds in excess of the tithe, but the assessments are maintained at a rate higher than the rent without any deduction for the tithe.

I was informed by a gentleman, in whose statement I have confidence, of these farms, where the rates actually paid amounted to 36 shillings, 60 shillings, and even 120 shillings in the pound on the rent minus the tithe. It was stated that the assessment committees have been very unwilling to reduce the assessments to the low rates at which farms are in many cases let, lest they should have to raise the rates in the pound to a point which would cause discontent among other ratepayers.

I promised to look into the matter, and although I have no authority to give directions or advice to assessment committees, and the appeal from them is not to the Local Government Board, but to the Quarter Sessions, it may be of some value that I should express an opinion on the subject.

As a general rule land ought to be assessed at the amount for which it will let from year to year, deducting the tithe where it is paid by the landlord. For this purpose the rent agreed upon between the owner and the tenant is *primâ facie* a measure for the assessment. The rent, however, is not inclusive, for it may be that the land is worth more than it is let for, as in the case of a beneficial lease; or, on the other hand, it may be that the general value of land in the neighbourhood has gone down, and the tenant under an existing lease has still to pay the agreed rent. In such cases the assessments should be above or below the agreed rent, as the case may be.

With this reservation the rent should, as a general rule, be the basis of the assessment, and I cannot think that the assessment committees are justified if, as alleged, they keep up the assessments on land in order to avoid raising the general rate in the pound.

The effect would be to relieve the tithe owner and the owners of other property from the burthen which should fall upon them in consequence of the depressed condition of agriculture, where land has fallen into such a deplorable condition, as is the case in many of the farms I saw, and it will only let for a nominal rent after deducting the tithe. I think the occupier is entitled to have his assessment reduced in the same proportion. The low assessment and the consequent smaller payment of rates would be an inducement to many persons to take such farms, while the reverse acts as a deterrent.

The effect of this would undoubtedly be to throw some greater burthen on other property in the union.

Let me illustrate by the Unions of Maldon, Chelmsford, Billericay, and Braintree. From a recent return it appears that the aggregate valuation of land in these unions is 222,000*l.*, of houses 210,000*l.*, and of railways and other property 82,000*l.* I have no means of ascertaining what the tithe is, but I will assume that it is about 55,000*l.* a year. The deduction of the tithe would reduce the assessment on the occupiers of land to 167,000*l.* The rates, which average about 3*s.* in the pound, would produce about 77,000*l.*

If the assessment of land were reduced by one-half, the aggregate valuation would be only 431,000*l.*; and in order to raise 77,000*l.* it would be necessary to raise the rates in the pound by 8*d.* The result would be that land would pay 15,300*l.* in lieu of 25,000*l.*, the tithe owners 10,000*l.* in lieu of 8,200*l.*, the owners of houses 38,000*l.* in lieu of 31,000*l.*, and railway and other property 15,000*l.* in lieu of 12,000*l.*

The relief, therefore, to land would be considerable in proportion to the increased burthen on other property. These figures, however, must be taken merely as illustrations and not as ascertained facts. It is probable that the average reductions of assessments of land would not be so great as one-half, though in individual cases it might be more.

With regard to tithe I would only observe that I heard from all quarters that the Tithe Act of 1891, which proposed to give relief in cases where the tithe has almost swallowed up the whole value of the land, has proved to be a dead letter, and in no case has any relief been obtained.

With respect to the land tax, which is exceptionally high in Essex, I need not point out that a reduction of the assessment to the poor rate, on which the tax is computed, will cause relief to the individual payer.

I am, yours very truly,
(Signed) G. Shaw-Lefevre.

The Hon. E. G. Strutt, Whitelands, Witham.

I do not think I can usefully add anything to Mr. Shaw-Lefevre's letter, for it brings very clearly to view the injustice from which agricultural land suffers from the method of assessment usually adopted, and points out equally as clearly how that class of land would be relieved if the method of assessing the value on the actual or rack rent paid were adopted; and how in such case houses, railways, tithes, and other ratable property would bear their proportionate share of the burden. He also points out a fact that is undoubtedly true, namely, that the low assessment, and the consequent smaller payment of rates, would be an inducement to many persons to take farms, even such farms as those in Essex of which he was writing, while the reverse acts as a deterrent.

It may be said, however, that the injustice and unfairness to which I am endeavouring to draw attention is only found in Essex. But this is not the case ; it is more or less common throughout all England ; as witness the following letters which appeared in *The Times* on October 27, the first being from a well-known member of the Council of the Royal Agricultural Society, who has spent the greater part of a long life in studying the subject of local taxation and in improving the practical administration of poor relief in this country ; and the other from the Honorary Examiner in the subject of parochial assessment to the Surveyors' Institution, a gentleman of very great experience in all matters relating to rating :—

To the Editor of "The Times."

Sir,—The letter of the President of the Local Government Board to Mr. Edward Strutt in *The Times* of to-day indicates the necessity of a reform in the law regulating the preparation of parochial valuation lists. I am well acquainted with some of the cases to which Mr. Shaw-Lefevre refers, having, as a governor of Guy's Hospital, cause of complaint for the over-assessment of hospital farms in Essex, in the management of which I take a personal interest. Some of these assessments have been, at much cost, appealed against in Quarter Sessions without success, and as matters now stand there is absolutely no escape from a very iniquitous imposition. I am in the same dilemma myself in the Isle of Ely, where an assessment committee places an arbitrary value, 100 per cent. above its real letting value, on farm land in my own occupation. Of course by this overcharge other descriptions of hereditaments (such as houses, railways, canals, tithes) are relieved.

In the union in which I reside, in Northamptonshire (the notorious Brixworth Union), I have acted for many years as chairman of the assessment committee, making rent the absolute criterion of annual value. Of course, in the instances of land occupied by owners or their relations, and of long leaseholds, further considerations have to be taken into account in adjusting the valuation; but these are exceptional.

For many years this rule of assessing was resisted, but, after much contention, was at last adopted as easy and just. The result is that the property tax assessment and the valuation lists in this union essentially coincide, as they ought to do.

The reform in the law needed is one that was under the consideration of Parliament some years back, providing for the surveyor of taxes co-operating with the overseers of the poor in the preparation of the parochial valuation lists.

Such is the law at present for the metropolis. It is to be hoped that Mr. Shaw-Lefevre may see his way to introduce a Bill on these lines next Session. He has the arguments for it now at his fingers' ends.

I am your obedient servant,

Hazelbeach, October 25. (Signed) ALBERT PELL.

SIR,—I have perused with interest the letter of Mr. G. Shaw-Lefevre in your issue of the 25th, and can very fully confirm the statement therein insisted upon—viz. that land in many places is paying more than its fair share of the parochial rates.

I have valued, for rating purposes, during the last four years parishes comprising about 140,000 acres, with the general result that the land has been relieved from rates to a very great extent, much of the burden having been transferred to the railways and other commercial property.

Your obedient servant,

(Signed) THE HONORARY EXAMINER IN THE SUBJECT OF PAROCHIAL ASSESSMENT TO THE SURVEYORS' INSTITUTION.

As these pages are passing through the press a very remarkable report by the Norfolk Chamber of Agriculture on the present condition of agriculture in that county has been published, which shows that the same injustice is being perpetrated there; and similarly also a report from Suffolk; while other instances of the same kind have been brought to my knowledge in various other parts of England; and there is no doubt whatever that at the present time agricultural land is rated at far too high an amount, and that agricultural ratepayers are bearing far more of the burden of local taxes than in fairness or justice they ought to bear.

Although there are several other points connected with this subject, which perhaps ought not to be passed over, yet I will touch only upon two, viz. the deduction of tithe, and appeals. It is asserted that the tithe is frequently not deducted from the rent before the ratable value is determined; and it would seem from Dr. Fream's report to the Royal Commission on Agriculture on the Andover district of Hampshire (see sec. 52), as well as from a letter in *The Times* of October 29, from the chairman of the Watford Union Assessment Committee, and from what I have myself heard, that some difficulty in this respect has arisen in consequence of the Tithe Act of 1891 having thrown the liability to pay the tithe, or to be more accurate the tithe rent-charge, on the owner, notwithstanding any contract made after the passing of the Act for the payment of the tithe rent-charge by the occupier. But this Act has made no legal difference in the position as regards the deduction, for the tithe rent-charge was ordered to be deducted by the Assessment Acts which I have before cited, not because it was a tenant's payment, as rates are, but because the tithe itself was a ratable property under the Act of Elizabeth, and being rated separately, it should not, of course, pay a second time, which it does if it is not deducted. This is not always considered, but the gross estimated rental is arrived at without deducting the tithe first, as ought to be the case; whereby an especial hardship is inflicted on farms where the tithe is higher than the actual rent. Thus a farm is worth 50*l.* per annum without tithe, and the tithe on it is 60*l.* per annum (the proportions are often higher), and the owner, therefore, inasmuch as he himself pays the tithe, charges the tenant 110*l.* per annum for the farm, and the tenant pays that sum to the owner as rent. But it is not fair that that sum should be taken as the gross estimated rental of that farm. The 60*l.* payable for tithe, which is separately assessed, and therefore pays its due proportion of rates, ought to be deducted first, and the farm should be charged on the balance, after allowing for the other legal deductions.

Courts of Quarter Sessions do not appear to be the most fitting tribunals to which appeals from assessment committees should be brought, because to a great extent they are made up of persons of the same turn of mind as the persons who constitute the assessment committees. There should be an appeal in so serious a matter as this is to some other Court, more judicial, and not local in its character. Or, as it has been suggested, the appeal might be to the Local Government Board, which should have power to appoint a professional valuer to fix the value, whose finding should be final. This would, no doubt, be satisfactory, except in those cases in which a point of law might arise; and in them it would be necessary to have recourse to some legal tribunal. In any case, the expenses of appeals should be lightened, for at present they are so heavy as to prevent a private individual from undertaking them.

In conclusion let me repeat a few words which I wrote some thirteen years ago. "It seems to me that ratepayers would feel more satisfied if the assessments for all rates were the same, and if there was one general rating authority for the whole country." To these I would add that the same authority that assesses real estate for rating purposes should assess it for taxation purposes, and that the overseers of the poor should co-operate with the surveyor of taxes in country districts, as they do now in the metropolis under the Valuation (Metropolis) Act 1869. The result would be that the property tax assessments and the valuation lists would practically, if not actually, coincide, and we should have one local authority the less.

S. B. L. Druce.

9 Old Square, Lincoln's Inn, W.C.

HOW TO ESTIMATE SEED MIXTURES FOR PASTURES AND HAY.

The value of a mixture for laying down pasture depends not on its quantity or its weight, but on the number and quality of the living plants that are produced from it. As one often hears of sowing so many bushels in the field, or so many pounds to the acre, it is very important to emphasize this as the correct view of a mixture.

First, the bulk of a seed mixture is no help in forming an estimate of its value. This will be apparent from the following table showing the weight, number of germinating seeds, and price of a bushel of eight of the best pasture grasses, and three clovers. In estimating these seeds the current prices of 1894 for the best quality of the seeds have been taken. This carries with it a corresponding high germinating power in the seeds. The foxtail is estimated at 85 per cent., tall fescue at 90 per cent., cocksfoot and Italian rye grass at 95 per cent., rough stalked meadow grass at 96 per cent., meadow fescue, perennial rye grass, catstail, and the three clovers at 98 per cent. This high quality of the seed necessarily carries with it a heavier weight per bushel.

Table I.—*Weight, Number of Seeds, and Price per Bushel of some Grasses and Clovers.*

One bushel of—	Weight in lb.	Number of seeds	Price £	s.	d.
Foxtail	14	5,830,000		17	6
Cocksfoot	21	8,500,000		15	9
Italian rye-grass	24	6,150,000		11	0
Tall fescue	25	5,530,000	1	17	6
Meadow fescue	28	6,500,000	1	4	6
Perennial rye-grass	28	6,120,000		9	4
Rough-stalked meadow-grass	28	60,000,000	2	6	8
Timothy	50	65,000,000	1	5	0
Red clover	65	15,000,000	3	15	10
Alsike	66	47,300,000	3	10	10
White clover	66	46,500,000	4	2	6

The grass experiments at Woburn have shown that a heavy yield may be obtained by the use of 10,000,000 seeds per acre. Accepting this as a basis of estimate, it will be seen from this table that a mixture consisting of a bushel of each of the first five grasses would sow 3¼ acres, while the same quantity of each of the last five would give 10,000,000 plants to 23¼ acres. It follows, then, that the value of a bushel of seeds for producing a crop depends entirely on the kind of seeds contained, and their relative proportions.

If we next consider the weight of seed that should be used to produce a satisfactory crop, we have to face the same uncertainties as in dealing with bulk. This is obvious from the following table of the number of germinating seeds in a pound of the best quality of the same grasses.

Table II.—*Number of Seeds in one pound of the same Grasses and Clovers.*

One pound of—	Number of seeds	Price
		s. *d.*
Foxtail	416,000	1 4
Cocksfoot	405,000	10½
Tall fescue	221,000	1 6
Meadow fescue	231,000	1 0
Italian rye-grass	256,000	5½
Perennial rye-grass	218,000	4
Rough-stalked meadow-grass	2,145,000	1 8
Timothy	1,294,000	6
Red clover	227,000	1 3
Alsike	704,000	1 1
White clover	717,000	1 0

A glance at this table shows that a mixture of a pound each of meadow grass and timothy produces more living plants (3,439,000) for 2*s.* 2*d.* than a mixture consisting of a pound of each of the remaining six grasses and three clovers (3,395,000) in the table at a cost of 8*s.* 10*d.*

The only reliable guide to the quantity of a mixture which should be used for laying down a field is to discover how many germinating seeds a definite amount, say a pound or a peck of each element, contains. Taking again 10,000,000 seeds per acre as the minimum amount to be sown, we have the following facts in regard to the same grasses and clovers.

Table III.—*Price, Bulk, and Weight of Ten Million Seeds of the same Grasses and Clovers.*

Ten million seeds of—	Price			Weight		Bulk	
	£	*s.*	*d.*	lb.	oz.	Bush.	Pecks
Timothy		3	4	7	11		⅗
Rough-stalked meadow-grass		7	6	7	10½		⅔
Perennial rye-grass		13	4	45	12	1	2⅗
Italian rye-grass		15	10	39	0	1	2⅗
Cocksfoot	1	0	0	24	15	1	0¾
Foxtail	1	11	8	24	0	1	3
Meadow fescue	2	3	4	43	3½	1	2¼
Tall fescue	3	4	2	45	2½	1	3⅕
Alsike		15	0	14	3¼		⅘
White clover		17	6	13	15		⅘
Red clover	2	3	4	43	15½		2¾

The value of this table for determining what quantity of each seed should be used must be apparent at a glance. Some seedsmen, seeing the importance of ascertaining the growing plants in a mixture, give in their catalogues the number of germinating plants in a pound of the seeds they supply. In making the selection, the kinds of seeds that it is proposed to introduce into the field must be first determined by the farmer. Then the quantities can be easily taken out.

One remarkable fact in this table is that an acre of land can have 10,000,000 plants of timothy placed on it at a cost of 3*s.* 4*d.* Timothy is one of the grasses most highly valued in America, and is generally used there with clover for hay as we use rye-grass. The feeding quality of the hay is high. Large importations of this hay were brought from Canada a year ago to make up for the great deficiency of our crop of 1893; in the face of some prejudice it satisfactorily supplied our need. Timothy is a truly perennial grass, with a considerable amount of foliage. Making timothy, then, the basis, and adding clovers and grasses in smaller quantities, it is clear that a mixture of the best quality of seeds, and the most valuable varieties, can be obtained at comparatively small prices. In the tables appended three such mixtures are given, not as specimens of what, without regard to price, one would like to use, but as cheap mixtures composed of the best quality of good grasses. In contrast with the first mixture it may be pointed out that if rye-grass were substituted for timothy the cost of the 10,000,000 seeds of rye-grass and clovers would be 14*s.* 3*d.*

TABLE IV.—*Specimen Mixtures with Timothy as the Basis.*

		Number of seeds	*s.*	*d.*
A.	Timothy	6,700,000	2	3
	Alsike	1,650,000	2	6
	White clover	1,650,000	2	11
		10,000,000	7	8
B.	Timothy	5,000,000	1	8
	Meadow-grass	1,000,000		9
	Cocksfoot	700,000	1	5
	Alsike	1,650,000	2	6
	White clover	1,650,000	2	11
		10,000,000	9	3
C.	Timothy	4,000,000	1	4
	Meadow-grass	1,200,000	1	0
	Cocksfoot	1,000,000	2	0
	Foxtail	500,000	1	7
	Alsike	1,650,000	2	6
	White clover	1,650,000	2	11
		10,000,000	11	4

WILLIAM CARRUTHERS.

44 Central Hill, Norwood, S.E.

VACCINATION AGAINST ANTHRAX.

In his researches regarding the cause of fowl cholera, M. Pasteur discovered that when the organism of that disease is cultivated in liquid media freely exposed to the air it gradually loses its virulence, and he showed that by taking advantage of this fact one could use a culture of the organism to vaccinate fowls, and protect them against a natural attack of the disease. Following the line of inquiry thus suggested, M. Pasteur ascertained that when the bacilli of anthrax are cultivated in meat-extract at a temperature between 42° and 43° Centigrade, they also gradually lose their vitality and their virulence, and at the end of about six weeks perish altogether. The loss of vitality, he discovered, was progressive, and proportionate to the time during which the culture had been maintained at the temperature mentioned. This was proved by testing the effect of the cultures at different periods when inoculated into animals. At the outset the culture had all the virulence of fresh anthrax blood, but by the twelfth day its virulence was so diminished that when inoculated into sheep only half of the animals were killed ; and by the twenty-fourth day the culture could be inoculated into sheep without entailing the death of any, although it set up a mild febrile disturbance. When animals were vaccinated with the culture of the twenty-fourth day, and subsequently inoculated with virulent anthrax bacilli from the blood of an animal dead of anthrax, all, or a great proportion of them, died, but if the animals had been vaccinated a second time, with a culture of the twelfth day, they were so protected that they could withstand subsequent inoculation with virulent anthrax bacilli. As a result of this discovery M. Pasteur felt himself warranted in announcing to the French Academy of Science in March, 1881, that he had at his command a means of protecting animals against anthrax, and in the following year the method which he proposed received its first experimental test.

The experiment was carried out on a farm near Melun, and fifty-eight sheep, two goats, and ten cattle were subjected to it. Needless to say, it excited much interest in France, and it was executed in the presence of a large number of eminent agriculturists, veterinary surgeons, and medical men. On May 5 twenty-four sheep, one goat, and six cows were inoculated for the first time with a weak protective vaccin, and twelve days afterwards the same animals were inoculated a second time with a stronger vaccin. On May 31 these vaccinated animals, and the remainder that had not been vaccinated, namely twenty-four sheep, one goat, and four cattle, were inoculated with a virulent anthrax cultivation. On June 2 all the animals that had undergone protective inoculation were found in apparent health ; while of the others, twenty-one sheep and the goat were dead, two other sheep were dying, and the only remaining one was attacked before the day was out. The non-vaccinated cows were not dead, but they presented the most formidable swelling at the point of inoculation. On June 3 one of the vaccinated sheep died, but the veterinary surgeon who made the post-mortem ascribed its death to another cause than anthrax.

Conclusive as these results may appear, they were not at the time sufficient to convince all the witnesses, for it was objected by some that the test would have been more crucial had the virulent material used been anthrax blood, instead of a cultivation containing spores of the anthrax bacillus. A new experiment was therefore carried out, and on July 16 following the final inoculation was performed, the virulent material used in this case being half a syringeful of blood and spleen pulp from a sheep four hours dead of anthrax. The results were no less decisive than in the first case. By the third day, fifteen out of the sixteen non-vaccinated animals had succumbed, while the vaccinated, nineteen in number, were in apparent health.

As a result of these test experiments, protective inoculation with vaccin furnished by M. Pasteur was speedily adopted on a most extensive scale, and in the following year (1882), in the Department of the Eure et Loir, nearly 80,000 sheep, between 4,000 and 5,000 cattle, and 500 horses were vaccinated. The loss from anthrax in the vaccinated flocks during the following twelve months was 0·45 per cent. In some flocks a certain proportion of the sheep had been left unvaccinated, in order to afford the best possible means of comparison, since the vaccinated and non-vaccinated were alike subject to the same conditions of food, climate, &c. In these mixed flocks the death-rate among the non-vaccinated was 3·9 per cent., while among the vaccinated it was only 0·4 per cent. In the cattle, the death-rate among the vaccinated was 0·24 per cent., as compared with an average mortality of 7·03 in previous years. As bearing upon the safety of the operation, M. Pasteur stated that 13,000 sheep, 3,500 cattle, and twenty horses had been vaccinated without a single accident. Twelve of these had subsequently been tested with a virulent virus, and all had resisted the test.

In occasional instances here and there in France the results of the inoculations were not quite so successful as those just summarised, for on some farms a number of the vaccinated animals perished from anthrax within a few days after the operation; and in some instances a not inconsiderable proportion of the vaccinated animals were afterwards unable to stand the test with virulent anthrax blood or culture. Moreover, in some cases, animals that had been twice vaccinated died within the course of the following few months from natural anthrax.

The publication of some of these unfortunate accidents and partial failures of the method appears to have caused some alarm among French agriculturists, for during the year 1883 the number of animals vaccinated was rather fewer than during the preceding year. During the following year, however (1884), the number of vaccinations again increased, and since then the vaccinations in France have each year been carried out on a most extensive scale. From 1882 to 1893, both inclusive, the number of sheep vaccinated in France was 3,296,815, and the number of cattle during the same period, 438,824. Among these vaccinated animals, the total loss from anthrax during the following twelve months is stated to have been 0·94 per cent. among the sheep, and 0·34 per cent. among the cattle; and this in districts where the mortality from anthrax before the introduction of M. Pasteur's method of vaccination was 10 per cent. per annum among sheep, and 5 per cent. per annum among cattle.

But it is not only in France that the vaccinations have been carried out on a large scale. The Italian Government is so convinced of the value of the method that it supplies the vaccin gratuitously to stockowners, on the condition that the vaccinations shall be carried out by qualified veterinary surgeons. Special laboratories for the preparation of the vaccin have also been founded in Austria, Spain, South America, Russia, and Australia.

These facts have for years past been known in a general way to members of the veterinary profession in this country, and probably to many stockowners also; but, nevertheless, Pasteur's method of vaccination has not yet been brought into serious use in Great Britain as a means of combating anthrax. Probably this is due in part to distrust of the foreign statistics, and in part to the fact that with us anthrax is seldom the formidable plague that it is in many other countries. It is, fortunately, true that there are very few farms in this country in which there is a steady annual loss of anything like 5 or 10 per cent. from anthrax, among either the cattle or the sheep. Nevertheless, there are farms on which the occasional losses from anthrax are so serious as to render the farmer very anxious to take advantage of Pasteur's discovery, if he were assured that the method is both safe and efficacious.

During the first half of the present year I had the opportunity to follow the results of the Pasteurian method of vaccinating against anthrax on several farms, and the main purpose of this article is to record the experience thus obtained, for the information of those who are so unfortunate as to have anthrax among their stock.[1]

Farm I.—On this farm 3 horses and 7 cattle had died from anthrax during the twelve months preceding the vaccinations. On February 24 last 11 horses and 19 cattle were subjected to the first vaccination. In all the animals a slight swelling formed at the point where the vaccinal fluid was injected, and on March 1 one of the cattle died. Its spleen was forwarded to me, and the microscopic examination proved that it had died from anthrax.

On March 9 the surviving animals (11 horses and 18 cattle) were injected with the second vaccin. No accidents followed the second vaccination, and no case of anthrax has since occurred among the vaccinated animals.

---

[1] In this connexion valuable assistance was rendered to me by Professor Edgar, F.R.C.V.S., Dartford; Mr. C. Taylor, M.R.C.V.S., Nottingham; Mr. P. Irving, M.R.C.V.S., Chipping Norton; and Mr. R. G. Verney, M.R.C.V.S., Stow-on-the-Wold.

Farm II.—On this farm 4 sheep and 7 cattle had died from anthrax during the previous twelve months. In consequence of this serious loss among the cattle, the tenant had given up keeping that class of stock, and at the time of the vaccinations there was only 1 cow on the farm. The other stock comprised about 100 yearling ewes, 250 ewes with lambs, 5 rams, and 11 horses. On March 2 the first vaccination was performed on 85 yearling ewes, while 5 of the same lot were left unvaccinated, to serve subsequently as control animals. No accident followed the first vaccination, and the sheep did not appear in any way affected by it.

On March 16 the above 85 yearling ewes were subjected to the second vaccination, and at the same time 225 ewes with lambs, 11 yearling ewes, 5 rams, 1 cow, and 10 horses were subjected to the first vaccination. A number of adult ewes were left unvaccinated, as it was intended to send them soon to the butcher. No accident followed these vaccinations, but 1 of the 85 vaccinated yearling ewes died from anthrax on April 4.

On March 30, 225 ewes, 1 cow, 3 rams, and 10 horses were subjected to the second vaccination. During the course of the following eleven days, 16 of the vaccinated ewes died from anthrax, namely, as follows:—April 2, 3 ewes; April 3, 2 ewes; April 4, 1 ewe; April 5, 3 ewes; April 6, 2 ewes; April 9, 4 ewes; and April 10, 1 ewe.

I have said that all of these animals died from anthrax; but it is right to state that only 7 of them were submitted to a post-mortem examination. In all of these the post-mortem appearances were indicative of anthrax, and in 2 the spleen pulp was found to be swarming with anthrax bacilli. In these 2 the post-mortem was made four hours after death, but in the others a considerably longer interval had elapsed, and putrefaction had advanced so far as to make it impossible to discover anthrax bacilli.

Between the date of the vaccinations and April 11, 4 lambs belonging to vaccinated ewes also died; only 1 of these was verified as a case of anthrax. This lamb was forwarded to me for examination, the result showing that its blood was swarming with anthrax bacilli. Presumably the cause of death was the same in the other 3. These lambs, which were from three to four weeks old, had not been vaccinated, but in all probability they had become infected by means of the bacilli contained in the milk of their mothers. Since April 11 no case of anthrax has occurred on this farm.

Farm III.—Precise information regarding the number of animals that have died from anthrax on this farm during the preceding twelve months was not obtainable, but there was a history of the disease extending back for a good many years. On a previous occasion the cattle had been vaccinated against anthrax by the Pasteurian method, and the tenant was very much against a repetition of the operation, on the alleged ground that it had caused tuberculosis in a considerable number of the animals operated on.

On May 1 last, 47 cattle on this farm were submitted to the first vaccination. In several of them a considerable swelling formed around the point of inoculation, whilst most of the milking cows for a few days lost their milk. On this account the owner refused to allow the animals to be submitted to the second vaccination. As far as can be ascertained, none of the vaccinated animals have died from anthrax since the vaccination.

FARM IV.—On this farm during the twelve months preceding the vaccinations 2 horses and several cattle had died from anthrax. In the month of June last 65 cattle and 16 horses were submitted to the first and second vaccinations. None of the animals were sensibly disturbed by the operation, and no cases of anthrax have since occurred among the vaccinated animals.

It must be admitted that the result of these trials of the Pasteurian method of vaccinating against anthrax is very unsatisfactory. It may be, and no doubt is, true that when thousands of animals are vaccinated the percentage of loss from the operation itself is a mere fraction per cent. ; but here we have a case in which, in one lot of sheep, 7 per cent. of the animals succumbed to the operation intended to protect them. If this had been the first recorded instance of the kind, one might have supposed that the unfortunate results were accidents in the strict sense of the word—that is, ascribable to some imperfection or mismanagement in the method of carrying out the operation. But, unfortunately, it appears that accidents of precisely the same kind occur every now and again in France, and that no human foresight can prevent them. Thus, in a note to the most recently published statistics regarding the anthrax vaccinations in France, M. Chamberland admits that accidents of this kind occur here and there every year after the vaccinations. He says that while ten, fifteen, or twenty veterinary surgeons receive on the same day the same vaccin, and carry out the vaccinations without accident, it sometimes happens that one of them reports that a few days after the vaccinations 5 or even 10 per cent. of the animals have succumbed to anthrax. These accidents are all included in the statistics, but they are so rare that they hardly influence the final result. They are deplored, because they raise a serious prejudice against the system of vaccination when they become known, and it is admitted that they have always been a great puzzle to those who are responsible for the manufacture of the vaccins. Now, however, M. Chamberland thinks that he has discovered an explanation of them, which he gives in the following words [1] :—

"In the first place, almost all these accidents take place after the first vaccination, and that leads us to think that very often the animals succumb, not to the inoculation, but to the spontaneous disease, which already existed in the animals, and which was just on the point of manifesting itself. Sometimes, it is true, animals die after the second vaccination, or even after the first, with symptoms which seem to indicate that the disease had its starting-point at the

[1] *Annales de L'Institut Pasteur*, March 1894.

seat of vaccination. The vaccin itself cannot be incriminated, since the same sample is sent on the same day to other veterinary surgeons, in whose hands it has not produced any ill effect. It is probable that the breed of the animals or the mode of feeding them may play a certain *rôle*; but that cannot be important, since the accidents occur everywhere, in every corner of France.

"We think, rather, that they ought to be attributed to some accidental impurities which have been introduced under the skin at the same time as the vaccin. In fact, we know to-day, beyond any doubt, that two microbes which, when inoculated separately under the skin of an animal, do not produce any injurious effect, may when they are associated entail a fatal result. But when one reflects on the conditions in which the inoculations are ordinarily performed—in buildings, on animals having the skin soiled with dirt, with syringes the needles of which are bound to be contaminated, one is bound to admit that impurities must be frequently inoculated at the same time as the vaccin. Hence those purulent œdemas which have been reported to us. We think that the presence of foreign microbes is the principal cause of the accidents in question. It does not appear to us to be possible to avoid them altogether, for in the practice of the operation on a large scale one cannot employ the precautions which are customary in laboratories. But they may be avoided in part by remembering that every impurity introduced under the skin at the same time as the vaccin may entail fatal consequences."

I have quoted at length M. Chamberland's explanation of the accidents which follow immediately after vaccination, but I cannot admit that it is satisfying with regard to the losses which followed the operation on Farm II. Fortunately, in that case the second vaccinations were performed by myself, and I am thus able to speak with confidence regarding the circumstances. In order to apply M. Chamberland's explanation to this particular case, one would have to suppose that at some time during the course of the vaccinations the needle of the hypodermic syringe became soiled with an impurity—that is to say, with a microbe having pathogenic properties—and that the disease which this accidental microbe set up at the seat of inoculation gave the anthrax bacilli present in the vaccin a better chance of multiplying. Now, I had myself the opportunity of examining several of the carcasses of the seventeen animals that succumbed after the second vaccination, and I can most positively assert that the seat of inoculation did not afford any evidence in support of the view that the animals had died from a mixed infection, and beyond any doubt no purulent œdema was present.

But in this case there is still another objection to the explanation which M. Chamberland has offered. If the accidents had been due to a soiling of the syringe or of the hands of the operator with some accidental microbe, one would not have expected a smaller proportion of fatalities among the animals which were last vaccinated on that day. But the eleven horses on the farm were vaccinated after the sheep, and with the same syringe, though with a different vaccin ; and in none of these did any accident occur, nor was there any notable swelling at the seat of inoculation. Besides that, on the evening of the same day the same syringe and a small quantity of the vaccin left over from vaccinating the sheep were used to vaccinate at the Royal Veterinary College three young calves and two yearling heifers, and no accident followed the operation in these cases. In face of these facts I feel bound to reject the explanation offered by M. Chamberland, and think that the accidents must be attributed either to the first vaccin having been too weak, or to the second vaccin having been too strong, for the animals operated upon. It may be well to add that the ewes among which these accidents occurred had been vaccinated for the first time by Professor Edgar and myself, and I can therefore vouch for the fact that every one of the animals received neither more nor less than the exact dose of the vaccin, as measured by the syringe supplied by the company. The explanation here given may not be the correct one, but it certainly appears to be more plausible than the one suggested by M. Chamberland.

Before stockowners in this country can be expected to submit their animals to Pasteurian vaccination, one must be able to lay before them information bearing upon—(1) the safety of the operation, and (2) the efficacy of it. The preceding part of this article will be of some assistance in guiding to a conclusion regarding the first of these points, while the following experiments furnish some information regarding the second :—

Experiment I.—On May 25 last, at 5 P.M., a vaccinated sheep, an unvaccinated sheep, and a vaccinated heifer were each inoculated with a virulent culture of anthrax. The sheep had been submitted to the first vaccination on March 2, and to the second vaccination on March 17. The heifer had been vaccinated for the first time on March 17, and for the second time on March 30. The result was as follows :—The unvaccinated sheep died the following day, at 5.30 P.M., that is, $24\frac{1}{2}$ hours after inoculation. The vaccinated sheep was found dead on the morning of the 27th, at 6.30 A.M., or $37\frac{1}{2}$ hours after inoculation. The vaccinated heifer began to show symptoms of illness on the afternoon of the 27th inst. : respiration was hurried, and a swelling as large as the hand had formed at the seat of inoculation. On the following days this swelling increased considerably in extent, while the other symptoms of illness at the same time became more aggravated. The animal died on June 1, at 6.30 P.M., or 6 days $1\frac{1}{2}$ hour after inoculation.

In all these animals a post-mortem examination proved that death was due to uncomplicated anthrax.

Experiment II.—For this experiment five sheep were used, namely :—(1) a vaccinated yearling ewe from Farm II. ; (2) an unvaccinated yearling ewe from the same flock ; (3 and 4) vaccinated ewes from Farm II. ; (5) an unvaccinated ewe from the same flock. On July 16, at noon, the first three of these animals had poured down their throats a quantity of water in which a culture of virulent anthrax bacilli and spores was suspended. Ewes 4 and 5 were inoculated on the inside of the thigh with a few drops of the same water.

The result was as follows :—Ewe 4 (a vaccinated ewe) was found dead at 10.30 P.M. on the 17th. Ewe 5 (an unvaccinated ewe) died on the 18th, at 4 A.M. No. 1 (a vaccinated yearling ewe) died on the 18th, at 7.30 P.M., and No. 2 (an unvaccinated yearling ewe) three hours later, viz. at 10.30 P.M. No. 3 (a vaccinated ewe) survived longest, but it also died, namely, on the 21st, at 12.40 P.M.

In these cases also the post-mortem examination proved that the animals had died from uncomplicated anthrax.

Experiment III.—The subject of this experiment was a pony which had been vaccinated with the first vaccin on March 17, and with the second on the 30th of the same month. On May 22, at 4 P.M., this pony was inoculated with a few drops of water holding in suspension virulent anthrax bacilli and spores. On the following day the temperature rose 2°, and a swelling about the size of a pigeon's egg formed at the seat of inoculation, in front of the shoulder. The general health of the pony was not seriously disturbed, and the local swelling disappeared entirely in the course of a few days. On two subsequent occasions in the month of June this pony was inoculated with enormous quantities of anthrax bacilli. On neither occasion did the inoculation give rise to anything more serious than a slight swelling at the seat of inoculation, and an elevation of temperature amounting to 2° or 3°.

The results of these experiments cannot be characterised otherwise than as very disappointing. With the exception of the pony, not one of the vaccinated animals offered any unusual resistance to infection, although the quantity of material used to infect them was not excessive. The result is doubly disappointing in the case of the vaccinated ewes of Experiment II., for these animals had been inoculated with a second vaccin that was fatal to 7 per cent. of the flock, and it was confidently expected that all the surviving animals would, when tested, give evidence of a marked degree of immunity. But, as has been seen, one of them actually died before its unvaccinated companion.

J. McFadyean.

Royal Veterinary College, Camden Town, N.W.

AN INFECTION EXPERIMENT WITH FINGER AND TOE.

The disease of finger and toe, which is met with wherever the turnip crop is cultivated, is probably nowhere more destructive than in the north of England. On certain classes of soil it is only by liming heavily every eight or ten years that turnips can be cultivated at all, and the expense involved in this treatment is felt to be almost a greater burden than agriculture, in its present condition, can bear. The desirability of devising some cheap means of mitigating or eradicating the disease, and so of rendering a heavy periodic dressing of lime unnecessary, is felt to be almost of national importance, and it was with the object of assisting in the solution of the problem that, in 1893, some experiments were started in the garden attached to this college. Most of the investigations are still incomplete, but the past season has furnished certain results which it is felt are

Illustration (prepared from a photograph) of the results of the Experiment.
The six heaps of turnips in the upper row correspond with the six heaps in the lower row each plot having been treated in duplicate. The numbers count from right to left, No. 1 being below No. 1A, No. 2 below No. 2A, and so on.

sufficiently conclusive and important to warrant their being brought to the notice of English farmers.

In the spring of 1894 Mr. Pringle of Branton, at my request, supplied the college with two bags of soil taken from a field which had a bad reputation for finger and toe. Until it was required we were careful to keep this soil in the condition of what may be called natural moistness, for in the previous year we had found that soil became useless for purposes of infection if it was allowed to become over-dry. On May 22 a piece of suitable land having been made ready for the reception of the turnip seed, it was laid off in shallow drills 27 inches apart and 28 feet long. The fungicide or antiseptic employed to counteract the effects of the infected soil on certain of the plots was quicklime (CaO), that is to say freshly burned lime, but ground in a phosphate mill to such a degree of fineness that

90 per cent. passed through a No. 100 sieve. When in this unusually fine state of subdivision quicklime rapidly absorbs moisture from the air, and in a fortnight or so becomes largely converted into the slaked or hydrated form. If it is to be used in the quick form, therefore, it must be applied within a few days after being ground, but whether it is less effective as a cure of finger and toe when slaked remains for the present undetermined.

The experiment was carried out in duplicate as follows: Each plot consisted of a single drill comprising $\frac{1}{691}$ acre, and the first plot of each series received neither diseased soil nor lime. Plots 2 to 6 each received 20 lb. of soil, plot 2 getting nothing else, but plots 3 to 6 receiving along with the soil $\frac{1}{8}$, $\frac{1}{4}$, 1, and 5 per cent. of the quicklime dust. Where both were applied, the diseased soil was first thoroughly mixed with the quicklime, and then the whole was distributed equally along the line of drill. The turnip seed (White Bullock) was afterwards sown without anything further being done. The roots were lifted, counted, and weighed on October 15, and the accompanying illustration gives a general view of the results. From plots 2 and 2A to plots 6 and 6A a gradual improvement will be observed, both in the illustration and in the table below, along the two sets of duplicate plots, the improvement, in fact, keeping pace steadily with the increase in the quantity of quicklime. The single plot, No. 7, without a duplicate, was hardly part of the experiment, the soil that remained over (50 lb.) after the other plots had been supplied being spread on a drill alongside plot 6A.

Soil-inoculation Experiment on Finger and Toe, conducted in 1894 *at the Durham College of Science, Newcastle-on-Tyne.*

Plots	Quantity of infected soil	Quantity of lime	Percentage of lime to infected soil	Average number of roots [1]	Number of diseased roots	Number of sound roots	Average yield per plot		Equivalent yield per acre	
	lb.	oz.					lb.	oz.	tons	cwt.
1 & 1A	0	0	0	42	0	42	30	6	9	10
2 & 2A	20	0	0	31	30	1	26	10	8	$8\frac{1}{4}$
3 & 3A	20	$\frac{2}{5}$	$\frac{1}{8}$	38	35	3	36	2	11	$5\frac{3}{4}$
4 & 4A	20	$\frac{4}{5}$	$\frac{1}{4}$	33	28	5	32	2	10	$0\frac{3}{4}$
5 & 5A	20	$3\frac{1}{5}$	1	36	26	10	40	10	12	14
6 & 6A	20	16	5	40	4	36	54	2	16	18
7	50	0	0	13	13	0	12	10	3	$19\frac{1}{4}$

[1] Avoiding fractious.

As will be seen from the illustration on the opposite page, extremely little variation was found in the duplicate plots, so that in the table I have thought it sufficient merely to state the average results obtained from the two sets of plots.

The soil on which this experiment was conducted is a heavy loam, well drained, resting on boulder-clay. The accompanying analysis made by my colleague, Mr. Greig Smith, B.Sc., shows that the soil contains 1·41 per cent. of lime, and cannot therefore be said to be deficient in this substance :—

[1] Organic matter and water of combination	19·81
Oxides of iron and alumina	6·14
Lime	1·41
Alkalies, &c.	1·01
Insoluble matter and sand	71·63
	100·00
[1] containing nitrogen	0.36

The results as tabulated show that where no infected soil was applied every turnip was sound. Plots 2 and 2A, getting diseased soil but no antiseptic, produced only a single sound root each. Three sound roots per plot were found when $\frac{2}{5}$ ounce of quicklime were added, and the number steadily rises till we come to plots 6 and 6A, where only four roots were found to be diseased on each plot. This is not a perfect cure, but still it is a great advance on plots 2 and 2A, and the few roots which were touched by the disease were by no means badly affected.

The column showing the weights indicates that from plot 2 onwards the yield rises almost in proportion as the disease decreases. The only slight variation is in plots 3 and 4 with their duplicates, where the weight is greater on plot 3 with thirty-five diseased roots than on plot 4 with only twenty-eight. The reason for this is that the total number of roots (thirty-eight) on plot 3 is greater than on plot 4, which contained an average of only thirty-three, and, as a comparison of plots 1 and 2 will show, diseased roots, which are little else than a water-logged mass of putrid vegetable matter, weigh almost as much as sound ones.

Plot 1, getting nothing, carried the maximum number of roots, namely forty-two ; a certain number of plants having been killed off on all the other plots, though fewest succumbed on that getting most lime. Plot 7, which was dressed with an extra large dose of soil, yielded only thirteen roots, and every one was diseased.

Although in this experiment the disease was nearly cured by a comparatively small dressing of quicklime (less than 700 lb. per acre) it is not likely that this quantity will prove so effective in the ordinary field cultivation of the turnip crop. In these trials only a comparatively small proportion (about 6 tons per acre) of the total soil was diseased, and as the lime was thoroughly mixed with this diseased soil, the two became incorporated in a manner which could scarcely be secured in practical agriculture. But of one thing there can be no doubt—namely, that when lime is ground down to an impalpable powder, its spreading and mixing power is vastly increased ; and farmers who saw 5 cwt. per acre applied in the case of some of our field experiments, maintained that the visible effects, so far as whitening the land was concerned, were as great as when five tons are applied in the usual way. The cost of grinding is not a very serious item, but the result of future experiments must decide whether it is profitable or not.

The experiment which has been described emphasizes the following practical points :—

1. That finger and toe (locally known in the North as "grub") is an extremely infectious disease, and may be easily induced by inoculating a soil perfectly free from the disease—and holding much more than an average quantity of lime—with soil from a diseased field.

2. That such diseased soil may be easily disinfected by lime, which points to the pathological phenomena being due to an organism—presumably *Plasmodiophora Brassicæ.*

3. That farmers cannot be too careful to prevent soil or diseased roots being conveyed from a field that is diseased to another that is sound, or from a diseased part of a field to a portion originally unaffected. In this connexion the main points to be observed are :—

(*a*) That no diseased roots be consumed by stock at the homestead, for they are thus certain to get into the farmyard manure in greater or less quantity, and in it will be conveyed to fields which will probably be used for the cultivation of turnips. Such roots should be consumed either where they grow or on a permanent grass field.

(*b*) That carts or horses should on no account traverse a diseased field and afterwards go directly on to a sound one, for the soil thus conveyed on the wheels of the carts, or on the feet of the horses, will certainly contain disease germs, and will be the means of spreading the disease.

(*c*) That the headlands should be carefully watched, so that disease may be stamped out by liming wherever it appears. As is well known, the headlands are generally more subject to the attack than any other part of the field, and in working the land the horses and agricultural implements carry away a certain amount of soil at every turning, and thus spread the disease all over the field.

(*d*) That unless conveyed mechanically the disease is not apt to spread far. In the above experiment plots 1 and 1A, which did not contain a single diseased root, were situated within 27 inches of plots 2 and 2A respectively, which contained only two sound roots between them, and yet this narrow interval was sufficient to prevent the passage of the disease germs. Similarly in the case of plots 6A and 7, the roots on the former were almost free from attack, while those on the latter were nearly annihilated.

William Somerville.

The Durham College of Science,
Newcastle-upon-Tyne.

THE AUTUMN OF 1894.

The weather of last autumn came to us in three distinct spells, each possessing features of a very strongly marked character.

During the first period, which lasted from the beginning of September until the middle of October, the type of weather was mainly anticyclonic, the highest barometrical pressures being found, as a rule, over our western and northern districts. With these conditions the prevailing winds were from the northward or eastward, and the weather fair and dry. Over the eastern, central, and southern parts of the country, however, the anticyclone was accompanied by an unusually large amount of cloud and mist ; and in consequence of this the day temperatures were decidedly low, the nights being, on the other hand, fairly mild for the time of year. Heavy falls of rain were experienced at times in isolated portions of our southern counties, but in the west and north of England the country was under the partial influence of a drought which prevailed with unusual severity in the west of Scotland and the north of Ireland.

The second period of weather, which lasted during the four weeks commencing with October 18 or 19, was of a widely different character. The influence of the anticyclone was now replaced by that of the cyclone, the low-pressure systems travelling in most cases in a north-easterly direction over or outside our western and northern coasts. The prevailing winds were therefore from points lying between south and west, and the weather was extremely mild and changeable, with repeated heavy falls of rain over our southern and south-western counties. The bad weather appears to have reached its culminating point between November 11 and 14, when a tremendous downpour of rain occurred over the entire southern half of England. Deluged by previous heavy falls the soil was incapable of absorbing this very serious addition, the result being that the river valleys and low-lying grounds generally were speedily visited by floods of an unusually widespread and destructive character. In some districts the water is said to have reached a higher level than at any time since the year 1852, while in isolated places the floods were described as the worst on record. An interesting feature in the history of this period is that, while the rainfall was so much in excess of the average, the amount of bright sunshine was also unusually large. The seeming paradox is explained by the fact that in the intervals between the departure of one cyclonic system and the arrival of the next, the sky often remained clear for many hours together, the days being in many places alternately very fine and very wet. Thunder and lightning were reported frequently in the south and south west ; and on November 12, when a serious barometrical depression advanced eastwards along the Channel, thunderstorms, with heavy hail, were experienced in the south-east of England. The only mention of snow during the season was on October 19, when a slight fall occurred in many parts of our northern and western counties.

After the middle of November the country was again brought under the influence of a large anticyclonic system which spread over us from the Continent. The weather therefore became fair and dry; and, although temperature remained somewhat high in the daytime, the nights were cold, with repeated frosts in the northern and inland districts. Cloud and fog were very prevalent in places, and over the country generally the amount of bright sunshine was far smaller than it had been during the rainy weather which prevailed earlier in the month.

The leading features in the weather of the entire season are shown in a statistical form on p. 815, the following remarks giving some details of interest in the history of each particular element.

Temperature.—During the earlier half of the quarter the mean temperature was below the average in five weeks out of seven, the deficit being greatest at the very commencement of the period. The last six weeks were distinguished by an excess of warmth in nearly all districts, the departure from the normal being greatest at the end of October and the beginning of November. Taking the season as a whole, we see from the table that the day temperatures were a little below the average in the eastern, midland, and southern counties, but a trifle above it in the western and north-eastern districts, and decidedly above it in the Channel Islands. The night temperatures showed an excess in all but the north-eastern counties, and especially in the south. Over the south-west of England the nights were unusually cool during the early part of the season, and the deficiency of nocturnal heat for the entire quarter was therefore rather large. The highest autumn temperatures were observed at varying times during the first three weeks in September, but in all the eastern, southern, and south-western districts the thermometer failed to reach 70°, the maximum readings being decidedly low for the time of year. At the beginning of November, however, the weather was exceptionally mild, the maximum temperature of 65° registered in London on the 1st being the highest November reading observed since the year 1847. The lowest readings were recorded mostly about October 22, when sharp frost occurred over the entire country. Over our southern and south-western counties and the Channel Islands, however, the lowest temperatures were observed quite at the close of the season.

Rainfall.—At the beginning of September the rainfall was in excess of the average, but in the succeeding six weeks there was a considerable deficiency in nearly all parts of the kingdom. In some parts of our midland and north-western counties an entire absence of rain was reported for about a fortnight in September;

while at Falmouth the weather remained absolutely dry for a period of twenty-three days ending with the middle of October. In the west of Scotland and the north of Ireland the drought was far more severe, the longest period without rain being reported at Edgeworthstown (Co. Longford), where an absolute drought lasted from September 5 to October 8, an unbroken run of thirty-four days. In many parts of these districts September was the driest month experienced for at least thirty years past. Soon after the middle of October, however, a great change in the weather took place, and during the ensuing four weeks an enormous excess of rain was reported over all the more southern parts of the country. In the midlands the total quantity for this period was more than twice as much as the average, in the Channel Islands nearly two-and-a-half times as much, and in our southern and south-western counties more than two-and-a-half times as much as the normal. At several places in the south-western parts of England the rainfall for the four weeks amounted to an average of more than 3 inches per week, the largest individual falls being 16·3 inches at Hazelbury and 14·7 inches at Godmanstone (both in Dorsetshire), 14·3 inches at Arlington (North Devon), 13·5 inches at Cattistock (Dorsetshire), and 12·7 inches at Llandovery (Glamorganshire). The heaviest rains in a short period occurred between November 11 and 14, when an aggregate of between 3 and 4 inches was recorded over a considerable portion of the southern half of England, the largest amounts at present reported being 6·6 inches at Hazelbury, 5·7 inches at Godmanstone, 5·5 inches at Scilly, 4·8 inches at St. Agnes (Cornwall), and 4·7 inches at Osborne (Isle of Wight). In many places the amount for these four days was in excess of the average quantity for the whole of November. It is not a little singular that a season which commenced with a partial drought should have been marked later on by so unusually heavy a rainfall, and it is still more remarkable that the two successive years 1893 and 1894 should have been distinguished respectively by one of the longest droughts and one of the heaviest floods of the present century. During the latter part of November the weather again became very dry, the last week being marked by an entire absence of rain in nearly all parts of England. Taking the quarter as a whole, we see from the table that there was a slight excess of rainfall in the Channel Islands, and a large excess over our southern and south-western counties. In the eastern district the autumnal rainfall agreed very closely with the normal, but in the north-eastern, the midland, and the north-western counties it was deficient, the amount in the last-mentioned district being only about three-fourths of the average. As a proof of the plumping nature of the rainfall, it will be seen that in the south-west, where the total amount was so large, the number of days with rain was considerably less than the average. A large deficiency in this respect was shown also in the Channel Islands, and, naturally enough, in the north-western counties; but in the east and south of England the number of rainy days was slightly in excess of the normal.

Temperature, Rainfall, *and* **Bright Sunshine** *experienced over* **England** *and* **Wales** *during the thirteen weeks ended December* 1, 1894.

(*The Autumn Season.*)

Districts	Temperature: Highest observed	Temperature: Lowest observed	Day temperatures: Mean	Day temperatures: Difference from average	Night temperatures: Mean	Night temperatures: Difference from average	Day and night temperatures combined: Mean	Day and night temperatures combined: Difference from average
	°	°	°	°	°	°	°	°
North-eastern counties	69	24	53·6	+0·1	43·0	−0·2	48·3	−0·1
Eastern counties	72	28	55·3	−0·5	43·3	+0·7	49·3	+0·1
Midland „	69	22	55·0	−0·1	42·2	+0·5	48·6	+0·2
Southern „	71	26	56·8	−0·3	45·8	+1·1	51·3	+0·4
North-western counties, including North Wales	65	25	54·8	+0·1	44·7	+0·3	49·8	+0·2
South-western counties, including South Wales	71	22	56·5	+0·1	45·3	−1·1	50·9	−0·5
Channel Islands	69	35	58·4	+0·7	50·6	+0·7	54·5	+0·7

Districts	Rainfall: Days with rain: Number	Rainfall: Days with rain: Difference from average	Rainfall: Total fall: Amount	Rainfall: Total fall: Difference from average	Bright Sunshine: Duration: Hours recorded	Bright Sunshine: Duration: Difference from average	Bright Sunshine: Percentage of possible amount: Percentage	Bright Sunshine: Percentage of possible amount: Difference from average percentage
			ins	ins.				
North-eastern counties	49	−3	6·7	−1·4	217	−18	23	−2
Eastern counties	53	+1	7·9	0·0	254	−36	27	−4
Midland „	45	−4	7·7	−0·8	225	−36	24	−3
Southern „	49	+1	11·0	+2·3	285	−40	30	−4
North-western counties, including North Wales	43	−10	8·6	−2·9	222	+30	24	+4
South-western counties, including South Wales	43	−14	14·8	+2·1	324	+12	34	+1
Channel Islands	50	−13	11·9	+0·4	352	+17	36	+1

NOTE.—The above Table is compiled from information given in the Weekly Weather Report of the Meteorological Office. The averages employed are :— For Temperature, the records made during the twenty years, 1871–90; for Rainy Days, the values for the thirteen years, 1878–90; for Total Rainfall, those for the twenty-five years, 1866–90; and for Bright Sunshine, those for the ten years, 1881–90.

Bright Sunshine.—During the earlier half of the autumn the amount of bright sunshine was mostly in excess of the average in the western districts, but very deficient over our eastern, midland, and southern counties. Later on a more general deficiency was reported, but in November the amount was more than the average, the excess being greatest during the very unsettled weather which prevailed early in the month. Taking the season as a whole, the figures in the table show a considerable excess in the north-west, and a slight excess over our south-western counties and the Channel Islands. In all other parts of the country, however, the amount of sunshine was unusually small. At the Greenwich Observatory, where a sunshine recorder has been in operation since the close of 1876, the state of affairs existing last autumn was very striking. During the months both of September and October the amount of sunshine was by far the smallest, while in November it was the largest ever recorded in those particular months. The excess in November was, however, not sufficient to compensate for the previous deficiency, and the amount for the entire autumn was, as a matter of fact, the smallest on record, the total number of hours being only 160, as against an average of 235. In place of an average daily allowance of sunshine amounting to about two hours and a half, the mean duration at Greenwich last autumn was very little more than an hour and three-quarters.

RECENT AGRICULTURAL INVENTIONS.

The subjects of Applications for Patents from Sept. 10 *to Dec.* 13, 1894.

N.B.—Where the Invention is a communication from abroad, the name of he Inventor is shown in italics, between parentheses, after the name of the applicant.

Agricultural Machinery and Implements, &c.

No. of Application. Year 1894.	Name of Applicant.	Title of Invention.
17209	BAMFORD, J.	Cultivators.
17470	SABINE, T.	Chaff-cutters.
18320	HOLT, J.	Potato-digger.
18586	SLEEP, W. H.	Ploughs.
18669	COCKER, J. N.	Potato-harvesters.
18699	BURRELL & HIBBERD	Sackhoist for threshing machines.
19086	RANSOME, J. E.	Cultivating land.

No. of Application. Year 1894.	Name of Applicant.	Title of Invention.
19160	THOMPSON, W. P. (*Stewart, U.S.A.*)	Harvesters.
19562	HASLAM & MAWDSLEY	Potato-digging, &c., machine.
20005	HORNSBY & others	Knotting mechanism for sheaf-binders.
20024	RICHMOND, J. G.	Chaff-cutters.
20091	BLACKSTONE & others	Root-pulpers.
20173	SLEEP, W. H. & R.	Ploughs.
20225	ROSBOTHAM	Potato-diggers.
20269	ROTTENBURY	Protectors for hay-ricks.
20270	SCHNETZER	Machine for sorting, &c., grain.
20440	SLADE, E.	Harrows.
20468	HORNSBY & INNOCENT	Ploughs.
20469	HORNSBY & SMITH	Knotting mechanism for sheaf-binders.
20527	HOWARD, J. H., & othrs	Straw-trussing machines.
20679	TIFFEN, G. W.	Plough.
20955	BENTALL, E. E.	Mowing machines.
20995	SCALES, E.	Chaff-cutters.
21049	GHEORGHESCU, C.	Seed-sowing machine.
21149	MCLAREN, J. & H.	Steam diggers.
21260	HORNSBY, J., & others	Ploughs.
21988	HOPE & PAXTON	Potato-raising machine.
22727	MARSHALL, J.	Threshing machines.
22747	HORNSBY & INNOCENT	Mowing and reaping machines.
23175	JOHNSON, W.	Reaping machines.
23287	BOWEN, W. R., & anr.	Sowing seeds.
23461	MARSHALL, J.	Sack-holders for threshing machines.
23871	COCHRAN J. S.	Cleaning grain and seeds.
23930	CORBANI, V.	Threshing machines.
24188	SHANKS, A. & J.	Reaping and mowing machines.
24204	SIBLEY, W. G.	Mowing machines.
24283	PEARSON, R.	Steam ploughs.

Stable Utensils and Fittings—Horse-shoes, &c.

17248	DEFOY, L.	Device for training horses.
17371	WAKFER, W. H.	Horse-shoes.
17519	MADDOCK & PERKINS	”
17583	WALDOCK, J. R.	Hames for equalising draught.
17677	WILLIAMS, W.	Collars.

No. of Application. Year 1894.	Name of Applicant.	Title of Invention.
17684	MARTIN, G. . . .	Rubber pad to insert in stirrups.
17686	TAAFFE, P. . . .	Horse clothing.
17900	WILSON, J. J. . .	Knee-caps.
17913	WATKINS & HEALY .	Frost nail for horses.
17940	LUKE, W. . . .	Harness.
17991	WILLARD & LEPORCQ .	Horse-shoes for ice, &c.
18004	BELL	Horse-shoes.
18095	CRUDGINGTON, W. .	Tug-stops.
18168	OTTAWAY, J. P. . .	Checking runaway horses.
18287	COPE, J., & TAYLOR, H.	Safety stirrup.
18342	TAAFFE, P. . . .	Saddles.
18343	,, . . .	Bridles.
18344	KELSEY, E. E. . .	Collars.
18438	SCHENK, W. E. . .	Stirrups.
18474	WRIGHT, R. . . .	Nosebags.
18566	LINDSAY, N. C., & anr.	Pneumatic horse-collar.
18584	BLICK, J. W. H. . .	Saddle.
18915	BOULT, A. J. (*Van Damme & anr., Belgium*) . . .	Horse-collars.
19020	TURNER, D. S. . .	Horse-collars and saddles
19031	EMMETT, J. & H. . .	Cart bridles.
19093	WOOD & others . .	Fastening device for harness
19250	CHAPMAN, W. . .	Horse-shoe.
19309	CHARD, T. T. . .	Phosphate food for horses.
19353	DANCER, SIR T. . .	Safety stirrups.
19808	CLOKE & STANDBROOK	Hoof-pad.
20007	STUART, I. . . .	Horse-shoe.
20082	THE MAIL HORSE-SHOE SYND., LIM. . .	Horse-shoes.
20146	TREWIN, A. . . .	Cushion horse-shoe.
20216	ASPINALL, R. . .	Horn horse-shoe.
20235	NOWAK, A. . . .	Apparatus for quieting restless horses.
20254	THOMPSON, J. . .	Harness.
20267	PIERPOINT, T. . .	Bits.
20492	DAY, W. T. . . .	Pneumatic harness-pad.
20493	FELSTEAD . . .	Horse-shoe.
20558	MEDHURST, M. . .	Preventing horses kicking, &c.
20635	WELCH, G. . . .	Horse-shoes.

No. of Application. Year 1894.	Name of Applicant.	Title of Invention.
20658	ALBERY, W.	Harness buckles.
20669	BARNETT, J. H.	Pneumatic horse-collar.
20722	JOHNSON, T.	Anti-slipping goloshes.
20758	GILLMAN	Pneumatic collar and saddle-pads.
20778	PRICE & BREWER	,, tyre horse-shoe.
20903	PICKLES, H.	Horse-shoes.
21277	OXBORROW, F. S.	Turret for saddles and hames.
21306	CARGILL, A.	Nosebag.
21823	DUNCOMBE, T. H.	Safety bolt-stirrup.
21891	CLEGG, T.	Top boot and shoe for horses.
22091	DENTON, H. R.	Feeding horses.
22162	DONNERSTAG, W., & anr	Tips or calkins for shoes.
22196	BIEBUYCK, G.	Safety saddle-bars.
22235	MAYOS, T.	Horse-shoes.
22429	THE MAIL HORSE-SHOE SYND., LIM., & others	Roughing horse-shoes.
22482	ROBERT, C. E., & othrs	Protectors for horse-shoes.
22656	KIDMAN, J.	Reversible cut-back ladies' saddles.
22708	WOOD, F. H.	Boots for horses.
22732	LUDLOW, E. H.	Horse-collars.
23058	BRADSHAW, J. L.	Harness.
23125	SOTIROPOULO, N.	Releasing runaway horses from vehicles
23256	SLEEMAN, M.	Stirrups.
23305	DUNCAN, A.	Suspenders for nosebags.
23332	LEE, J.	Horse food-rest.
23475	BEHRENS, N.	Automatic rein-holder.
23512	STAINES, T., & others	Air-collar.
23624	ZIPPERLING, F.	Detaching horses from vehicles.
23776	FROST, H.	Safety stirrups.
23864	MEYERS, J. C.	Feed-bag.
23896	GUMBLEY & RENOUF	Saddles.
24210	SEWELL, H.	Balling instrument for horses, &c.

Carts and Carriages.

19660	GOLBY, F. W.	Carriages.
20210	COOPER, S.	Carriages, carts, &c.
20498	WARBURTON, F. & W.	Lorries or wagons.
20717	THOMPSON, G. S.	Brakes for vehicles.
20897	SMITH, J. & C.	Tip wagons and tip carts.

No. of Application. Year 1894.	Name of Applicant.	Title of Invention.
21018	Döring, H.	Flexible shafts.
21089	Jones, W.	Supporting shafts of four-wheeled wagons horizontally.
23236	Luke, H.	Unbreakable shafts, with supports, to prevent horses falling.
23445	Norrington, B.	Tip carts.

Dairy Utensils, &c.

17210	McKeever & Gray	Packing-case for cheese.
17629	Bradford, T.	Butter-working apparatus.
17676	Benit, J. C.	Preserving milk and cream.
18285	Gaertner, G.	Reducing proportion of casein in milk, and regulating simultaneously proportion of fat.
18322	Geary, J. V.	Separating cream from milk.
18428	Cooper, W.	Churns for conveying milk.
18521	Bradford, T.	Churns.
18567	Boyd, J. P.	Boxes for preserving butter in transport.
19092	Bradford, T.	Churns.
20137	Goodchild, E. A.	Churns.
21092	Wilkinson, R. H.	Rapidly estimating water in butter.
21502	Ludlow, H. W.	Milk cans or churns.
21540	De Laval, C. G. P.	Mechanical milking apparatus.
21830	Abel (Drosse & Ludloff)	Milk-separators.
21710	Hope, C. F.	Cheese.
21984	Cheeld, S.	Centrifugal churns.
21994	Boggild	Refrigerators.
22209	Bradford, T.	Butter-drying apparatus.
22210	„	Churning „
22318	Withers, P. (*Helzel, Italy*)	Cream-separators, &c.
22642	Broekhuijsen & anr.	Securing milk cans.
22864	Badger, R.	Sieve for milk.
23005	Sturges, L.	Churns.
23288	Bingham, A. M.	Combined churn and butter-worker.
23788	Wright, S. H.	Churning apparatus.

Poultry and Game, &c., Appliances

17197	Arnold, M.	Jess for pigeons.
18136	Robb, J. M. C.	Penning poultry, &c.

No. of Application. Year 1894.	Name of Applicant.	Title of Invention.
19906	Hooper, J. A.	Incubators.
21035	Christianson, T. R. C.	Storing eggs.
22213	Heeley, G.	Grit and egg-making food for poultry.
22515	Rose, H. J. F.	Detachable nest-boxes.
23053	Siviter, C. W.	Wheel heating flue and portable chamber for foster-mothers, &c.
23419	Bird, C.	Gauge for measuring eggs.
23465	Vaughan-Sherrin, J.	Incubators.

Miscellaneous.

20003	Phillipson, B. R.	Food for cattle.
20350	Farn, W. D., and Clarke, U.	Supplying food automatically to cattle and horses.
20710	Bruce, W. T., and Still, A.	Dog kennels.
21224	Schwartz, W.	Cattle food.
21875	Pitman, C. W.	Sheep-shearing machine.
22097	Browne, A.	Supplying fodder automatically.

Numbers of Specifications relating to the above subjects published since March 10, 1894.[1]

(Price 8*d.* each copy.)

Specifications of 1893.

16818, 17726, 17968, 18063, 18708, 18825, 18901, 19577, 19793, 19823, 19841, 19877, 20027, 20171, 20217, 20271, 20453, 20725, 21109, 21243, 21428, 21584, 21669, 21726, 21970, 22330, 22441, 23187, 23207, 23266, 23339, 23348, 23467, 23491, 23588, 23871, 24011, 24027, 24408, 24703, 24830, 25078.

Specifications of 1894.

127, 241, 579, 612, 621, 1049, 2210, 2767, 4340, 5185, 8711, 10433, 11400, 12298, 12792-3-4, 13496, 14485, 14640, 14703, 14845, 15340, 15407-8, 15566, 15638, 15786, 16142, 17197, 17768, 17804; 18143, 18176, 18287, 18413, 18567, 19309, 19335.

---

[1] Copies may be obtained at the Patent Office (Sale and Store Branch), 38 Cursitor Street, London, E.C.

TABLE I.—*Acreage under each kind of* **Crop, Bare Fallow,** *and* **Grass** *as returned upon June* 4, 1894, *and June* 5, 1893, *in Great Britain, with Totals for the United Kingdom.*

		Great Britain 1894	Great Britain 1893	United Kingdom, including Isle of Man and Channel Islands 1894	United Kingdom, including Isle of Man and Channel Islands 1893
		acres	acres	acres	acres
Total Area of Land and Water (*a*)		56,771,728	56,771,728	77,671,319	77,671,319
Total Acreage under all Kinds of Crops, Bare Fallow, and Grass (*b*)		32,629,855	32,643,709	47,919,830	47,979,698
Corn Crops.	Wheat	1,927,962	1,897,524	1,980,228	1,955,213
	Barley or Bere	2,095,771	2,075,097	2,268,193	2,251,293
	Oats	3,253,401	3,171,756	4,524,167	4,435,944
	Rye	90,617	55,929	102,676	69,526
	Beans	244,180	244,954	247,062	248,304
	Peas	243,043	210,479	243,551	210,900
	Total	7,854,974	7,655,739	9,365,877	9,171,180
Green Crops.	Potatoes	504,454	527,821	1,232,055	1,262,674
	Turnips and Swedes	1,956,573	1,975,235	2,276,284	2,286,473
	Mangel	353,598	347,009	406,164	394,543
	Cabbage, Kohl Rabi, & Rape	177,394	156,202	228,230	203,270
	Vetches or Tares	187,117	175,492	192,113	181,152
	Other Green Crops	121,633	105,147	151,246	134,643
	Total	3,300,769	3.286,906	4,486,092	4,462,755
Clover, Sainfoin, and Grasses under Rotation.	For Hay	2,121,904	2,047,008	2,776,226	2,701.846
	Not for Hay	2,381,728	2,522,622	3,086,528	3,214,503
	Total	4,503,632	4,569,630	5,862,754	5,916,349
Permanent Pasture, or Grass *not broken up in Rotation.* (*c*)	For Hay	4,852,442	4,270,480	6,408,260	5,803,011
	Not for Hay	11,612,627	12,222,087	21,170,140	21,897,370
	Total	16,465,069	16,492,567	27,578,400	27,700,381
Flax		1,760	1,258	102,622	68,715
Hops		59,535	57,564	59,535	57,565
Small Fruit		68,415	65,487	68,868	(*d*) 65,845
Bare Fallow or Uncropped Arable Land		375,701	514,558	395,682	536,908

(*a*) Not including tidal water.
(*b*) Not including nursery grounds, woods, and plantations, or mountain and heath land.
(*c*) Exclusive of mountain and heath land.
(*d*) Not separately returned in Ireland.

TABLE II.—*Number of* **Horses, Cattle, Sheep,** *and* **Pigs** *returned upon June* 4, 1894, *and June* 5, 1893, *with Totals for the United Kingdom.*

		Great Britain 1894	Great Britain 1893	United Kingdom, including Isle of Man and Channel Islands 1894	United Kingdom, including Isle of Man and Channel Islands 1893
		No.	No.	No.	No.
Horses.	Used solely for Agriculture	1,004,291	1,012,867	(*a*) —	(*a*) —
	Unbroken Horses	454,095	441,894	(*a*) —	(*a*) —
	Mares kept solely for breeding	71,075	69,766	(*a*) —	(*a*) —
	Total	1,529,461	1,524,527	2,092,290	2,079,587
Cattle.	Cows and Heifers in Milk or in Calf	2,460,086	2,554,624	3,925,486	4,014,055
	Other Cattle. 2 Years and above	1,516,672	1,580,242	2,592,604	2,683,415
	Other Cattle. 1 Year & under 2	1,217,145	1,354,523	2,140,592	2,334,049
	Other Cattle. Under 1 Year	1,153,210	1,211,287	2,122,114	2,176,035
	Total	6,347,113	6,700,676	10,780,796	11,207,554
Sheep.	Ewes kept for breeding	9,668,002	10,128,676	18,541,761	19,760,056
	Other Sheep 1 Year and above	6,342,730	6,911,063		
	Other Sheep Under 1 Year	9,850,768	10,240,595	11,496,057	12,014,768
	Total	25,861,500	27,280,334	30,037,818	31,774,824
Pigs.	Sows kept for breeding	351,119	308,722	(*a*) —	(*a*) —
	Other Pigs	2,038,907	1,804,808	(*a*) —	(*a*) —
	Total	2,390,026	2,113,530	3,794,043	3,278,030

(*a*) Not separately returned in Ireland.

Table showing the Estimated Total Production of **Hops** *in the Years* 1894 *and* 1893, *with the Acreage and Estimated Average Yield per Statute Acre, in each County in England in which Hops were grown.*

Counties	Estimated total produce 1894	Estimated total produce 1893	Acreage 1894	Acreage 1893	Estimated average yield per acre 1894	Estimated average yield per acre 1893
	cwt.	cwt.	acres	acres	cwt.	cwt.
Berks	93	82	11	11	8·45	7·45
Gloucester	214	198	39	33	5·49	6·00
Hants	24,581	21,077	2,911	2,795	8·44	7·54
Hereford	37,749	65,939	7,525	7,079	5·02	9·31
Kent	424,779	230,891	35,520	34,815	11·96	6·63
Salop	545	1,318	140	123	3·89	10·72
Suffolk	112	—	17	21	6·59	—
Surrey	17,595	12,293	1,935	1,845	9·09	6·66
Sussex	106,205	50,445	7,589	7,326	13·99	6·89
Worcester	24,973	32,686	3,848	3,516	6·49	9·30
Total	636,846	414,929	59,535	57,564	10·70	7·21

Note.—As the above Preliminary Estimate is issued at the earliest possible moment after receipt of the particulars, it is necessarily subject to correction n the Annual Produce Statistics.

TABLE III.—*Summary of Agricultural Produce Statistics* (**Wheat, Barley,** *and* **Oats**) *for England, Wales, Scotland, and Great Britain in* 1894.

WHEAT

—	Estimated Total Produce		Acreage		Estimated Average Yield per Acre	
	1894	1893	1894	1893	1894	1893
	Bushels	Bushels	Acres	Acres	Bushels	Bushels
England . . .	56,087,603	46,429,407	1,826,626	1,798,869	30·71	25·81
Wales	1,420,082	1,205,006	56,470	54,562	25·15	22·09
Scotland . . .	1,665,116	1,612,884	44,866	44,093	37·11	36·58
Great Britain . .	59,172,801	49,247,297	1,927,962	1,897,524	30·69	25·95

BARLEY

—	Estimated Total Produce		Acreage		Estimated Average Yield per Acre	
	1894	1893	1894	1893	1894	1893
	Bushels	Bushels	Acres	Acres	Bushels	Bushels
England . . .	61,194,073	49,032,708	1,766,142	1,751,602	34·65	27·99
Wales	3,347,992	2,802,971	111,572	111,851	30·01	25·06
Scotland . . .	7,753,001	7,699,698	218,057	211,644	35·55	36·38
Great Britain . .	72,295,066	59,535,377	2,095,771	2,075,097	34·50	28·69

OATS

—	Estimated Total Produce		Acreage		Estimated Average Yield per Acre	
	1894	1893	1894	1893	1894	1893
	Bushels	Bushels	Acres	Acres	Bushels	Bushels
England . . .	88,289,392	67,164,434	1,978,312	1,914,373	44·63	35·08
Wales	9,012,652	7,452,468	250,866	240,865	35·93	30·94
Scotland . . .	38,160,887	38,270,477	1,024,223	1,016,518	37·26	37·65
Great Britain . .	135,462,931	112,887,379	3,253,401	3,171,756	41·64	35·59

Royal Agricultural Society of England.

(*Established May* 9, 1838, *as the* English Agricultural Society, *and Incorporated by Royal Charter on March* 26, 1840.)

Patron.

(*Letter from Secretary of State, dated March* 6, 1840.)

HER MOST GRACIOUS MAJESTY THE QUEEN.

President for 1893—1894.

THE DUKE OF DEVONSHIRE, K.G.

Trustees.

Year when elected on Council	
1879	H.R.H. The Prince of Wales, K.G., *Marlborough House, Pall Mall.*
1838–40, 1855	Acland, Rt. Hon. Sir Thomas Dyke, Bart., *Killerton, Exeter, Devonshire.*
1858	Bridport, Gen. Viscount, G.C.B., *Cricket St. Thomas, Chard, Somerset.*
1861	Cathcart, Earl, *Thornton-le-Street, Thirsk, Yorkshire.*
1861	Dent, John Dent, *Ribston Hall, Wetherby, Yorkshire.*
1871	Egerton of Tatton, Lord, *Tatton Park, Knutsford, Cheshire.*
1863	Kingscote, Col. Sir Nigel, K.C.B., *Kingscote, Wotton-under-Edge, Gloucestershire.*
1848	Lawes, Sir John Bennet, Bart., *Rothamsted, St. Albans, Herts.*
1854–59, 1862	Macdonald, Sir Archibald K., Bart., *Woolmer Lodge, Liphook, Hants.*
1867	Ravensworth, Earl of, *Ravensworth Castle, Gateshead, Durham.*
1852–57, 1866	Richmond and Gordon, Duke of, K.G., *Goodwood, Chichester, Sussex.*
1869	Ridley, Rt. Hon. Sir M. W., Bart., M.P., *Blagdon, Cramlington, Northumberland.*

Vice-Presidents.

1889	H.R.H. Prince Christian, K.G., *Cumberland Lodge, Windsor, Berkshire.*
1874	Chandos-Pole-Gell, H., *Hopton Hall, Wirksworth, Derbyshire.*
1872–74, 1884	Chaplin, Rt. Hon. Henry, M.P., *Blankney Hall, Lincoln.*
1882	Emlyn, Viscount, *Golden Grove, Carmarthen, S. Wales.*
1876	Feversham, Earl of, *Duncombe Park, Helmsley, Yorkshire.*
1881	Gilbey, Sir Walter, Bart., *Elsenham Hall, Essex.*
1872	Lathom, Earl of, G.C.B., *Lathom Hall, Ormskirk, Lancashir*
1865	Lopes, Rt. Hon. Sir Massey, Bart., *Maristow, Roborough, Devon.*
1880	Moreton, Lord, *Sarsden House, Chipping Norton, Oxon.*
1874	Spencer, Earl, K.G., *Althorp, Northampton.*
1881	Thorold, Sir John H., Bart., *Syston Park, Grantham, Lincolnshire.*
1870	Whitehead, Charles, *Barming House, Maidstone, Kent.*

Other Members of Council.

Year when elected on Council	
1862–66, 1877	*ARKWRIGHT, J. HUNGERFORD, *Hampton Court, Leominster, Herefordshire.*
1880	ASHWORTH, ALFRED, *Tabley Grange, Knutsford, Cheshire.*
1890	*BEACH, JOSEPH, *The Hattons, Wolverhampton, Staffordshire.*
1871	BOWEN-JONES, J., *Ensdon House, Montford Bridge, Salop.*
1890	*BROUGHAM AND VAUX, Lord, *Brougham Hall (Penrith), Westmoreland.*
1885	CAIRD, JAMES A., *Northbrook, Micheldever, Hants.*
1883	*CLAY, CHARLES, *Walton Grange, Wakefield, Yorkshire.*
1893	CORNWALLIS, F. S. W., M.P., *Linton Park, Maidstone, Kent.*
1885	COVENTRY, Earl of, *Croome Court, Severn Stoke, Worcestershire.*
1887	CRUTCHLEY, PERCY E., *Sunninghill Lodge, Ascot, Berkshire.*
1891	*CURTIS-HAYWARD, Lieut.-Col. J. F., *Quedgeley, Gloucester.*
1888	DARBY, ALFRED, *Little Ness, Shrewsbury, Salop.*
1893	*DEVONSHIRE, Duke of, K.G., *Chatsworth, Derbyshire.*
1891	DUGDALE, J. MARSHALL, *Llwyn, Llanfyllin* (viâ *Oswestry*), *Mont.*
1879	*FOSTER, S. P., *Killhow, Carlisle, Cumberland.*
1875	*FRANKISH, WILLIAM, *Limber, near Brocklesby, Lincolnshire.*
1879	GORRINGE, HUGH, *Kingston-by-Sea, Brighton, Sussex.*
1879	*GRENVILLE, R. NEVILLE, *Butleigh Court, Glastonbury, Somerset.*
1889	HAMOND, ANTHONY, *Westacre, Swaffham, Norfolk.*
1888	*HORNSBY, JAMES, *Stapleford Park, Melton Mowbray, Leicestershire.*
1876	HOWARD, CHARLES, *Biddenham, Bedfordshire.*
1883–90, 1894	JERSEY, Earl of, *Middleton Park, Bicester, Oxon.*
1886	MAINWARING, C. S., *Galltfaenan, Trefnant, R.S.O., North Wales.*
1874	MARTIN, JOSEPH, *Highfield House, Littleport, Isle of Ely, Cambs.*
1884	MILLER, T. HORROCKS, *Singleton Park, Poulton-le-Fylde, Lancashire.*
1886	*MUNTZ, PHILIP ALBERT, M.P., *Dunsmore, Rugby, Warwickshire.*
1881	PARKER, Hon. CECIL T., *Eccleston, Chester.*
1886	PELL, ALBERT, *Hazelbeach Hill, Northampton.*
1889	*PIDGEON, DANIEL, *The Long House, Leatherhead, Surrey.*
1888	*PORTLAND, Duke of, *Welbeck Abbey, Worksop, Notts.*
1886	*RANSOME, J. E., *Holme Wood, Ipswich, Suffolk.*
1871	*RAWLENCE, JAMES, *Bulbridge, Wilton, Salisbury, Wilts.*
1889	ROWLANDSON, SAMUEL, *Newton Morrell, Darlington (Yorkshire).*
1874	*SANDAY, GEORGE H., *Langdale Lodge, Clapham Park, Surrey.*
1886	SCARTH, W. T., *Staindrop House, Darlington, Durham.*
1886	SMITH, ALFRED J., *Rendlesham, Woodbridge, Suffolk.*
1889	*SMITH, HENRY, *The Grove, Cropwell Butler, near Nottingham.*
1889	*SPEARMAN, Sir J. L. E., Bart., *The Hall, Wem, Salop.*
1891	STANYFORTH, E. WILFRID, *Kirk Hammerton Hall, York.*
1875	*STRATTON, RICHARD, *The Duffryn, Newport, Monmouthshire.*
1882	*SUTHERLAND, Duke of, *Stafford House, St. James's, S.W.*
1883	*SUTTON, MARTIN J., *Kidmore Grange, Caversham, Oxon.*
1889	TAYLOR, GARRETT, *Trowse House, Norwich.*
1890	TERRY, JOSEPH P., *Berry Field, Aylesbury, Buckinghamshire.*
1889	*TREMAYNE, JOHN, *Heligan, St. Austell, Cornwall.*
1882	*WARREN, REGINALD AUGUSTUS, *Preston Place, Worthing, Sussex.*
1892	*WESTMINSTER, Duke of, K.G., *Eaton Hall, Chester.*
1889	*WHEELER, E. VINCENT V., *Newnham Court, Tenbury, Worcestershire.*
1889	WILSON, C. W., *Rigmaden Park, Kirkby Lonsdale, Westmoreland.*
1865	WILSON, Sir JACOB, *Chillingham Barns, Belford, Northumberland.*

* Members of Council who retire by rotation, but who may be re-elected.

STANDING COMMITTEES.

*** The PRESIDENT is a Member *ex officio* of all Committees, and the TRUSTEES and VICE-PRESIDENTS are Members *ex officiis* of all Standing Committees except the Committee of Selection.

Finance Committee.

KINGSCOTE, Col. Sir NIGEL (Chairman).
RIDLEY, Sir M. W., Bart., M.P.
THOROLD, Sir J. H., Bart.
ASHWORTH, A.
FRANKISH, W.
SANDAY, G. H.

House Committee.

CHAIRMAN of Finance Committee.
THE PRESIDENT.
WESTMINSTER, Duke of.
BRIDPORT, General Viscount.
PARKER, Hon. C. T.
GILBEY, Sir WALTER, Bart.
RIDLEY, Sir M. W., Bart, M.P.
WILSON, Sir JACOB.

Journal Committee.

CATHCART, Earl (Chairman).
EMLYN, Viscount.
THOROLD, Sir J. H., Bart.
ASHWORTH, A.
CAIRD, J. A.
DENT, J. D.
FRANKISH, W.
PELL, A.
PIDGEON, D.
SUTTON, MARTIN J.
WHITEHEAD, CHAS.

Chemical Committee.

*EMLYN, Viscount (Chairman).
PARKER, Hon. C. T.
ACLAND, Sir T. D., Bt.
*LAWES, Sir J. B., Bt.
*MACDONALD, Sir A. K., Bt.
SPEARMAN, Sir J. L. E., Bt.
*THOROLD, Sir J. H., Bt.
*ARKWRIGHT, J. H.
*BOWEN-JONES, J.
*CAIRD, J. A.
*DENT, J. D.
GRENVILLE, R. N.
*HOWARD, C.
*PELL, A.
ROWLANDSON, S.
STANYFORTH, E. W
*SUTTON, MARTIN J.
*TERRY, J. P.
VOELCKER, Dr.
*WARREN, R. A.
*WHITEHEAD, CHAS.

* These constitute the Woburn Sub-Committee.

Botanical and Zoological Committee.

WHITEHEAD, CHAS. (Chairman).
PARKER, Hon. C. T.
THOROLD, Sir J. H., Bt.
ARKWRIGHT, J. H.
ASHWORTH, A.
BOWEN-JONES, J.
CAIRD, J. A.
CARRUTHERS, W.
CORNWALLIS, F. S. W., M.P.
FRANKISH, W.
HORNSBY, J.
MAINWARING, C. S.
WHEELER, E. V. V.

Veterinary Committee.

THOROLD, Sir J. H., Bt. (Chairman).
BRIDPORT, General Viscount.
MORETON, Lord.
PARKER, Hon. C. T.
KINGSCOTE, Col. Sir NIGEL.
WILSON, Sir JACOB.
ASHWORTH, A.
AXE, Professor.
BROWN, Professor.
CHANDOS-POLE-GELL, H.
CLAY, C.
COPE, A. C.
CROOKSHANK, Prof.
CURTIS-HAYWARD, Lt.-Col.
DARBY, ALFRED.
DENT, J. D.
FLEMING, Dr. GEORGE.
FOSTER, S. P.
HAMOND, A.
MCFADYEAN, Prof.
MASTER OF FARRIERS COMPANY.
MILLER, T. H.
PRESIDENT OF ROYAL COLL. OF VETY. SURGEONS.
SIMONDS, Prof.
SMITH, A. J.
STANYFORTH, E. W.
WHEELER, E. V. V.
WILSON, C. W.

Stock-Prizes Committee.

SANDAY, G. H. (Chairman).
COVENTRY, Earl of.
BROUGHAM AND VAUX, Lord.
MORETON, Lord.
PARKER, Hon. C. T.
GILBEY, Sir WALTER, Bt.
SPEARMAN, Sir J. L. E., Bt.
WILSON, Sir JACOB.
ARKWRIGHT, J. H.
BEACH, J.
BOWEN-JONES, J.
CHANDOS-POLE-GELL, H.
CRUTCHLEY, P. E.
DARBY, ALFRED.
DUGDALE, J. MARSHALL.
FOSTER, S. P.
FRANKISH, W.
HOWARD, C.
MAINWARING, C. S.
MARTIN, JOSEPH.
MILLER, T. H.
MUNTZ, P. A., M.P.
ROWLANDSON, S.
SIMONDS, Professor.
SMITH, A. J.
SMITH, HENRY.
STANYFORTH, E. W.
TAYLOR, GARRETT.
TERRY, J. P.
TREMAYNE, J.
WHEELER, E. V. V.
WILSON, C. W.
The Stewards of Live Stock.

Implement Committee.

FRANKISH, W. (Chairman).
MORETON, Lord.
PARKER, Hon. C. T.
THOROLD, Sir J. H., Bt.
WILSON, Sir JACOB.
ANDERSON, W.
BEACH, JOSEPH.
BOWEN-JONES, J.
CAIRD, J. A.
CLAY, C.
CRUTCHLEY, P. E.
CURTIS-HAYWARD, Lt.-Col.
GRENVILLE, R. NEVILLE.
HORNSBY, J.
HOWARD, C.
MARTIN, JOSEPH.
PIDGEON, D.
RANSOME, J. E.
ROWLANDSON, S.
SANDAY, G. H.
SMITH, A. J.
SMITH, HENRY.
STANYFORTH, E. W.
The Stewards of Implements.

General Cambridge Committee.

THE WHOLE COUNCIL, with the following representatives of the LOCAL COMMITTEE:—

BIDWELL, CHARLES.
CAMBRIDGE UNIVERSITY, Vice-Chancellor of.
CAMBRIDGE, Mayor of.
CAMBRIDGE, Town Clerk of.
CUNNINGTON, Alderman.
FOSTER, C. F. CUNLIFFE.
JONAS, GEORGE.
MORGAN, Rev. E. H.
PETERS, R.
VINTER, J. O.

Show-Yard Works Committee.

WILSON, Sir JACOB (Chairman).
PARKER, Hon. C. T.
ASHWORTH, A.
CLAY, CHARLES.
FRANKISH, W.
HORNSBY, J.
HOWARD, C.
MARTIN, J.
SANDAY, G. H.
STANYFORTH, E. W.

Committee of Selection.

CATHCART, Earl (Chairman).
COVENTRY, Earl of.
PARKER, Hon. C. T.
GILBEY, Sir WALTER, Bart.
WILSON, Sir JACOB.
DARBY, ALFRED.
ROWLANDSON, S.

And the Chairmen of the Finance, Journal, Chemical, Stock-Prizes, and Implement Committees.

Education Committee.

MORETON, Lord (Chairman).
KINGSCOTE, Col. Sir NIGEL.
ARKWRIGHT, J. H.
BOWEN-JONES, J.
DENT, J. D.
DUGDALE, J. M.
FOSTER, S. P.
MAINWARING, C. S.
PELL, A.
PIDGEON, D.
RANSOME, J. E.
SUTTON, M. J.
TREMAYNE, J.
VOELCKER, Dr.
WHEELER, E. V. V.

Dairy Committee.

PARKER, Hon. C. T. (Chairman).
BRIDPORT, Gen. Viscount.
THOROLD, Sir J. H., Bt.
ARKWRIGHT, J. H.
ASHWORTH, A.
CURTIS-HAYWARD, Lt.-Col.
DARBY, ALFRED.
DUGDALE, J. M.
MAINWARING, C. S.
GRENVILLE, R. N.
STANYFORTH, E. W.
TAYLOR, GARRETT.
VOELCKER, Dr.

Secretary.

ERNEST CLARKE, 12 Hanover Square, W.

Editor of the Journal—WILLIAM FREAM, B.Sc., LL.D., *Downton, Salisbury.*
Consulting Chemist—Dr. J. AUGUSTUS VOELCKER, 12 *Hanover Square, W.*
Consulting Botanist—W. CARRUTHERS, F.R.S., F.L.S., 44 *Central Hill, Norwood, S.E.*
Consulting Veterinary Surgeon—Professor JAMES BEART SIMONDS, *St. John's Villa, Ryde, Isle of Wight.*
Zoologist—CECIL WARBURTON, M.A., *Zoological Laboratory, Cambridge.*
Veterinary Inspectors—THE OFFICERS OF THE ROYAL VETERINARY COLLEGE.
Consulting Engineer—F. S. COURTNEY, C.E., 3 *Whitehall Place, S.W.*
Surveyor and Superintendent of Works—WILSON BENNISON, 66 *Ashley Road, Crouch Hill, N.*
Consulting Surveyor—GEORGE HUNT, *Evesham, Worcestershire.*
Publisher—JOHN MURRAY, 50A *Albemarle Street, W.*
Bankers—THE LONDON AND WESTMINSTER BANK, *St. James's Square Branch.*

GEOGRAPHICAL DISTRIBUTION OF MEMBERS OF THE COUNCIL AND OF GOVERNORS AND MEMBERS OF THE SOCIETY.

Districts	Counties	Number of Governors and Members	Number of Members of Council	Names of Members of Council
A.	Bedfordshire	143	1	C. Howard.
	Buckinghamshire	157	1	Jos. P. Terry.
	Cambridgeshire	216	1	Joseph Martin.
	Essex	237	1	Sir Walter Gilbey, V.P.
	Hertfordshire	188	1	Sir J. B. Lawes, T.
	Huntingdonshire	74	—	
	London	549	1 (London and Middlesex)	G. H. Sanday.
	Middlesex	90		
	Norfolk	311	3	H.R.H. the Prince of Wales, K.G., T.; Anthony Hamond; Garrett Taylor.
	Oxfordshire	163	3	Earl of Jersey; Lord Moreton, V.P.; M. J. Sutton.
	Suffolk	251	2	J. E. Ransome; A. J. Smith.
		2,379	14	
B.	Cumberland	154	1	S. P. Foster.
	Durham	190	2	Earl of Ravensworth, T.; W. T. Scarth.
	Northumberland	278	2	Sir M. White Ridley, T.; Sir Jacob Wilson.
	Westmoreland	82	2	Lord Brougham and Vaux; C. W. Wilson.
		704	7	
C.	Derbyshire	212	2	Duke of Devonshire, P.; H. Chandos-Pole-Gell, V.P.
	Leicestershire	150	1	J. Hornsby.
	Lincolnshire	321	3	Sir J. H. Thorold, V.P.; Rt. Hon. H. Chaplin, V.P.; W. Frankish.
	Northamptonshire	181	2	Earl Spencer, K.G., V.P.; A. Pell.
	Nottinghamshire	270	2	Duke of Portland; H. Smith.
	Rutland	33	—	
		1,167	10	

DISTRIBUTION OF MEMBERS OF THE SOCIETY—*continued.*

Districts	Counties	Number of Governors and Members	Number of Members of Council	Names of Members of Council
D.	Berkshire	221	2	H.R.H. Prince Christian, K.G., V.P.; P. E. Crutchley.
	Cornwall	139	1	John Tremayne.
	Devonshire	180	2	Sir T. D. Acland, T.; Sir M. Lopes, V.P.
	Dorsetshire	85	—	
	Hampshire	250	2	Sir A. K. Macdonald, T.; J. A. Caird.
	Kent	407	2	C. Whitehead, V.P.; F. S. W. Cornwallis.
	Somersetshire	138	2	Visct. Bridport, T.; R. Neville Grenville.
	Surrey	253	1	D. Pidgeon.
	Sussex	329	3	Duke of Richmond and Gordon, K.G., T.; H. Gorringe; R. A. Warren.
	Wiltshire	150	1	J. Rawlence.
		——2,152	— 16	
E.	Yorkshire	889	6	Earl of Feversham, V.P.; Earl Cathcart, T.; J. D. Dent, T.; C. Clay; S. Rowlandson; E. W. Stanyforth.
F.	Gloucestershire	291	2	Col. Sir Nigel Kingscote, T.; Lt.-Col. J. F. Curtis-Hayward.
	Herefordshire	162	1	J. H. Arkwright.
	Monmouthshire	47	1	R. Stratton.
	Shropshire	393	2	J. Bowen-Jones; A. Darby.
	Staffordshire	306	2	Duke of Sutherland; Jos. Beach.
	Warwickshire	314	1	P. A. Muntz.
	Worcestershire	247	2	Earl of Coventry; E. V. V. Wheeler.
	South Wales	212	2	Viscount Emlyn, V.P.; Sir J. L. E. Spearman.
		——1,972	— 13	
G.	Cheshire	494	4	Duke of Westminster; Lord Egerton of Tatton, T.; Hon. Cecil T. Parker; A. Ashworth.
	Lancashire	466	2	Earl of Lathom, V.P.; T. H. Miller.
	North Wales	279	2	J. M. Dugdale; C. S. Mainwaring.
		——1,239	— 8	
Scotland		230		
Ireland		169		
Channel Islands		13		
Isle of Man		16		
Foreign Countries		175		
Honorary Members		22		
		—— 625		
Grand Totals		11,127	— 74	

GOVERNORS OF THE SOCIETY.

	Date of election as Member	Date of election as Governor
H.R.H. THE PRINCE OF WALES, K.G....Marlborough House, Pall Mall, S.W., and Sandringham	—	Feb. 3, 1864
†H.R.H. THE DUKE OF SAXE-COBURG AND GOTHA (DUKE OF EDINBURGH), K.G....Clarence House, St. James's, S.W.	—	Aug. 6, 1884
†H.R.H. THE DUKE OF YORK, K.G....York House, St. James's Palace, S.W.	—	April 6, 1892
†H.R.H. THE DUKE OF CAMBRIDGE, K.G....Gloucester House, Piccadilly, W.	—	Aug. 6, 1862
H.R.H. PRINCE CHRISTIAN OF SCHLESWIG-HOLSTEIN, K.G....Cumberland Lodge, Windsor	—	Aug. 4, 1875
*ACLAND, Rt. Hon. Sir T. Dyke, Bart...Killerton, Exeter . .	May 29, 1838	Mar. 3, 1875
†ALLCROFT, Herbert John...Stokesay Court, Onibury, Salop .	—	Dec. 12, 1888
†AMHERST OF HACKNEY, Lord...Didlington Hall, Brandon . .	Feb. 2, 1859	May 7, 1890
ANCASTER, Earl of...Normanton Park, Stamford . . .	Mar. 3, 1869	May 5, 1875
ARCHER-HOUBLON, George B....Welford Park, Newbury, Berks	—	Mar. 6, 1889
*ARCHER-HOUBLON, R....Bartlow, Cambridge	Jan. 10, 1840	Mar. 5, 1890
†ARKWRIGHT, J. Hungerford...Hampton Court, Leominster .	—	June 5, 1861
ASHBURTON, Lord...The Grange, Alresford, Hants . . .	—	May 7, 1890
†ASHWORTH, Charles E....The Heath, Knutsford	July 5, 1865	July 29, 1891
*BAILLIE, W. Hunter...43 Norfolk Square, Hyde Park, W. .	July 13, 1838	Mar. 5, 1890
BARNARD, Lord...Raby Castle, Darlington	—	July 27, 1892
†BATH, The Marquis of...Longleat, Warminster	—	July 6, 1853
*BATTEN, John...Yeovil, Somersetshire	July 16, 1839	Mar. 5, 1890
BEDFORD, Duke of...Woburn Abbey, Bedfordshire . . .	—	May 3, 1893
†BENN, Thomas G....Reigny House, Newton Reigny, Penrith .	Mar. 13, 1878	Aug. 2, 1882
†BLYTH, James...Woodhouse, Stansted, Essex	Nov. 3, 1875	July 27, 1892
BORTHWICK, Sir Algernon, Bart., M.P....Heath House, Hampstead Heath, N.W.	—	Dec. 12, 1888
BRADFORD, Earl of...Weston Park, Shifnal	Mar. 7, 1860	Mar. 3, 1875
BRASSEY, Henry Leonard C....Preston Hall, Aylesford . .	—	Feb. 3, 1892
BRIDPORT, Gen. Viscount, G.C.B....Cricket St. Thomas, Chard	Jan. 19, 1842	April 2, 1862
†BROOKS, Sir William Cunliffe, Bart....Barlow Hall, Chorlton-cum-Hardy, Manchester	—	Aug. 7, 1872
†BROWNE, Alexander H....Callaby Castle, Whittingham R.S.O., Northumberland	—	Mar. 6, 1872
BURTON, Lord...Rangemore, Burton-on-Trent	Nov. 7, 1888	June 25, 1890
CADOGAN, Earl, K.G...Culford Hall, Bury St. Edmunds . .	—	Dec. 11, 1889
†CATHCART, Earl...Thornton-le-Street, Thirsk	Feb. 6, 1856	April 3, 1867
†CAVENDISH, Victor C.W., M.P....Devonshire House, Piccadilly, W.	—	Mar. 2, 1892
CAWDOR, Earl of...Stackpole Court, Pembrokeshire . . .	Nov. 17, 1841	Mar. 3, 1875
†CHANDOS-POLE-GELL, H....Hopton Hall, Wirksworth, Derbyshire	Nov. 6, 1861	June 23, 1891
CHAPLIN, Rt. Hon. Henry, M.P....Blankney Hall, Lincoln .	—	Nov. 2, 1870
†CLIFDEN, Viscount... Holdenby House, Northampton . .	—	July 3, 1889
†CLINTON, Lord...Heanton Satchville, Beaford, N. Devon . .	April 3, 1867	April 2, 1890

* Elected a Foundation Life Governor March 5, 1890. † Life Governor.

	Date of election as Member	Date of election as Governor
CLITHEROW, Colonel Edward J. S....Hotham Hall, Brough, Yorkshire	—	Feb. 6, 1889
*CLUTTON, John...Buckland Court, Betchworth, Surrey	Dec. 15, 1838	Mar. 5, 1890
†COLMAN, J. J., M.P....Carrow House, Norwich	June 1, 1870	Feb. 6, 1889
†CORBETT, John...Impney, Droitwich	July 2, 1873	Feb. 4, 1891
CORNWALLIS, Fiennes S. W., M.P....Linton Park, Maidstone	—	July 2, 1884
COTES, Charles Cecil...Woodcote, Newport, Salop	—	Dec. 6, 1876
†COWPER, Earl, K.G....Panshanger, Hertford	—	April 7, 1875
CRAVEN, Thomas...Woodheyes Park, Ashton-on-Mersey	May 6, 1891	Dec. 6, 1893
CROOKSHANK, Prof. E. M....Saint Hill, East Grinstead	—	Nov. 6, 1889
DARNLEY, Earl of...Cobham Hall, Gravesend	—	May 5, 1852
DARTMOUTH, Earl of...Patshull Hall, Wolverhampton	—	Dec. 9, 1891
D'AUMALE, H.R.H. The Duke...Wood Norton, Evesham	—	April 7, 1875
†DENT, John Dent...Ribston Hall, Wetherby	July 2, 1851	Feb. 3, 1875
DERWENT, Lord...Hackness Hall, Scarborough	—	April 7, 1869
†DE TRAFFORD, Sir H. F., Bart....Trafford Park, Manchester	Aug. 1, 1883	June 1, 1892
†DEVONSHIRE, Duke of, K.G....Chatsworth, Chesterfield, Derbyshire	—	June 2, 1880
†DICKSON-POYNDER, Sir J., Bart., M.P....Hartham Park, Corsham, Wilts	Nov. 2, 1887	April 2, 1890
†DUNMORE, Earl of...Carlton Club, S.W.	—	Feb. 3, 1869
†DURHAM, Earl of...Lambton Castle, Durham	—	July 14, 1880
EGERTON OF TATTON, Lord...Tatton Park, Knutsford	Mar. 6, 1872	Nov. 7, 1883
†ELLESMERE, Earl of...Worsley Hall, Manchester	—	July 7, 1869
†EMLYN, Viscount...Golden Grove, Carmarthenshire	March 3, 1863	Mar. 2, 1892
ESSEX, Earl of...Cassiobury Park, Watford	Nov. 7, 1888	Nov. 2, 1892
EVANS, John Carbery...Hatley Park, Gamlingay, Cambs.	—	Feb. 4, 1891
FEVERSHAM, Earl of...Duncombe Park, Helmsley	Mar. 5, 1862	Mar. 3, 1875
FIFE, Duke of, K.T....15 Portman Square, W.	—	Nov. 7, 1888
FITZWILLIAM, Earl, K.G....Wentworth Woodhouse, Rotherham	—	June 5, 1872
*FLETCHER, John Philip...Darby Lodge, Sunbury-on-Thames	Feb. 19, 1840	Mar. 5, 1890
†FORTESCUE, Earl...Castle Hill, South Molton	—	Nov. 6, 1861
FREAKE, Sir Thomas G., Bart....Warflect, Dartmouth	—	July 30, 1890
†FREEMAN-MITFORD, A.B., C.B., M.P....Batsford Park, Moreton-in-the-Marsh, Gloucester	—	Nov. 3, 1886
†FYTCHE, J. Lewis...The Terrace, Freshwater, Isle of Wight	April 5, 1854	June 4, 1879
GARDNER, Rt. Hon. Herbert, M.P....48 Charles Street, Berkeley Square, W.	—	Dec. 7, 1892
GILBEY, Sir Walter, Bart...Elsenham Hall, Essex	Nov. 2, 1870	June 5, 1889
†GILL, Reginald B.E....Bickham, Roborough, S. Devon	July 2, 1884	Dec. 12, 1888
GILSTRAP, Sir W., Bart....Fornham Park, Bury St. Edmunds	May 7, 1862	April 2, 1890
GOOCH, Sir Alfred S., Bart...Benacre Hall, Wangford, Suffolk	—	July 13, 1882
GORDON, H. PANMURE, Loudwater House, Rickmansworth	—	Mar. 1, 1893
GRAFTON, Duke of, K.G....Wakefield Lodge, Stony Stratford	—	June 3, 1884
†GRANT, Sir G. Macpherson, Bt....Ballindalloch Castle, N.B.	April 1, 1863	April 2, 1890
*†GREY, Earl, K.G....Howick, Lesbury, Northumberland	—	May 12, 1838
GRIFFITHS, John James...Highbury Grange, Highbury, N.	—	May 1, 1889
GWYNNE, John...Kenton Grange, The Hyde, N.W.	—	Mar. 5, 1879
HAREWOOD, Earl of...Goldsboro' Hall, Knaresborough	June 6, 1883	Nov. 2, 1892
HENRY, Mitchell...Kylemore Castle, Co. Galway	Nov. 7, 1877	Dec. 10, 1890

* Elected a Foundation Life Governor March 5, 1890. † Life Governor.

	Date of election as Member	Date of election as Governor
HERTFORD, Marquis of...Ragley Park, Alcester	Aug. 2, 1882	May 7, 1884
HESKETH, R. Bamford...Gwrych Castle, Abergele, Denbighshire	—	Dec. 7, 1892
†HEYWOOD, Sir T. Percival, Bt...Doveleys, Uttoxeter . . .	—	May 14, 1845
†HOLFORD, Capt. George L., C.I.E....Westonbirt, Tetbury, Glos.	—	April 6, 1892
†HOTHFIELD, Lord...Hothfield Place, Ashford, Kent . . .	—	May 7, 1879
HOUGHTON, Lord...Crewe Hall, Crewe	Feb. 6, 1884	Mar. 7, 1894
*†HULSE, Col. Sir Edward, Bt...Breamore Ho., Fordingbridge .	—	June 13, 1838
JOICEY, E....Blenkinsopp Hall, Haltwhistle, Northumberland .	—	Dec. 12, 1888
*KEMBLE, Thomas...Runwell Hall, Wickford, Essex . . .	July 10, 1839	Mar. 5, 1890
†KINGSCOTE, Col. Sir Nigel, K.C.B....Kingscote, Wotton-under-Edge, Gloucestershire	April 6, 1854	July 1, 1874
†KNIGHT, Sir F. Winn., K.C.B...Wolverley House, Kidderminster	—	June 15, 1842
KOHLAPUR, H.H. The Maharajah of...Kohlapur, India .	—	Feb. 6, 1889
†KYNNERSLEY, Thomas F....Leighton Hall, Ironbridge, Salop	Nov. 7, 1883	Nov. 4, 1891
†LATHOM, Earl of, G.C.B....Lathom House, Ormskirk . . .	April 7, 1869	Nov. 6, 1872
†LAWES, Sir J. B., Bart...Rothamsted, St. Albans . . .	April 29, 1846	Dec. 11, 1878
†LECONFIELD, Lord...Petworth House, Sussex	—	June 5, 1872
†LEICESTER, Earl of, K.G...Holkham Hall, Norfolk . . .	—	Nov. 15, 1843
†LEIGH, Lord...Stoneleigh Abbey, Kenilworth.	—	Dec. 1, 1858
†LONDESBOROUGH, Earl of...Londesborough Pk., Market Weighton	Nov. 5, 1862	April 2, 1890
†LONDONDERRY, Marquis of, K.G....Seaham Hall, Seaham Harbour, co. Durham	—	June 3, 1885
†LONSDALE, Earl of...Lowther Castle, Penrith	—	July 4, 1883
†LOPES, Rt. Hon. Sir Massey, Bart...Maristow, Roborough, Devon	Mar. 15, 1848	May 7, 1884
LUCAS, Sir Thomas, Bart...12A Kensington Palace Gardens, W.	—	Dec. 12, 1888
McCALMONT, Harry...Cheveley Park, Newmarket . . .	—	Feb. 7, 1894
*MACCLESFIELD, Earl of...Sherburn Castle, Tetsworth . .	Aug. 8, 1838	Mar. 5, 1890
†MACDONALD, Sir A. K., Bart...Woolmer Lodge, Liphook . .	July 31, 1849	Nov. 1, 1871
†MANVERS, Earl...Thoresby Park, Ollerton, Newark . . .	—	July 2, 1873
†MAPLE, John...Bedford Lodge, Haverstock Hill, N.W. . .	Nov. 2, 1864	Mar. 5, 1890
MIDDLETON, Lord...Birdsall House, York	—	Mar. 3, 1875
*MONCK, J. Bligh...Coley Park, Reading	May 23, 1839	Mar. 5, 1890
†MOORSOM-MITCHINSON-MAUDE, C.R....Harewood, Leeds . .	Dec. 2, 1857	July 26, 1893
†MORETON, Lord...Sarsden House, Chipping Norton, Oxon. .	—	Mar. 3, 1875
†MOREWOOD, C. R. Palmer...Alfreton Park, Derbyshire . .	April 7, 1875	Feb. 7, 1894
†MORRISON, Alfred...Fonthill House, Hindon, Wilts . . .	—	July 3, 1861
†MOUNT-EDGCUMBE, Earl of...Mount-Edgcumbe, Plymouth .	Nov. 6, 1861	Mar. 5, 1890
MUNCASTER, Lord...Muncaster Castle, Ravenglass, Cumberland	—	June 23, 1891
†MUNTZ, George F...Umberslade Park, Birmingham . . .	Dec. 4, 1867	June 30, 1875
NEELD, Sir Algernon W., Bart...Grittleton, Chippenham . .	Nov. 7, 1888	Dec. 9, 1891
NEWTON, Lord...Lyme Park, Disley, Stockport	—	Aug. 4, 1858
NORFOLK, Duke of, K.G....Arundel Castle, Sussex . . .	—	July 29, 1891
NORMANTON, Earl of...Somerley, Ringwood, Hants. . . .	—	Mar. 3, 1875
*NORTH, Rt. Hon. Col. J. Sidney...Wroxton Abbey, Banbury .	May 8, 1839	Mar. 5, 1890
†NORTHBROOK, Earl of...Stratton, Micheldever Station, Hants .	—	June 2, 1880
PAGET, Lord Alexander...The Oaklands, Tarporley, Cheshire .	July 6, 1881	July 3, 1889
†PEEL, Edmund...Brynypys, Ruabon	Feb. 3, 1858	Mar. 5, 1890
*PINNEY, Col. William...30 Berkeley Square, W.	Mar. 13, 1839	Mar. 5, 1890
†PORTLAND, Duke of...3 Grosvenor Square, W.	—	June 2, 1880

* Elected a Foundation Life Governor March 5, 1890. † Life Governor.

	Date of election as Member	Date of election as Governor
†PORTMAN, Viscount...Durweston, Blandford	Aug. 6, 1862	Mar. 5, 1890
PORTSMOUTH, Earl of...Hurstbourne Park, Whitchurch, Hants	—	Dec. 9, 1891
†POWIS, Earl of...Powis Castle, Welshpool	April 6, 1887	June 23, 1891
RAVENSWORTH, Earl of...Ravensworth Castle, Gateshead	Feb. 5, 1868	July 1, 1885
*†RICHMOND & GORDON, Duke of, K.G...Goodwood, Chichester	June 20, 1838	Dec. 2, 1868
†RIDLEY, Rt. Hon. Sir Matthew W., Bart., M.P....Blagdon, Cramlington, Northumberland	Apr. 7, 1869	May 5, 1886
RIPON, Marquis of, K.G....Studley Royal, Ripon	—	July 3, 1861
ROTHSCHILD, Leopold de...Ascott, Wing, Leighton Buzzard	—	Mar. 1, 1893
ROTHSCHILD, Lord...148 Piccadilly, W.	Nov. 7, 1888	June 4, 1890
*RUSSELL, Lord C. J. F....Drakelow Lodge, Woburn	May 26, 1838	Mar. 5, 1890
RUTLAND, Duke of, K.G....Belvoir Castle, Leicestershire	Dec. 12, 1888	Dec. 9, 1891
†SALISBURY, Marquis of, K.G...Hatfield House, Herts	—	Feb. 6, 1889
*SAUNDERS, T. B....The Priory, Bradford-on-Avon	June 13, 1838	Mar. 5, 1890
SAVILE, Lord, G.C.B...Rufford Abbey, Ollerton, Notts	—	Mar. 27, 1889
†SCHRÖDER, Baron J. H. W....The Dell, Egham, Surrey	Nov. 3, 1869	April 2, 1890
†SEFTON, Earl of, K.G....Croxteth, Liverpool	—	Dec. 8, 1869
*§SIMONDS, Prof. James Beart...St. John's Villa, Ryde, I.W.	July 25, 1838	Mar. 5, 1890
*SIMONDS, W. Barrow...Abbotts Barton, Winchester	June 19, 1839	Mar. 5, 1890
†SMITH, Hon. W. F. D., M.P...3 Grosvenor Place, S.W.	—	Dec. 9, 1891
†SMYTH, Sir J. H. Greville, Bart...Ashton Court, Bristol	—	July 3, 1878
SOUBERBIELLE, Edouard...78 Cromwell Road, S.W.	—	Mar. 4, 1891
*SPARKS, William...Crewkerne	June 6, 1838	Mar. 5, 1890
SPENCER, Earl, K.G...Althorp Park, Northampton	Dec. 5, 1860	Mar. 3, 1875
†STAPYLTON, Major H. M....Myton Hall, Helperby, Yorks.	July 11, 1865	May 7, 1890
STRAFFORD, Earl of...Wrotham Park, Barnet	Dec. 8, 1875	Mar. 7, 1894
*STRATTON, J. Locke...Turweston House, Brackley	May 13, 1839	Mar. 5, 1890
SUFFIELD, Lord, K.C.B....Gunton Park, Norwich	July 1, 1868	Nov. 3, 1875
SUTHERLAND, Duke of...Trentham, Stoke-on-Trent	Mar. 1, 1882	Dec. 7, 1892
†SUTTON, John Manners...Kelham, Newark	—	May 8, 1844
†SUTTON, Martin J...Kidmore Grange, Caversham, Oxon.	May 1, 1878	Feb. 1, 1882
†SWINBURNE, Sir John, Bart....Capheaton, Newcastle-on-Tyne	May 1, 1867	May 7, 1890
†TANQUERAY, John S...Balmain, 5 Albany Road, St. Leonards	Feb. 16, 1848	May 8, 1849
†THOROLD, Sir John H., Bart....Syston Park, Grantham	Aug. 5, 1868	May 1, 1889
TREDEGAR, Lord...Tredegar Park, Newport, Mon.	—	May 3, 1876
TURBERVILL, Col. J. P....Laleston House, Bridgend	Mar. 5, 1884	July 27, 1892
†TWEEDMOUTH, Lord...Ninewells, Chirnside, N.B.	—	July 31, 1889
†WANTAGE, Lord, V.C...Lockinge, Wantage	June 3, 1863	May 1, 1872
WESTMINSTER, Duke of, K.G...Eaton Hall, Chester	July 3, 1860	June 5, 1872
†WHITEHEAD, Charles...Barming House, Maidstone	Apr. 1, 1857	Feb. 6, 1889
WILLOUGHBY DE BROKE, Lord...Kineton House, Warwick	—	Dec. 10, 1890
†WILSON, Sir Jacob...Chillingham Barns, Belford, Northumbd.	Dec. 5, 1860	Dec. 7, 1892
†WINDSOR, Lord...Hewel Grange, Bromsgrove	—	Nov. 6, 1878
*WOOD, James...Ockley Manor, Keymer, Sussex	Aug. 8, 1838	Mar. 5, 1890
†YERBURGH, Robert A., M.P...Billinge, Scarr, Blackburn	—	Nov. 7, 1885

* Elected a Foundation Life Governor March 5, 1890. † Life Governor. § Honorary Member.

HONORARY MEMBERS OF THE SOCIETY.

("*British Subjects or Foreigners who have rendered exceptional services to Agriculture or Allied Sciences," and who have been elected under Bye-law* 8 *as Honorary Members, without payment of subscription.*)

	Date of election as Ordinary Member	Date of election as Honorary Member
Anderson, Wm., D.C.L., M.Inst.C.E., F.R.S....Lesney Ho., Erith	Aug. 2, 1871	Nov. 6, 1889
Brown, Professor George T., C.B....Royal Veterinary College, Camden Town, N.W.	Dec. 3, 1862	May 1, 1878
Chauveau, Prof. Auguste, M.D., LL.D....10 Avenue Jules Janin, à Passy, Paris	—	Dec. 6, 1893
Dannfelt, Carl Juhlin...Consul-General of Sweden and Norway, 24 Great Winchester St., E.C.	—	Feb. 1, 1871
Fleming, George, LL.D., C.B....Higher Leigh, Combe Martin, North Devon	—	Mar. 13, 1878
Gilbert, Sir J. Henry., F.R.S....Harpenden, St. Albans	—	July 4, 1883
Hellriegel, Prof. Hermann...Bernburg, Anhalt, Germany	—	Dec. 9, 1891
Hohenbruck, Baron Arthur von...I Niebelungengasse 8, Vienna	—	Nov. 5, 1890
Liveing, Prof. G. D., M.A., F.R.S....Cambridge	—	Mar. 7, 1894
Maercker, Prof. Dr. M....Versuchs-Station, Halle, Germany	—	Nov. 2, 1892
Passy, Louis...45 Rue de Clichy, Paris	—	June 23, 1891
Pasteur, Louis...Membre de l'Institut, 45 Rue d' Ulm, Paris	—	Aug. 1, 1883
Playfair, Rt. Hon. Lord, K.C.B....68 Onslow Gardens, S.W.	—	July 6, 1842
Proskowetz, Emanuel Ritter von, Senr....Kwassitz, Moravia	—	Nov. 5, 1890
Riley, Prof. C. V., M.A., Ph.D....Department of Agriculture, Washington, U.S.A.	—	Dec. 7, 1887
Sanderson, Dr. J. Burdon, F.R.S....Oxford	—	May 1, 1878
Schlieffen, Count...Schlieffenburg, bei Lalendorf, Mecklenburg, Germany	—	Dec. 12, 1883
Sickesz van de Cloese, Dr. C. J....Heerengracht 17, The Hague, Holland	—	Dec. 9, 1891
Simonds, Prof. J. Beart...St. John's Villa, Ryde, Isle of Wight	July 25, 1838	April 3, 1849
Thiel, Dr. H....Privy Councillor, and Director of the Department of Agriculture, 17 Lutherstrasse, Berlin	—	Aug. 1, 1883
Tisserand, Eugène...Directeur de l'Agriculture, Ministère de l'Agriculture, 17 Rue du Cirque, Paris	—	Aug. 1, 1883
Vilmorin, Henry L. de...17 Rue de Bellechasse, Paris	Aug. 2, 1879	June 4, 1890

SUMMARY OF MEMBERS ON THE REGISTER,

March 31, 1894.

21 **Foundation Life Governors** (Members elected before the granting of the Charter on March 26, 1840).

70 **Governors** paying an annual subscription of 5*l.*

80 **Life Governors** who have compounded for their annual subscriptions.

7,134 **Members** paying an annual subscription of 1*l.*

3,707 **Life Members** who have compounded for their annual subscriptions.

93 **Life Members by Examination.**

22 **Honorary Members.**

11,127 **Total number of Governors and Members at March 31, 1894.**

Dr. BALANCE SHEET,

Corresponding figures for 1892 £		£	s.	d.	£	s.	d.
28,488	To RESERVE FUND at December 31, 1892	27,964	14	4			
804 / 139	Interest on 30,000*l.* Consols for one year	802	13	4			
1,265	Life Compositions received during 1893	1,170	0	0			
30,697		29,937	7	8			
2,732	Less: Contribution to Revenue (14*s.*) from 3,923 Life Members, being total number of Life Members on Register	2,746	2	0			
27,965					27,191	5	8
6,447	To CAPITAL as per last account, represented by Books, Furniture, Country Meeting Plant, Machinery, Cash, &c.	8,894	3	11			
	Less: DEPRECIATION written off:						
250	Books and Furniture (10 per cent. off 2,273*l.* 13*s.* 3*d.*) . £227 7 3						
219	Country Meeting Plant (15 per cent. off 1,408*l.* 1*s.* 9*d.*) . 211 4 3						
128	Machinery (10 per cent. off 1,156*l.* 6*s.* 6*d.*) . 115 12 8						
598		554	4	2			
5,849		8,339	19	9			
990	Add: Balance at Credit of Ordinary Income and Expenditure Account, as per Statement (*A*)	344	19	2			
2,055	Balance at Credit of Chester Show Account, as per Statement (*B*)	2,403	10				
8,894					11,088	8	11
36,859					£38,279	14	7

ERNEST CLARKE, *Secretary.*

WELTON, JONES & Co., *Accountants,*

DECEMBER 31, 1893. Cr.

Corresponding figures for 1892 £		£ s. d.	£ s. d.
29,033	By 30,000*l.* NEW CONSOLS ($2\frac{3}{4}$ per cent.) at cost		29,033 9 4
	Value on 31st December, 1893, at $98\frac{3}{8}$=29,512*l.* 10*s.* [Of this 30,000*l.* Stock, 105*l.* is held against Special Prizes.]		
2,254	By BOOKS and FURNITURE (including 19*l.* 8*s.* purchased in 1893)	2,046 6 0	
1,239	By COUNTRY MEETING PLANT (including 169*l.* 5*s.* 9*d.* purchased in 1893)	1,196 17 6	
1,156	By MACHINERY	1,040 13 10	
4,649			4,233 17 4
229	By Sundry DEBTORS		174 12 6
	By CASH IN HAND, December 31, 1893:		
1,407	Bankers	335 10 8	
352	Secretary and Surveyor	364 1 1	
1,759			699 11 9
	By CASH ON DEPOSIT, and interest thereon		5,034 3 6
1,997	By EXPENDITURE in 1893, but belonging to 1894, and carried forward		477 4 9
37,667			39,702 19 2
754	Less: Sundry CREDITORS	1,047 18 8	
54	Less: Subscriptions received in 1893, but belonging to 1894, and carried forward	74 0 0	
	Less: Net Receipts in connection with the Cambridge Meeting, 1894	301 5 11	
808			1,423 4 7
	Memorandum:—The above Assets are exclusive of the value of the stock of Journals, Pamphlets and Diagrams; and also of 298*l.*, the amount recoverable in respect of arrears of Subscriptions to the 31st December, 1893.		
36,859			£38,279 14 7

Examined, audited, and found correct this 12th day of March, 1894.

A. H. JOHNSON
S. B. L. DRUCE } *Auditors on behalf of the Society.*

Income.

Corresponding figures for 1892		£ s. d.	£ s. d.
	ANNUAL SUBSCRIPTIONS:—		
£51 / 346	*Governors*: Subscriptions for 1893	356 0 0	
69	*Members*: Received in 1892, but belonging to 1893	51 1 0	
6,847	Subscriptions for 1893	6,933 14 0	
199	Subscriptions for previous years	82 0 0	
7,466			7,425 15 0
	LIFE COMPOSITIONS:—		
2 722	Contribution to Revenue (See Balance Sheet)—3,923 Members at 14*s.*		2,746 2 0
	RECEIPTS FROM PUBLICATIONS:—		
138	Ordinary Sales of Journal (less Publisher's Charges)	160 6 8	
425	Advertisements in Journal	418 8 8	
18	Sales in Office of Back Numbers of Journal	4 3 4	
68	Sales of Pamphlets	39 14 8	
72	Sales of Insect, Wheat and Potato Diagrams	31 2 11	
696	Receipts from Sales of Text Book on Agriculture (3rd Edition, £34 11*s.* 1*d.*, 4th Edition, £454 4*s.* 11*d.*)	488 16 0	
1,416			1,172 12 3
656	LABORATORY FEES		762 1 3
7	DEPOSITS OF COMPETITORS IN SENIOR EXAMINATION FORFEITED		5 0 0
210	RENTS FROM SUB-LETTING		210 0 0
40	INTEREST ON BANK BALANCES		85 6 8
12,528			£12,406 17 2

ERNEST CLARKE, *Secretary.*

WELTON, JONES & CO., *Accountants.*

Expenditure.

Corresponding figures for 1892		£ s. d.	£ s. d.
	General Administration:—		
£2,282	Salaries of Secretarial Staff (including Temporary Assistance)	2,573 14 0	
190	Pensions to Officials	190 0 0	
70	Professional Charges (Solicitors, Auditors, &c.)	46 4 0	
747	House Rent, Taxes, House Expenses, and Repairs	722 0 1	
67	Binding and Purchase of Books	40 1 0	
385	Printing and Stationery	341 15 1	
145	Postage and Telegrams	178 9 2	
32	Carriage of Parcels, and Cabs	14 14 2	
89	Advertising and Miscellaneous Office Expenses	108 15 10	
4,007			4,215 13 4
	Journal of Society:—		
1,367	Printers' Bills for the four numbers of 1893	1,442 17 8	
183	Wood Engravings and Illustrations	143 7 11	
183	Editor and Literary Contributions	835 3 4	
652	Postage, Packing, and Delivery	663 7 6	
37	Miscellaneous Journal Printing	33 18 3	
29	Miscellaneous Journal Expenses	30 16 0	
2,852			3,149 10 8
88 / 300	**Printing List of Members** (Net Cost)		123 19 5
	Laboratory:—		
1,084	Salaries and Wages	1,023 8 0	
48	Chemicals	21 18 5	
52	Printing, and Sundry Expenses	73 12 7	
—	Law Charges	51 18 4	
1,184			1,175 17 4
	Text-Book on Agriculture:—		
808	Printers' Bill for 4th Edition	305 14 9	
—	Proportion of Cost of New Illustrations	80 14 6	
105	Proportion of Author's Fee	52 10 0	
4	Miscellaneous Expenses	1 18 6	
917			440 17 9
	Other Scientific Departments:—		
200	Consulting Botanist's Salary	200 0 0	
—	Consulting Zoologist's Salary	166 13 4	
500	Grant to Royal Veterinary College	500 0 0	
3	Medals for Proficiency in Cattle Pathology	2 14 0	
5	Advertising Appointment	12 8 6	
40	Printing Expenses—Finger and Toe Inquiry	4 6 6	
—	Miscellaneous Expenses	1 9 2	
748			887 11 6
	Education Prizes and Scholarships:—		
175	*Senior Examination*: Money Prizes, 55*l.*; Fourteen Life Memberships at 15*l.*=210*l.*	265 0 0	
56	Fees to Examiners	74 11 0	
200	*Junior Examinations*: 10 Scholarships at 20*l.*	200 0 0	
16	Fees to Examiners	15 15 0	
12	Advertising Examinations	14 15 8	
—	Hire of Room for Senior Examination	15 0 0	
24	Printing, &c.	21 11 10	
483			606 13 6
	Harewood House (Preliminary Expenses for acquisition of):—		
	Surveyors' Fees and Expenses	200 11 6	
	Law Charges, £257 6*s.* 6*d.*; Stamp Duties, £250 6*s.* 6*d.*	507 13 0	
	Printing, £54 3*s.* 8*d.*; Account Books, &c., £28 19*s.* 0*d.*	83 2 8	
	Interest on Purchase Money and Debenture Stock	571 9 4	
	Insurance, Gas, Water, &c.	34 0 0	
	Bank Charges, 17*s.* 8*d.*; Miscellaneous, £31 8*s.* 4*d.*	32 6 0	
			1,429 2 6
	Grants and Special Expenses:—		
958	Grant to Mansion House Association on Railway and Canal Traffic	10 10 0	
	Subscription to Rothamsted Jubilee Fund	2 2 0	
	Illuminated Addresses to Sir John Lawes and Dr. Gilbert	15 0 0	
			27 12 0
11,538	Total Expenditure		12,061 18 0
990	Balance carried to Balance Sheet		344 19 2
12,528			£12,406 17 2

Examined, Audited, and found correct this 12th day of March, 1894.

A. H. JOHNSON, S. B. L. DRUCE } *Auditors on behalf of the Society.*

Corresponding figures for 1892.		£ s. d.	£ s. d.
	SUBSCRIPTION:—		
£2,000	From Chester Local Committee		2,000 0 0
	FEES FOR ENTRY OF IMPLEMENTS:—		
4,186	Implement Exhibitors' Payments for Shedding	4,396 9 9	
193	Non-members' Fees for Entry of Implements	198 0 0	
4,379			4,594 9 9
	FEES FOR ENTRY OF LIVE STOCK:—		
421	By Members:—1,690 Entries @ 5*s.*	422 10 0	
23	141 Post Entries @ 10*s.*	70 10 0	
196	By Non-members:—206 Entries @ 1*l.*	206 0 0	
14	20 Post Entries @ 2*l.*	40 0 0	
654			739 0 0
318	Fees for Horse Boxes and Stalls		360 10 0
9	Fees for Shedding for Vehicles in Harness Classes		13 10 0
	FEES FOR ENTRY OF POULTRY:—		
25	By Members:—187 Entries @ 2*s.* 6*d.*	23 7 6	
6	14 Post Entries @ 5*s.*	3 10 0	
138	By Non-members:—565 Entries @ 5*s.*	141 5 0	
8	6 Post Entries @ 10*s.*	3 0 0	
2	Entries of Table Poultry	2 19 0	
179			174 1 6
	OTHER ENTRY FEES:—		
27	Non-members' Fees for Entry of Produce	133 15 0	
8	Fees for Entry in Horse-shoeing Competition	7 5 0	
21	New Implement Fees forfeited	14 0 0	
—	Deposit in Butter-making Competition forfeited	0 10 0	
56			155 10 0
	CATALOGUE:—		
78	Extra Lines for particulars of Implement Exhibits	83 4 0	
8	Woodcuts for New Implements	9 13 9	
258	Advertisements in Combined Catalogue	249 3 6	
345			342 1 3
41	Sales of Implement Section of Catalogue (including bound copies)	42 13 6	
646	Sales of Combined Catalogue @ 1*s.*	748 5 6	
39	" " " (bound) @ 2*s.* 6*d.*	27 19 6	
—	Programmes and Awards	13 12 7	
4	Catalogues sold after Show, &c.	6 3 4	
730		838 14 5	
57	Less Commission on Sales in Showyard	64 11 0	
672			774 3 5
	MISCELLANEOUS RECEIPTS:—		
119	Fines for non-exhibition of Live Stock, &c.	157 18 6	
6	Fines outstanding from previous Shows	15 7 6	
125			173 6 0
53	Premiums for Supply of Refreshments		685 13 11
	Premium for Cloak Rooms and Lavatories		36 15 0
	Carried forward		£10,049 0 10

Corresponding figures for 1892.			£ s. d.	£ s. d.
	Cost of Erection of Showyard:—			
£5,004	Timber		5,546 9 9	
136	Ironmongery		231 17 6	
61	Paints, Oil, Glass, Lead, &c.		47 15 7	
61	Bricks, Lime, Cement, Coal, &c.		68 10 8	
—	Laying Drains to Dairy		10 6 6	
1,437	Canvas, Roofing Clotb, Felt, Baize, &c.		1,646 5 5	
552	Railway Charges, 383*l.* 10*s.* 2*d.*; Horse Hire, 161*l.* 12*s.* 2*d.*		545 2 4	
61	Stationery, Postage, and Telegrams		57 3 7	
—	Calico for Dairy		8 1 8	
—	Repairs to Stacks, 16*l.* 9*s.* 4*d.*: Police Supervision, 7*l.* 6*s.* 9*d.*		23 16 1	
36	Insurance, 32*l.* 2*s.*; Hire of Furniture, 4*l.* 0*s.* 6*d.*		36 2 6	
2,061	Wages		2,324 0 4	
626	Superintendent of Works: Salary and Expenses		619 0 0	
10,034			11,164 11 11	
	Less:—			
2,880	Sale of Materials	£3,633 11 6		
1,822	Work for Exhibitors and Purveyors	1,914 16 8		
			5,548 8 2	
4,702				5,616 3 9
5,332				
	Expenses of Secretary's Department:—			
54	Expenses of Inspection Committee		35 8 7	
13	Secretary's Journeys to Chester and Expenses		11 18 10	
139	Expenses for Extra Clerkage		223 1 6	
24	Preparation of Catalogues		54 9 2	
				324 18 1
231	**Printing:—**			
410	Printing of Prize Sheets, Certificates, Admission Orders, Parchment Numbers, Circulars to Exhibitors, Prize Cards, Members' Tickets, and Miscellaneous		406 12 0	
6	Secretary's Local Printing		10 10 6	
37	Programmes for Members		46 4 5	
11	Plans of Sbowyard		13 18 6	
631	Printing of Stock and Implement Catalogues		718 16 7	
87	Binding of Catalogues		71 12 4	
38	Carriage of Catalogues to Showyard		15 18 0	
75	Printing Awards		43 1 5	
				1,326 13 9
1,294	**Advertising, Bill Posting, and Placarding:—**			
72	Advertising Closing of Entries, &c., in Newspapers		67 13 0	
503	Advertising Show by Posters and in Newspapers		600 0 0	
115	Printing of Posters		217 17 3	
				885 10 3
690				
	Postage, Carriage, &c.:—			
86	General Postage, 73*l.* 13*s.* 6*d.*; Postage of Tiokets to Members, 41*l.* 1*s.* 5*d.*			114 14 11
3,966	**Amount of Prizes Awarded** (for details see page xviii)			4,714 6 0
	Cost of orage for Live Stock:—			
520	Hay, 262*l.* 13*s.* 7*d.*; Straw, 415*l.* 5*s.* 8*d.*; Green Food, 208*l.* 8*s.* 6*d.*; Insurance, 2*l.*; Bank Charges, 1*l.* 0*s.* 7*d.*		889 8 4	
	Less: Interest allowed by Bauk		2 2 3	
				887 6 1
	Judges' Fees and Expenses:—			
123	Judges of Sheep Shearing, 24*l.* 10*s.*; Judges of Miscellaneous Implements, 47*l.*; Ditto for Lodgiugs, 28*l.*; Judges of Sheaf-biuders, 48*l.*		147 10 0	
615	Judges of Horses, 132*l.* 14*s.* 9*d.*; Cattle, 178*l.* 17*s.*; Sheep, 280*l.* 8*s.* 8*d.*; Pigs, 45*l.* 10*s.* 9*d.*; Poultry, 30*l.* 14*s.* 4*d.*; Cbeese, 55*l.* 6*s.* 11*d.*; Butter and Butter-making, 37*l.*; Ditto for Lodgings, 20*l.*; Cider and Perry, 17*l.* 7*s.*; Jams and Preserved Fruits, 8*l.* 19*s.* 3*d.*; Horse-shoeing, 34*l.* 10*s.*		841 8 8	
22	Badges for Judges and other Officials		24 9 3	
19	Rosettes		30 14 4	
				1,044 2 3
12,899	Carried forward			£14,913 15 1

Corresponding figures for 1892.		£ s. d.	£ s. d.
£9,324	Brought forward		10,049 0 10
	Admissions to Showyard:—		
23	Saturday, June 17, @ 2*s.* 6*d.*	32 18 3	
891	Monday, June 19, @ 5*s.*	599 2 0	
2,071	Tuesday, June 20, @ 2*s.* 6*d.*	2,618 16 7	
1,892	Wednesday, June 21, @ 2*s.* 6*d.*	2,378 13 3	
1,817	Thursday, June 22, @ 1*s.*	2,833 16 4	
1,183	Friday, June 23, @ 1*s.*	669 12 5	
7,877			9,132 18 10
29	Day Tickets		190 5 0
180	Season Tickets		270 7 0
	ntrances to Horse Ring:—		
80	Monday, June 19	48 18 0	
208	Tuesday, June 20	275 6 0	
143	Wednesday, June 21	181 18 0	
78	Thursday, June 22	136 7 0	
53	Friday, June 23	9 13 0	
561			652 2 0
	airy:—		
40	Receipts at Stand at Dairy	45 7 6	
71	Sale of Produce at Dairy	93 0 11	
111			138 8 5

Prizes Awarded:—

		£ s. d.
Horses, 1,455*l.*; Cattle, 1,982*l.* 10*s.*		3,437 10 0
Sheep, 1,075*l.*; Pigs, 396*l.*		1,471 0 0
Poultry		254 10 0
Cheese, 642*l.*; Butter, 92*l.*		734 0 0
Cider and Perry, 40*l.*; Jams and Fruits, 15*l.*		55 0 0
Butter-making, 69*l.*; Horse-shoeing, 32*l.*		101 0 0
Trials of Sheaf-binders, 100*l.*; Sheep-shearing Machines, 20*l.*		120 0 0
Silver Medals for New Implements and Butter-maker		10 16 0
Contribution to Bee Department		40 0 0
		6,223 16 0
Less:—		
Prizes offered by Local Committee	£1,392 0	
" " Various Societies	105 10	
" " Farriers' Company	12 0	
		1509 10 0
		£4,714 6 0

18,082		£20,433 2 1

ERNEST CLARKE, *Secretary.*
WELTON, JONES & CO., *Accountants.*

Corresponding figures for 1892.		£ s. d.	£ s. d.
£12,899	Brought forward		14,913 15 1
	EXPENSES OF ADMINISTRATION:—		
245	*Stewards*:—House, 75*l.*; Housekeeping Expenses, 139*l.* 6*s.* 8*d.*; Personal and Railway Expenses, 54*l.* 4*s.* 10*d.*	268 11 6	
111	*Assistant Stewards*:—Honoraria, 68*l.*; Railway Expenses, 13*l.* 0*s.* 11*d.*; Lodgings, 47*l.* 10*s.*	128 10 11	
149	*Secretary and Official Staff*:—Houses, 52*l.* 16*s.*; Secretary's Expenses, 12*l.* 0*s.* 2*d.*; Maintenance of Clerks, 47*l.* 3*s.*; Travelling Expenses, 18*l.* 14*s.* 1*d.*	130 13 3	
90	*Finance Office*:—Superintendent of Turnstiles, 17*l.* 2*s.*; Money Changer, 6*l.* 5*s.*; Money Takers, 44*l.* 2*s.*; Bankers' Clerks, 16*l.* 0*s.* 6*d.*	83 9 6	
63	*Awards Office*:—Superintendent, 15*l.*; Clerks, 32*l.* 3*s.* 11*d.*; Award Boys, 5*l.* 19*s.* 6*d.*	53 3 5	
659			661 8 7
	General Management:—		
76	Foreman and Assistant Foreman	113 18 8	
369	Yardmen, Grooms, and Foddermen	306 12 8	
34	Door and Gate Keepers	35 3 0	
152	Carriage Hire, 59*l.* 17*s.*; Horse Hire, 63*l.* 8*s.* 8*d.*	123 5 8	
—	Inspector of Lavatories	2 10 0	
630			581 10 0
118	*Veterinary Department*:—Veterinary Inspectors, 92*l.* 11*s.*; Ditto for Lodgings, 20*l.*; Veterinary Assistants, 15*l.* 4*s.* 8*d.*; Yardmen, 2*l.*	129 15 8	
229	*Engineering Department*:—Consulting Engineers and Assistants, 167*l.* 16*s.* 3*d.*; Ditto for Lodgings, 14*l.*; Carriage, 13*l.* 9*s.* 7*d.*; Repairs and Maintenance of Machinery, 29*l.* 7*s.*; Insurance, 7*l.* 17*s.* 6*d.*; Wages to Workmen, 19*l.* 2*s.* 3*d.*; Hot Water Fittings to Dairy, 22*l.* 5*s.* 9*d.*; Hire of Boiler, 15*s.*	274 4 4	
540	*Police, &c.*:—Metropolitan Police, 539*l.* 10*s.* 9*d.*; Commissionaires, 22*l.* 15*s.* 1*d.*	562 5 10	
888			966 5 10
192	*Dairy*:—Milk, 107*l.* 12*s.*; Ice, 20*l.* 12*s.* 6*d*; Dairy Staff, 80*l.* 16*s.* 4*d.*; Salt, 1*l.* 16*s.*; Utensils, 38*l.* 10*s.* 7*d.*; Carriage, 1*l.* 0*s.* 10*d.*; Stationery, 1*l.* 16*s.* 11*d.*	252 5 2	
7	Expenses of Analysing Milk of Dairy Cows	4 16 9	
199			257 1 11
24	*Poultry*:—Penning, Attendant and Food, 14*l.* 2*s.* 4*d.*; Prize Cards, 7*l.* 0*s.* 7*d.*; Killing Poultry, 3*l.* 4*s.* 8*d.*; Purchase of Dead Poultry, 4*l.* 4*s.*; Carriage of Poultry to and from Showyard, 13*l.* 8*s.* 9*d.*	42 0 4	
2	Horse-shoeing Gratuities	1 15 0	
26			43 15 4
	GENERAL SHOWYARD EXPENSES:		
42 / 44	Hire of Furniture, 11*l.* 11*s.* 6*d.*; Hire of Chairs, 29*l.* 4*s.* 3*d.*; Tan, 2*l.* 6*s.*; Telegraph, 16*l.* 10*s.* 3*d.*; Newspapers, 16*s.* 9*d.*	60 8 9	
65	Band of Cheshire Regiment	80 13 6	
13	St. John Ambulance Association	12 12 0	
15 / 21	Ironmongery	10 3 3	
34	Mowing	11 0 0	
10	Royal and Official Luncheons	27 7 6	
—	Gratuities to Bath Chairmen	8 0 0	
28	Miscellaneous Payments:—Secretary, 4*l.* 18*s.* 10*d.*; Surveyor, 38*l.* 19*s.* 6*d.*	43 18 4	
270			263 3 4
	EXPENSES OF TRIALS:—		
—	Cost of providing Sheep for Trials of Sheep-shearing Machines.		8 16 2
	Trials of Sheaf Binders:—		
80	Hotel Expenses, &c. Sheaf-binding Trials	68 17 1	
35	Carriage Hire, 16*l.* 2*s.* 6*d.*; Horse Hire, 4*l.* 13*s.*	20 15 6	
12	Hire of Chairs, 1*l.* 3*s.* 8*d.*; Hire of Tent, 12*l.*	13 3 8	
111	Cost of providing Fields for Trials	82 8 8	
23	Wages, 21*l.* 3*s.* 3*d.*; Petty Payments, 3*l.* 4*s.* 11*d.*	24 8 2	
169	Engineers and Assistants	75 9 9	
24	Repairs to Machinery, 32*l.* 14*s.* 6*d.*; Carriage, 12*l.* 18*s.* 6*d.*	45 13 0	
455			330 15 10
16,027			18,029 12 1
2,055	Balance carried to Balance Sheet		2,403 10 0
18,082			£20,433 2 1

Examined, audited, and found correct this 12th day of March, 1894.

A. H. JOHNSON
S. B. L. DRUCE } *Auditors on behalf of the Society.*

Table showing the Number of GOVERNORS and MEMBERS in each Year from the Establishment of the Society.

Year ending with Show of	President of the Year	Governors		Members			Total
		Life	Annual	Life	Annual	Honorary	
1839	3rd Earl Spencer	—	—	—	—	—	1,100
1840	5th Duke of Richmond	86	189	146	2,434	5	2,860
1841	Mr. Philip Pusey	91	219	231	4,047	7	4,595
1842	Mr. Henry Handley	101	211	328	5,194	15	5,849
1843	4th Earl of Hardwicke	94	209	429	6,155	15	6,902[1]
1844	3rd Earl Spencer	95	214	442	6,161	15	6,927
1845	5th Duke of Richmond	94	198	527	5,899	15	6,733
1846	1st Viscount Portman	92	201	554	6,105	19	6,971
1847	6th Earl of Egmont	91	195	607	5,478	20	6,391
1848	2nd Earl of Yarborough	93	186	648	5,387	21	6,335
1849	3rd Earl of Chichester	89	178	582	4,643	20	5,512
1850	4th Marquis of Downshire	90	169	627	4,356	19	5,261
1851	5th Duke of Richmond	91	162	674	4,175	19	5,121
1852	2nd Earl of Ducie	93	156	711	4,002	19	4,981
1853	2nd Lord Ashburton	90	147	739	3,928	19	4,923
1854	Mr. Philip Pusey	88	146	771	4,152	20	5,177
1855	Mr. William Miles, M.P.	89	141	795	3,838	19	4,882
1856	1st Viscount Portman	85	139	839	3,896	20	4,979
1857	Viscount Ossington	83	137	896	3,933	19	5,068
1858	6th Lord Berners	81	133	904	4,010	18	5,146
1859	7th Duke of Marlborough	78	130	927	4,008	18	5,161
1860	5th Lord Walsingham	72	119	927	4,047	18	5,183
1861	4th Earl of Powis	84	90	1,113	3,328	18	4,633
1862	H.R.H. Prince Consort 1st Viscount Portman	83	97	1,151	3,475	17	4,823
1863	Viscount Eversley	80	88	1,263	3,735	17	5,183
1864	2nd Lord Feversham	78	45	1,343	4,013	17	5,496
1865	Sir E. C. Kerrison, Bt., M.P.	79	81	1,386	4,190	16	5,752
1866	1st Lord Tredegar	79	84	1,395	4,049	15	5,622
1867	Mr. H. S. Thompson	77	82	1,388	3,903	15	5,465
1868	6th Duke of Richmond	75	74	1,409	3,888	15	5,461
1869	H.R.H. Prince of Wales	75	73	1,417	3,864	17	5,446
1870	7th Duke of Devonshire	74	74	1,511	3,764	15	5,438
1871	6th Lord Vernon	72	74	1,589	3,896	17	5,648
1872	Sir W. W. Wynn, Bt., M.P.	71	73	1,655	3,953	14	5,766
1873	3rd Earl Cathcart	74	62	1,832	3,936	12	5,916
1874	Mr. Edward Holland	76	58	1,944	3,756	12	5,846
1875	Viscount Bridport	79	79	2,058	3,918	11	6,145
1876	2nd Lord Chesham	83	78	2,164	4,013	11	6,349
1877	Lord Skelmersdale	81	76	2,239	4,073	17	6,486
1878	Col. Kingscote, C.B., M.P.	81	72	2,328	4,130	26	6,637
1879	H.R.H. Prince of Wales	81	72	2,453	4,700	26	7,332
1880	9th Duke of Bedford	83	70	2,673	5,083	20	7,929
1881	Mr. William Wells	85	69	2,765	5,041	19	7,979
1882	Mr. John Dent Dent	82	71	2,849	5,059	19	8,080
1883	6th Duke of Richmond & Gordon	78	71	2,979	4,952	19	8,099
1884	Sir Brandreth Gibbs	72	72	3,203	5,408	21	8,776
1885	Sir M. Lopes, Bt., M.P.	71	69	3,356	5,619	20	9,135
1886	H.R.H. Prince of Wales	70	61	3,414	5,569	20	9,134
1887	2nd Lord Egerton of Tatton	71	64	3,440	5,387	20	8,982
1888	Sir M. W. Ridley, Bt., M.P.	66	56	3,521	5,225	16	8,884
1889	Her Majesty The Queen	73	58	3,567	7,153	15	10,866
1890	Lord Moreton	122	58	3,846	6,941	17	10,984
1891	Earl of Ravensworth	117	60	3,811	6,921	19	10,928
1892	Earl of Feversham	111	69	3,784	7,066	20	11,050
1893	Duke of Westminster	107	74	3,786	7,138	21	11,126
1894 Mar.	Duke of Devonshire	101	70	3,800	7,134	22	11,127

[1] The figures for 1843 are taken from the December report, after the removal of the names of members who had discontinued their subscriptions; but it was reported in the previous May that 1,436 had been elected during the preceding twelve months, bringing the then nominal total to 7,285. In all other cases, from 1840 to 1893, the figures are from the reports of the Council to the anniversary meeting in May. It should, however, be observed that the totals were occasionally affected by the necessary revision of the list.

ROYAL AGRICULTURAL SOCIETY OF ENGLAND.

Proceedings of the Council.

WEDNESDAY, FEBRUARY 7, 1894.

THE DUKE OF DEVONSHIRE, K.G. (PRESIDENT), IN THE CHAIR.

Present:

Trustees.—Gen. Viscount Bridport, G.C.B., Earl Cathcart, Mr. John Dent Dent, Col. Sir Nigel Kingscote, K.C.B., Sir A. K. Macdonald, Bart., the Duke of Richmond and Gordon, K.G., Right Hon. Sir M. W. Ridley, Bart., M.P.

Vice-Presidents.—H.R.H. Prince Christian, K.G., Mr. Chandos-Pole-Gell, Lord Moreton.

Other Members of Council.—Mr. J. Bowen-Jones, Mr. Charles Clay, Earl of Coventry, Mr. Percy E. Crutchley, Lieut.-Col. J. F. Curtis-Hayward, Mr. Alfred Darby, Mr. J. Marshall Dugdale, Mr. S. P. Foster, Mr. W. Frankish, Mr. Hugh Gorringe, Mr. Anthony Hamond, Mr. James Hornsby, Mr. Joseph Martin, Mr. T. H. Miller, Mr. P. A. Muntz, M.P., Mr. R. Neville-Grenville, Hon. Cecil T. Parker, Mr. J. E. Ransome, Mr. J. Rawlence, Mr. S. Rowlandson, Mr. G. H. Sanday, Mr. W. T. Scarth, Mr. A. J. Smith, Mr. Henry Smith, Sir J. L. E. Spearman, Bart., Mr. R. Stratton, Mr. J. P. Terry, Mr. John Tremayne, the Duke of Westminster, K.G., Mr. C. W. Wilson.

Professor Brown, C.B.; Mr. F. W. Wragg, President of the Royal College of Veterinary Surgeons.

Officers.—Mr. Ernest Clarke, Secretary; Dr. Fream, Editor of the Journal; Dr. J. Augustus Voelcker, Consulting Chemist; Mr. Wilson Bennison, Surveyor.

The following members of the Cambridge Local Committee were also present:—The Mayor (Mr. E. H. Parker), Mr. Charles Bidwell, Mr. G. Jonas, Rev. E. H. Morgan, the Town Clerk (Mr. J. E. L. Whitehead), and Mr. R. Peters (Secretary of the Local Committee).

Apologies for non-attendance were received from Sir John Thorold, Bart., Sir Jacob Wilson, Mr. J. H. Arkwright, Mr. Alfred Ashworth, Mr. Joseph Beach, Mr. J. A. Caird, Mr. Charles Howard, Mr. Albert Pell, Mr. Martin J. Sutton, Mr. R. A. Warren, Mr. E. V. V. Wheeler, and Mr. Charles Whitehead.

Death of a Member of Council.

The minutes of the last monthly Council, held on December 6th, 1893, having been approved,

The Duke of Westminster (who had temporarily taken the chair pending the arrival of the President) made a feeling allusion to the loss which the Council had sustained since their last meeting through the lamented death, under circumstances of peculiar painfulness, of their colleague, Mr. George Mander Allender. Mr. Allender had been associated with the Society as a member for the long period of thirty-five years; but it was only in comparatively recent times that the Council had had the advantage of his practical mind and business acumen in the deliberations at their meetings. Those who were associated with the memorable show of 1879 at Kilburn would remember his activity as Steward of Forage, and in the general organisation of that Meeting. He was elected a member of the Council in May 1881, and had rendered valuable services on their House, Stock Prizes, Implement, Showyard Works, Dairy, and other Committees. He (the Duke) had worked with Mr. Allender on the House Committee in connection with the acquisition of the Society's new premises, and had learnt to appreciate his great business qualities. The sad circumstances of his untimely death would accentuate the regret that all his colleagues must feel at the loss of one so full of energy and resourcefulness. (Hear, hear.)

New Governors and Members.

The election of the following two Governors and eighty-one members was then proceeded with :—

Governors.

McCalmont, H...Cheveley Park, Newmarket.
Morewood, C. R. Palmer..Alfreton Park, Derbyshire.

Members.

Amherst, Hon. Florence M...Didlington Hall, Brandon.
Amherst, Hon. Sybil M...Didlington Hall, Brandon.
Aspinall, T...Pilsworth, Birch, Lancs.
Asplen, W. J. W...Thriplow Place, Royston.
Bagnall, O. R...Broad Campden, Glos.
Birch, Rev. J. A. G...Kirk Hammerton Vicarage, York.
Birkett, Tom..72 Wordsworth St., Penrith.
Bowman, Thos...Harlaxton Lodge, Grantham.
Bowser, J...Thornton House, Frithville, Boston.
Campbell, H. B...Merton, Thetford.
Cane, C. H. B...Dunchurch, Rugby.
Carnegie, Hon. D. G...Longwood, Winchester.
Carter, H. P...Hurn Farm, Holbeach.
Chadwick, S. T...Haulfre, Beaumaris.
Cordrey, W...36 Southwark Street, S.E.
Coulson, J. A...Low Caythorpe, Bridlington.
Coy, J...Bridge Hall Farm, Burgess Hill.
Dawnay, Capt. the Hon. L. P...Beningbrough Hall, Yorks.
Ellis, W.G. P...4 St. Edward's Passage, Cambridge.
Enock, F...11 Parolles Rd., Upper Holloway, N.
Foster, C. F. Cunliffe..3 Sidney Street, Cambridge.
Gardner, T...Portland Lodge, Newmarket.
Gibson, J. E...East Farm, Fourstones, Northd.
Gordon, F...Bentley Priory, Stanmore.
Gray, C...Whitchurch, Aylesbury.
Gribble, G. J...Henlow Grange, Biggleswade.
Harrison, H...Hooton Mount, Eastham, Cheshire.
Howard, S. G...Kirtling, Newmarket.
Hunter, W. S...Aldwark Manor, Easingwold.
Jillings, W. H...The Nunnery, Thetford.
Jones, J. A...1 Imeson Terrace, Linthorpe, Yorks.
Lambert, L. F...Greenhill, Redditch.
Langdale, C. H...Mill House, Morpeth.
Lassitter, F...Sydney, New South Wales.
Lawder, J. O...10 West Villas, Upton Park.
Laybourne, R...Malpas, Newport, Mon.
Leplae, E...Ardoye, West Flanders, Belgium.
Lord, A. H...Jackson Fold, Pilsworth, Whitefield, Manchester.
Lyster, G. F...Plas Isaf, Ruthin.
Marshall, G. T. V...Audley House, Great Gransden, Sandy.
Marshall, R..Enholmes, Partington, Hull.
Meares, O. A...15 St. James' Terrace, N.W.
Measures, B...Tilbrook Grange, Kimbolton.
Meggeson, T. A...11 Nelson Ter., Stockton-on-Tees.
Meggitt, H. W...203 High Street, Hull.
Morris, T...Whittle Fold Farm, Birch, Lancs.
Moulden, J...Beancroft, Marston, Ampthill.
Mutton, D...Triangle, Plumpton, Lewes.
Newton, W. L...Braybrooke, Market Harborough.
Norman, H. E. H...Grove House, Southall.
O'Rorke, Ashley..Dunchurch, Rugby.
Parry, H. E...Manor Farm, Wrexham.
Pepper, Major C...Ballygarth Castle, Julianstown, Drogheda.
Perkins, John, LL.D...East Hatley, Sandy.
Prentice, Manning..Woodfield, Stowmarket.
Price, T. M...Tremains, Bridgend.
Rands, Frederick E...Ipswich.
Roberts, W. I...Lidlington, Ampthill.
Robinson, Roland I...Gisburne, Yorks.
Savage, R. T...Thorpe Hamlet, Norwich.
Scurr, C. N...Merrington, Ferry Hill.
Sharp, A. H...Dumbleton Hall, Evesham.
Singleton, H. M...6 Florence Ter., Ealing, W.
Slater, J...Cordell Hall, Stansfield, Suffolk.
Slater, S. W...Cheveley Hall, Newmarket.
Smith, H...Sutton Farm Lodge, Cookham.
Taylor, J. L...Penmaen Cliffe, Dolgelly.
Tew, J. S., M.D...Nottingham.
Thorley, J...Ringdale House, Faringdon.
Tinsley, Geo...Flint House, Holbeach Marsh.
Tinsley, W. H...Poplar Ho., Holbeach Marsh.
Tomalin, L. R. S...95 Milton Street, E.C.
Trimble, W. T...Dalston, Carlisle.
Watson, A...East Ardwick, Pontefract.
Waudby, J...Frizinghall, Bradford.
Wiedmann, H...Tarnhouse, Beetley, Dereham.
Wilkinson, C. E. O...Moor Farm, Baschurch.
Williamson, F. C...Whitburn Hall, Sunderland.
Wood, C. H. G...Carleton Lodge, Pontefract.
Wright, Carden..Whaplode, Spalding.
Wright, Wm...Organsdale Farm, Kelsall.

Country Meeting of 1895.

The Secretary laid upon the table the formal invitation from the Mayor and Corporation of Darlington for the holding of the Society's Country Meeting of 1895 at that place, together with a number of memorials received in support thereof from the following local authorities and institutions :—

Corporations: — Darlington, Newcastle-on-Tyne, Hartlepool, Middlesbrough, Richmond, Scarborough, Stockton-on-Tees, Thornaby-on-Tees, and West Hartlepool.
Local Boards:—Barnard Castle, Benfieldside, Benwell and Fenham, Felling, Leadgate, Northallerton, Redcar, Southwick, Tow Law, and Willington.
Unions:—Auckland, Bedale, Darlington, Durham, Easington, Leyburn, Middlesbrough, Northallerton, Reeth, Richmond, Sedgefield, Stokesley, and Teesdale.

Highway Boards:—Auckland, Barnard Castle, Castle Eden and Seaham, Darlington District, Durham and Chester-le-Street, Greta Bridge, Northallerton, Richmond District, Stockton, and Hartlepool.

Chambers of Agriculture:—Cleveland, Darlington, Durham and N.R., and Stockton-on-Tees.

Agricultural Societies, &c.:—Newcastle Farmers' Club, Barnard Castle, Beamish, Pontop and Consett, Bishop Auckland, Northumberland, Sedgefield and District, Stokesley, Wensleydale, and Whitby Agricultural Societies; the Durham and N.E.R. Agricultural Horse Society; the Gainford Horse and Foal Show Society; the S. Durham and N. Yorkshire Horse and Dog Show Society.

The SECRETARY also read the report of the Committee of Inspection (the Hon. Cecil T. Parker, Sir Joseph Spearman, Bart., and Mr. James Hornsby), recommending the acceptance of the invitation from Darlington, and advising the selection of the site known as the Hummersknott site.

Deputation from Darlington.

After some general discussion on the report,

Mr. W. T. SCARTH introduced a deputation from the town and district of Darlington, including Lord Barnard (Chairman of the Local Committee), the Marquis of Londonderry, K.G., Sir Henry Havelock Allan, Bart., the Mayor of Darlington (Mr. G. W. Bartlett), the ex-Mayor (Mr. Edward Manners), Alderman T. T. Sedgewick, Councillor G. W. Marshall, the Town Clerk, the Borough Surveyor, Mr. A. W. F. Eade, Mr. Christopher Middleton, Mr. Richard Ord (President of the Darlington and North Riding Chamber of Agriculture), Mr. Richard C. Pearce (Secretary of the Chamber), Mr. F. Raymond Steavenson (Assistant Secretary of the Local Committee), &c.

Mr. John Dent Dent and Mr. S. Rowlandson, members of the Council, also accompanied the deputation.

Lord BARNARD said he appeared in his capacity as Chairman of the Committee which had been formed in the neighbourhood of Darlington for the purpose of inviting the "Royal" Society to hold its annual Country Meeting of 1895 in that town. The county of Durham itself was justly celebrated in more than one way, and the North Riding of York, which was a purely agricultural district on the other side of the Tees, was within two or three miles of the borough of Darlington. Cotherstone cheeses, Wensleydale cheeses, the famous breed of Clydesdale horses, and latterly the Wensleydale sheep, were amongst the agricultural specialties of the district. The ground which they had had the privilege of showing to their friends on the Inspection Committee was, perhaps, not an ideal one, but he remembered perfectly well what Sir Jacob Wilson said in the showyard last year, that an absolutely ideal ground was impossible. In point of beauty, and other advantages, it might be favourably compared with ground to be found in almost any other locality. The town of Darlington itself was one of the most important industrial centres of England. He said that not out of hostility to other towns, but simply because they thought that the town of Darlington and the neighbourhood around it merited their attention. It had this advantage over other towns, that it was, perhaps, the most central place in the district in point of railway accommodation and in point of ease of access to other parts. of England, and particularly by the North-Eastern line to the counties of Northumberland, Cumberland, and Westmoreland. Referring again to the ground, the only difficulty was that a footpath ran across it; but they had every reason to believe that steps could be taken for diverting that footpath temporarily during the show, as was the case at the Cambridge Meeting of the present year. They had the support not only of the large landowners and of the farmers, who were an important class both in numbers and position in the locality, but they also had the most hearty support and assistance from the authorities and inhabitants of the borough itself. The Mayor would put before the meeting the claims and advantages which the borough afforded. The President of the Darlington Chamber of Agriculture (one of the most useful bodies in the neighbourhood) would say a few words on behalf of the agriculture of the district, and the Marquis of Londonderry would represent the general claims of the district to their favourable attention.

The Mayor of DARLINGTON (Mr. G. W. Bartlett) said that the inhabitants of the borough had entered very cordially into the proposal, and that a sum of upwards of 6,000*l.* had been definitely subscribed to defray the expenses. The various agricultural societies throughout the county of Durham, Chambers of Agriculture, and other public bodies had by resolution offered their hearty co-operation to assist in securing that complete success in the town of Darlington and the county of Durham which they all desired. Representing the Town Council as well as the town of Darlington, he tendered to them a very cordial invitation to hold their Country Meeting of 1895 at Darlington. It would perhaps save time and be more agreeable if he allowed the memorial to speak for itself, merely adding one or two remarks as to essential points. As they were well aware, the centres they visited should be sufficiently populous. So far as the county of Durham was concerned, within the limits of the county, and within a distance of thirty miles from Darlington; there was a population of 1,000,000, not including the large industrial populations of Middlesbrough, Cleveland, and the mining districts. Then he might say that the county of Durham was really the most densely populated in England, with the exception of Middlesex and Lancashire. Within fifteen miles of Darlington there was a population of 260,000. The county contained many thickly populated towns, such as the following: Stockton and Thornaby, 60,000; Hartlepool and West Hartlepool, 70,000; Sunderland, 120,000; Gateshead, 100,000; South Shields and Tyne Dock, 100,000; and Middlesbrough, 100,000; so that within easy reach of Darlington there was ample population to justify the holding of the show in that particular district. With respect to the position, he thought that if they came to the county of Durham at all, it would be natural that they should come to the town of Darlington, as the largest and most important agricultural centre. Its railway accommodation was quite exceptional. There were two stations, and Bank Top Station was one of the largest stations out of London. At Darlington there converged the various lines throughout the North of England from the agricultural centres, as well as from the commercial centres. There was ample accommodation at both stations, which were not more than two miles from the suggested site of the show. There were most excellent roads leading to the show-ground. As to accommodation, the North country was noted for its hospitality, and they did not intend to forfeit their reputation in that respect if the Society should favour them with a visit. Within the borough nearly 3,000 persons could be accommodated, and outside there were many pleasant summer resorts, such as Saltburn, Redcar, Barnard Castle, and Richmond, so that they could accommodate very easily at least 10,000 people, and more if necessary. As concerning the site, the report of the Inspection Committee would be of more service than any words that he could add. The Hummersknott site consisted of 100 acres of well-drained land, near to the town, and within almost a stone's-throw of the villa residences stretching out in that direction. It was less than two miles from the railway station; and an excellent turnpike road, which ran the whole distance alongside the site, would be another advantage. He would like to add that they would feel it as an honour conferred upon the town if the Society accepted their invitation. Their leading idea was clearly set forth in the concluding paragraph of their memorial:—

That your memorialists, feeling that the primary aim of your Society is the advancement of agriculture in every part of England, and that by breaking new ground the Society arouses enthusiasm amongst all classes, encouraging agriculturists to discard old methods and adopt modern improvements, and having in the foregoing shown the vastness of the agricultural and commercial industries of the district, its unsurpassed facilities of transit, and the capability and willingness to fittingly accommodate visitors to your show, trust you will find it consistent with the great interests confided to your charge to accede to the prayer of this memorial.

Mr. RICHARD ORD (President of the Darlington Chamber of Agriculture) said that in the first place he had received a letter from the Marquis of Zetland, who regretted his inability to be present as a representative of that Chamber. He appeared himself as President and a representative of the Darlington, South Durham, and North Yorkshire Chamber of Agriculture, which was a fairly influential and flourishing Chamber, consisting of some 400 or 500 members, a large number of whom took part in their monthly deliberations, and who were interested in all the leading agricultural topics of the day. Everyone would hail with the liveliest satisfaction the advent to the town of Darlington of the Royal Agricultural Society. He remembered that upon at least three occasions names had been appended to the subscription list, in the event of the Society paying them a visit, but they had never had to sign any cheques. At the present time everyone was ready to put his hand in his pocket, and to part with his money like a man, in the hope of welcoming the Royal Agricultural Society. It was, of course, absolutely impossible to prognosticate the success of a show, because so much depended upon the weather; but this he could say, that, be the weather fair or foul, they would receive at the hands of the people of Darlington and neighbourhood a reception equal to any that had been accorded to any Meeting of the Society in any other town of England. He ventured to hope that should the Society accede to their request, and bring the Royal Show to Darlington in 1895, in future the county of Durham would be known and celebrated for the success of its Royal Show, for the extraordinary excellence of its exhibits, and above all for the manly warmth and openheartedness with which it welcomed the President, the Council, and the members of the Royal Agricultural Society of England. (Hear, hear.)

The Marquis of LONDONDERRY cordially supported the invitation. He reminded them that the county of Durham and the town of Darlington had invited the Society upon previous occasions, and one of the chief reasons why they had not then been successful was that their hotel accommodation had not been considered sufficient. That was now altered. They had at least two excellent hotels, and he believed that ample arrangements could be made for the housing of both people and animals which would give every satisfaction. He could assure them that the North-Eastern Railway would carry out the arrangements in the same perfect manner as at Newcastle. That company, as they knew, had the monopoly of the North of England, and he rejoiced in the fact. If all other companies served their districts in the same way as the North-Eastern served him, they would be very fortunate people. He simply mentioned this to show that the Society would be served at Darlington by one of the best companies in the world in a manner which they had every right to expect. If they saw their way to visit the town of Darlington in 1895 they would never regret the decision at which they arrived.

Mr. DENT said it was not often that the gigantic company of the North-Eastern Railway received such a compliment as that which had fallen from Lord Londonderry. He merely rose to say that when the Society's show was held at Newcastle in 1887, and at York in 1883, the arrangements made were, he believed, quite satisfactory both to that Council and to the exhibitors. Darlington was the cradle of the North-Eastern Company, and it would be their special endeavour—as far as the Company could do so—to make the show there a success. The Council might rely upon it that the North-Eastern would do the best they could to make everything go off pleasantly and satisfactorily.

The PRESIDENT then said that, on behalf of the Council of the Royal Agricultural Society, he had to tender to the deputation their best thanks for the invitation which they had given to the Society to visit Darlington next year. Under ordinary circumstances, it would have been his duty to ask the deputation to retire, in order that the Council might deliberate on the invitation; but on that occasion he was authorised by the Council to state that the report of the Committee of Inspection was so satisfactory, and the requirements of the Society were so completely met, that they were prepared at once to accept the invitation which they had been good enough to offer. The Council desired him to express their sincere thanks to the local representatives who had attended there that day for the information which they had given to the Council, and for the arrangements which they were prepared to make for the reception of the Society next year. The formal resolution of the Council accepting the invitation had still to be passed, and would be communicated to the Local Committee in due course, together with the draft of the formal agreement between the Corporation of Darlington and the Society. He had only once more to thank them for the invitation which they had given, and to express the pleasure which the Council of the Royal Agricultural Society felt in being able to accept that invitation.

Lord BARNARD said that before they left the room he must ask his Grace and the Council to accept their sincere thanks for the courtesy with which they had been received, and for the gratifying announcement which had been made. The news, as soon as it reached Darlington, would be received with acclamation, and it would stir up the people of the locality to spare no effort to make the show a perfect success.

The Mayor of DARLINGTON said that they appreciated very highly the honour which the Society would confer upon them, and he was sure that they would endeavour, both in the town and in the district, to show their appreciation by heartily cooperating in the endeavour to make the show a success.

The deputation having retired,

Sir MATTHEW RIDLEY, M.P., said he had great pleasure in moving the following resolution: "That the Country Meeting of 1895 be held at Darlington, upon the Hummersknott site, subject to the usual agreement being entered into with the Society by the Mayor and Corporation of Darlington."

He had all the more pleasure in moving that resolution because he had himself taken part on former occasions when competitive towns were desirous of the honour of receiving the Royal Society. He remembered that upon the former occasion there was not much accommodation in Darlington for the reception of visitors. Now that had been remedied, and the hotel accommodation was improved. Not only in Darlington, but also in the Northern counties of the district, the Society's visit would give the greatest satisfaction.

Mr. SCARTH, in seconding the motion, said that the intelligence would be received at Darlington by all classes with the very greatest satisfaction. It was a large agricultural district with a variety of occupations, and the Society's visit had been looked forward to for many years as likely to prove of great benefit and give great pleasure to the locality.

The PRESIDENT then put the motion, which was unanimously adopted.

The reports of the various Standing Committees were then presented and adopted, as below:—

Finance.

Sir NIGEL KINGSCOTE reported his election as Chairman of the year. The accounts for the month ended December 30, 1893, as certified by the Society's Accountants, showed total receipts amounting to 1,537*l.* 14*s.* 7*d.*, and expenditure amounting to 3,211*l.* 13*s.* 1*d.* The actual balance at the bankers' on December 30, 1893, allowing for cheques outstanding, was 335*l.* 10*s.* 8*d.* The accounts for the month ended January 31, 1894, which were also presented, showed total receipts amounting to 6,712*l.* 16*s.* 9*d.*, and expenditure amounting to 638*l.* 15*s.* 1*d.* The balance at the bankers on January 31, 1894, allowing for cheques outstanding, was 6,409*l.* 11*s.* 8*d.* Accounts amounting in all to 570*l.* 0*s.* 6*d.* had been passed, and were recommended for payment. The quarterly statement of subscriptions, arrears, and property as at December 30, 1893, and a tabular statement of subscriptions received month by month during the last ten years, were laid upon the table.

House.

Sir NIGEL KINGSCOTE also reported his election as Chairman of the House Committee for the year. The Committee had discussed and settled various matters connected with the Society's present premises and their new quarters at Harewood House, the interior decoration of which was about to be commenced.

The Committee had the pleasure to announce that, in addition to the sums already reported to the General Meeting held last December, a donation of 25*l.* had been generously made by Mr. T. J. Mann, of Sawbridgeworth, towards the fund for the acquisition of Harewood House by the Society. The sincere thanks of the Council were due to Mr. Mann for this acceptable gift, and he (Sir Nigel) trusted that others who were in a position to do so would follow so excellent an example. (Hear, hear.)

Journal.

Earl CATHCART reported his election as Chairman for the ensuing year. The Committee had the pleasure to report the following donations to the Society's library, and to recommend that the best thanks of the Council be given to the donors :—

Reynolde Scot's "Perfite Platforme of a Hoppe Garden," 1576, and Hawes' "Observations on Agriculture," 1783.—*Presented by Mr. Charles Whitehead.*

Thomas Tusser's "Five Hundred Points of Good Husbandry," London, 1614.—*Presented by Mr. E. W. Stanyforth.*

Olivier de Serres' "Théâtre d'Agriculture et Mesnage des Champs," two vols., Paris 1804–5.—*Presented by the Société Nationale d'Agriculture de France.*

Transactions of the English Arboricultural Society, Vols. I. and II.—*Presented by the Society.*

The courtesy of the French Society had been reciprocated by the gift of a number of volumes of the Journal which were wanting to complete the set in that Society's library. Instructions had been given to the Editor as to the contents of the March Journal, and various suggestions for articles and notes had been considered. The next number of the Journal would contain a biography of Robert Bakewell; and the thanks of the Council were due to a member of the family, Mr. J. S. Bakewell, for his courtesy in placing at the disposal of the Society, for the purpose of illustrating this article, a painting representing Robert Bakewell on horseback, now in his possession.

Donations to the Library.

Earl CATHCART said that, as the Council would have heard from the minutes, the Journal Committee had received during the recess several valuable gifts of old agricultural books. There were, however, a great many gaps in the Society's collection of historical works on Agriculture which the Committee would like to see filled, and as there would be plenty of shelf space in their new house, he trusted that members of the Council, and of the Society generally, would be so good as to send to the Secretary any surplus agricultural books which they might possess, in order that the library might be made worthy of the Society.

Chemical.

Mr. DENT reported the election of Viscount Emlyn as Chairman of the year. The report of the Woburn Sub-Committee had been received and adopted. The revised Guide as to the Purchase of Fertilisers and Feeding Stuffs, and Instructions for Selecting and Sending Samples for Analysis, prepared in view of the Act of last year, had been printed in the current number of the Journal, and had been extensively circulated amongst members in a separate form. Dr. Voelcker had reported that, so far as the experience of the single month of January went, the new Act had not yet made any material difference to the chemical work of the Society. In several cases members, when sending samples to the Society's laboratory, had enclosed the invoices given to them, and had asked whether the deliveries were in accordance with the statements given on the invoice, or whether the invoices were in the proper form laid down by the Act. In two cases deficiencies, or breach of warranty, had been noted, but nothing had yet been heard as to further steps being taken. It would appear, from the information given, that the Act had had a good effect, so far as the purchaser was concerned, of insuring that he was provided with an invoice. The terms of the invoices had not always been in accordance with the standard adopted by the Society, but had practically been invoices satisfying the Act. It was abundantly clear, however, that the order forms issued by the Society were used to a considerable extent, and would be still more extensively adopted, many requests having been made through the office for copies of them, and of the revised guide.

The Committee recommended that separate mention of basic slag (with a fee for analysis of 10*s.*) be made in the schedule of fees, and that on the back of the order form the following be added :—

> Basic slag to be guaranteed to contain a certain percentage of phosphoric acid [a good quality contains 15 to 17 per cent. of phosphoric acid], and to be sufficiently finely ground that 70 to 90 per cent. passes through a sieve having 10,000 meshes to the square inch.

Seed and Plant Diseases.

Mr. Bowen-Jones reported that Mr. Whitehead had been elected Chairman of the year. The Committee had discussed at some length a variety of interesting points in connection with the inquiry into "Finger and Toe" in turnips, which was still proceeding. They were indebted to the Duke of Richmond and Gordon for valuable information received from his Grace's tenants in Scotland, in the form of answers to the Society's Schedule of Questions, and to Mr. Wm. Dawson, of the Duke's Home Farm, Gordon Castle, for an exhaustive report and observations thereon. The information thus obtained would be incorporated in the general report to be hereafter written for the Journal.

A New Forage Plant.

Mr. Bowen-Jones said that Lord Moreton had asked him to state with regard to a new forage plant called *Polygonum Sakhalinense*, which had been brought to the notice of the Committee, that he had already grown some in his grounds as an ornamental plant, and that he was willing to extend its cultivation with a view to see whether stock would eat it. Lord Moreton thought that it would be well if other members of the Council who had the plant in their grounds would do the same. There were two other kinds of the plant which were not of such large growth. This was the giant variety ; the others were smaller. The plant was of the same family as buckwheat, and it was thought desirable to see if it were of any value as a forage plant.

Veterinary.

Mr. Dent reported the election of Sir John Thorold as Chairman of the year, and the addition of Professor Axe to the Committee. A letter had been read from the Board of Agriculture stating that as the demands of the Public Departments for the year 1894–5 were exceptionally heavy, the Lords of the Treasury regretted that they were unable to sanction the necessary financial provision for the inquiry into the subject of abortion in cattle suggested by the Council of the Royal Agricultural Society. In these circumstances, the Committee were of opinion that it was desirable that an inquiry into this disorder should be undertaken by the Society itself, and they accordingly recommended that a Committee of Inquiry be appointed for this purpose, such Committee to be empowered to collect evidence from stock-breeders and from veterinary surgeons, both by the issue of circulars of inquiry and by the calling of witnesses, and to be instructed to report as to the advisability of experiments with breeding animals being undertaken by the Society. In the event of these proposals being adopted by the Council, the Committee recommended that the Special Committee be constituted as follows :—Sir John Thorold, Hon. C. T. Parker, Sir Nigel Kingscote, Colonel Curtis-Hayward, Mr. Garrett Taylor, Professor Brown, Professor Axe, Professor McFadyean, and Dr. Sims Woodhead, with power to add to their number.

Professor Brown had presented the following report:—

Pleuro-pneumonia.—No case of this disease has been discovered in this country since the early part of November. During the past year there were 9 fresh outbreaks in 5 counties; 30 diseased cattle and 1,157 healthy ones which had been exposed to the risk of infection were slaughtered by order of the Board of Agriculture, in addition to 86 suspected cattle, which, on post-mortem examination were found free from the disease.

Swine Fever.—From November 1 up to January 27, 1,645 pigs died from this disease in Great Britain; 9,607 were slaughtered by order of the Board of Agriculture as diseased, or having been exposed to infection, and 152 suspected were slaughtered, but found, on post-mortem examination, to be free from the disease.

Anthrax.—Returns of this disease were received from 68 counties in Great Britain last year, as compared with 60 in 1892, 50 in 1891, and 48 in 1890. The increase in the number of outbreaks of anthrax, which began early last year and continued throughout the year, is still going on. In the four weeks ended January 27 there were 56 fresh outbreaks reported and 115 animals attacked, as compared with 35 outbreaks and 92 animals attacked in the corresponding four weeks of 1893.

Rabies.—This disease has now for some time been on the increase. During the past year there were 93 cases, as compared with 40 in 1892. In the first four weeks of the present year there have been 13 cases, as compared with 9 in the corresponding period of last year.

Outbreak on Lord Middleton's Estate.—On December 23 last a request to investigate an outbreak of disease on a farm belonging to Lord Middleton was addressed to the College. The Secretary of the College replied that Professor McFadyean doubted whether it would be possible to determine the nature of the disease before another animal was attacked, but that he would visit the farm before that if it was thought desirable. Since that date Professor McFadyean has been in correspondence with Mr. Wright, Lord Middleton's agent, and it has been arranged that he (Professor McFadyean) shall visit the farm on Thursday next. No fresh cases have occurred in the interval.

Investigations.—Since the last meeting of the Veterinary Committee investigations for the members of the Royal Agricultural Society have been made regarding the following diseases:—Mineral poisoning in cattle, parasitic enteritis in cattle, braxy in sheep, anthrax in horses and cattle, and diarrhœa in calves, which will be referred to in detail in the Annual Report of the Royal Veterinary College.

Abortion in Cattle.

Mr. Dent said that as the Treasury were unwilling to provide funds for an investigation by the Government into the causes of abortion in cows, the Veterinary Committtee, being unanimously of the opinion that such an inquiry was urgently necessary in the general interests of stock-owners, had resolved to ask authority from the Council for the Society itself undertaking an investigation on its own account. Following the precedent of 1876, when the Chemical Committee collected some very valuable information on the subject of the manurial value of cakes and other feeding-stuffs, by means of evidence given verbally before it by experts, it was proposed that the Special Committee to be appointed should take evidence from veterinarians and stock-owners, and endeavour in this way to ascertain the lines for further inquiry. What they now proposed would involve but little expense, and if the Special Committee should find it necessary later on to ask for a grant of money for exact scientific investigations into the matter, he hoped the Council might see its way to vote a sum for the purpose. At present, however, they only asked for authority to the Committee to take evidence, and to issue, as a preliminary, circular letters of inquiry to those who were likely to be able to afford useful information. The Committee would be much obliged to any member of the Society who would kindly give information himself, and suggest the names of other stock-owners to whom the circular might usefully be sent. The questions to which answers were desired were as follows:

Questions.

1. During what years have you had experience of abortion among your cows?
2. What was the total number of cows kept and the number that aborted in each year?
3. At what month of gestation did most cases occur?
4. Did abortion occur among cows at grass as well as among those housed?
5. What was the nature of the diet of the cows during the winter months?
6. Was it observed that the cows that aborted stood near each other in the byre?
7. What was generally done with the cows that aborted—were they sold or again put to the bull?
8. Have you observed repeated abortion in the same cow?
9. Have you formed any opinion regarding the following as possible causes of the abortion in your stock:—

   Fright or accidental injury,
   Ergot in grass or hay,
   Errors in feeding,
   Contagion?

10. Have you observed that cows served by a particular bull were specially liable to abortion?

11. Have you had any experience of abortion in mares or ewes?

12. Have you tried the preventive measures recommended in the Society's Journal (Vol. II., 1891, page 739), or any other method of treatment? and, if so, with what result?

13. Would you be willing to allow any experimental treatment to be adopted in your herd?

14. Any general observations likely to prove useful for the purposes of the inquiry.

The Veterinary Department of the Board of Agriculture.

Mr. DENT said he desired to say a few words with reference to the reports as to the contagious diseases of animals which they had been accustomed to receive regularly from the Board of Agriculture, through Professor Brown. The Veterinary Committee of the Council were indebted to Professor Brown for the great care which he had always exhibited in connection with these reports; and the kindly relations which had always existed between the Committee and the Veterinary Department were a source of great satisfaction. There were rumours that an alteration was about to be made in that Department, and it was uncertain at the present moment whether Professor Brown was still at the head of that Department, or what was his exact position. It was not, however, their business to express opinions, or to make statements to the Departments of the Government as to whom they should appoint, or how they should fill up vacancies in their offices. He had only to say on the part of the Veterinary Committee, and he was sure on the part of the Council, that they sincerely trusted that a gentleman of equal professional eminence, and with the same kindly and judicious manner as had characterised Professor Brown, would be appointed to the vacancy. He hoped and trusted that they might find that to be the case, and that the relations of the Veterinary Committee with the Board of Agriculture might be as cordial in the future as they had been in the past.

The Duke of RICHMOND and GORDON said that, being deeply concerned in the welfare of agriculture, he took the very greatest interest in the Veterinary Department of the Board of Agriculture, partly, perhaps, because he had had the satisfaction of placing that Department upon its present footing when he was Lord President of the Privy Council about the year 1878. And having appointed Professor Brown, Mr. Cope, and Mr. Duguid to their present offices, he should like to take that public opportunity of expressing his thanks to those three gentlemen for the very admirable manner in which, since that time and up to now, they had carried out the duties of the Department. The agriculturists of the country were deeply indebted to them. Those duties had been carried out in a remarkably able and zealous manner, and he should be very sorry if, in any change which took place, the administration of the Department should be varied from that which had existed so long. Mainly owing to the exertions of that Department and of those who had been at the head of it, cattle plague had been stamped out, pleuro-pneumonia (as they had just heard in the report of the Veterinary Committee) no longer existed in this country, and foot-and-mouth disease had been entirely eradicated. (Cheers.) It seemed to him that it was absolutely essential that the Veterinary Department should continue to be officered in the same manner as in the past. Mr. Dent had stated that it was no business of theirs to dictate to the Board of Agriculture what they should do; but, at the same time, he (the Duke) thought that, as practical agriculturists, they might express their opinion upon this very important subject, and in a manner which, he hoped, might reach the ears of the President of the Board of Agriculture. Professor Brown's impending retirement, under the rules of the public service, had been known to that Department since the beginning of last year, but they had not yet heard of any person being appointed as his successor. Up to the present time there had been three professional officers at the head of the Veterinary Department, organising the work, and having their time fully occupied with their public duties. Professor Brown having ceased his connection with the Board of Agriculture, the Veterinary Department was left with only two gentlemen, most eminent in their profession, Mr. Cope and Mr. Duguid, who were now doing, or attempting to do—he felt sure most conscientiously—the work which had formerly been done by three. The cattle plague in 1877 was stamped out with an expenditure of 7,000*l.* after the Veterinary Department had been established on its present footing. In the previous epidemic, when the Department was less highly organised, the "stamping out" process had cost some millions of money. It was not, therefore, a very exaggerated statement to make that, as a consequence of the Veterinary Department being equal to the task of dealing with these terrible diseases, the country had been a great gainer from a monetary point of view. He asked whether that was the time when the Veterinary Department ought to be weakened. On the contrary, he thought it ought to be strengthened. They knew at that moment, from the public prints, and from the report of the Veterinary Committee, that there was a considerable amount of swine fever in this country, and that a praiseworthy attempt was being made by the Board of Agriculture to get rid of that disease. It was also well known that, in order to arrive at a conclusion as to the best means of eradicating swine fever, an enormous quantity of post-mortem examinations were necessary. He therefore ventured to suggest that this was not the time when the Veterinary Department should be weakened. Supposing that there were only two professional gentlemen left to do the work of the Department, and that there were a sudden outbreak of disease, a breakdown of the machinery might occur, with serious consequences to the community at large. He thought that it would not be at all satisfactory to the agriculturists of this country unless to succeed Professor Brown an appointment was made without delay of a gentleman, as eminent in the veterinary profession as could be found, to occupy the position that had been filled by Professor Brown with so much credit to himself and such advantage to the country. (Hear, hear.)

Professor BROWN said he should be glad to be permitted to express his personal satisfaction at the very kind remarks which his Grace the Duke of Richmond and Gordon and Mr. Dent had made as to the Veterinary officers and the Veterinary Department. In 1878 the Duke of Richmond had reorganised the Department which then existed, and appointed himself and his colleagues, who had worked with him long before that time, and since. His colleagues would be very greatly gratified when he reported to them what he had heard that day in their favour. So far as the question of his retirement and the future arrangements of the Veterinary Department were concerned, it could not be desirable that he should say anything more than this, which he was authorised to say, viz., that the whole question of his retirement and of his future connection with the Board of Agriculture was under consideration. His chief object in rising now was to thank the Council very heartily on behalf of his colleagues and himself for the very cordial way in which they had expressed their appreciation of their services.

Stock Prizes.

Mr. SANDAY reported his election as Chairman of the year. The first-prize animal in Class 54 at the Chester Meeting (Mr. Robert Thompson's Shorthorn heifer "Margaretta Millicent") and the second-prize animal in Class 80 (Mr. Ellis's Welsh heifer "Tiny") having failed to comply with the Society's regulations as to calving, the Committee recommended that these two animals be disqualified, and the three prizes in Class 54 and the second and third prizes in Class 80 be awarded as follows:—

CLASS 54.

No. 577, First Prize of 15*l.* to Edward Ecroyd for "Armathwaite Rose" (*Second Prize*).

No. 573, Second Prize of 10*l.* to C. W. Brierley for "Rosedale Georgie" (*Third Prize*).

No. 576, Third Prize to David Cooper for "Lady Agnes" (*Reserve Number*).

CLASS 80.

No. 795, Second Prize of 10*l.* to W. E. Oakley for "Bog Myrtle" (*Third Prize*).

No. 797, Third Prize of 5*l.* to Hon. F. G. Wynn for "Glyn Agnes" (*Reserve Number*).

The following offers of champion prizes at the Cambridge Meeting had been received since the last meeting, and were recommended for acceptance :—

1. Four silver cups for the best boar or sow of the following breeds: Large White, Middle White, Small White, and Tamworth, from the National Pig-breeders' Association.
2. A prize of £10 for the best boar or sow in the Berkshire pig classes, from the British Berkshire Society.

It had also been resolved that the following new regulation be inserted in the prize-sheet with regard to mares shown in Classes 32 and 48, " not with foal at foot, but stinted in 1894 ":—

49*a*. In the case of a mare entered in Class 32 or Class 48 as having been "foaled previous to 1891, not with foal at foot, but stinted in 1894," a certificate from the owner of the stallion which has served such mare, stating that the mare has been served in 1894 before June 10, must be sent either with the form of entry or, if it cannot be sent with the entry, before the first day of the Meeting. If such certificate be not received by the Secretary before the day appointed for the judging, the mare will be disqualified from competition.

Various letters and suggestions as to the composition of the prize-sheet had been read, and their consideration postponed until the prize-sheet for 1895 was under discussion.

Judges Selection.

Mr. SANDAY (Chairman) reported that the Committee had selected a list of judges to be invited to act on the usual terms at the Cambridge Meeting in June next for the various classes of stock, poultry, produce, and implements (see p. xlii.).

Implement.

Mr. FRANKISH reported his election as Chairman of the year. The Committee recommended that trials of haymakers, tedders, and kickers—by horse-power—be held in connection with the Society's Meeting of 1895. A letter had been read from an intending competitor inquiring the definition of an oil-engine, and whether the evaporating apparatus must be an integral part of the engine, or whether it might be separate and at a distance from the engine. The Committee recommended that the inquirer be referred to Regulation 5 of the Implement Prize Sheet, and that he be informed that the use of Russoline oil implies a direct explosive engine; but that if an apparatus can be designed with separate evaporator which would compete with others having direct explosion, and using Russoline oil, it would not be excluded from competition.

General Cambridge.

Sir NIGEL KINGSCOTE presented the recommendation of the Committee that the prices of admission to the showyard on the several days of the Meeting should be as follows :—

Saturday, June 23rd, 2s. 6d.;
Monday, June 25th, 5s.;
Tuesday and Wednesday, 2s. 6d. each day;
Thursday and Friday, 1s. each day.

The Local Committee had submitted a list of typical farms for inspection by the Society's Commissioner, and the Committee recommended that a selection of the particular farms to be visited be left to the Local Committee in concert with the Secretary.

Showyard Works.

The Hon. CECIL T. PARKER reported the election of Sir Jacob Wilson as Chairman of the year. The Surveyor had reported that since the last meeting of the Committee he had paid several visits to Cambridge in connection with the preparation of the showyard. A large portion of the site had had to be drained and levelled, and a number of trees removed. These works were now nearly completed, and were being carried out by the Local Committee in a satisfactory manner. The Surveyor had submitted plans showing the distribution of the several refreshment pavilions in the Cambridge Showyard, and also plans of the various erections, which had been considered and approved. The Committee had considered and approved the form of tender for the supply of refreshments at the Cambridge Meeting. As there were some important changes in the arrangements of the sheds this year, the Committee recommended that a lithographed plan of the sheds be issued with the tender form, and that the tenders be made returnable on Monday, April 2nd. Letters had been read from Messrs. W. & T. Avery, offering to lend a cattle weigh-bridge for use in the stock-yard, and from Messrs. Pooley & Son, offering a weighing machine for the fodder-yard at Cambridge, and the Committee recommended the acceptance of these offers. Various letters from intending exhibitors at Cambridge had been read, and instructions given thereon.

Selection.

Earl CATHCART reported his election as Chairman of the year. Professor Chauveau having expressed his gratification at being elected an Honorary Member of the Society, the Society's Seal was, on the motion of Earl CATHCART, seconded by Sir NIGEL KINGSCOTE, ordered to be affixed to his Diploma.

Education.

Mr. DUGDALE reported Lord Moreton's election as Chairman for the year. The examiners in the several subjects at the Senior Examination, to be held from the 8th to the 12th May next, had been appointed. An application for a free grant of a set of the Society's Insect Diagrams had been declined.

Dairy.

The Hon. CECIL T. PARKER reported his election as Chairman of the year. Nineteen entries had been received in Class 284, for preserved butter, and the butter was now stored in a cool cellar at Cambridge to await the opening of the show. A suggestion had been offered of demonstrations of fattening and dressing poultry at the Cambridge Meeting. The Committee did not see their way to advise that anything should be done in that direction during the present year, but a note had been made of the matter for consideration in connection with the Country Meeting of 1895. Various details in connection with the dairy at Cambridge had been discussed and settled.

Suggestion at General Meeting.

The Council then proceeded to consider the following suggestion made by Surgeon Lieut.-Col. Ince, M.D., and Mr. G. D. Yeoman at the General Meeting held on December 7th, 1893:—

> That the Report of the Council to the General Meeting should be placed in the hands of members before the day fixed for the meeting—

and agreed upon the following reply:—

> This is a question which has been fully considered by the Council upon two previous occasions, viz., on March 7, 1888, and June 5, 1889. The two General Meetings of the Society to which printed reports are presented by the Council are held respectively on May 22 (the Anniversary General Meeting) and the Thursday of the Smithfield week. The Report of the Council to the May Meeting is usually prepared on the first Wednesday in May, but cannot be immediately issued, owing to the necessity for including in it details of the entries of stock, poultry, produce, &c., which have been made for the ensuing Country Meeting, and the entries for which do not close until May 12. Of recent years, however, an endeavour has been made to communicate the Report as soon as it is complete to the agricultural papers in time for publication prior to the meeting, so that members may have the opportunity of ascertaining its contents beforehand. The Report has been so published upon several occasions, and this course will in future be adopted in regard to the Anniversary Meeting whenever it is possible.
>
> The December General Meeting is in a different category altogether, and any alteration of the existing system would dislocate the whole of the Society's procedure. The Report to this meeting is only prepared by the Council on the day preceding the meeting, when also the final settlement is made of the prizes for the Country Meeting of the next year, in accordance with the Standing Orders of the Society. The various announcements as to these prizes constitute a large portion of the Report, and if the General Meeting were held at a date after the Smithfield week, the members who are chiefly interested in this Report would in all probability be absent.
>
> Copies of each Half-yearly Report are, however, always available by 11 o'clock upon the day of the meeting for the use of those members who are desirous of perusing it in anticipation of the meeting at noon.

Date of Next Meeting.

Various letters and other documents having been laid upon the table, and other business transacted, the Council adjourned until Wednesday, March 7th, at noon.

WEDNESDAY, MARCH 7, 1894.

THE DUKE OF RICHMOND AND GORDON, K.G. (TRUSTEE), IN THE CHAIR.

Present:—

Trustees.—Gen. Viscount Bridport, G.C.B., Earl Cathcart, Mr. John Dent Dent, Col. Sir Nigel Kingscote, K.C.B., Sir A. K. Macdonald, Bart., Earl of Ravensworth, the Duke of Richmond and Gordon, K.G., the Rt. Hon. Sir M. W. Ridley, Bart., M.P.

Vice-Presidents. — Mr. Chandos-Pole-Gell, Viscount Emlyn, Earl of Lathom, G.C.B., Sir J. H. Thorold, Bart.

Other Members of Council.—Mr. Alfred Ashworth, Mr. J. Bowen-Jones, Mr. Charles Clay, Mr. F. S. W. Cornwallis, M.P., Earl of Coventry, Mr. Percy E. Crutchley, Lieut.-Col. J. F. Curtis-Hayward, Mr. J. Marshall Dugdale, Mr. W. Frankish, Mr. Hugh Gorringe, Mr. Anthony Hamond, Mr. James Hornsby, Mr. Charles Howard, Mr. C. S. Mainwaring, Mr. Joseph Martin, Mr. T. H. Miller, Hon. Cecil T. Parker, Mr. Albert Pell, Mr. J. E. Ransome, Mr. G. H. Sanday, Mr. Henry Smith, Mr. E. W. Stanyforth, Mr. J. P. Terry, the Duke of Westminster, K.G., Mr. E. V. V. Wheeler, Mr. C. W. Wilson.

Professor Brown, C.B.

Officers.—Mr. Ernest Clarke, Secretary; Dr. Fream, Editor of the Journal; Dr. J. Augustus Voelcker, Consulting Chemist; Mr. Wilson Bennison, Surveyor.

The following members of the Cambridge Local Committee were also present:—The Mayor (Mr. E. H. Parker), Mr. C. F. Cunliffe Foster, Mr. G. Jonas, Rev. E. H. Morgan, Mr. J. Odell Vinter, the Town Clerk (Mr. J. E. L. Whitehead), and Mr. R. Peters (Secretary of the Local Committee).

Apologies for non-attendance were received from H.R.H. Prince Christian, K.G., Sir Jacob Wilson, Mr. J. H. Arkwright, Mr. Joseph Beach, Mr. J. A. Caird, Mr. Alfred Darby, Mr. R. A. Warren, and Mr. Charles Whitehead.

In the unavoidable absence of the President, the Duke of Richmond and Gordon (Trustee) was, in accordance with Bye-law 28, called to the chair.

The minutes of the last meeting, held on February 7, having been approved,

Death of the "Father" of the Society.

the CHAIRMAN said it was his painful duty to announce officially to the Council the death of the "Father" of the Royal Agricultural Society, Sir Harry Verney, who died on February 12 last, at the patriarchal age of ninety-two. Sir Harry had had a very remarkable career. Born in 1801, he entered the Army in 1819, and retired so long ago as 1830, having first served in the 7th Fusiliers, and afterwards in the Grenadier Guards. It was a noteworthy fact that, notwithstanding his great age, he attended the annual regimental dinner of the Grenadier Guards up to the time of his death. It was not, however, his career as a soldier that they regarded, but his associations with agriculture as a member and as the "Father" of their Society, and as one of the most respected specimens of an English country gentleman that this country had produced. Sir Harry Verney was the last survivor of those who met together at the Freemasons' Tavern on May 9, 1838, to found the English Agricultural Society. The presence at that meeting of men so varied in their views as Earl Spencer (the first President of the Society), his (the Duke's) father, who succeeded Lord Spencer in the Presidency, Lord Portman, Sir Robert Peel, Sir James Graham, Mr. Shaw-Lefevre (afterwards Viscount Eversley), Sir Harry Verney, Mr. Handley, M.P., Mr. Philip Pusey, and others, sufficiently indicated the broad and comprehensive basis upon which the new Society was established. Sir Harry Verney was a member of the original Committee, and in a sketch of Earl Spencer, which appeared in their Journal in March, 1890, Sir Harry mentioned that "as the 'Father' of the Society now that both Lord Eversley and Lord Portman are dead, I am one of the few links between the first half-century of its existence and the inauguration of what we may venture to hope will be a second period of still greater usefulness, now that the necessity of the adaptation of science to the workaday uses of the present is seen to be of vital importance to our position as a nation of the world." He (the Chairman) thought that the Council would unanimously approve of the instructions given by the President for the Council to be officially represented at the funeral by the Secretary of the Society. He (the Duke) did not think he need say anything more to commend to them the memory of Sir Harry Verney, because they were all well aware of the active part which Sir Harry had taken in his own county in all matters connected with agriculture. (Hear, hear.)

New Governors and Members.

The election of the following two Governors and sixty-eight members was then proceeded with:—

Governors.

Houghton, Lord..Crewe Hall, Crewe.
Strafford, Earl of..Wrotham Park, Barnet.

Members.

Alderson, J. R...Low Hills, Castle Eden.
Allen, F. B...Ifield, Crawley.
Ambrose, C. C...Swaffham Prior, Cambridge.
Ashford, A...Burdcrop Park, Swindon.
Atkinson, W. H...Cangort, Shinrone, King's Co.
Beddoes, T...Stottesdon, Cleobury Mortimer.
Bellamy, W...Copalder, Doddington, Cambs.
Billing, A. F...Bretby, Burton-on-Trent.
Birch, W...Sefton, Seaforth, Liverpool.
Bird, J. B...Station Road, Cambridge.
Bishop, A. W...Market Place, Cambridge.
Blencowe, A. H...R. A. College, Cirencester.
Bouser, J...Fotheringay, Oundle.
Brown, R...Walton Bank, Stone.
Burgess, W. J...Magdalen, Lynn.
Carrick, G...Leverington Hall, Wisbech.
Creasy, A...Great Bentley, Essex.
Crick, C...Priestgate, Peterborough.
Crowe, W...Hart, Castle Eden.
Dawson, W. M...Sevington, Alresford.
Dickins, T...Bushey Grove Farm, Watford.
English, A. W...Walsoken, Wisbech.
Francis, Alex...Chatteris, Cambs.
Grain, A. T...Great Shelford, Cambridge.
Grieve, W. A. M...11 Queen's Gate Terrace, S.W.
Griggs, Joseph..Loughborough.
Hardy, W...The Warren Farm, Hartlepool.
Henderson, J...Castle Eden Village, co. Durham.
Heugh, John..High Coniscliffe, Darlington.
Hull, T. R...Jericho, Ingatestone.
Hurrell, H. W...Newton, Cambridge.
Kneen, T...Glencrutchery, Isle of Man.
Lambton, Capt. the Hon. Charles..Holwell Stud Farm, Essendon, Herts.
Lane, Thomas W...Holbeach.
MacIlwaine, A. W...Stoneferry, Hull.
Maxstead, R. A...Justices, Findingfield, Essex.
Meyer, H. L...Bretby, Burton-on-Trent.
Morton, Wm...Stow Bardolph, Downham.
Moulton, C. J...Chatteris, Cambs.
Murray, T...Pesspool Hall, Haswell, co. Durham.
Parker, E. H...Benet Street, Cambridge.
Parsons, C...Horseheath, Cambridge.
Parsons, T. W...Horseheath, Cambridge.
Peacock, J. W...Hockwold, Brandon.
Peckover, Alex...Bank House, Wisbech.
Portsmouth, R...Weybrook Farm, Sherborne St. John, Basingstoke.
Prater, T. H...Aberford, Leeds.
Prodham, Henry..Sherburn, Yorks.
Reed, Colonel L...Elm, Wisbech.
Richards, T...Wimblington, March.
Robertson, R. D...Rowsham, Aylesbury.
Rowell, Alfred..Bury, Hunts.
Simpson, J. B...Hunmanby, Yorks.
Snowdon, R. W...Wingate, co. Durham.[1]
Taylor, A. H...3 Grosvenor Place, Cheltenham.
Taylor, E. S...Eye Hill House, Soham.
Todd, A. R...Denton, Harleston.
Townley, Rev. C. F...Fulbourn Manor, Cambridge.
Tyringham, R. W. G...Tyringham, Newport Pagnell.
Waite, G. H...Neap House, Doncaster.
Walker, E. H. H...Beamish Park, Chester-le-Street.
Wallis, Thomas..Witchford, Ely.
Watson, J...Stanley, Chester-le-Street.
Wert, Hy...Marmont Priory, Upwell, Wisbech.
Whittome, A...Burnt House, Whittlesea.
Wilkerson, E...Barley, Royston.
Wilkinson, T...Shirebrook, Mansfield.
Wootton, J...Denver, Downham.

The reports of the various Standing Committees were then presented and adopted as below:—

Finance.

Sir Nigel Kingscote (Chairman) reported that the accounts for the month ended February 28, 1894, as certified by the Society's Accountants, showed total receipts amounting to 665*l.* 3*s.*, and expenditure to 570*l.* 2*s.* 8*d.* The balance at the bankers' on February 28 last, allowing for cheques outstanding, was 6,504*l.* 12*s.* Accounts amounting in all to 2,811*l.* 7*s.* 4*d.* had been passed, and were recommended for payment. The Secretary had submitted to the Committee the balance-sheet for 1893, which had been ordered to be laid before the Auditors (see pp. xii. and xiii.). The Secretary had also submitted a statement of the amounts paid out of the Society's funds in connexion with the preliminary expenses for the acquisition of Harewood House, and the Committee recommended that the total amount—1,429*l.* 2*s.* 6*d.*—be debited to the ordinary Income and Expenditure Account of the Society for 1890.

House.

Sir NIGEL KINGSCOTE (Chairman) reported various recommendations from this Committee as to the redecoration and furnishing of Harewood House. A letter had been received from the Shire Horse Society accepting the Society's offer to make over to them the lease of No. 12 Hanover Square, and the Committee recommended that the details of the transfer be left in the hands of a Sub-Committee, to consist of Sir Nigel Kingscote, Sir Matthew Ridley, and the Secretary, with authority to confer with the Sub-Committee appointed by the Shire Horse Society.

Journal.

Earl CATHCART (Chairman) reported the acceptance by Mr. Robert Bruce, of Darlington, of the appointment as the Society's Commissioner to visit and report upon the selected farms in the district of the Country Meeting of 1895. A letter had been received from the Cambridge and Counties Agricultural Education Committee, stating that the back numbers of the Society's Journal had been purchased and bound, and asking if the Council would place the Committee upon the Society's free list for future numbers of the Journal as issued. The Committee recommended that this application be complied with. A letter had been read from the Société Nationale d'Agriculture de France, thanking the Society for the gift of the back numbers of its Journal, which had been forwarded to complete the set in the French Society's Library. The Committee had the pleasure to report the following donations to the Society's Library, and recommended that the best thanks of the Council be given to the donors:—

Dr. Dickson's "Farmer's Companion" (2 vols.), London, 1813; "Farmer's Calendar" (5th edition), London, 1809; and George Johnson's "History of English Gardening," London, 1829.—*Presented by Mr. Charles Whitehead.*

Heinrich von Thünen's "Systems of Culture. French translation by Jules Laverrière. Paris, 1851.—*Presented by Monsieur Jules Laverrière, Librarian of the Société Nationale d'Agriculture de France.*

A complete set of the Memoirs of the Rothamsted Experiments (9 vols.).—*Presented by the Board of Agriculture.*

The Committee recommended that in future the address of the author be printed in small type at the foot of each article, in addition to the author's signature. The Committee had discussed the final draft of the contents proposed for the next number of the Journal, and had given directions to the Editor thereon. Proofs of the portrait of Robert Bakewell and of the illustration of Bakewell's house had been submitted and approved. It was proposed that the next number should contain a short biographical notice by the Secretary of the late Sir Harry Verney, the "Father" of the Society, accompanied by a woodcut representing Sir Harry on horseback (see p. 178).

Earl CATHCART said that the Council were much indebted to the Board of Agriculture for a beautifully bound set of the complete Memoirs of the Rothamsted Experiments. It was a very graceful return for any services which the Society might have been able to render to the Board.

Chemical.

Viscount EMLYN (Chairman) reported, with regard to the experiments which had been undertaken at the Society's Experimental Farm at Woburn as to the value of linseed oil as a food for cattle, that it had been found that the oil supplied in the form of cake provided a far better food for cattle than the oil used by itself. Dr. Voelcker had reported that the number of samples sent to the Laboratory during the last quarter had been 368, as against 379 for a corresponding period in 1892–93. The experience of the last month in regard to the working of the Fertilisers and Feeding Stuffs Act had been very similar to that reported last month. Two samples had been sent which were known to have come out below the guarantee given, but no further steps appeared to have been taken in either case. In one case an order had been given for linseed cake, but when a sample was submitted the word "linseed" had been struck out of the delivery note, and the name "Dyeffkin" substituted, a label having been pasted on the note, which had printed on it, "We sell this cake as being of the usual merchantable quality of the brand named; exact composition unknown." This, of course, supplied no guarantee whatever.

On the motion of Viscount EMLYN, the Quarterly Report of the Committee was adopted, and ordered to be printed in the next number of the Society's Journal (see p. 127).

Seeds and Plant Diseases.

Mr. ASHWORTH reported that the Consulting Botanist had dealt with an inquiry as to the best means of extirpating *Colchicum*, or autumn crocus, a plant which was poisonous to cattle. Lord Moreton had mentioned that he had succeeded in considerably reducing the growth of this plant by stabbing it in the ground whilst in leaf. This plan had the effect of starving the roots and so destroying the plant. An inquiry had been received as to the presence of ergot amongst oats to be sown as seed. The Consulting Botanist had examined the seed, and had found that it contained an admixture of rye, which probably accounted for the presence of the ergot. Although ergot had not hitherto been known to attack oats, there was no reason why it should not do so, as all gramineous plants were liable to ergot, and under the circumstances it would be wiser not to sow the seed. The Committee recommended that in future it be known as the "Botanical and Zoological Committee," instead of the "Seeds and Plant Diseases Committee," as it was considered that the latter title did not adequately indicate the nature of the subjects with which it dealt

Veterinary.

Sir JOHN THOROLD (Chairman) reported that the Special Committee on Abortion in Cattle had met on the afternoon of Monday, March 5, and had examined three witnesses. A considerable number of replies had been received to the Society's circular letters of inquiry upon the subject, and these were in the hands of Professor Brown for examination and analysis. The Special Committee would again meet on Monday, April 2 next, when further witnesses would be examined. A communication had been received from the Highland and Agricultural Society of Scotland, forwarding copies of a resolution passed by the Board of Directors on the subject of the fraudulent sale of foreign meat, and suggesting that the Society should take similar action. After some discussion, it had been resolved to recommend that the following resolution of the Highland Society be adopted by the Council and forwarded to the Board of Agriculture:

> That the Council desire to urge upon the Board of Agriculture the extreme importance of taking immediate steps to prevent the sale of foreign meat in name and form of British meat, and, if necessary, of calling upon the Government to introduce such a measure as would enable the authorities to effectually put an end to this fraudulent practice.

The Examiners in Cattle Pathology for the Diploma of the Royal College of Veterinary Surgeons in 1893 had reported that the following gentlemen, placed in order of merit, were entitled to the medals offered by the Society:—

(1) Mr. H. T. Sawyer, Veterinary-Lieutenant, A.V.D., care of Veterinary-Colonel Lambert, C.B., 5, King Street, Westminster, S.W.
(2) Mr. E. T. Thorburn, Morton House, Frome, Somerset.

The Committee recommended, therefore, that the Society's large medal be given in silver to Mr. Sawyer, and in bronze to Mr. Thorburn.

Professor Brown had presented the following report:—

> PLEURO-PNEUMONIA.—No case of this disease has been discovered in Great Britain since the end of last year, but several suspected cases were reported, and 9 of the suspected cattle were slaughtered, and found

on post-mortem examination free from the disease.

SWINE FEVER.—During the first eight weeks of the present year no less than 954 pigs died from this disease in Great Britain, as compared with 738 in the corresponding period of last year. The number of swine slaughtered by order of the Board of Agriculture as diseased or having been exposed to the risk of infection since the beginning of the year has been 7,407, and, in addition to these, 124 suspected swine were slaughtered, but found free from swine fever on post-mortem examination. These cases of swine fever were distributed over forty-eight counties, viz. forty-two in England, five in Wales, and one in Scotland.

ANTHRAX.—This disease still continues to increase. There have been 117 fresh outbreaks reported in the first eight weeks of the present year, and 228 animals attacked, as compared with 71 outbreaks and 200 animals attacked in the corresponding period of last year. These fresh outbreaks were distributed over twenty-nine counties in England, three in Wales and ten in Scotland.

GLANDERS AND FARCY.—The recently published returns relating to this disease show some decrease. There have been 185 fresh outbreaks and 241 horses attacked, as compared with 247 outbreaks and 442 horses attacked in the corresponding period of last year.

RABIES.—There have been 25 cases of this disease reported in Great Britain in the eight weeks, as compared with 11 in the corresponding period of last year. These cases of the disease occurred in five counties in England and three in Scotland.

Swine Fever.

In reference to swine fever, two very important Orders have recently been issued by the Board of Agriculture, but they have only been in operation since February 18:—(1) No. 5,156—The Swine Fever (Infected Areas) Order of 1894, which is in force in those districts named in Order 5,159. The effect of this Order is to close all markets and sales of swine, except for slaughter, and then only with a licence of the local authority, and to prevent the movement of swine out of those districts named, without a licence of the receiving authority, and then only for immediate slaughter, or for some special purpose. (2) Order 5,161—Markets and Fairs (Swine Fever) Order—closes the markets for swine, except for slaughter, in those other parts of England and Wales which are not named in the Infected Areas Order (5,159), the only districts which are not under restrictions being those named in the schedule to that Order. The Markets and Fairs (Swine Fever) Order (5,161) does not apply to Scotland, as the disease appears to be mainly confined to the neighbourhood of Glasgow, around which an infected area has been declared.

A formal resolution as to the fraudulent sale of foreign meat in the terms proposed by the Veterinary Committee was moved by Sir JOHN THOROLD, seconded by Sir NIGEL KINGSCOTE, and carried unanimously.

Stock Prizes.

Mr. SANDAY (Chairman) reported that a letter had been received from Mr. Leonard Pilkington, in which he stated his inability to forward by March 1st the certificate of calving of his Ayrshire cow "Betty," to which the second prize in Class 98 at the Chester Meeting had been awarded, and the Committee therefore recommended the disqualification of the cow in question under Regulation 54, and the award of the prize to the reserve number animal, as follows:—

CLASS 98.

No. 922, Second Prize of £5 to Leonard Pilkington for "Brown Duchess" (*Reserve Number*).

Judges Selection.

Mr. SANDAY also reported that, with very few exceptions, the gentlemen nominated to act as judges of stock, &c., at Cambridge had accepted the Society's invitation, and arrangements had been made for filling up the vacancies. Letters had been read from several gentlemen who had been nominated as judges, and instructions had been given for replies thereto. The Committee recommended that the list of judges of the several classes of stock, produce, implements, &c., be published in the forthcoming number of the Journal (see p. xlii).

Implement.

Mr. FRANKISH (Chairman) reported that the firm of Easton & Anderson, Ltd., who were appointed Consulting Engineers to the Society in November, 1889, having been amalgamated with a firm of electrical engineers, under the title of Easton, Anderson, & Goolden, Limited, the Committee were of opinion that it would be more satisfactory if a definite appointment were made of one individual as the Society's Consulting Engineer, to whom all matters connected with the Society's engineering business could be referred, and who would be personally responsible for the arrangements at the Country Meetings. They accordingly recommended that Mr. F. S. Courtney, C.E., who has for a number of years had charge of the Engineer's Department at the Country Meetings, be appointed Consulting Engineer to the Society on the same terms as Messrs. Easton & Anderson.

Suggestions for regulations for the trial of haymakers and tedders in connection with the Darlington Meeting of 1895, drawn up by Mr. Courtney, had been preliminarily considered, and instructions given for them to be printed and circulated to each member of the Committee in anticipation of the next meeting.

On the motion of Mr. FRANKISH, seconded by Mr. SANDAY, it was formally resolved that Mr. F. S. Courtney, C.E., be appointed Consulting Engineer of the Society on the same terms as Messrs. Easton & Anderson, Limited, and that he hold such office during the pleasure of the Council.

General Cambridge.

Mr. DENT reported that the Corporation of Cambridge had arranged for the following cab fares to be charged between the Showyard and all the railway stations at Cambridge:—*Cabs*, &c., fare for one person, 1*s.*; for each additional person, 6*d.*: *Omnibuses*, *brakes*, &c., 6*d.* per person. The Local Committee had nominated as agents for the sale of dairy produce Messrs. Hallack & Bond, of Market Street, Cambridge. A request made by the Chairman of the Chesterton Local Board, on behalf of the residents of that place (population 8,000), for a separate entrance to the Show by way of the Victoria Bridge, which, it was represented, would be a great boon to visitors coming into Cambridge from the north side of the county, had been considered, and, under the special circumstances, the Committee recommended that this request be acceded to. Questions arising out of the closing of some of the paths running through the Showyard, which the present state of the works rendered necessary, had been discussed, and, after hearing the views of the local representatives, it had been decided to leave the matter in the hands of the Honorary Director for settlement with the Local Committee. Arrangements had been made for the holding of a service in the Showyard on Sunday, June 24, and the Bishop of Ely had kindly consented to preach the sermon. A letter had been received from the Master of Jesus College, offering to place at the disposal of the Society as many sets of rooms in the College as might be required for the stewards and chief officials during the time of the Show, and the Committee recommended that this kind offer be gratefully accepted, with the best thanks of the Society.

Footpaths across Cambridge Showyard.

The Hon. C. T. PARKER (Honorary Director) observed that whilst the Council would naturally be anxious to consult local convenience as far as possible with regard to the closing of the numerous footpaths that intersected the Showyard, yet he could not ignore the fact that it was indispensable that some at least of the paths should be closed almost immediately, and the remainder as soon as the preparations for the Show made it necessary. He must remind the Council that the question of the closing of the footpaths from March 1, 1894, was made the subject of special inquiry from the Chair when the deputation from Cambridge came before the Council in February, 1893, and definite assurances were given that there would be no difficulty in the matter, and that the Town Council were ready to take the responsibility of closing the paths at the time named. A clause to this effect was accordingly inserted in the formal agreement executed by the Corporation and the Society as to the holding of the meeting at Cambridge this year. With every desire to minimise any local inconvenience that might arise, he was bound, as responsible for the orderly management and punctual preparation of the Showyard, to say that it would not be possible to get the buildings and shedding erected in time unless some very considerable limitations were at once imposed upon the use by the public of the footpaths across the common.

It was agreed that the matter should be left in the hands of the Honorary Director, to arrange with the Local Committee in the way best calculated to meet the convenience of all parties.

Showyard Works.

The Hon. C. T. PARKER said that, owing to the regrettable and enforced absence of Sir Jacob Wilson, he had been voted to the chair at the meeting held on Tuesday. Mr. Bennison had enclosed the Showyard at Cambridge with a high fence, and completed the erection of the offices and timber-yard. The Local Committee were laying in the water mains, and had nearly completed the levelling of the yard. Promises had been received from various railway companies of the loan of sleepers to the Society free of cost for the purpose of constructing roads in the yard. The Committee recommended that the offer of Messrs. H. J. and C. Major to roof the dairy, and of the Patent Victoria Stone Company to pave the dairy, be accepted on the same conditions as at the Chester Meeting.

Selection.

Earl CATHCART (Chairman) reported the recommendations of the Committee (1) that the Earl of Jersey, of Middleton Park, Bicester, be elected a member of Council in the room of the late Mr. Allender; (2) that Mr. S. Rowlandson be elected Steward of Forage for the Darlington Meeting of 1895; (3) that the Honorary Membership of the Society be conferred on Prof. G. D. Liveing, M.A., F.R.S., Professor of Chemistry in the University of Cambridge, in recognition of his distinguished services to agriculture.

Earl CATHCART, in formally moving the election of the Earl of Jersey as a member of the Council, said it would be remembered that when he was deputed by the Council to communicate with Lord Jersey as to his retirement from the Council upon his proceeding to New South Wales as Governor of that Colony, he (Lord Cathcart) was authorised at the same time to say that they would be very happy to see him there again on his return to England. A vacancy having occurred through the lamented death of Mr. Allender, they were now in a position to ask Lord Jersey to resume his seat on the Council.

Mr. DENT seconded the motion, which was unanimously agreed to.

Election of an Honorary Member.

Earl CATHCART, in moving that Professor Liveing, of Cambridge, be elected an Honorary Member of the Society, said that Professor Liveing was a very eminent man and a very distinguished chemist, whom the Society would desire in any case to honour. As the Society was going to Cambridge this year, there might perhaps be appropriateness in his election taking place now.

Viscount EMLYN, Chairman of the Chemical Committee, seconded the motion, which was adopted unanimously, and the Society's Seal was authorised to be affixed to Prof. Liveing's diploma.

Dairy.

The Hon. C. T. PARKER (Chairman) reported that a letter, dated February 20, 1894, had been received from the Great Eastern Railway Company, stating that at a meeting of the superintendents of the various companies, held at the Railway Clearing House on January 24, 1894, it had been agreed "that the companies in whose district the Show is held will be willing to undertake the cartage to and from the Showyard of the annual Meeting of the Royal Agricultural Society of England of packages of poultry, and of produce—butter, &c.—not weighing more than 7 lb., at the rate of 3d. per package each way, on the understanding that the charge is paid by the Society." It is understood that if at any time the Showyard should be at an exceptional distance from the railway station, the amount to be charged will have to be reconsidered. Various other matters connected with the Dairy Department at the Cambridge Meeting had also been arranged.

Education Life Memberships.

Mr. PELL, in moving, pursuant to notice, "That the Education Life Memberships conferred upon the winners of first-class certificates at the Society's Senior Examination be discontinued after the present year," said that he brought forward his motion some time ago, having regard to the finances of the Society, and especially to the fact that the continuance of the present system would, as time went on, fill the Society with a number of Life Members, of whom no doubt a great many would not be connected with agriculture, but who would become a heavy charge upon the funds of the Society. The Council were aware that a resolution had been passed by the Education Committee, which had the effect of reducing these Life Memberships to five per annum. This was a step in the right direction, seeing that in 1893 no less than fourteen of these Life Memberships were conferred upon young men who were successful in the Senior Examination. They must recollect that the value to the Society of the composition money received from a young man of twenty-five to thirty years of age was considerably less than the amount received from a man of forty to fifty years of age. All these new Life Members would be men at the very opening of their career, and likely, therefore, to claim the advantages of membership for a very long time. There was another point to which he would like to draw the attention of the Council. The report made in 1888 by Sir John Thorold's Committee showed that a very large proportion of young men who attained these distinctions in agricultural examinations abandoned agriculture as a profession. It might therefore be fairly argued that these Life Members would, to a considerable degree, have nothing to do in after-life with the business and science of agriculture.

Sir NIGEL KINGSCOTE said he seconded the resolution because he really thought that the prizes offered were quite sufficient to bring about the emulation required, and if any candidate who won a prize seriously meant to carry out agriculture as his profession, he could not do better than spend his prize in paying for a Life Membership. He really did not see why the Society should go to this cost, which had become a very heavy one. He thought the sum of 55*l.*, which was at present given annually in prizes, was quite sufficient, and he therefore hoped that the Council would adopt Mr. Pell's motion.

The resolution was then put and carried *nem. dis.*

Rothamsted Jubilee Fund.

The Duke of WESTMINSTER said that it would be within the recollection of the Council that a Committee was appointed some time ago to draw up a scheme for the celebration of the Jubilee of the Rothamsted Experiments. That scheme was inaugurated by the Prince of Wales in a speech he made at a meeting which was convened by him (the Duke) at the time of his Presidency of that Society. The large sum of 700*l.* had been collected, and those present at the commemoration meeting on July 29 last would doubtless agree that the arrangements made proved satisfactory to Sir John Lawes and Sir Henry Gilbert, and to the subscribers at large. The Committee desired him as their Chairman to express thanks to the Council of the Royal Agricultural Society for their kindness in placing the Council Chamber and office facilities at the disposal of the Committee. He wished also to take the opportunity of saying how much the Committee were indebted to the very valuable—as usual—services of Mr. Clarke as Honorary Secretary to the fund, and to his staff, who gave their services most readily and efficiently. He desired to ask the permission of the Council for the records of the fund to be placed in the custody of the Society, in order that they might be available for the inspection of any subscriber to the fund.

The necessary permission was formally granted.

Country Meeting of 1895.

The SECRETARY submitted for approval the agreement proposed to be entered into between the Corporation of Darlington and the Society for the holding of the Country Meeting of 1895 at that place, and the Society's Seal was authorised to be affixed thereto.

Date of Next Meeting.

Various letters and other documents having been laid upon the table, the Council adjourned till Wednesday, April 4th, 1894, at noon.

LIST OF JUDGES

APPOINTED TO ACT FOR THE

CAMBRIDGE MEETING, JUNE 23 TO 29, 1894.

IMPLEMENTS.

Oil Engines.—*Classes* 1 & 2.

PROFESSOR D. S. CAPPER, M.A., King's College, London.
PROFESSOR EWING, M.A., Cambridge.
R. NEVILLE GRENVILLE, Butleigh Court, Glastonbury.

Spraying Machines.—*Classes* 3 & 4.

CHARLES WHITEHEAD, F.L.S., Barming House, Maidstone.

Sheep Dipping Apparatus.—*Class* 5.

J. B. ELLIS, West Barsham, Walsingham, Norfolk.
ALFRED J. SMITH, Rendlesham, Woodbridge, Suffolk.

Churns.—*Classes* 6 & 7.

PERCY E. CRUTCHLEY, Sunninghill Lodge, Ascot, Berks.
DOUGLAS A. GILCHRIST, University Extension College, Reading.

Miscellaneous Implements
Entered for Silver Medals.

CALEB BARKER, Estate Office, Shadwell, Thetford.
C. GAY ROBERTS, Colleside, Haslemere, Surrey.

HORSES.

Hunters.—*Classes* 1–7.

JOHN BLENCOWE COOKSON, Meldon Park, Morpeth.
SIR RICHARD D. GREEN PRICE, BART., The Poplars, Kingsland, Shrewsbury.

Cleveland Bays and Coach Horses, Ponies and Harness Horses and Ponies.
Classes 8 & 9; 23–26.

GEORGE ROBSON, Shires House, Easingwold, Yorks.
ROMER WILLIAMS, 58 Great Cumberland Place, W.

Hackneys.—*Classes* 10–22.

WILLIAM CASE, Tuttington, Aylsham, Norfolk.
FRANK USHER, Middlethorpe, Market Weighton, Yorks.

Shires and Agricultural.
Classes 27–37; 54.

H. G. BURKITT, Grange Hill, Bishop Auckland.
JOHN MORTON, West Rudham Hall, Swaffham, Norfolk.

Clydesdales.—*Classes* 38–42.

ROBERT CRAIG, Crondon Park, Ingatestone, Essex.
W. R. TROTTER, South Acomb, Stocksfield-on-Tyne.

Suffolks and Agricultural.
Classes 43–53; 55.

D. A. GREEN, East Donyland, Colchester, Essex.
JOHN A. HEMPSON, Erwarton Hall, Ipswich.

CATTLE.

Shorthorn.—*Classes* 56–64.

CHARLES HOWARD, Biddenham, Bedford.
T. H. HUTCHINSON, The Manor House, Catterick, Yorks.

Hereford.—*Classes* 65–71.

R. S. OLVER, Trescowe, Washaway, R.S.O., Cornwall.
JOSEPH P. TERRY, Berry Field, Aylesbury.

Devon.—*Classes* 72–77.

JOHN JACKMAN, Glanville Road, Tavistock, Devon.
HENRY SIMMONS, Bearwood Farm, Wokingham, Berks.

Sussex.—*Classes* 78–83.

PENNINGTON GORRINGE, Westham, Hastings.
ALFRED HEASMAN, Court Wick, Littlehampton.

Welsh.—*Classes* 84–88.

H. ELLIS, Tairmeibion, Bangor, North Wales.

J. W. GRIFFITHS, Penally Court, Penally, South Wales.

Red Polled.—*Classes* 89–95.

CLARE SEWELL READ, Honingham Thorpe, Norwich.

ROBERT WALKER, Altyre, Forres, N.B.

Aberdeen Angus and Galloway.

Classes 96–103.

JAMES CRANSTON, Nunwood, Dumfries, N.B.

WILLIAM ROBERTSON, Linkwood, Elgin, N.B.

Ayrshires, Kerries and Dexters.

Classes 104 *&* 105; 117–122.

ANDREW ALLAN, North Kirkland, Dalry, N.B.

ROBERT MCCLURE, Glenhazel, Kenmare, co. Kerry.

Jersey.—*Classes* 106–111.

WILLIAM ARKWRIGHT, Sutton Scarsdale, Chesterfield.

JAMES BLYTH, Wood House, Stansted, Essex.

Guernsey.—*Classes* 112–116.

W. A. GLYNN, Seagrove, Seaview, Isle of Wight.

J. W. MOSS, Feering, Kelvedon, Essex.

SHEEP.

Leicester.—*Classes* 125–128.

BENJAMIN PAINTER, Burley-on-the-Hill, Oakham.

HENRY SMITH, The Grove, Cropwell Butler, near Nottingham.

Cotswold.—*Classes* 129–132.

THOMAS BROWN, Marham Hall, Downham Market, Norfolk.

T. S. TAYLOR, Compton Abdale, R.S.O., Gloucestershire.

Lincoln.—*Classes* 133–137.

ROBERT FISHER, Leconfield, Beverley, Yorks.

J. T. NEEDHAM, Great Carlton House, Louth.

Oxford Down.—*Classes* 138–142.

J. B. ELLIS, West Barsham, Walsingham, Norfolk.

JAMES T. HOBBS, Maisey Hampton, Fairford, Gloucestershire.

Shropshire. (Rams.)

Classes 143–145.

T. A. BUTTAR, Corston, Coupar Angus, N.B.

J. E. FARMER, Felton, Ludlow, Salop.

Shropshire. (Ewes.)

Classes 146 *&* 147.

CHARLES COXON, Elford Park, Tamworth.

T. S. MINTON, Montford, Shrewsbury.

Southdown.—*Classes* 148–152.

GEORGE HAMPTON, Findon, Worthing, Sussex.

HUGH PENFOLD, Selsey, Chichester.

Hampshire Down.—*Classes* 153–157.

F. P. BROWN, Compton, Newbury.

WILLIAM NEWTON, Crowmarsh Battle, Wallingford.

Suffolk.—*Classes* 158–162.

J. W. EAGLE, The Hall, Walton-on-Naze, Colchester.

G. M. SEXTON, Stone Lodge, Ipswich.

Wensleydale.—*Classes* 163–165.

W. CARR, Langden Holme, Whitewell, Clitheroe.

T. FIRBANK KING, Edgley, Leyburn, R.S.O., Yorks.

Border Leicester and Kentish or Romney Marsh

Classes 166–168; 172 *&* 173.

THOMAS BAIN, Legars, Kelso, N.B.

J. J. BOWMAN, Netherby, Carlisle.

Somerset and Dorset Horned.

Classes 169–171.

JOHN CHICK, Compton Valence, Maiden Newton, Dorset.

JOHN FARTHING, Yarford, Kingston, Taunton.

Cheviot, Black-faced Mountain, Lonk, Herdwick and Welsh Mountain.

Clases 174–183.

JOHN INGLEBY, Austwick, Lancaster.

EDWARD NELSON, Gatesgarth, Cockermouth.

PIGS.

White.—*Classes* 184–195.

D. R. DAYBELL, Bottesford, Nottingham.
MAJOR F. A. WALKER-JONES, Queen's Park, Chester.

Berkshire and Black.
Classes 196–203.

HEBER HUMFREY, Shippon, Abingdon, Berks.
J. A. SMITH, Rise Hall, Akenham, Ipswich.

Tamworth.—*Classes* 204–207.

E. BURBIDGE, South Wraxall, Bradford-on-Avon.
C. W. TINDALL, Brocklesby Park, Lincolnshire.

POULTRY.

Classes 208–283.

W. FORRESTER ADDIE, Estate Office, Powis Castle, Welshpool.
O. E. CRESSWELL, Morney Cross, Hereford.
J. W. LUDLOW, Vauxhall Road, Birmingham.

PRODUCE.

Butter and Soft Cheese.
Classes 284–286; 292–294.

PROFESSOR T. CARROLL, Albert Farm, Glasnevin, Dublin.
CHARLES PRIDEAUX, Motcombe, Shaftesbury, Dorset.

Cheese.—*Classes* 287–291.

GEORGE ALDRIDGE, Station Road, Gloucester.
GEORGE LEWIS, Ercall Park, Wellington, Salop.

Cider and Perry.—*Classes* 295–298.

THOMAS MAYE, Totnes, Devon.

Jams and Fruits.—*Classes* 299–301.

CHARLES WHITEHEAD, F.L.S., Barming House, Maidstone.

Hives and Honey.—*Classes* 302–319.

W. B. CARR, Orpington, Kent.
F. J. CRIBB, Morton, Gainsborough.
J. M. HOOKER, 9, Beaufort Gardens, London, S.E.

COMPETITIONS.

Butter-making.

PROFESSOR T. CARROLL, Albert Farm, Glasnevin, Dublin.
CHARLES PRIDEAUX, Motcombe, Shaftesbury, Dorset.

Horse-shoeing.

HENRY G. LEPPER, M.R.C.V.S., Aylesbury.
CLEMENT STEPHENSON, F.R.C.V.S., Sandyford Villa, Newcastle-on-Tyne.

OFFICIAL REPORTER.

W. FREAM, B.Sc., LL.D., 12 Hanover Square, London, W.

CAMBRIDGE MEETING, 1894: CLOSING OF ENTRIES.

Exhibitors are reminded that the last day for entries of STOCK, POULTRY, and PRODUCE at the Cambridge Meeting is **Tuesday, May 1st, 1894.** *Post Entries* may be tendered up to Saturday, May 12th, 1894, on payment of **extra fees**; but the acceptance of such Post Entries is dependent upon space being available for them.

In applying for the necessary printed forms of Certificate, intending exhibitors are requested to state the number of the Class, and **how many entries** they wish to make in such Class, as each entry (except of Poultry) requires a separate Certificate.

The Society's Registered Telegraphic address is "PRACTICE, LONDON." Replies by telegraph cannot be sent unless paid for in advance, and cannot be guaranteed in any case.

PRINCIPAL ADDITIONS TO THE LIBRARY DURING THE YEAR 1893.

[*The name of the Donor, or the mode of acquisition, appears in Italics after the title of each work.*]

AIKMAN, C. M., Farmyard Manure: its Nature, Composition, and Treatment. 8vo. Edinburgh and London, 1892 .... *Author*

BOSWELL, Peter, The Poultry-Yard. New edition. 12mo. London, 1845. *Purchased*

CHEAL, J., Practical Fruit-Farming. 8vo. London, 1893 .... *Publishers*

Clark, B., Tracts on the Horse. 4to. London, 1829–31 .... *Purchased*

Coleman, J. Bernard, and Frank T. Addyman, Practical Agricultural Chemistry for Elementary Students. 8vo. London, 1893 .... *Publishers*

Cornevin, Ch., Des Résidus Industriels dans l'Alimentation du Bétail. 8vo. Paris, 1892 .... *Purchased*

Cunningham, W., The Growth of English Industry and Commerce. 2 vols. 8vo. Cambridge, 1890–92 .... *Purchased*

DEHÉRAIN, P. P., Annales Agronomiques. Tome XIX. 8vo. Paris, 1893. *Govt. of France*

FAWCETT, W., A Provisional List of the Indigenous and Naturalised Flowering Plants of Jamaica. 8vo. Kingston, 1893.............................. *Author*

—— An Index to Economic Products of the Vegetable Kingdom in Jamaica. 8vo. Kingston, 1891 .... *Author*

Fitzherbert. The Boke of Surueyinge. 12mo. London, 1546...... *Purchased*

Flock-Books :—

Hampshire Down Flock-Book. Vol. IV. 8vo. Salisbury, 1893 ... *Society*

Lincoln Long-Wool Sheep Breeders' Flock-Book. Vol. I. 8vo. Lincoln, 1892 .... *Society*

Oxford Down Flock-Book. Vol. V. 8vo. London, 1893 .... *Society*

Suffolk Sheep Flock-Book. Vol. VII. 8vo. Bury St. Edmunds, 1893. *Society*

Wensleydale Blue-Faced Sheep Flock-Book. Vol. IV. 8vo. Hawes, 1893. *Society*

Wensleydale Long-Wool Sheep Flock-Book. Vol. IV. 8vo. Bedale, 1893. *Society*

Frank, Dr. A. B., und Dr. P. Sorauer. Pflanzenschutz. Anleitung für den praktischen Landwirt zur Erkennung und Bekämpfung der Beschädigungen der Kulturpflanzen. 8vo. Berlin, 1892 .... *Purchased*

Fresenius, Dr. C., Zeitschrift für analytische Chemie. Jahrgang 32. 8vo. Wiesbaden, 1893 .... *Purchased*

GARNIER, R. M., History of the English Landed Interest: its Customs, Laws, and Agriculture. (Modern Period.) 8vo. London, 1893......... *Author*

Gasquet, F. A., The Great Pestilence (A.D. 1348–49), now commonly known as the Black Death. 8vo. London, 1893 .... *Publisher*

Gibson, H., The History and Present State of the Sheep-Breeding Industry in the Argentine Republic. 8vo. Buenos Aires, 1893 .... *Author*

Grandeau, L., Etudes Agronomiques. Tome VI. 8vo. Paris, 1892. *Purchased*

—— L'Alimentation de l'Homme et des Animaux domestiques. 8vo. Paris, 1893 .... *Purchased*

Griffiths, May, A Primer on the Science and Art of Butter-Making, &c. 8vo. London, 1892 .... *Author*

Harleston Farmers' Club, 1838–49, Reports of the. 8vo. London, 1850. *Purchased*

Harley, Wm., The Harleian Dairy System. 8vo. London, 1879 ... *Purchased*

Hawes on Agriculture. 8vo. London, 1783 .... *Mr. Charles Whitehead*

Herd-Books:—

British Berkshire Herd-Book. Vol. IX. 8vo. Salisbury, 1893 ...... *Society*

Coates's Herd-Book. New Series. Vol. XXXIX. 8vo. London, 1893. *Society*

Davy's Devon Herd-Book. Vol. XVI. 8vo. Exeter, 1893 .... *Society*

Galloway Herd-Book. Vol. XIII. 8vo. Dumfries, 1893 .... *Society*

Herd-Book of Hereford Cattle. Vol. XXIV. 8vo. Hereford, 1893... *Society*

Kerry and Dexter Herd-Book. Vols. I.–III. Part 1. 8vo. Dublin, 1890–92. *Royal Dublin Society*

National Pig Breeders' Association Herd-Book. Vols. I.–VIII. 8vo. St. Ives and London, 1885–92 .... *Association*

North Wales Black Cattle Herd-Book. Vol. V. 8vo. Bangor, 1893... *Society*

Polled Herd-Book (Aberdeen-Angus). Vol. XVII. 8vo. Banff, 1893... *Society*

Red Polled Herd-Book. Vol. IX. 8vo. Norwich, 1892 .... *Society*

South Devon Herd-Book. Vol. III. 8vo. Exeter, 1893........ *Society*

Sussex Herd-Book. Vol. VIII. 8vo. London, 1893 .... *Society*

Institut Pasteur, Annales (set of). 8vo. Paris, 1887–1891 ...... *Purchased*

Johnston's Elements of Agricultural Chemistry. By Sir Chas. A. Cameron and C. M. Aikman. 7th edition. 8vo. London, 1894 ...... *Publishers*

Koch, A., Encyklopädie der gesammten Thierheilkunde und Thierzucht, &c. Band 1.–XI. 8vo. Wien und Leipzig, 1885–94........ *Purchased*

Lavalard, E., Le Cheval dans ses rapports avec l'Economie Rurale et les Industries de transport. Tome II. 8vo. Paris, 1894 .... *Purchased*

Lawes, Sir John B., and Gilbert, Sir J. Henry, Memoranda of Origin, Plan, and Results of Field and other Experiments at Rothamsted, Herts. Royal 8vo. London, 1893 .... *Authors*

Lefevre, Rt. Hon. G. Shaw, M.P., Agrarian Tenures. 8vo. London, 1893. *Publishers*

Long, Jas., The Dairy Farm. 2nd edition. 8vo. London, 1889... *Purchased*

Mayet, P., Agricultural Insurance in Organic Connection with Savings Banks, Land Credit, and the Commutation of Debts. Translated from the German by the Rev. Arthur Lloyd. 8vo. London, 1893...... *Publishers*

Mechi, Alderman, How to Farm Profitably. 8vo. London, 1859. *Mr. W. W. Whitaker*

Norfolk Farmer, The Practical. 8vo. Norwich, 1813 .... *Purchased*

Ormerod, Miss E. A., Sixteenth Annual Report of Observations of Injurious Insects. 8vo. London, 1893 .... *Author*

Parliamentary Papers:—

Agricultural Produce Statistics of Great Britain for 1892. 8vo. London, 1893 .... *Board of Agriculture*

Agricultural Returns. Statistical Tables showing Acreage under Crops and Grass, and the Number of Horses, Cattle, Sheep, and Pigs in the United Kingdom, with Particulars for each County of Great Britain, 1893. 8vo. London, 1893 ....*Board of Agric.*
Agricultural Statistics of Ireland for 1892. Fol. Dublin, 1893. *Registrar-General for Ireland*
Army Veterinary Department, Annual Statistical and General Reports of the, for 1893. Fol. London, 1893 ....*Dept.*
Board of Trade Journal. Vols. XIV., XV. 8vo. London, 1893. *Board of Trade*
Cattle affected with Pleuro-Pneumonia, Papers and Correspondence relating to the. 8vo. London, 1893................................*Board of Agric.*
Census of England and Wales (1891). Complete ....*Purchased*
Corn Sales, Report from the Select Committee on. Fol. London, 1893. *Purchased.*
Field Voles (Scotland). Report of Departmental Committee. Fol. London, 1893..*Purchased*.
Foreign Meat, Marking of, Report of House of Lords Committee. Fol. London, 1893..*Purchased*
Insects and Fungi Injurious to Crops, Report on. 1892. 8vo. London, 1893...... ....*Board of Agric.*
Irish Agricultural Production for 1887–93, Returns of. Fol. Dublin, 1893. *Registrar-General for Ireland*
National Education in Ireland for the Year 1891. Appendix to the Fifty-eighth Report of the Commissioners of. Fol. London, 1892. *Com.*
Potato Disease, Report on further Experiments in Checking, in the United Kingdom and Abroad. 1893. 8vo. London, 1893...*Board of Agric.*
Royal Commission on Labour (The Agricultural Labourer). Fol. London, 1893 ....*Purchased*
Statistical Abstract for the Principal and other Foreign Countries in each Year from 1881 to 1890–91. 8vo. London, 1893......*Board of Trade*
Statistical Abstract for the several Colonial and other Possessions of the United Kingdom in each Year from 1878–92. 8vo. London, 1893. *Board of Trade*
Trade and Navigation, Accounts for 1893. 8vo. London, 1893. *Board of Trade*
Trade of the United Kingdom with Foreign Countries and British Possessions for 1892, Annual Statement of. Fol. London, 1893. *Board of Trade*

Pennetier, Dr. G., Histoire Naturelle Agricole du Gros et Petit Bétail. 8vo. Paris, 1893 ....*Author*

Riley, C. V., Insect Life. Vol. V. 8vo. Washington, 1893...*U.S. Sec. Agric.*

Scot, Reynolde. A Perfite platforme of a Hoppe Garden, &c. 4to. London, 1576 ....*Mr. Charles Whitehead*
Seebohm, F., The English Village Community, An Essay in Economic History. 8vo. London, 1883 ....*Purchased*
Semler, H., Die tropische Agrikultur. Band IV. 2te Hälfte. 8vo. Wismar, 1893..*Purchased*
Serres, Olivier de, Le Théâtre d'Agriculture. 2 vols. 4to. Paris, 1804–1805 *Soc. Nat. d'Agr. de France*
Sheldon, Prof. J. P., Practical Dairy Farming. 8vo. London, 1893. *Publishers*
Sidney, S., The Book of the Horse. 4to. London, N.D. ....*Purchased*
Sillett, John, A New Practical System of Fork and Spade Husbandry. 8vo. London, 1850 ....*Mr. W. W. Whitaker*
Steele, Jas., An Essay on Manufacturing Milk into Butter and Cheese: and on Calf-Feeding, &c. 2nd Edition. 8vo. Edinburgh, 1802. *Purchased*

Stephens, Henry, The Yester Deep Land-Culture. 8vo. Edinburgh and London, 1855 .... *Purchased*

Stud-Books:—

Cleveland Bay Stud-Book. Vol. IX. 8vo. York, 1893 .... *Society*
Clydesdale Stud-Book. Vol. XV. 8vo. Glasgow, 1893 .... *Society*
Hackney Stud-Book. Stallions and Mares. Vol. X. 8vo. London, 1893. *Society*
Hunters' Improvement Society. Vol. V. Record of Mares and Sires. 8vo. London, 1894 .... *Society*
Shire Horse Stud-Book. Vol. XIV. 8vo. London, 1893 .... *Society*
Suffolk Stud-Book. Vol. VIII. 8vo. Diss, 1893 .... *Society*
Yorkshire Coach-Horse Stud-Book of Great Britain and Ireland. Vol. V. 8vo. York, 1893 .... *Society*

Symons, G. J., On the Distribution of Rain over the British Isles during the Year 1891. 8vo. London, 1891 .... *Author*

THORNTON'S Circular. Vol. XIII. No. 102. 8vo. London, 1892. *Mr. John Thornton*
Tresca, Alf., Le Matériel Agricole Moderne. Tome I. 8vo. Paris, 1893. *Purchased*
Tusser, Thomas, Five Hundred Points of Good Husbandry. 4to. London, 1614 .... *Mr. E. W. Stanyforth*

ULLMANN, Dr. M., Kalk und Mergel. 8vo. Berlin, 1893 .... *Purchased*

VETERINARIAN. Vol. LXVI. 8vo. London, 1893 .... *Editor*
Veterinary Journal. Vols. XXXVI., XXXVII. 8vo. London, 1893 ... *Editor*
Veterinary Record for 1893. 4to. London, 1893 .... *Editor*
Voelcker, Dr. J. A., Report on the Improvement of Indian Agriculture. 8vo. London, 1893 .... *Author*

WALLACE, R., Farm Live Stock of Great Britain. 3rd Ed. 8vo. London, 1893. *Publishers*
Watt, G., A Dictionary of the Economic Products of India. Vol. VI. Parts 1–4. 8vo. London and Calcutta, 1892–93 .... *India Office*
Wilson, John, British Farming. 8vo. Edinburgh, 1862 .... *Purchased*

YOUATT, W., The Complete Grazier. 13th Ed. Rewritten and Enlarged by Dr. W. Fream. 8vo. London, 1893 .... *Author*

The Society is indebted to numerous Government Departments, both at home and abroad, to Boards of Agriculture, Agricultural Societies, and kindred institutions, for copies of their Annual Reports, Journals, Proceedings, Transactions, Bulletins, and other documents received regularly for the Library, in exchange for copies of the Journal: also to the Editors of many agricultural and general papers for the current numbers of their publications, which have been placed in the Reading Room for reference.

ROYAL AGRICULTURAL SOCIETY OF ENGLAND.

Proceedings of the Council.

WEDNESDAY, APRIL 4, 1894.

THE DUKE OF DEVONSHIRE, K.G. (PRESIDENT), IN THE CHAIR.

Present:—

Trustees. — Earl Cathcart, Lord Egerton of Tatton, Col. Sir Nigel Kingscote, K.C.B., Sir A. K. Macdonald, Bart., Earl of Ravensworth.

Vice-Presidents.—Viscount Emlyn, Earl of Feversham, Sir Walter Gilbey, Bart, Earl of Lathom, G.C.B.

Other Members of Council.—Mr. J. H. Arkwright, Mr. Joseph Beach, Mr. J. Bowen-Jones, Mr. J. A. Caird, Mr. Charles Clay, Mr. F. S. W. Cornwallis, M.P., Mr. Percy E. Crutchley, Lieut.-Col. J. F. Curtis-Hayward, Mr. Alfred E. W. Darby, Mr. J. Marshall Dugdale, Mr. W. Frankish, Mr. R. Neville Grenville, Mr. Anthony Hamond, Mr. Charles Howard, Earl of Jersey, Mr. Joseph Martin, Mr. T. H. Miller, Mr. P. A. Muntz, M.P., Hon. Cecil T. Parker, Mr. Albert Pell, Mr. J. E. Ransome, Mr. S. Rowlandson, Mr. G. H. Sanday, Mr. W. T. Scarth, Mr. Henry Smith, Sir J. L. E. Spearman, Bart., Mr. E. W. Stanyforth, Mr. R. A. Warren.

Professor Brown, C.B.

Officers.—Mr. Ernest Clarke, Secretary; Dr. Fream, Editor of the Journal; Dr. J. Augustus Voelcker, Consulting Chemist; Professor J. B. Simonds, Consulting Veterinary Surgeon; Mr. Cecil Warburton, Zoologist; Mr. Wilson Bennison, Surveyor.

The following members of the Cambridge Local Committee were also present:—The Mayor (Mr. E. H. Parker), Mr. C. F. Cunliffe Foster, Mr. G. Jonas, Rev. E. H. Morgan, Mr. J. Odell Vinter, and Mr. R. Peters (Secretary of the Local Committee).

Apologies for non-attendance were received from the Earl of Coventry, General Viscount Bridport, G.C.B., Sir J. H. Thorold, Bart., Sir Jacob Wilson, Mr. Alfred Ashworth, Mr. Dent, Mr. Hornsby, Mr. Rawlence, Mr. Martin J. Sutton, Mr. J. P. Terry, and Mr. Charles Whitehead.

New Governors and Members.

The minutes of the last monthly meeting of the Council, held on March 7, having been approved, the election of the following three Governors and forty-six members was then proceeded with:—

Governors.

BUTE, Marquis of..Mount Stewart, Rothesay.
COVENTRY, Earl of..Croome Court, Severn Stoke, Worcestershire.
JERSEY, Earl of, G.C.M.G...Middleton Park, Bicester.

Members.

BATTINSON, G...2, Copthall Buildings, E.C.
BELLYSE, E. R...Stapeley, Nantwich.
BLAKE, C. F. S...Shanklin Towers, I.W.
BROUGHALL, Wm...Oldington, Bridgnorth.
COCK, I...Westwick Hall, Cambridge.
COLLIS, A. H...Gt. Brington, Northampton.
DANIEL, Lieut.-Col. W. H...Whytings, Nuthurst, Horsham.
DARLING, R...Hart, Castle Eden.
DAVIES, A...Clun Mills, Salop.
DIMOCK, E...Denney Abbey, Waterbeach, Cambridge.
EVANS, E. W. D...Camnantissa, Llandyssil, Cardigan.
FEW, E...Willingham, Cambridgeshire.
FYSON, S...Stoneleigh House, Warboys, Hunts.
GIBBS, G. H...Ablington Manor, Fairford.
GLENDAY, A...Sutton Coldfield, Warwick.
GRADWELL, R. A...Dowth Hall, Drogheda.
HEADLAM, Rev. A. W...St. Oswald's Vicarage, Durham.

HERBERT, E. A. F. W...Upper Helmsley Hall, York.
KING, H...Gt. Chesterford, Saffron Walden.
KITSON, R. P...Kingston, Jamaica.
LALOR, A. D...Highworth, Wilts.
LAMBERT, F. D...Moor Hall, Cookham, Berks.
MCGREGOR, G. D...Winstanley, Wigan.
MARCHANT, R. C...18, Westfield Park, Redland, Bristol.
MILBOURNE, J. S...Radcot Ho., Faringdon.
MOORSOM, E. R. H...Thwaite Hall, Erpingham, Norfolk.
NOCK, B. B...Horsehills, Wolverhampton.
PAGET, L. C...Ammerdown, Radstock, Bath.
PEACOCK, T...Littleport, Ely.
PETO, H...Eversholt, Woburn.
PIERSON, Rev. K. T...Little Fransham Rectory, Norfolk.
POWER, M. K. M...Aston Court, Ross, Herefordshire.
RADCLIFFE, W. P...Hurdlestown, Kells, co. Meath.
READWIN, W. H...Foxley, East Dereham.
SACKVILLE, S. G. Stopford..Drayton House, Thrapston.
SAVILL, J. H...Boleyns, Bocking, Braintree.
SMITH, Wm...Potton, Beds.
TURNER, D...Gt. Brington, Northampton.
VEREKER, Captain J. M...Sutton Park, Sandy.
WALPOLE, W. T...Beyton, Bury St. Edmunds.
WELBY, W. E...Fotheringhay, Oundle.
WHITEHEAD, J. E. L...Cambridge.
WOODDISSE, Wm...Ashbourne, Derby
WRIGHT, Chas., jun...Elford Farm, Stretham Ferry, Cambs.
WYKES, J. W...Little Brington, Northampton.
YARROW, J...Teversham Hall, Cambridge.

Sir NIGEL KINGSCOTE, in announcing the names of two gentlemen who had been duly nominated for election as Governors at the next meeting of the Council, said it was very desirable that the number of Governors of the Society should be increased, and he hoped that Members of Council would kindly use their influence in their respective districts to induce other noblemen and gentlemen to become Governors.

The reports of the various Standing Committees were then presented and adopted as below:—

Finance.

Sir NIGEL KINGSCOTE (Chairman) reported that the accounts for the month ended March 31, 1894, as certified by the Society's accountants, showed total receipts amounting to 3,023*l.* 12*s.* 4*d.*, and expenditure to 2,814*l.* 2*s.* 9*d.* The balance at the bankers' on March 31, 1894, allowing for cheques outstanding, was 6,714*l.* 1*s.* 3*d.* Accounts amounting in all to 3,528*l.* 4*s.* 10*d.* had been passed, and were recommended for payment. The quarterly statement of subscriptions, arrears, and property to March 31, 1894, had been laid upon the table. The Committee recommended that implement exhibitors be placed on the same footing as stock exhibitors as to the privilege of exhibiting as members at the Cambridge Meeting, viz. that they must have paid at least two annual subscriptions as members of the Society, including the subscription for 1894; or (if new members) must have paid the subscription for the current year and for a year in advance.

House.

Sir NIGEL KINGSCOTE (Chairman) reported various recommendations as to suggested alterations and improvements in Harewood House. The Committee had considered the question of the seating accommodation in the new Council Chamber, and had given directions for the necessary tables and settees to be put in hand forthwith.

Journal.

Earl CATHCART (Chairman) laid upon the table copies of Part 1 of Vol. V. of the Journal, which was in course of issue to members. Various accounts in connection with the number had been passed, and were recommended for payment. An application from Mr. C. F. Archibald for 150 extra copies of his article on Wild Birds had been granted on the usual conditions. An application from the Ontario Department of Agriculture for an exchange of publications had been acceded to, but another application had been declined. The Committee had the pleasure to report the following donations to the Society's library, and they recommended that the thanks of the Council be given to the donors:—

Stephen Switzer's "Practical Fruit Gardener," London, 1763: and William Ellis's "Practical Farmer, or the Hertfordshire Husbandman," London, 1759.—*Presented by Mr. Charles Whitehead.*

"Eloge of M. Drouyn de Lhuys, First President of the Société des Agriculteurs de France."—*Presented by Monsieur Paul Blanchemain.*

Sheldon's "British Dairying" and the "Future of British Agriculture."—*Presented by Prof. Sheldon.*

They also reported the purchase for

the library of a French edition of Columella's works, published in 1556, and of a brochure by the late Mr. Wren Hoskyns on the History and Characteristics of Land Tenure in England. The arrangements proposed for the next number of the Journal had been discussed, together with a variety of suggestions for Articles and Notes, and instructions thereon had been given to the Editor.

Earl CATHCART said that he was happy to notice present the Earl of Jersey, who had now resumed his seat upon the Council, which he vacated on his appointment to the Governorship of New South Wales. He hoped that Lord Jersey would also resume his membership of the Journal Committee, and he therefore formally proposed that Lord Jersey should be added to the Committee.

Chemical.

Viscount EMLYN (Chairman) said that the Committee had carefully considered the arrangements for the future conduct of business in the Chemical Department, and had agreed upon the following report:—

Report of the Chemical Committee as to the Chemical Department.

At their first meeting held after the passing of the Fertilisers and Feeding Stuffs Act of last year, the Chemical Committee reported "That they considered it very desirable that the work of the Chemical Committee and Dr. Voelcker's position as Consulting Chemist of the Society should be reconsidered" (Journal, Vol. IV., 1893, page clxxx); and they have since given the matter careful attention.

2. In view of the fact that in a considerable number of counties the county councils have decided to charge upon the local rates a substantial part of the fees payable to district agricultural analysts for analyses performed under the Act (thus reducing the fees payable by the purchaser to a lower rate than those chargeable to members of the Royal Agricultural Society for analyses performed by the Society's Chemist), the Committee cannot avoid the conclusion that the number of samples sent to the Society for analysis may tend in the future to diminish, though this result has not, it is true, yet occurred, perhaps on account of the short length of time the Act has been in operation.

3. Whether this should prove so or not, however, the original object of the Society in securing the establishment of a ready and convenient means by which farmers may check the quality of the goods supplied to them has now been realised; and it must remain with members of the Society to decide for themselves the precise method of obtaining the analyses of fertilisers and feeding-stuffs which they may require.

4. The Committee are of opinion that the fees charged to members for analyses made by the Society's Consulting Chemist are not susceptible of further reduction, without making an increased demand upon the Society's general funds, which they do not consider justified by the circumstances; and it is obvious that the Society could not enter upon a competition with county councils (who have the local rates at their command) by reducing the fees to the lowest point which a county council may consider should be charged to the purchaser.

5. At the same time, the Committee think that the superior advantages of case and facility in members obtaining analyses under the Society's regulations may, in a great many cases, counteract the comparative cheapness of the analyses performed by district agricultural analysts under the necessary restrictions and formalities of the Act of 1893; and they do not therefore propose any limitations or alterations whatever in the chemical privileges now enjoyed by members.

6. The particular machinery employed in carrying out these analyses seems, however, to the Committee to be disproportionately expensive in view of the altered circumstances, and it does not appear to them to be now necessary that a separate laboratory with a separate staff should be maintained on the Society's own premises.

7. If the head of the Society's Chemical Department were engaged solely in scientific investigations and abstruse researches, there might be undoubted advantages in his laboratory being under the Society's own roof; but it is of the essence of his duties that he should be in touch with the trade in fertilisers and feeding-stuffs, as he must be competent to advise members as to values and guarantees and details of every kind respecting purchases and sales. Dr. Voelcker's time can be claimed by the Society only four hours a day for five days in the week. His absence at other times makes necessary an assistant in charge; and there is waste of power in other directions, because the Society's work falls chiefly in the spring, and a trained staff has to be kept comparatively unemployed during certain months of the year in order to be ready to cope with the work when it gets heavy.

8. It happens that Dr. Voelcker has recently moved into new premises for his business laboratory at 22, Tudor Street, Blackfriars, E.C. He has one floor now quite unoccupied, which would give fully as much accommodation as the Society's Laboratory, and attached to this is a private room that Dr. Voelcker could set apart for Society purposes.

9. The convenience to him of not having to go to two offices every day would be so great that he is willing to devote this floor to the Society's work, free of any charge for rent and gas, if the Society will let him have the fittings now in the Hanover Square Laboratory (useless for any other purpose) to fit it up with. His personal attendance in one place throughout the day will obviate the necessity for a person of the rank and pay of senior assistant, who could be replaced by an ordinary assistant; and, by greater economy in administration, Dr. Voelcker sees his way to save the Society another £100 in salaries and wages.

10. It can hardly be contended that there is any advantage in the actual details of analysis being performed at Hanover Square, partly under Dr. Voelcker's personal supervision and partly under that of an assistant, over their being performed always under Dr. Voelcker's eye at a laboratory elsewhere. Nor does there appear any more reason why Dr. Voelcker should give daily attendance at the Society's own offices than that the other Consulting Officers should do so. Dr. Voelcker's official correspondence might be dated from the Society's offices; he would attend there whenever required, by appointment, and at all the meetings of the Chemical Committee.

11. Should any very large decrease take place in the number of samples sent to the Society, the general question of the Chemical Department must of course be reconsidered, but it appears to the Committee to be desirable that a considerable portion of the time of a skilled analyst should be always at the disposal of the Society, and, if his time be not occupied with individual analyses for members, it should be devoted to research. The experiments which the Society is conducting at Woburn deserve more attention from a chemical-research point of view than Dr. Voelcker has, with the many calls upon his time, and with a limited staff, been heretofore able to devote to them; and the Committee think that the money which it has been hitherto necessary to expend in maintaining a separate establishment, with its attendant charges, and which will be saved under the proposed new arrangement, might with greater advantage to the general interests of the Society be employed by the engagement of a skilled assistant (at a remuneration of some £150 per annum) whose time should be wholly devoted to special work and researches, and who should not be employed in routine work at all.

12. If these proposals be accepted by the Council, the Committee suggest that, as from June 30 next, the allowance of £550 a year contemplated by Sir John Thorold's Committee of 1888 as the amount chargeable for assistance in the Chemical Department should be paid direct to Dr. Voelcker, in addition to his salary, on the understanding that for this amount he will defray all expenses for assistants, chemicals, and the like, necessary for the analyses required by members of the Society, and that he will, out of this sum, set apart £150 per annum for the remuneration of a skilled assistant to be engaged solely in research and special work for the Society.

13. Adding £50 for printing and incidental expenses, to be defrayed by the Society, the gross cost of the Chemical Department would amount to £1,300 annually, against which would rank all the fees received by the Society for the analyses (average £700 per annum), leaving the net charge of the Chemical Department in all its branches at £600 a year, the figure reported to Sir John Thorold's Committee in 1888.

(Signed) EMLYN, Chairman.

April 3, 1894.

This report was adopted, and the details as to the transference of the Laboratory were left in the hands of the Chairman for settlement.

Woburn Sheep-feeding Experiments.

Viscount EMLYN also reported that the Chemical Committee had received from the Woburn Sub-Committee a report by Dr. Voelcker as to the results of the sheep-feeding experiments conducted during the past winter. The detailed account of the experiments would be published in the Journal, but the following summary of them would be of interest:—

In consequence of short crops of roots and hay in 1893, it was considered desirable to institute experiments to ascertain how economy in the use of these foods could be pursued, and, chiefly, whether by feeding sheep on roots, with larger supplies of cake and corn, they could be profitably got fit for the butcher earlier with economy of roots, and also whether hay chaff as additional food could be well dispensed with.

Three pens, each containing twenty sheep, were put on roots on November 30, 1893. The original cost per head of the sheep was 37*s.*

Pen I. was fed with linseed cake and barley in equal proportions, up to 2 lb. per head daily of the mixture; Pen II. with the same food but up to 1 lb. only per head daily of the mixture; while Pen III. had the same quantity as Pen II., but with ½ lb. of hay chaff in addition.

Pen I. was fit for the butcher in eighty days; the cost of the feeding, including roots, was 8*s.* 11*d.* per head, and the price realised was 48*s.* each, showing a net profit of 2*s.* 1*d.* per head.

Pens II. and III. were ready for killing after 108 days, or twenty-eight days later than Pen I.

In Pen II. the cost of food was 9*s.* 7*d.* per head, the price realised 50*s.* 4*d.* each, and the net gain 3*s.* 9*d.* per head. In Pen III. the cost of food was 10*s.* 11*d.* per head, the price realised 52*s.* 6*d.* each, and the net gain per head 4*s.* 7*d.*

These results show—

1. That no economy results from feeding with a large quantity of cake and meal for a shorter period, as compared with steady ordinary feeding for a longer period.

2. That the addition to the diet of a small quantity of hay chaff is attended with profit.

Botanical and Zoological.

Mr. ARKWRIGHT reported that a note had been read from Dr. Voelcker as to certain analyses of soils which he had made in connexion with the inquiry into finger-and-toe in turnips. The Committee recommended that Dr. Voelcker be requested to prepare a report for an early number of the Journal, giving a digest of the information contained in the replies to the Society's circular letter of questions, and the results of the analyses of soils which he had made (see page 318).

Mr. Carruthers reported that his experiments on the botanical side of the inquiry were still proceeding; and it was hoped that the results would be ready in time for publication with the report to be prepared by Dr. Voelcker (see page lxx).

Finger-and-toe in Turnips.

Mr. ARKWRIGHT added that Dr. Voelcker had ascertained, from the analyses that he had made and the replies received, that where finger-and-toe occurred it was co-existent with a deficiency of lime in the soil; but that soils containing an abundance of lime did not appear to be affected by the disease. Dr. Voelcker suggested that any future experiments should be in the direction of trying to see whether any direct application of manures or chemicals would prevent the fungus appearing, or destroy it after it had appeared, and in the direction of ascertaining whether it was possible or impossible to infect with the disease soils which were *not* deficient in lime, and in which finger-and-toe was never known to exist.

Veterinary.

Mr. STANYFORTH reported that a letter had been read from Mr. Cope tendering his resignation as a member of the Veterinary Committee. It had been resolved that Mr. Cope's resignation be accepted, with regret, together with an expression of appreciation for his past services as a member of the Committee. A letter, dated March 16, 1894, had been read from the Central Chamber of Agriculture inviting the Society to send representatives upon a deputation to the President of the Board of Agriculture to ask that live animals should only be allowed to be imported, subject, except under very special conditions, to the invariable rule of slaughter at the port of landing. The date of the deputation having been fixed for Tuesday, April 3, it had not been possible for a decision to be arrived at by the Council as to whether the Society should be officially represented upon the occasion referred to; but the Council had already taken action in the direction desired by their resolution of February 1, 1893,[1] which had been duly communicated to the Board of Agriculture.

A second meeting of the Special Committee on Abortion in Cows had been held on the previous afternoon, when evidence had been taken from three further witnesses. The Special Committee had suggested that a leaflet should be circulated forthwith amongst stockowners recommending the preventive treatment against epizootic abortion, which had been successfully practised by Professor Nocard, of Alfort, France, and requesting particulars of the results of the treatment from those who adopted it. It was proposed that, when the owner so desired, arrangements should be made for a veterinary surgeon to visit the farm at the cost of the Society, and to advise as to the preparation and application of the solution. The Committee recommended that the suggestion of the Special Committee should be adopted, and that a copy of the proposed leaflet should be sent with each member's copy of the new Journal, now in process of distribution. The resignation had been received of Mr. Lewis Rees as the Society's Provincial Veterinary Surgeon for Carmarthenshire, in consequence of his proceeding to Brecon, Mr. Rees at the same time applying for the vacant post of Provincial Veterinary Surgeon for Breconshire. The Committee recommended that Mr. Lewis Rees be appointed to this post, to hold office during the pleasure of the Council. An application was also received from Mr. Charles Morgan, M.R.C.V.S., applying for the post of Provincial Veterinary Surgeon for the county of Carmarthen, in succession to Mr. Rees, resigned, and the Committee recommended that he be appointed on the usual conditions.

The Committee recommended the appointment of Mr. Clement Stephenson, F.R.C.V.S., as Lecturer on Horse Shoeing at the Cambridge Meeting, on the same terms as last year.

The following report had been presented by Professor Brown :—

PLEURO-PNEUMONIA.—During the four weeks ended March 24, according to the returns published in the *London Gazette*, no case of this disease was discovered in Great

[1] Journal. Vol. IV., Part I., 1893, p. xxxi.

Britain, but four suspected animals were slaughtered and found on post-mortem examination to be free from the disease.

SWINE FEVER.—Up to the present time there appears to be no decrease in the number of pigs dying of swine fever or slaughtered as being diseased or having been exposed to the risk of infection. According to the *Gazette* returns, 758 pigs died of swine fever in the four weeks, 5,549 were slaughtered either as diseased or in-contact animals, and 68 suspected swine were slaughtered, but found on post-mortem to be free from swine fever.

ANTHRAX.—From the recently published returns, anthrax still maintains its higher rate of prevalence this year as compared with previous years. There were 57 fresh outbreaks in four weeks, and 99 animals attacked, as compared with 34 outbreaks and 62 animals attacked in 1893, and 19 outbreaks and 28 animals attacked in 1892.

GLANDERS (INCLUDING FARCY).—The returns relating to these still continue below the average of the past two or three years. There have been 79 fresh outbreaks this year in the four weeks, and 104 horses attacked, as compared with 107 outbreaks and 177 horses attacked in the corresponding period of last year.

RABIES.—There have been nine cases of this disease reported in four weeks in the counties of Cornwall, Lancaster, York (W.R.), and Lanark.

Abortion in Cattle.

Colonel CURTIS-HAYWARD said he was unfortunately unable to be present at the meeting of the Special Committee on Abortion in Cattle last Monday, but he suggested that before the leaflet was issued the Society should make an addition to it. They would be recognising, by the issue of that leaflet, that there was a presumption in favour of the disease being infectious, while apparently it suggested no precautions to be taken in regard to the aborted fœtus. In his part of the country it was the practice to put the fruits of the abortion upon the nearest dung-heap. He had a letter from a gentleman in Somersetshire to say that in his county it was the custom to simply leave the fœtus in the field to rot and to pollute the air. If an infectious disease was the source of abortion, he would like to suggest an addition to the effect that special precautions should be taken with the fœtus, and, if possible, to say that it should be burned.

Professor BROWN said the precaution Colonel Curtis-Hayward suggested was so perfectly obvious that it had not occurred to any member of the Committee to advise it. There was, of course, no objection to the proposed addition, if it was thought desirable. If it was true that the practice still continued of allowing the fœtus to lie rotting in the field, then it certainly would be advisable add some suggestion as to the immediate and proper disposal of the aborted fœtus and the disinfection of the premises.

The Hon. C. T. PARKER considered it would be most desirable to to have the addition made to the leaflet, because he knew that the practice of a great many farmers that he had seen was to throw the fœtus of cows that had aborted on to the dung-heap, where it was allowed to lie in all stages of putrefaction.

Mr. PELL thought it was universally known that every precaution should be taken in regard to animals that had slipped their young, and as to the premises in which the accident happened. He therefore hoped that if any suggestions were made to farmers and agriculturists generally, it would be explained that they were made in consequence of local ignorance or misconception on the subject; otherwise it might be taken as an extraordinary piece of advice coming from that Society.

Sir NIGEL KINGSCOTE said that the evidence already taken before the Special Committee had been most strongly to the effect that the disease was very infectious, and he could not help thinking, therefore, that the suggested addition was most desirable.

After further discussion, it was arranged that an addition to the circular, drawn up by Professor Brown, should be made in accordance with Col. Curtis-Hayward's suggestion, and the issue of the leaflet was accordingly authorised in the following form:—

PREVENTION OF EPIZOOTIC ABORTION IN COWS.

From the evidence which has recently been brought to the notice of the Society, it is considered desirable to recommend to the special attention of stockowners, in whose herds abortion has appeared, the system of preventive treatment, which is described in the following quotation from the article on Abortion in the Society's Journal, Vol. II., Part IV., 1891, page 738.

The plan which Professor Nocard recommends to be used in cow-sheds and premises in which epizootic abortion occurs year by year is the following:—

1. Every week the places in which cows are kept must be well cleansed, and especially the part behind the cows, and then disinfected by a strong solution of sulphate of copper (blue vitriol), or a solution of carbolic acid, one to fifty of water.

2. The under part of the tail, the anus, vulva, and parts below of all the cows must be sponged daily with the following lotion, which is a strong poison :—

Rain water or distilled water	2 galls.
Corrosive sublimate . .	$2\frac{1}{2}$ drs.
Hydrochloric acid . .	$2\frac{1}{2}$ ozs.

During the first season of this treatment only a moderate amount of improvement is to be expected, but after the next season abortion will cease entirely.

It would very much assist the Society in their inquiry if members of the Society whose herds have been affected by abortion would inform the Secretary at once if they propose to adopt this system of treatment in their herds; and, afterwards, if they would send to him particulars of the results of the treatment. When the owner desires it, arrangements will be made for a veterinary surgeon to visit the farm at the cost of the Society, and to advise as to the preparation and application of the solution.

It appears that in some districts no precautions are taken to destroy the fœtus after abortion. This should be done *without delay in every case*, by burning or burial in quicklime. The latter should also be freely scattered over the ground contaminated with the discharge.

ERNEST CLARKE, Secretary.

12, Hanover Square, London, W.
April, 1894.

Stock Prizes.

Mr. SANDAY (Chairman) reported the recommendation of the Committee that a grant be made of 5,000*l.* for prizes for live stock, poultry, and produce at the Darlington Meeting of 1895, and he accordingly gave notice of a formal resolution to that effect.

Judges' Selection.

Mr. SANDAY also reported that the list of Judges in all departments of the forthcoming Cambridge Meeting had been finally completed, and had been published in the March number of the Journal (see page xlii).

Implement.

Mr. FRANKISH (Chairman) reported that a letter had been received from Mr. F. S. Courtney, accepting the office of Consulting Engineer to the Society, on the terms proposed by the Council. In view of the large number of entries for oil-engines, it had been decided that the trials of such engines should commence at 9 a.m. on Monday, June 18—a week before the Show—and that exhibitors be required to deliver their engines at the trial ground not later than Monday, June 11, in accordance with regulation 3. As the number of feet of shedding applied for by exhibitors in the implement department was considerably in excess of the space which was available for the purpose, arrangements had been made by the Surveyor for the taking in of an increased area of ground. Even this would not be sufficient for the purpose, and the Committee recommended, therefore, that the question as to any necessary reduction to be made in the amount of space applied for by exhibitors be remitted to the Allotment Committee for their decision. The Committee recommended that at the Darlington Meeting of 1895 prizes be offered in two classes for (1) the best haymaking machine and (2) the best clover-making machine, prizes of 20*l.* and 10*l.* being offered in each class. The Committee had settled the regulations for such prizes, which they now submitted for the approval of the Council as follows :—

Darlington Meeting, 1895.

PRIZES FOR EXPLOSIVE OIL ENGINES.

In connexion with the Darlington Meeting of 1895, the following prizes are offered by the Royal Agricultural Society of England for hay- and clover-making machines :—

	First Prize	Second Prize
	£	£
Class I. Hay-making machines	20	10
Class II. Clover-making machines	20	10

Darlington Meeting, 1895.

GENERAL REGULATIONS OF TRIALS.

1. The trials will take place during the hay harvest of 1895, on land selected by the Society in the neighbourhood of Darlington.

2. The necessary arrangements for the grass and clover crops required for the trials will be made by the Society.

3. Notice of the place and date of the trials will be posted to every competitor as soon as they are fixed.

4. Every competitor must himself provide for the delivery of his machines on the trial ground, and for the removal of the same after the trials.

5. Horses will be provided by the Society to work the machines during the trials, but competitors who desire it may provide their own horses.

6. Every machine must be delivered at the depôt on the trial fields, in proper working order, not less than two days previous to the commencement of the trials.

7. The competitor will find one attendant to drive and work each machine. Any assistance given by the competitor himself or other workman will be noted by the Judges.
8. The order in which the several machines will be tested will be determined by the Stewards, who will decide by lot.
9. Machines are not to be worked under conditions as to weather and crop when such machines would not be used in the actual work of a farm.
10. The attention of the Judges and Engineer will be particularly directed to the following matters :—
1. Price.
2. Weight.
3. Simplicity, strength, and construction.
4. Efficient protection of the gearing, and freedom of the machine from choking.
5. Excellence of work in turning and lightening up of the crop without damaging it.
6. Draught in work.

11. Should the Judges find any of the machines to be of practically equal merit, they are empowered to bracket them as equal, and so divide the prize-money.
12. Entries for the prizes in any of these classes must be made on or before Monday, April 1, 1895, and must be accompanied by a deposit of £1 for each entry. Such deposit will be forfeited if the implement is not submitted for competition at the time appointed for the trials.

By order of the Council,
ERNEST CLARKE, Secretary.
12, Hanover Square, London, W.
April 4, 1894.

General Cambridge.

The Earl of FEVERSHAM reported the recommendations of the Committee that the Band of the King's Dragoon Guards be engaged to play on four days of the Show; that the usual application be made to the Home Secretary for the services of a detachment of the A Division of the Metropolitan Police; and that 16,000 copies of the combined Stock and Implement Catalogue be printed as usual. Copies had been laid upon the table of the Official Register of Houses and Apartments to be let in Cambridge during the time of the Show. Various other details had been discussed and settled, including the arrangements to be made for the sale of timber after the Show.

Showyard Works.

The Hon. C. T. PARKER reported that the Showyard at Cambridge was enclosed with a high fence, and that about 6,000 feet of implement and machinery-in-motion shedding had been built. The stables were also in a very forward state, and the refreshment pavilions were well in hand. The Local Committee had completed the levelling of the yard, and were now laying the water mains, and the whole of the works were in a very forward state. The Committee had approved a revised plan of the Showyard, showing the proposed rearrangements made necessary by the unusually large amount of space applied for this year by the exhibitors in the implement department. The following tenders for the supply of refreshments at Cambridge were recommended for acceptance :—Nos. 1, 3, 4, and 9, W. E. Wood (Cambridge Syndicate); No. 2, George E. Barton, York; No. 5, H. S. Bailey, Birmingham; No. 6, Bourne and Co., Dudley; No. 8, Bodega; No. 10, T. E. Cuthbert, York. The Secretary had submitted specimens of prize cards, slightly smaller than those at present in use, which were approved by the Committee. The Local Committee had recommended the appointment of Mr. Arthur Tress Grain as the auctioneer for the sale of the timber after the close of the Cambridge Meeting, and the Committee recommended the appointment of Mr. Grain, subject to his acceptance of the conditions of appointment laid down by the Society.

Selection.

Earl CATHCART (Chairman) said that, as the Council would be aware, a list of the twenty-five members of Council who retired by rotation, with their attendances at Committee and Council meetings, had to be prepared at that meeting, in anticipation of the General Meeting on May 22. Under Bye-law 23 (*b*), Members who had not attended meetings of the Council at least twice in each year were not eligible for re-election; and as the Duke of Portland had been unable to give the necessary number of attendances during the last two years, his name could not be submitted to the Council for re-election at the General Meeting to be held in May. There would therefore be a vacancy to be filled up on that occasion. The other retiring members of Council had all complied with the Bye-law, and their attendances were recorded in the following list, which he now laid upon the table for publication in the usual manner :—

Attendances at Meetings of Council and Committees from April, 1892, to March, 1894, inclusive	Council Meetings Total number, 18	Committees No. of Meetings	Committees Attendances
ARKWRIGHT, J. H. . .	9	101	53
BEACH, J.	8	33	12
BROUGHAM AND VAUX, Lord	9	23	7
CLAY, C.	14	51	35
CURTIS-HAYWARD, Lt.-Col.	16	43	33
DEVONSHIRE, Duke of (elected May 2, 1893)	2	11	3
FOSTER, S. P.	5	53	16
FRANKISH, W.	14	125	99
GRENVILLE, R. NEVILLE	9	48	14
HORNSBY, J.	12	51	19
MUNTZ, P. A., M.P. . .	9	23	6
PIDGEON, D.	7	48	13
RANSOME, J. E. . . .	15	31	15
RAWLENCE, J.	8	—	—
SANDAY, G. H. . . .	16	92	77
SMITH, H.	17	40	29
SPEARMAN, Sir J., Bart.	11	50	17
STRATTON, R.	7	19	3
SUTHERLAND, Duke of.	4	—	—
SUTTON, MARTIN J. . .	13	63	47
TREMAYNE, J.	8	49	24
WARREN, R. A. . . .	15	32	28
WESTMINSTER, Duke of	8	27	11
WHEELER, E. V. V. . .	13	69	51

Mr. BOWEN-JONES handed in a formal nomination, in writing, signed by himself and Mr. Charles Howard, of Mr. H. P. Ryland, of Moxhull Hall, Erdington, Birmingham, to fill the vacancy on the Council caused by the retirement of the Duke of Portland.

Earl CATHCART observed that he understood Mr. Ryland was a practical agriculturist, and likely to prove of great advantage to the Society as a member of Council. He thought that at this time it was right and proper that a practical agriculturist should be placed on the Council, in order to keep up that balance which they all desired should be maintained.

Dairy.

The Hon. C. T. PARKER (Chairman) reported the settlement of a variety of details in connexion with the Cambridge Meeting, including the size of the dairy, the supply of milk, the provision of motive power, and the penning and feeding of poultry, &c.

Miscellaneous.

On the motion of Viscount EMLYN, seconded by Mr. MARTIN, it was resolved that Sir John Thorold and Mr. Charles Whitehead be re-elected as the Society's representatives upon the Lawes Agricultural Trust for a term of five years.

The SECRETARY reported that thirty-two entries had been received for the Society's forthcoming Senior Examination, to be held from the 8th to the 12th May next. This compared with thirty-seven entries last year (the highest total reached) and twenty-eight entries in 1892.

Letters were read (1) from Professor Liveing, of Cambridge, thanking the Council for his election as an Honorary Member of the Society; (2) from the Charity Commissioners, asking if the Council would be prepared to nominate a Governor upon the Sandbach School and Almshouses Foundation, when completed, which was ordered to be answered affirmatively; and (3) from the Board of Agriculture, announcing that an International Exhibition of Fruit Culture would be held at St. Petersburg from September 22 to November 12 next, and that particulars of the regulations as to the taking of space could be obtained on application to the Administration de la Société de Culture Fruitière, Musée Impérial d'Agriculture, Fontanka 10, St. Petersburg.

Date of Next Meeting.

Various letters and other documents having been laid upon the table, the Council adjourned until Wednesday, May 2 next, at noon.

WEDNESDAY, MAY 2, 1894,

THE DUKE OF DEVONSHIRE, K.G. (PRESIDENT), IN THE CHAIR.

Present:—

Trustees.—Earl Cathcart, Lord Egerton of Tatton, Col. Sir Nigel Kingscote, K.C.B., Sir A. K. Macdonald, Bart., the Duke of Richmond and Gordon, K.G.

Vice-Presidents.—Lord Moreton, Sir J. H. Thorold, Bart., Mr. Charles Whitehead.

Other Members of Council.—Mr. Alfred Ashworth, Mr. J. Bowen-Jones, Lord Brougham and Vaux, Mr. Charles Clay, Mr. F. S. W. Cornwallis, M.P., the Earl of Coventry, Mr. Percy E. Crutchley, Mr. Alfred E. W. Darby, Mr. J. Marshall Dugdale, Mr. S. P. Foster, Mr. W. Frankish, Mr. Hugh Gorringe, Mr. R. Neville Grenville, Mr. Anthony Hamond, Mr. James Hornsby, Mr. Charles Howard, Earl of Jersey, Mr. Joseph Martin, Mr. T. H. Miller, Hon. Cecil T. Parker, Mr. Albert Pell, Mr. J. E. Ransome, Mr. James Rawlence, Mr. G. H. Sanday, Mr. A. J. Smith, Mr. Henry Smith, Mr. E. W. Stanyforth, Mr. Garrett Taylor, Mr. J. P. Terry, Mr. E. V. V. Wheeler, Mr. C. W. Wilson.

Professor Brown, C.B.

Officers.—Mr. Ernest Clarke, Secretary; Dr. Fream, Editor of the Journal; Dr. J. Augustus Voelcker, Consulting Chemist.

The following members of the Cambridge Local Committee were also present:—Mr. Alderman Cunnington, Mr. C. F. Cunliffe Foster, Mr. G. Jonas, Mr. J. Odell Vinter, the Town Clerk (Mr. J. E. L. Whitehead), and Mr. R. Peters (Secretary of the Local Committee).

Apologies for non-attendance were received from H.R.H. Prince Christian, K.G., General Viscount Bridport, G.C.B., Sir Jacob Wilson, Mr. J. H. Arkwright, Mr. Joseph Beach, Mr. J. A. Caird, Mr. C. S. Mainwaring, and Professor Simonds.

New Governors and Members.

The minutes of the last monthly meeting of the Council, held on April 4, having been approved, the election of the following eleven Governors and eighty-eight members was then proceeded with:—

Governors.

Calthorpe, Lord, Elvetham, Winchfield.
Christie-Miller, Wakefield, Britwell, Maidenhead.
Clarendon, Earl of, The Grove, Watford.
Derby, Earl of, G.C.B., Knowsley, Prescot.
Dewhurst, G. Littleton, Beechwood, Lymm.
Greenall, Gilbert, Walton Hall, Warrington.
Jones, Walter J. H., Blakemere, Hartford, Cheshire.
Llangattock, Lord, The Hendre, Monmouth.
Mason, James, Eynsham Hall, Witney, Oxon.
Reiss, James E., Jodrell Hall, Holmes Chapel.
Zetland, Marquis of, Aske Hall, Richmond, Yorks.

Members.

Anderson, H., Carr Mill Cottage, St. Helen's.
Bakewell, J. S., The Old Hall, Balderton, Newark.
Beetham, G., 11, Gledhow Gardens, S.W.
Blyth, C. S., Rayne, Braintree.
Boldero, L. J., Hargrave, Bury St. Edmunds.
Booth, B.B., Plashwood Park, Haughley.
Bridge, A., 30, Gray's Inn Road, W.C.
Brown, F., Baydales Farm, Darlington.
Carless, W., M.R.C.V.S., Stafford.
[1] Cartwright, T., Rothwell, Kettering.
Clarke, J., Park Hill Farm, Tring.
Clarke, S. R., Borde Hill, Cuckfield.
Clay, H. H., Oak Grove, Chepstow.
Cooper, T., King's Lynn.
Coverdale, F. J., Ingatestone Hall, Ingatestone.
Cranfield, H., Buckden, Hunts.
Crouch, F., Miswell, Tring.
Daniell, A., Blunham, Sandy.
Darwin, Capt. S. C., R.N., Buxton.
Deheer, A. W., Rishangles Lodge, Eye.
Dewhurst, W. A., Oughtrington House, Lymm.
Doyne, D. H., Ripley, Yorks.
Duberly, Hon. Mrs., Gaynes Hall, St. Neots.
Ellis, W., Morven Park, Potters Bar.
Evans, John, Coity, Bridgend.
Frohock, J., Lolworth Grange, St. Ives.
Fyfe, D. A., Wharf Road, Stratford, E.
Gardner, G. W., Gressingham, Hornby.
Gilchrist, P. C., F.R.S., Frognal Bank, Finchley Road, N.W.
Gisborne, W., Allestree Hall, Derby.
Green, W. P., Chestnut Ho., Radcliffe-on-Tr.
Grove, Capt. S., The Grove, Taynton, Glos.

---

[1] *Reinstated under Bye-law* 12.

HALL, G. H., Beechwood, Ranby, Retford.
HAMOND, Col. R. T., Pampisford Hall, Cambridge.
HANKEY, G. L., Yen Hall, West Wickham.
HARRIS, STANLEY, The Holt, Aspley Guise.
HART, H. W., Land of Green Ginger, Hull.
HOLDSWORTH, WM. A., County Asylum, Barnwood, Glos.
ISHAM, VERE, Bury St. Edmunds.
JILLINGS, C., Great Abingdon, Cambs.
JOHNSTON, J. C., Station Road, Cambridge.
[1] KIRK, TH., Owstwick Hall, Holderness.
KNIGHT, C. A. B., Downton Castle, Ludlow.
LISTER, Major E. L., Cefn Ila, Usk.
LLOYD, H., Pitsford Hall, Northampton.
LONG, G., The Priory, Swavesey, St. Ives.
LUXMOORE, Rev. C. C., Broughton Rectory, Newport Pagnel.
LYDDON, C. T., Brooklea, Lisvane, Cardiff.
MCCAY, T. C., 3, Rumford Street, Liverpool.
MACKIE, JAMES B., Reading.
MACQUEEN, Miss M. M., Hutton, Preston.
MADDISON, W. H. F., The Lindens, Darlington.
MARTIN, HEBER G., Littleport, Ely.
MILNE, Rev. E. A., Shenley Rectory, Bletchley.
MILNES. E. S., Culland Ho., Brailsford, Derby.
MORRIS, C. K., Oakham, Rutland,
MORRIS, W. C., Oakham, Rutland.
MOSS, J. S., Wintershill Ho., Bishop's Waltham.
MULLINS, ALFRED E., Chepstow.
NEWLAND, A., Maindee, Newport, Mon.
OAKLEY, HENRY, Ifton, Chepstow.
ORD, J. B., Wear View, Bishop Auckland.
OVERMAN, HENRY, Weasenham, Swaffham.
PARRY, J. M., Lawton Hall, Leominster.
PERRY, B., Pill House, Chepstow.
PIGG, E., Chipping, Buntingford.
PILTER, R., 24, Rue Alibert, Paris.
PROCTOR, EDWIN, 22, High Street, Hull.
PURVIS, G., 5, Bow Church Yard, E.C.
ROUT, F. R., Banham, Attleborough.
SALTMARSHE, Col. A., Army and Navy Club, S.W.
SHAND, L. H. B., Clayton Rectory, Hassocks.
SHIRLEY, L. J., Brickkiln Farm, Wolverton.
SOLLY, R. H., Penwith, Cambridge.
STACE, JOSEPH, Strood Hill, Rochester.
STANLEY, C. W., 81, Albert Hall Mansions, S.W.
STANSFIELD, A. W., Skipton-in-Craven, Yorks.
STONES, G., Manor Farm, Stourport.
SWANN, R., Hirst Head, Bedlington, Northumberland.
TUFNELL, W. N., Monken Hadley, Braintree.
WARDE, F., Aldon, Addington, W. Malling.
WATKINSON, F. W. D., Muston Hall, Hummanby, Yorks.
WEBB, C. E., Wildwood Lodge, Hampstead.
WEST, S., Croft House, Upwell, Wisbech.
WOOD, G. W., Gateford Villa, Worksop.
WOOD, J., 37, Chapel St., Islington, N.
WOODHAMS, ARTHUR, Rochester.
WRIGHT, JOSEPH H., Witchford, Ely.

On the motion of Sir NIGEL KINGSCOTE, it was unanimously resolved :—

That the Secretary be authorised to receive nominations of new members, and to admit them to the privileges of membership for the Cambridge Meeting, on condition that they sign the usual contract and pay their subscription for the current year.

[1] *Reinstated under Bye-law* 12.

The reports of the various Standing Committees were then presented and adopted as below :—

Finance.

Sir NIGEL KINGSCOTE (Chairman) reported that the accounts for the period ended April 28, 1894, as certified by the Society's Accountants, showed total receipts amounting to 3,509*l.* 10*s.* 7*d.*, and expenditure to 3,543*l.* 9*s.* 10*d.* The actual balance at the bankers' on April 28, 1894, allowing for cheques outstanding, was 6,680*l.* 2*s.* Accounts amounting in all to 2,199*l.* 14*s.* 4*d.* had been passed and were recommended for payment. The Committee recommended that Mr. Sanday and Mr. Ashworth be elected Stewards of Finance for the Cambridge Meeting.

The Chester Agricultural College.

Sir NIGEL KINGSCOTE said he might perhaps be allowed to call the attention of the Council to the announcement that they might not all have remarked, but which had appeared in *The Times* and other newspapers a short time since, to the effect that the Royal Agricultural Society of England had promised 1,000*l.* towards the fund that was being raised to start an Agricultural College for Cheshire. The immediate result of that announcement was perhaps what was to be expected, viz. inquiries addressed to him as the custodian of the Society's finances as to whether the Council would be likely to be equally generous towards other Colleges of the same kind. It was hardly necessary for him to tell them that the Society had not (indeed, could not) make grants of this description; but, as he had not observed any contradiction of the statement in the daily press, he thought it might be desirable that the actual facts of the case should be placed before the public. The 1,000*l.* in question was not, of course, given by the Society, but represented the balance of the amount collected by the Chester Committee towards defraying the local expenses incident to the holding of the Society's annual show at that city last June. The Local Committee's accounts, when finally made up, showed the unexpectedly large balance of 1,282*l.* at disposal; and at a final meeting of the Committee, held on January 21 last, it was decided by that Committee that, after the presentation of various honoraria to members of the Local Executive, 1,000*l.* should be set aside to assist "in the formation, establishment, or working" of the Agricultural College projected by the Cheshire County Council. The Royal Agricultural Society itself had, of course, no control over the funds collected and administered by the Local Committee; and, as they would be aware, the Society had no funds of its own from which it could give the munificent donation to the Cheshire Agricultural College which had been erroneously ascribed to it. Indeed, its Charter would probably be found to exclude the possibility of financial assistance by the Society to any individual institution of the kind. As they were doing their best to obtain as many new Governors and Members as possible, he thought the report above referred to might, unless contradicted, injuriously affect the Society by creating the erroneous impression that it was rich enough to make these large donations, and that it did not require further support.

House.

Sir NIGEL KINGSCOTE (Chairman) reported that the Committee had given instructions as to certain details connected with the fittings and internal decoration of Harewood House. The Committee had had a conference with the representatives of the Shire Horse Society, and had agreed as to the terms of the under-lease which it was proposed to grant to that Society, and which would take effect as from August 11 next. It was recommended that the Anniversary General Meeting on May 22 should be held in the Great Hall of the Royal Medical and Chirurgical Society, 20 Hanover Square, W.

Journal.

Earl CATHCART (Chairman) reported that various accounts for printing, binding, &c., had been passed for payment. The arrangements for the next number of the Journal had been considered, and directions thereon had been given to the Editor.

Chemical.

Mr. PELL presented a report from the Committee dealing with details of the Chemical Department, and also a report from the Woburn Sub-Committee as to the future conduct of the Pasture Experiments at Woburn.

Botanical and Zoological.

Mr. WHITEHEAD (Chairman) reported that further consideration had been given to the question as to the lines upon which the inquiry into finger-and-toe in turnips should be continued for the future, and it had been resolved to recommend—

(1) That the Consulting Botanist be requested to continue his experiments in the direction of ascertaining whether any direct application of manures will prevent the finger-and-toe appearing, or destroy it after it has appeared.

(2) That Dr. Voelcker be requested to institute a series of experiments at Woburn, with the object of ascertaining whether it is possible or impossible to infect with the disease certain soils which are not lime-deficient, and on which finger-and-toe is never known to exist.

Subject to the approval of the Journal Committee, Dr. Voelcker had undertaken to prepare a report for the next number of the Journal, giving the results of the analyses of soils which he had made in connexion with the inquiry, and a digest of the information contained in the replies to the Society's circular letter of questions. (see page 318).

Earl CATHCART said that the Journal Committee were very anxious to push this matter in regard to finger-and-toe in turnips, and they were exceedingly desirous that Dr. Voelcker's report should be published at the earliest possible opportunity.

Veterinary.

Sir JOHN THOROLD (Chairman) presented the following report from Professor Brown:—

PLEURO-PNEUMONIA.—Another outbreak of this disease was discovered a few days ago on a farm at Minster, near Margate, in Kent. There seems little doubt that this outbreak is connected with those of last autumn in Middlesex—some cows purchased in the Metropolitan Cattle Market last August from a dealer on whose premises in Middlesex pleuro-pneumonia was reported in September. Arrangements are being made for the slaughter of all the cattle which have been exposed to the risk of infection.

SWINE FEVER.—According to the returns published in the *London Gazette*, this disease continues quite as prevalent as ever. During the four weeks ended April 21 there were 689 pigs died of swine fever, 5,463 were slaughtered as diseased or as having been exposed to the risk of infection, and ninety-six were slaughtered as suspected but found free from the disease on post-mortem examination.

ANTHRAX.—There seems to have been a slight decrease in the number of outbreaks in the four weeks ended April 21 as compared with the preceding four weeks. There have been thirty-six outbreaks and ninety animals attacked, as compared with fifty-seven outbreaks and ninety-nine animals attacked.

GLANDERS.—During the four weeks above referred to there have been seventy-eight outbreaks of this disease in Great Britain and 115 horses attacked.

RABIES.—There have been fourteen cases of this disease in four weeks: they occurred in the counties of Lancaster, Surrey, York (W. R.), Ayr, and Lanark.

INVESTIGATIONS.—Since the last meeting of the Committee investigations have been made for members of the Society regarding the following diseases:—

1. Parasitic pneumonia in sheep (caused by the *S. rufiscens*).
2. Pyæmia (blood-poisoning) in calves.
3. Abortion in cows (four outbreaks).

Tuberculin has been supplied for use in one herd, and anthrax vaccine has been issued for the inoculation of fifty-five cattle and six horses.

At the Royal Veterinary College experiments have been made to test the protective effect of Pasteurian vaccination against anthrax in cattle, horses, and sheep. In reference to protective inoculation for anthrax it is necessary to inform owners of stock that, according to the published statistics for several years, the losses from inoculation do not usually much exceed 1 per cent. In some cases, however, the losses amount to 5 or even 10 per cent.

The correspondence which had passed between the Secretary and the Board of Agriculture on the subject of the restrictions at present existing on the movement of swine from infected areas under the Swine Fever Orders Nos. 5156 and 5159, as affecting the entry of pigs at the Cambridge Meeting, had been laid upon the table, together with the Secretary's circular letter of April 18 on the same subject. Having regard to the fact stated in Professor Brown's report that swine fever continues as prevalent as ever, and considering the very serious inconvenience which would result if a case of the disease should occur in the Showyard, and necessitate the slaughter and burial of all the pigs sent for exhibition, the Committee recommended that no entries of pigs be accepted for the Cambridge Meeting.

Letters had been read from the Highland and Agricultural Society of Scotland, requesting the co-operation of the Royal Agricultural Society in organising a deputation from the leading agricultural societies to the Presidents of the Board of Agriculture and the Board of Trade, asking that fresh legislation may be immediately undertaken by the Government for repressing fraudulent practices in the sale of foreign meat as British meat. The Committee recommended that a reply be sent to the Highland Society to the effect that, whilst the Council fully realise the great importance of the subject, it would in their opinion be better, before taking action in the direction suggested, to await the introduction of the Bill dealing with cases of fraudulent misrepresentation in regard to the sale of meat which the President of the Board of Agriculture had stated was now under consideration, and which he hoped to submit to Parliament at an early date.

About 17,000 copies had been printed and circulated of the leaflet on Abortion in Cattle, as drawn up by the Special Committee, and amended by the Council at their last meeting. The Special Committee on Abortion had held its third meeting on April 30, when evidence had been taken from four further witnesses. Letters had been received from Mr. Lewis P. Rees and Mr. Charles Morgan, accepting the post of Provincial Veterinary Surgeon for the counties of Brecon and Carmarthen respectively, upon the terms laid down by the Council.

Exclusion of Pigs from Cambridge Meeting.

Sir JOHN THOROLD said that as the question of swine fever and the exclusion of pigs from the Cambridge Showyard had had important developments since the last Council Meeting, he desired to explain the reasons of the recommendation made by the Veterinary Committee that no entries of pigs should be accepted for Cambridge. The Council would have observed, from the correspondence between the Secretary of the Society and the Board of Agriculture, which had been circulated and published, that, in the view of the Board, it was necessary to maintain the existing restrictions as to the movement of pigs now in the counties scheduled as "Swine Fever Infected Areas." That being so, the Society would have been precluded in any case from accepting any entries from the scheduled counties; and, in view of the extent to which swine fever was still prevailing, the Veterinary Committee had been compelled to consider whether any exhibition of pigs at all in the Cambridge Showyard should be permitted. Having carefully considered the whole circumstances, the Veterinary Committee were unanimous in their opinion that it would be best to decline all entries of pigs. There was, of course, the consideration that the entries of pigs would be very partial, some counties not being able to exhibit, and others being free from the disease. It was a matter of common knowledge that many people were taking measures to send their pigs out of infected districts into non-infected districts for the purpose of sending them to the Show, and the consequences of an outbreak in the Showyard would be very serious. Under these circumstances, the Council would probably be of opinion that it would be very much better, both in the interests of the Society and in the interests of owners of stock, that they should decline to accept any entries of pigs at Cambridge. He begged, therefore, formally to move—

> That, having regard to the fact stated in Professor Brown's report to the Veterinary Committee that swine fever continues as prevalent as ever, and looking to the very serious inconvenience which would result if a case of the disease should occur in the Showyard, and necessitate the slaughter and burial of all the pigs sent for exhibition, no entries of pigs be accepted for the Cambridge Meeting.

The Hon. C. T. PARKER having seconded the motion,

Mr. TERRY said he would like to ask a few questions with regard to this matter, which he considered was very serious for the breeders of pigs who might be intending to exhibit, and who had been getting their pigs ready for a long time for the Cambridge Meeting. From the report that Professor Brown had made, he gathered that swine fever was still as prevalent as ever, but that it was not more prevalent than it was three months ago. He did not know, and he could not think, of any case of swine fever whatever that had emanated from any of their showyards, although the disease had been raging throughout the country for a very considerable period. If the pigs did not go to the Royal Show, they would be going to county shows. He considered that there was less danger in contracting disease from the exhibition of pigs than in the exhibition of any other animals, because pigs were put into the crates, out of which they were not taken until they got into the showyard. He quite agreed that they ought to do all they could to stamp out swine fever, but, at the same time, it was rather late to be taking such a serious view of it as they were now doing.

Mr. STANYFORTH said that as he was responsible for bringing this matter forward in the Veterinary Committee, he might perhaps be allowed to say a few words upon this very important subject. He would like first of all to read out the list of districts at present scheduled as infected. There were large areas, comprising the counties of Bedford, Chester, Derby, Lancaster, Norfolk, Somerset, Stafford, Warwick, the West Riding of Yorkshire, and other districts. They would see that these areas comprised a very large proportion of England. Professor Brown's report said that swine fever was as prevalent as ever, and that there was certainly no decrease. Very likely before their Show there might be other portions of England which would be scheduled as infected areas, so that their show of pigs could not be called a representative one. In addition to those who were prevented by law from coming from infected areas, they had received letters from breeders of pigs who were not in infected areas, but who would be reluctant to send their pigs on account of this prevalence of swine fever. The latter portion of the letter received from the Board of Agriculture, in reply to that written by their Secretary asking whether any relaxation of the rules was likely to be made in regard to the exhibition of pigs at agricultural shows, was worthy of their consideration :—

> The Board regret that they do not see their way to give special facilities for the exhibition of swine brought from infected areas, and the Board would express the hope that the Royal Agricultural Society of England will, as far as possible, discourage such exhibition as being opposed to the spirit and intention of the Orders in question, and as involving a distinct risk of the further spreading of disease.

From this correspondence they might safely conclude that if they could aid the Board of Agriculture in stamping out this disease by preventing pigs from coming to Cambridge at all, they would certainly be performing a great public duty. It was the opinion of Professor Brown that on this occasion it would be very much safer and wiser for them not to accept any entries of pigs for the Cambridge Meeting, and in this view he thought the Council would concur. He was perfectly aware that this action would be criticised, and no doubt to some exhibitors of pigs it would be a very great disappointment; but he hoped that breeders would prove their unselfishness in this matter by acknowledging, at any rate, that the Society had acted for the future safety of pig-breeding, and that generally it ought to do all it could to stamp out swine fever from the country.

Professor BROWN said that, though he was not prepared to say there was more swine fever in the country than there was three months ago, he did most distinctly say that new centres entirely unsuspected, and in different parts of the country which had previously been considered perfectly free, had been discovered within the last few months. Under present circumstances, the exhibition of pigs would be held under considerable difficulties. One risk to which the Society would be exposed was this. A number of pigs were being moved from infected areas into healthy ones, and the number of healthy districts was daily decreasing. If an inspector discovered an outbreak in any part of the country, and found that any pigs belonging to the owner had been sent to the show, he would be bound to follow them, and at least to kill the pigs in that sty and bury them on the spot.

Sir JOHN THOROLD wished to point out, in reply to Mr. Terry, that they were not in a position to take action sooner, because the question in its present aspect had only recently arisen.

Mr. TERRY said that he was perfectly satisfied, as they had now a great deal more information on the subject than they had before.

The motion was then put from the Chair, and carried unanimously.

Stock Prizes.

Mr. SANDAY (Chairman) said that the essential business before the Committee at their meeting held yesterday was the large entries of live stock that had already been received for the Cambridge Meeting. It would be in the recollection of the Council that so long ago as July 26 last the Society had given notice that it might become necessary, in view of the fact that the area of the Cambridge Showyard could not be extended, that some limitation in the entries of live stock should be made; and exhibitors had therefore been informed, both in the prize sheets and on every form of certificate of entry issued, that post entries, if tendered, could only be accepted provisionally, subject to there being space available for them. The returns prepared by the Secretary showed that the entries of horses, cattle, and sheep received up to the date of closing the lists at ordinary rates would monopolise practically all the space available for the exhibition of live stock; and that being so, the Committee had no alternative but to recommend that the list be now closed, and that no post entries of live stock be accepted. He might mention that there was a considerable increase in the horse entries over even the final entries at Chester, that there were more than the average of cattle, and practically as many sheep. As the Council would be aware, their great difficulty was always the building of the sheds in time for the opening of the Show. As boxes were necessary for the stallions and brood mares, and stalls for the other horse classes, and as all the animals of the same breed were shown together, and as, moreover, different widths of shedding were required for bulls and cows, it was impossible for the Surveyor, until the entries were closed, and had been sorted in the Secretary's office, to arrange his buildings. Hence it was always necessary for a considerable interval to elapse between the closing of the entries and the opening of the Show; and exhibitors did not appear always to give due consideration to this fact when they represented the difficulty felt by them in selecting by May 1 the animals from their studs and herds which were likely to be in the best show condition nearly two months later. The Committee thought it would be quite possible, so long as there was no disarrangement of the sheds, to give such exhibitors the opportunity of substituting for an animal which had been entered in ordinary course, and which the exhibitor subsequently thought better not to send to the Show, the entry of another animal of the same class which he considered might represent him better. This would, the Committee hoped, have the additional advantage of preventing so many empty stalls and pens in the Showyard. It would, of course, be necessary that there should be a formal entry of such substituted animal, and that such entry should be made in time for the proper particulars to be given in the forms issued to exhibitors and in the catalogue. The Committee proposed, therefore, to permit a substituted entry to be made, upon payment of a fee, up to, but not later than, May 31.

Carrying out these suggestions, he formally moved the following resolutions:—

1. That, in view of all the space in the Showyard available for the purpose being required for the exhibition of the horses, cattle, and sheep which have already been duly entered in competition for the prizes, the Secretary be instructed, in accordance with Regulation 4 of the Prize Sheet, to decline all entries of horses, cattle, and sheep of which complete particulars are not now in the possession of the Society.

2. That an exhibitor who has already made an entry of horses, cattle, or sheep in a particular class be permitted, between this date and Thursday, the 31st instant, to withdraw the entry of such animal and to substitute for it the entry of another animal in the same class, on payment of the difference between the amount of the entry fee originally paid for the animal withdrawn, and the post entry fee: but that, with this exception, no post entries of horses, cattle, or sheep be accepted.

Limitation of Entries of Stock.

The Earl of COVENTRY said he was sorry that the Committee had found it necessary to limit the number of entries in a class which members had been accustomed to make. This was an especial hardship in the case of yearlings. Some animals in these classes improved and others went back in condition very much at this time of the year, so that it did not follow that the animal which was the best on May 1, when the entries closed, would be the best at the time of the Show. He concluded that there bad been very strong reasons for limiting the number of entries. At the same time he recognised the proposal as to the acceptance of substituted entries up to May 31 as partially meeting the difficulties felt by exhibitors in the matter of selecting their best animals for exhibition at the Society's Shows.

The Duke of RICHMOND and GORDON said that Lord Coventry had spoken in the interests of breeders of cattle and horses. He (the Duke) wished to speak in the interests of the breeders of sheep. It was rather a hard case that they should be restricted to exhibiting only two rams, whereas formerly they could exhibit more. He hoped this question would be considered in connexion with the arrangements for the Darlington Meeting next year.

Mr. MARTIN said he was sorry that it should be necessary for Mr. Sanday to propose the resolution as to post entries, and he asked whether the calculation in regard to the accommodation available had been made prior to the resolution as to the exclusion of pigs.

Mr. SANDAY replied that the calculation had been made upon the assumption that the pigs would be excluded. By using to the utmost the available space in the Showyard, there would only be just room to accommodate the number of entries already made. The size of the Show had been increasing for a considerable number of years past, and some means had to be adopted to reduce the amount of space required. It was on that account more particularly that the number of entries was limited as alluded to by the Duke of Richmond.

The Hon. CECIL T. PARKER said that a glance at the plan of the Showyard would show that it was absolutely impossible to get in more entries than had been arranged for.

The proposed resolutions were then put and carried unanimously.

Implement.

Mr. FRANKISH (Chairman) reported that upwards of 13,400 feet of space had been applied for in the Implement Department of the Cambridge Meeting, and that 442 stands had been allotted by the Allotment Committee. The Committee had given detailed consideration to the arrangements for the trials of oil-engines, spraying machines, and sheep-dipping apparatus. The Consulting Engineer had reported his proposed arrangements for the trials of oil-engines, which were approved. It was arranged that one large tank of Russoline oil should be provided, in order that a trial of all the engines might be conducted with oil from the same reservoir. The Committee recommended that competitors be informed that their machines must be delivered on Monday, June 11, 1894, and that the trials begin on Monday June 18, 1894. The Committee also recommended that the trials of sheep-dipping apparatus commence on Friday, June 22, 1894, at 2 P.M., and that they be held at the farm of Mr. J. B. Ellis, Redlands, Lolworth, situated five and a-half miles from Cambridge, on the high road to St. Ives.

General Cambridge.

Sir NIGEL KINGSCOTE reported that preliminary consideration had been given to the draft programme of the Meeting, and that it would be finally settled at the next meeting of the Committee, to be held at 4.15 p.m. on Tuesday, June 5 next. Applications from various societies for permission to hold meetings in the Showyard had been granted on the usual conditions, the times of such meetings to be settled at the next meeting of the Committee. Various other details relating to the trials of spraying machines, the supply of gas, floral decorations, &c., had been discussed, and the Local Committee had undertaken to make the necessary inquiries in regard thereto.

Judges' Selection.

Mr. SANDAY also reported that the classes for poultry had been distributed amongst the three Judges as follows:—

To be judged by Mr. J. W. Ludlow: Wyandottes, Plymouth Rocks, Minorcas, Ducks, Geese, and Turkeys. *To be judged by Mr. O. E. Cresswell*: Dorkings, French, Brahma, Cochin, and Langshans. *To be judged by Mr. W. Forrester Addie*: Game, Leghorns, Andalusians, Hamburgs, and "any other variety." The table poultry to be judged by all three Judges.

The Committee recommended that Mr Thomas Stirton be appointed a Judge of Miscellaneous Implements at Cambridge in place of Mr. C. Gay Roberts, unable to act. The Umpires, to act in case of necessity for the several classes of live stock, had also been selected.

Showyard Works.

The Hon. CECIL T. PARKER reported that the implement shedding at Cambridge was complete, and that about 3,500 feet of horse boxes had been built. The grand stand, band stand, dairy and offices, and all of the pavilions were in a very forward state, as well as the water-mains and the sleeper-roads to the entrances, which were being laid by the Local Committee. Instructions had been given with respect to a large number of other details, including the arrangements for refreshments, the supply of gas, insurance, &c.

Selection.

Earl CATHCART (Chairman) reported the recommendation of the

Committee that Sir John Thorold be suggested to the General Meeting as President of the Society for the ensuing year. The Secretary had reported that he had received the following nomination under Bye-law 23 for the vacancy on the Council caused by the retirement of the Duke of Portland:—

Mr. H. P. Ryland, of Moxhull Hall, Erdington, Birmingham. Nominated by Mr. Bowen-Jones and Mr. Charles Howard.

Nomination of President for 1894–95.

Earl CATHCART said he had now to approach a delicate subject—viz., the consideration of their nomination to the General Meeting of the President of the Society for the ensuing year. He could not go further without saying how delighted they all had been to serve under the distinguished command of their President for this year (the Duke of Devonshire), and how grateful they all were for the interest he had taken in their proceedings. It had been the duty of the Committee of Selection to give their best consideration to the question of the Presidency in succession to his Grace, and they had happily come to the conclusion, without the least hesitation, to propose the name of his friend Sir John Thorold as President for the next year. (Loud cheers.) Sir John Thorold was known outside to the whole agricultural world as a thoroughly practical man. Probably no man in his position—no great landowner in England—had met agricultural stress and disaster with more courage than Sir John Thorold. As regards the proceedings of their own Society, he had only to mention to them what Sir John Thorold had done to commend this nomination to the members of the Society. It might be totally unnecessary to do so, but it was only right and fair that conspicuous services should be acknowledged. On December 7, 1881, he (Lord Cathcart) had the pleasure of proposing the formal resolution electing Sir John Thorold as a member of the Council, and that resolution had been seconded by Sir Nigel Kingscote. Sir John was now one of the twelve Vice-Presidents of the Society, having been elected to that position on June 5, 1889. He was a member of their Finance, Journal, Chemical, Botanical, Veterinary, Implement, and Dairy Committees. He had acted as Steward of Implements from 1884 to 1886, as Steward of Dairying from 1886 to 1888, as Supplementary Steward at Windsor in 1889, and as Steward of Finance at Chester last year. Thus it would be seen that Sir John had done service for the Society in almost every capacity during the twelve and a-half years that he had sat upon the Council. He had been an active member of the Dairy Committee practically since its foundation, and, indeed, was one of the first to direct the special attention of the Society to subjects connected with dairying. He had been Chairman of the Veterinary Committee for the last eight years, and had also rendered valuable services to the Journal, Chemical, Botanical, and Implement Committees, and last, but not least, to the Finance Committee. The Committee appointed at his instance in 1887, and known to all of them as Sir John Thorold's Committee, went thoroughly into the whole question of the Society's administration, and, as the result of its labours, most important and beneficial reforms were carried into effect. Indeed, he (Lord Cathcart) regarded Sir John as the Joseph Hume of their Society. Sir John had always been most diligent in attending their monthly meetings, and had been invariably helpful in their deliberations on all the details of the Society's work; and he had therefore the greatest pleasure in proposing his nomination to the General Meeting for the Presidency next year. (Cheers.)

Sir Nigel KINGSCOTE had great gratification in seconding the resolution. He heartily re-echoed every word Lord Cathcart had said.

The resolution having been put from the Chair, and carried unanimously, Sir JOHN THOROLD said he had to thank Lord Cathcart for the much too flattering account of his services which he had been kind enough to give. He could only say that his relations with the Society had been to him a very great source of pleasure, and he hoped that in undertaking the duties of President he might be able to carry them out to the satisfaction of the Council.

Education.

Lord MORETON announced that the Society's Senior Examination would take place in the following week at the Examination Hall of the Royal College of Physicians and the Royal College of Surgeons, situated on the Victoria Embankment.

On the motion of Lord MORETON, seconded by Mr. WHEELER, it was resolved that Mr. J. Bowen-Jones be re-elected as the Society's Representative Governor upon the Governing Body of Childe's School Foundation, Cleobury Mortimer.

Dairy.

The Hon. C. T. PARKER (Chairman) reported that the Committee had settled the following regulations for the Trials of Churns at the Cambridge Meeting, and recommended that they be issued forthwith.

1. All the churns for competition must be despatched, carriage paid, so as to reach the dairy in the Cambridge Showyard not later than 2 P.M. on Monday, June 18, 1894. The official labels issued by the Secretary should be firmly attached to the churns before they are despatched.

2. The trials will commence with Class VI. (churns capable of dealing with ten quarts and upwards of cream, not to exceed one-man power) on Wednesday, June 20, 1894, at 9 A.M., and will proceed daily until completed.

3. The order in which the several churns shall be tried will be decided by lot.

4. Each competitor in Class VI. is required to state the maximum amount of cream with which his churn is capable of dealing; and his churn will be tried with this amount, provided that it does not exceed one-man power.

5. Subject to the preceding regulation, each competitor will first churn, by himself or by his servant, in the way that he thinks best adapted to bring out the capabilities of his churn. The person churning will be required to make up the butter after it has been treated by the Delaiteuse and weighed by the Judges.

6. In order to test the power used, another churning of selected churns will afterwards be made by the Society's own staff.

7. Each competitor in Class VII. will be required to state the maximum amount of cream he will use in each churning during the trial.

8. The necessary cream for the trials will be provided by the Society.

9. Butter workers and tables, and the Delaiteuse, will be furnished by the Society; but all other utensils for making up the butter must be provided by the competitors themselves.

10. Competitors are required, before sending their churns to Cambridge, to affix a grooved pulley of a size to take a ⅜-in. diameter leather rope, and of such diameter as to give the required number of revolutions with a belt speed of 300 ft. per minute. They must also make provision for the fixing of their churns, for which purpose they should send small angle-irons, for fixing the churns to the wooden baulks in the floor.

ERNEST CLARKE,
Secretary.

A letter from an exhibitor asking whether Regulation 87 of the Prize Sheet, as to ironing and boring, as applied to Stilton cheese, would also apply to Double Cottenham cheese, which in make and shape was similar to Stilton, was ordered to be answered in the affirmative.

Country Meeting of 1896.

On the motion of the Hon. CECIL T. PARKER, seconded by Sir JOHN THOROLD, it was resolved that, in accordance with the Scheme of Rotation revised in 1892, the Country Meeting of 1896 be held in District C, consisting of the counties of Derby, Leicester, Lincoln, Northampton, Nottingham, and Rutland.

Miscellaneous.

A letter from the Principal of the Aspatria Agricultural College on the subject of the Society's Senior Examinations was ordered to be referred to the Education Committee.

Various other letters and documents having been laid upon the table, and the Report from the Council to the General Meeting, to be held on the 22nd instant at No. 20 Hanover Square, having been prepared, the Council adjourned until Wednesday, June 6 next, at 10.30 a.m.

WEDNESDAY, JUNE 6, 1894.

THE DUKE OF DEVONSHIRE, K.G. (PRESIDENT), IN THE CHAIR.

Present:—

Trustees.—Gen. Viscount Bridport, G.C.B., Earl Cathcart, Lord Egerton of Tatton, Col. Sir Nigel Kingscote, K.C.B., Earl of Ravensworth, the Duke of Richmond and Gordon, K.G., Right Hon. Sir M. W. Ridley, Bart., M.P.

Vice-Presidents.—H.R.H. Prince Christian, K.G., the Earl of Feversham, Rt. Hon. Sir Massey Lopes, Bart., Lord Moreton, Sir John H. Thorold, Bart.

Other Members of Council.—Mr. J. H. Arkwright, Mr. Alfred Ashworth, Lord Brougham and Vaux, Mr Charles Clay, Mr. F. S. W. Cornwallis, M.P., Earl of Coventry, Mr. Percy E. Crutchley, Lieut.-Col. J. F. Curtis-Hayward, Mr. Alfred Darby, Mr. J. Marshall Dugdale, Mr. S. P. Foster, Mr. W. Frankish, Mr. Hugh Gorringe, Mr. James Hornsby, Earl of Jersey, Mr. Joseph Martin, Mr. T. H. Miller, Hon. Cecil T. Parker, Mr. Albert Pell, Mr. J. E. Ransome, Mr. S. Rowlandson, Mr. G. H. Sanday, Mr. A. J. Smith, Mr. Martin J. Sutton, Sir J. L. E. Spearman, Bart., Mr. E. W. Stanyforth, Mr. John Tremayne, Mr. E. V. V. Wheeler, Sir Jacob Wilson.

Officers.—Mr. Ernest Clarke, Secretary; Dr. Fream, Editor of the Journal; Dr. J. Augustus Voelcker, Consulting Chemist; Professor J. B. Simonds, Professor Brown, C.B., Consulting Veterinary Surgeons.

Apologies for non-attendance were received from Mr. Anthony Hamond, Mr. Charles Howard, Mr. C. S. Mainwaring, Mr. James Rawlence, Mr. Henry Smith, Mr. R. A. Warren, and Mr. Charles Whitehead.

New Governors and Members.

The minutes of the last monthly meeting of the Council, held on May 2, having been approved, the election of the following six Governors and eighty members was then proceeded with:—

Governors.

Beever, W. F. Holt, Yewden Lodge, Henley-on-Thames.
Cawston, George, 56, Upper Brook St., W.
Iveagh, Lord, 5, Grosvenor Place, S.W.
Rosebery, Earl of, K.G., 38, Berkeley Sq., W.
Starkie, Col. Le Gendre N., Huntroyde, Burnley.
Warren, R. A., Preston Place, Worthing.

Members.

Abdy, Sir W. N., Bt., Manifold, Wick, Kelvedon.
Aldridge, A. W. B., Rushbrooke, Bury St. Eds.
Amphlett, T. E., Acton Hall, Stourport.
Astley, R. B., Melton Constable.
Bacon, J. C., Seafield, Santon, Isle of Man.
Bennett, R. E., 12, Market Hill, Buckingham.
Benson, W. A. C., Silverdale, Staffs.
[1] Berry, G., Fairseat, Wrotham.
Bidlake, G. Brooklands, Wellington, Salop.
Brankston, T., Brendon, W. Chislehurst Park.
Brocklebank, T., Heswall, Chester.
Brooke, C. E., 45, Finsbury Square, E.C.
Burkitt, W., Grange Hill, Bishop Auckland.
Clark, J. B., Braughing, Ware.
Coleman, F., Fairfield, Mt. Barker, S. Aust.
Coleman, T., Beauchamps, Buntingford.
Collen, A., West Wickham, Cambs.
Cookson, N. C., Oakwood, Wylam, R.S.O.
[1] Daine, H. S., Woolfall Hill Farm, Huyton, Liverpool.
Dixie, A. E., Pilton, Oundle.
Douglas, Capt. G. S., White Barns, Buntingford.
Duke, Sir J., Bart., Laughton, Sussex.
Dundas, M. G., Litcham, Swaffham.
Earle, R., Ellerton, Scorton, Darlington.
Edmonds, J., Gillingham, Chatham.
Fawcett, W., Strudgates Farm, W. Hoathley.
Godding, W. H., Brimslade, Marlborough.
Godson, J. S., West Wretham, Thetford.
Grandage, A. Bramhope, Leeds.
Griffin, F. W., Borough Fen, Peterborough.
Grounds, Frederick, March.
Hall, A. C., Six Mile Bottom, Newmarket.
Hall, G. F., The Lodge, Elston, Bedford.
Harrison, H., Wyther, Kirkstall, Leeds.
Hughes, R. H., Basingstoke.
Jefferson, T. E., Ballaholt, Ballasalla, I. of M.
Jefferys, F. W., Dawsmere, Gedney, Holbeach.
Johns, A., Kimbolton, St. Neots.
Jones, M. T., The Grange, Wrexham.
Jones, R. T., Crescent Road, Crouch End, N.
Kelley, F. A., Oak Lea, Broomhall Park, Sheffield.
King, T., Great Chesterford.
Lomas, A., Langford Hall, Maldon.
Lomas, Wm., Stannington, Sheffield.
Lubienski-Bodenham, Count Louis, Rotherwas, Hereford.
Mann, W. H., Elland Road, Leeds.
Mather, R., Steeple Claydon, Winslow.
Megginson, Baker, Atherstone.
Meux, Sir H. B., Bt., Dauntsey, Chippenham.

[1] Life member by examination.

Morris, S., Wretham Hall, Thetford.
Nicholas, John H., Braintree.
Nichols, J., Stannington Wood Farm, Sheffield.
Owen, T. G., Pennmynydd, Valley, Anglesey.
[1] Paterson, J. W., 14 Brunstane Road, Portobello, N.B.
Peel, Sidney C., The Lodge, Saudy.
Peel, T.. Potterton Hall, Leeds
Penberthy, Prof. Jno., R.V.C., Camdcu Town.
Phillips, J. E. J., Royston.
Prichard, B. R. S., Brislington, Bristol.
Ridlington, A., Gt. Whyte, Ramsey, Hunts.
Robinson, D., Clitheroe Castle, Lancs.
Savile, F. H. M., Castle Ashby, Northampton.
Scott, W. J., Middridge, Heighington, Darlington.
Smith, F. N., Wingfield Pk., Pentrich, Derby.
Smith, V. B., Little Shelford, Cambs.
Spurgin, Dr. H. B., Northampton.
Stitt, W. S., Hadleigh Hall, Essex.
Stone, F. W., Holms Hill Ho., Ridge, Barnet.
Sugden, S. E., 22 Green Head Rd., Huddersfield.
[1] Tipper, C. J. R., The Agr. Coll., Aspatria.
Tooth, Stanley, 25 Paul's Wharf, E.C.
Toynbee, T., Croxley Hall Farm, Rickmansworth.
Ward, E. G., Weston Manor, Freshwater.
[1] Welch, A. C., 5 W. Newington Pl., Edinburgh.
Westmacott, H. A., Benwell Hill, Newcastle-on-Tyne.
Whiteman, S. E., Coppingford, Huntingdon.
[1] Whittaker, J. D., R. A. C., Cirencester.
Wilson, M.A., Eshton House, Gargrave-in-Craven.
Winter, T., Univ. Coll. N. Wales, Bangor.
Wood, John, Wentworth, Rotherham.

The reports of the various Standing Committees were then presented and adopted, as below:—

Finance.

Sir Nigel Kingscote (Chairman) reported that the accounts for the period ended May 31, 1894, as certified by the Society's Accountants, showed total receipts amounting to 2,715*l.* 0*s.* 9*d.*, and expenditure 2,339*l.* 18*s.* 3*d.* The actual balance at the bankers' on May 31 last, allowing for cheques outstanding, was 7,055*l.* 4*s.* 6*d.* Accounts amounting in all to 6,092*l.* 19*s.* 6*d.* had been passed, and were recommended for payment.

House.

Sir Nigel Kingscote (Chairman) laid upon the table the deed of underlease of the premises at 12 Hanover Square to the Shire Horse Society, and the Committee recommended that this deed be approved, and the Seal of the Society affixed thereto. As the commencement of the tenancy of 12 Hanover Square by the Shire Horse Society is fixed by the underlease for August 11 next, the Committee recommended that the final meeting of the Council, before the autumn recess, be fixed for July 25 next (instead of August 1, as originally proposed), in order to facilitate the removal of the Society's offices before August 11. The Committee had inspected the new premises, and had given various directions as to the works in progress.

On the motion of Sir Nigel Kingscote, seconded by Sir Jacob Wilson, the Seal of the Society was authorised to be affixed to the underlease of No. 12 Hanover Square to the Shire Horse Society. The affixing of the Seal in accordance with the bye-laws was attested by the signatures of the Duke of Devonshire as President, Sir Nigel Kingscote as Trustee, and Mr. Ernest Clarke as Secretary.

Journal.

Earl Cathcart (Chairman) reported that applications for permission to reprint (1) Mr. Clement Stephenson's article on Aberdeen-Angus Cattle and (2) Dr. Voelcker's Report on the Churn Tests at Chester had been granted on the usual conditions. The Society was indebted to Mr. Charles Whitehead for presentations to the library of Ellis's "Husbandry" (1777) and Ellis's "Chiltern and Vale Farming" (1732), and the Committee recommended that the best thanks of the Council be given to Mr. Whitehead for these donations. A letter was read from the Meteorological Office asking if the Society had any changes to suggest in the list of recipients of the forthcoming Hay Harvest Forecasts, and the Secretary was directed to reply in the negative. The arrangements for the next number of the Journal had been considered, and directions thereon given to the Editor.

The Committee had considered the suggestion made by Mr. J. Kersley Fowler at the General Meeting on May 22, that the Society should give attention to the subject of beetroot cultivation for the manufacture of sugar, and they recommended the following reply for the adoption of the Council:—

Numerous articles upon the subject of beetroot cultivation have appeared from time to time in the Society's Journal. During

[1] Life member by examination.

recent years an editorial note on the Cultivation of Sugar Beet appeared in Part II. of the Journal for 1890 (page 441), and a special article on "Sugar Beet Cultivation in Austria-Hungary," by the Secretary, appeared in Part II. of the Journal for 1891 (page 325). Many attempts have been made in this country to grow beetroot for sugar, but none of them have met with success. Although in an unusually dry and sunny summer, such as that of last year, beetroot with sufficient saccharine may be grown, yet it is doubtful whether with the average English summer the cultivation of beetroot for sugar in this country would prove remunerative.

Earl CATHCART said that the Council were exceedingly obliged to Mr. Whitehead, who had given them some very valuable books for the library. As the Society had now such good book-shelf accommodation in their new house, the Journal Committee would be very much obliged for any further presentations.

Chemical.

Mr. STANYFORTH presented the quarterly report of this Committee upon cases of adulteration in manures and feeding-stuffs, and a report from the Woburn Sub-Committee as to details connected with the Society's Experimental Farm. Arrangements had been made for visits to the farm of students connected with the Cambridge and Counties Agricultural Education Scheme, and of members of the Leicestershire Surveyors' Institute.

On the motion of Mr. STANYFORTH, the quarterly report of the Chemical Committee was adopted, and ordered to be published in the Journal (see page 322).

At the suggestion of Sir JOHN THOROLD, the date of the Committee's annual visit to the Experimental Farm at Woburn was fixed for Thursday, July 26, 1894, instead of Wednesday, June 13, as arranged last month.

Botanical and Zoological.

Lord MORETON reported that the Consulting Botanist had carefully distributed the spores of the fungus which causes the "finger-and-toe" in turnips in eleven plots, and that in ten of them he had added the following substances to observe their action on the fungus:—Three strengths of lime, gypsum, soot, kainit, copper sulphate, iron sulphate, bleaching powder, and corrosive sublimate, one plot having nothing added to it. In all the plots the seedling turnips were attacked and destroyed by the little parasitic fungus *Pythium de Baryanum*, except in that dressed with corrosive sublimate. This poison not only completely destroyed the Plasmodiophora, but the Pythium also, though it did not affect the seedling turnips. Some indications of the attack were observed, but the rapid injury caused by the Pythium overpowered the plants, and prevented the "finger-and-toe" developing.

Veterinary.

Sir JOHN THOROLD (Chairman) reported the unanimous recommendation of the Committee that Professor Brown be asked to accept the office of Consulting Veterinary Surgeon to the Society in conjunction with Professor Simonds, and that Mr. Ashworth be asked to act as Chairman of the Committee during Sir John Thorold's tenure of office as President of the Society.

The following report had been received from Professor Brown:—

PLEURO-PNEUMONIA.—In connexion with the outbreak of this disease discovered in Kent towards the end of April, seven cattle affected with pleuro-pneumonia were slaughtered, and 150 others which had been in contact were also slaughtered by order of the Board of Agriculture.

SWINE FEVER.—620 swine died from swine fever in the four weeks in which 6,619 were slaughtered by order of the Board of Agriculture as diseased or in-contact animals, while 131 suspected pigs were slaughtered, but found on *post-mortem* to be free from the disease.

ANTHRAX.—There were thirty-seven fresh outbreaks of this disease in four weeks. Seventy-nine animals were attacked, of which sixty-seven died, four recovered, and eight remained alive diseased when the last published return was made up.

Sir JOHN THOROLD, in moving the adoption of this report, said it was his pleasant duty to ask the Council to appoint Professor Brown as Consulting Veterinary Surgeon to the Society. In view of the altered circumstances of Professor Brown's connexion with the Board of Agriculture, the Council would wish to attach him to the Society, and he did not think that any better plan could be adopted than by appointing him as Consulting Veterinary Surgeon to the Society, in association with Professor Simonds—to whom, he might say, the appointment was most agreeable. He begged, therefore, to move that Professor Brown be appointed Consulting Veterinary Surgcon to the Society, in conjunction with Professor Simonds.

Earl CATHCART, in seconding the proposition, said thcy would never forget the great obligations they were under to their old friend Professor Simonds. Professsor Simonds, however, did not live near London, whilst Professor Brown was in immediate touch with all that was going on. It was also essential that Professor Brown should have some *locus standi*, and he hoped that he would accept the appointmcnt as an expression of their great respect for him.

The Duke of RICHMOND and GORDON said that he had very pleasant recollections of his association during six years with Professor Brown at the Privy Council Office, and he could only say that if the Council availed themselves of Professor Brown's services and great professional skill, the Society would be a great gainer. He hoped, therefore, that Professor Brown would be appointed.

The motion having bcen put and carried unanimously,

Professor BROWN said that, in accepting the appointment which the Council had conferred upon him, he counted it, of course, as a very great compliment. He should be, as he had always been, most happy to help the Society in every possible way. As he had said to the Committce yesterday, he did not feel that he could possibly enjoy more confidence than he had always experienced from the Council. It was an additional satisfaction to him to know that this present appointment was to be in association with Professor Simonds, with whom, with very slight intermissions, he had been associated as a colleague for more than a quarter of a century.

Special Committee on Abortion in Cattle.

Sir JOHN THOROLD, in presenting the report of this Committee (see page 312), said that the Council might probably not be altogether satisfied with the result of the inquiry. The Committee trusted, however, that something of benefit to farmers would ensue, although they did not feel justified in asking the Council to undertake the very large expenditure which it was thought would be necessary to determine the question at issue. They had been assured by the Board of Agriculture that, when the favourable moment arrived, the Board would be prepared to take up the matter; but apparently the favourable moment was deferred, and, during the interval, the Committee suggested that the Council should place at the disposal of the Veterinary Committee the sum of 200*l*., which would be used by them cxclusively for carrying on such experiments as might help to throw some light on the subject. There was a further sum of money at the disposal of the Royal Veterinary College, and, with these two amounts, it was hoped that some satisfactory result might be obtained. The Committee were very much indebted to Professor Brown for his assistance during their labours, and for condensing the results of the inquiry into the report. He begged to give notice that at the next meeting of the Council he would move that a grant of 200*l*. be placed at the disposal of the Veterinary Committee for carrying out a further investigation into this subject.

Stock Prizes.

Mr. SANDAY (Chairman) reported a variety of correspondence with exhibitors and others, as to which directions had been given to the Secretary. The preliminary consideration of the prize-sheet for the Darlington Meeting of 1895 was proceeded with, and the Committee recommended that copies of the prize-sheet, as arranged, be printcd and circulated to each member of the Committee for further consideration at their next meeting.

Mr. SANDAY then moved, pursuant to notice, Mr. ASHWORTH seconded, and it was unanimously resolved, that the sum of 5,000*l*. be placed at the disposal of the Committee for providing prizes for live stock, poultry, and produce at the Darlington Meeting of 1895.

Judges' Selection.

Mr. SANDAY also reported that, in consequence of the death of Mr. G. M. Sexton, who had been appointed one of the Judges of Suffolk sheep for the Cambridge Meeting, Mr. Cordy S. Wolton, of Ixworth, had been invited to act, and had consented to do so.

Implement.

Mr. FRANKISH (Chairman) reported that various letters had been read from competitors in the several competitions at the Cambridge Meeting, and instructions thereon given to the Secretary. The question as to the advisability of admitting the public to view the trials of oil-engines at Cambridge had been considered, and the Committee recommended that no one be admitted to the trials of oil-engines except those who were directly interested in the engines competing, and the Judges and officials of the Society.

General Cambridge.

The Earl of FEVERSHAM reported that the draft programme of the Cambridge Meeting had been discussed and finally settled. The Committee recommended that Mr. Harry Johnson, of 28 Petty Cury; Mr. C. Redin, of Trinity Street; and Mr. W. P. Spalding, of 43 Sidney Street, Cambridge, be appointed agents for the sale of season tickets for the Cambridge Meeting. The question of the issue of tickets on the shilling days in large quantities at reduced rates had been considered, and the Committee recommended that *bonâ fide* employers of labour be allowed tickets at the rate of 1*l.* for twenty-five, not less than 100 to be taken. Applications from various societies for permission to hold meetings in the large tent at Cambridge had been acceded to, and the following time-table for them had been arranged:—

Monday, June 25, 1894.

Kerry and Dexter Cattle Society	2.30 p.m.

Tuesday, June 26, 1894.

Shropshire Sheep Breeders' Association	10.30 a.m.
Polo Pony Stud-Book Society	11 a.m.
Royal Agricultural Society of England	12.30 p.m.
Shire Horse Society	2 p.m.
Shorthorn Society	2.30 p.m.
Southdown Sheep Club	2.30 p.m.
Cotswold Sheep Society	3 p.m.
National Pig Breeders' Association	3.30 p.m.
British Berkshire Society (Council)	4 p.m.

Wednesday, June 27, 1894.

National Sheep Breeders' Association	10 a.m.
Hackney Horse Society (Council)	11 a.m.
Suffolk Sheep Society	12 noon
Hunters' Improvement Society	2 p.m.
British Bee-keepers' Association	3 p.m.
Agricultural Exhibitors' Association	3.30 p.m.
National Traction Engine Owners' and Users' Association	4 p.m.

Showyard Works.

The Hon. C. T. PARKER said that he had been asked by Sir Jacob Wilson, Chairman of the Committee, whom they were all glad to see amongst them once more, to read the report of the Committee. The implement yard at Cambridge was quite complete, and exhibits were now arriving. The pavilions were completed, and the dairy, trial shed, and stockyard were in a forward state. Various accounts, including the Surveyor's estimates for wages and materials, had been passed and referred to the Finance Committee for payment. Offers (1) from Mr. George Villers, of Cambridge, for the gratuitous supply of the floral decorations in the Showyard; and (2) from Messrs. J. and J. Brown for the furnishing of the Royal Pavilion, had been accepted.

Education.

Lord MORETON (Chairman) reported that thirty-two candidates entered and twenty-eight actually competed at the Society's Senior Examinations, which took place from May 8 to May 12 last, and that of these twenty-eight competitors fifteen had satisfied the examiners. They recommended that, in addition to the five Life Memberships offered for competition at this examination, a Life Membership be also conferred upon the candidate placed sixth in order of merit, as the marks gained by him were practically equal to those of the fifth candidate. They had agreed upon a detailed report (see page 331) embodying the results of the examination and the various points dealt with by the Examiners.

Education Life Memberships.

In answer to questions by Mr. FOSTER and Earl CATHCART,

Lord MORETON said the Council would remember that at the General Meeting on May 22 attention was drawn to the proposed alteration in the regulations of their Senior Examination, by which, after the present year, the Life Memberships awarded in connexion with the Senior Examination would be discontinued. The Committee had discussed the matter for a considerable time on the previous afternoon, and they had come to the conclusion that it was impossible for them to do anything in the matter as a Committee, because the Council had resolved only a short time ago to discontinue the award of these Education Life Memberships. In some years the standard of excellence was higher than others, and the man who in one year might have been placed first might be placed much lower down in another year were he again to compete. He might say that there was a third alternative, which personally he thought might be the right course to adopt. The Secretary had suggested that, instead of a hard-and-fast rule, as at present, Life Memberships should be given to those candidates who gained, say, two-thirds of the total marks. That seemed to him, and to several other members of the Committee, a very useful suggestion.

Mr. RANSOME said that, as a member of the Education Committee, he might say that there was some little difference in the Committee as to what would be the best course to take. They felt that they had no power to do anything in the matter unless it was referred back to them by the Council. He wished, therefore, to give notice of the following motion:—

> That the resolution of March 7, 1894, by which the granting of Life Memberships to successful students was abolished, be rescinded, and that it be referred to the Education Committee to consider whether Life Memberships of the Society may not in future be conferred upon those candidates who gain a high percentage of the total number of marks.

Mr. FOSTER said that, having had a great deal to do with an agricultural college in the North of England, he thought this suggestion was preferable to the decision arrived at by the Council on March 7.

Mr. PELL thought that the matter had better be referred back without any suggestion attached to it, which might only prove an embarrassment.

After further discussion, Mr. RANSOME withdrew the second part of his proposed motion, and gave notice that at the meeting of Council to be held in London on July 25 he would move—

> That the resolution of March 7, 1894, by which the granting of Life Memberships to successful students was abolished, be rescinded.

Miscellaneous.

The two suggestions made by members at the General Meeting having been considered in connexion with the reports of the Journal and Education Committees respectively, and various letters and other documents having been laid upon the table, the Council adjourned until Wednesday, June 27, 1894, at 3 p.m., in the Showyard at Cambridge. It was also arranged that the final meeting of the Council before the autumn recess should be held on Wednesday, July 25, 1894, instead of August 1, as originally proposed.

Proceedings at 55th Anniversary Meeting of Governors and Members.

HELD IN THE HALL OF THE ROYAL MEDICAL AND CHIRURGICAL SOCIETY, 20 HANOVER SQUARE.

TUESDAY, MAY 22, 1894,

THE DUKE OF DEVONSHIRE, K.G. (PRESIDENT), IN THE CHAIR.

THE fifty-fifth anniversary general meeting of Governors and members was held in the Hall of the Royal Medical and Chirurgical Society, at 20 Hanover Square, on Tuesday, May 22, 1894, his Grace the Duke of Devonshire, K.G., President, in the chair.

Present:—

Trustees.—Earl Cathcart, Col. Sir Nigel Kingscote, K.C.B., the Earl of Ravensworth.

Vice-President. — Sir John H. Thorold, Bart.

Other Members of Council.—Mr. J. Hungerford Arkwright, Mr. Percy E. Crutchley, Mr. William Frankish, Mr. James Hornsby, the Earl of Jersey, Mr. P. Albert Muntz, M.P., the Hon. C. T. Parker, Mr. J. E. Ransome, and Mr. Martin J. Sutton.

Governors.—The Earl of Powis, Mr. C. C. Cotes, Mr. W. Barrow Simonds.

Members.—Viscount Cross, G.C.B., G.C.S.I., Lord Harlech, the Hon. Alex. Parker, Sir N. A. Staples, Bart., Sir Henry Simpson, Messrs. R. C. Assheton, Wm. Barford, W. Worby Beaumont, E. C. Blackstone, Arthur Carey, J. A. Chope, Horace F. Cox, Thomas A. M. Dickin, T. A. Dickson, John Wm. Dixon, T. C. Garfit, W. W. Glenny, H. J. Greenwood, Granville Leveson Gower, R. F. Gubbin, E. B. Hadley, J. Howard, George Jonas, Frederick King, G. H. H. Oliphant-Ferguson, Major Charles Pepper, Messrs. Hugh Rogers, Edward Trimen, Professor Robert Wallace.

Officers.—Mr. Ernest Clarke, Secretary; Dr. J. Augustus Voelcker, Consulting Chemist.

The SECRETARY having read the Bye-Laws governing the transaction of business at the anniversary meetings,

President for 1894–5.

Lord HARLECH moved: "That Sir John Thorold, Bart., be elected President of the Society for the year ensuing the Cambridge Meeting," and said he was sure that this motion would require no recommendation from him, for Sir John Thorold's work in connexion with the Society was so very well known, and he had shown so much zeal and ability, that the motion might be submitted without further preface.

Mr. WM. BARFORD seconded the motion, observing that Sir John Thorold had every qualification for filling the Chair with honour and usefulness to the Society. He (Mr. Barford) had attended thirty-five "Royal" Shows without missing one, so that he felt that he might speak with some little experience on the subject. He had watched Sir John Thorold's abilities both in connexion with the Society and elsewhere, and he felt sure that he would do honour to the Chair.

The motion having been carried unanimously,

Sir JOHN THOROLD said he had to thank the meeting very much for their kindness in electing him President for the ensuing year, and the gentlemen who had spoken for their kind words on his behalf. He could only say that since he had been a member of the Council, and, in fact, since he had been a member of the Society, he had taken the greatest interest in its work and should always continue to so. Knowing how ably he would be assisted by the Society's staff, he had no doubt that he would be able, as other Presidents before him, to bring the important business of the Society to a satisfactory conclusion.

Re-election of Council.

The Trustees and Vice-Presidents having been re-elected by show of hands, the election of twenty-five members of Council was proceeded with, and the President appointed the Hon. Alex. Parker, Mr. Arthur Carey, and Mr. H. J. Greenwood to act as scrutineers of the voting papers. These having been duly collected, and the report of the scrutineers thereon received, it was announced that the twenty-four members of Council who retired by rotation had been re-elected, together with Mr. Howard P. Ryland, of Moxhull Hall, Erdington, Birmingham, who had been duly nominated to fill the vacancy caused by the retirement of a member under Bye-Law 23.

Report of Council.

The SECRETARY then read an abstract of the Report of the Council to the meeting (see page 304).

Viscount CROSS, in moving the adoption of the report, said it was to his mind a highly satisfactory one, and he was sure that everyone who had taken the trouble to read it would be perfectly satisfied with the number of members and with the state of the finances. They might congratulate themselves that they were very soon to take possession of a house worthy of their great association. He was sure that the arrangements for the Cambridge Meeting, as set out in the report, would give satisfaction to everyone. At all events, the Society was fully alive to the duties it had to perform, and the Cambridge Meeting would add another triumph to those which the Society had achieved in the past. It was a matter of great satisfaction to see that the Board of Agriculture were making a determined effort to put a stop to swine fever, which had been so disastrous from one end of the country to the other. He did not think that agriculturists generally took sufficient advantage of the results of the experiments made by the Society, or of their privileges in obtaining analyses, and he hoped these advantages would be utilised more frequently by members of the Society. Speaking as a farmer of many years' standing, he could not congratulate the Society upon the state of the agricultural prospects. Although this year they were in hopes that, owing to the commencement of the fine spring weather, they would have better crops than for some time, as farmers had had weather entirely to their mind for the putting in of seed, yet the chilling effect of this winter week in which they were holding their "spring meeting" would deject the spirits of those who had been buoyed up with great hopes of the future. He had great pleasure in moving the adoption of the report.

Mr. GEORGE JONAS seconded the motion.

Mr. T. A. DICKSON referred to the decision of the Council to discontinue after the present year the award of free life memberships of the Society in connexion with its annual Senior Examinations. He said that these examinations had been going on now for twenty-seven years. The strain of the different reports which had been presented to successive Council meetings in the past had been disappointment at the small number of candidates who had presented themselves for the examination ; but during the last five or six years the number had increased, and gradually a greater number had been elected life members of the Society. As far as he could gather from the published reports of the Council meeting held last March, when the decision to discontinue these life memberships was announced, the idea seemed to be that very few of those who succeeded in obtaining this great honour eventually took up agriculture as a profession. Looking at the last published list of the members—that issued at the end of December 1892—he found that there were eighty-four members of the Society who had free life memberships owing to their having passed this examination. He had taken some little trouble to find out what was the present occupation of these members. From fourteen he had as yet no return whatever, owing to their residence abroad or in the Colonies, but of the remaining seventy only two wrote to say that they were not, at the present time, intimately connected with agriculture. Ten were engaged in farming, twenty-three were land agents, eighteen were teachers at different centres, such as Edinburgh University, Newcastle-on-Tyne, Reading, Cairo, Poonah, &c., and seventeen were either small landowners or were otherwise intimately connected with the agricultural industry. He believed that Mr. Pell, who was responsible for the motion, said that all these young men were elected at too small a composition. Let them, then, increase the amount of the life composition to 20*l*., or, if they preferred, revert to the decision come to by the Council in December, which was to award life memberships every year to the first five successful candidates in the Senior Examination. He did not wish to move any amendment to the Report, but he should like to have some explanation of this change of policy on the part of the Council.

Professor WALLACE wished to add a word or two in support of what had been said by Mr. Dickson. He could assure them that it would prove one of the greatest misfortunes to agricultural teaching if these life memberships were withdrawn, especially at this moment. They had great difficulties in getting the County Councils to do something for agricultural education, and if a great Society like that were to take away one of the most important honours open to students, he thought it would be a most unfortunate thing for the interests of agricultural education.

The PRESIDENT said he was not present at the meeting of the Council at which this change was unanimously resolved upon; but the gentlemen who brought this subject forward would probably be satisfied if he informed them that the matter would be reconsidered by the Council as a suggestion from the general meeting.

Suggestions.

In response to the usual inquiry from the Chair as to whether any Governor or member had any remarks to make or suggestions to offer that might be referred to the Council for consideration,

Mr. J. KERSLEY FOWLER suggested that some attention should be given by the Council to the growth of sugar beetroot in this country. A large number of stations had recently been set apart in the Kingdom for testing the saccharine contained in the roots grown. In every instance the amount of the saccharine contained in the roots in almost every part of England, Scotland, and Ireland was equal to that of Belgium, France, and Germany, showing that this country really could and ought to grow the whole of the sugar which it at present imported from abroad.

Mr. FREDERICK KING reviewed the progress which had been made by the Society since it first met at Cavendish Square, and held its first meeting at Oxford in 1839, and referred to the Society's great indebtedness to those gentlemen who had so generously helped them to acquire their new premises at Harewood House.

Vote of Thanks to Chairman.

No other member rising,

Mr. C. C. COTES said he had great pleasure in proposing a vote of thanks to the Duke of Devonshire for presiding.

Mr. W. BARROW SIMONDS seconded the motion, which was put by the SECRETARY, and carried unanimously.

The PRESIDENT thanked the meeting very much for their kind vote of thanks. He hoped that most of them would meet upon the next occasion of their meeting at Cambridge, and he trusted that the Show would be as successful as any in former years, and worthy of the great pains which had been taken by the Council and its Committees in all the preparations.

The proceedings then terminated.

ROYAL AGRICULTURAL SOCIETY OF ENGLAND.

Proceedings of the Council.

THURSDAY, JUNE 28, 1894.

(IN THE SHOWYARD AT CAMBRIDGE.)

EARL CATHCART (TRUSTEE) IN THE CHAIR.

Present:

Members of Council.—Earl Cathcart (Trustee), Mr. Alfred Ashworth, Mr. Joseph Beach, Lord Brougham and Vaux, Mr. Charles Clay, Mr. Percy E. Crutchley, Lieut.-Col. J. F. Curtis-Hayward, Mr. Alfred Darby, Mr. J. Marshall Dugdale, Mr. W. Frankish, Mr. Joseph Martin, Hon. C. T. Parker, Mr. Albert Pell, Mr. J. E. Ransome, Mr. S. Rowlandson, Mr. G. H. Sanday, Mr. W. T. Scarth, Mr. A. J. Smith, Mr. Henry Smith, Sir J. L. E. Spearman, Bart., Mr. E. W. Stanyforth, Mr. E. V. V. Wheeler, Mr. C. W. Wilson.

Officers.—Mr. Ernest Clarke, Secretary; Dr. Fream, Editor of the Journal; Dr. J. Augustus Voelcker, Consulting Chemist; Professor Brown, C.B., Consulting Veterinary Surgeon; Mr. R. Peters, Secretary of the Local Committee.

In the unavoidable absence of the President, the Chair was taken by Earl Cathcart, Trustee.

The Minutes of the last monthly meeting of the Council, held on June 6, 1894, were taken as read and approved.

The SECRETARY reported that in view of the presence in the Showyard of H.R.H. the Duke of York on the previous day (Wednesday), for which the Council meeting had been summoned, the President had, in the absence of a quorum at the appointed hour, adjourned the Council until 1 P.M. on that day (Thursday).

The Birth of a Prince.

The SECRETARY then read the following telegram from H.R.H. the Duke of York, received by the President in reply to the message of congratulation telegraphed from the General Meeting, held on the previous Tuesday (see page xc):—

> To the DUKE OF DEVONSHIRE, Showyard, Cambridge.—We thank the General Meeting of the Royal Agricultural Society of England very warmly for their most kind congratulations on the birth of our son.—GEORGE.

On the motion of the CHAIRMAN, it was resolved that this telegram be entered upon the Minutes.

Election of New Members.

The election of the following forty-three new members was then proceeded with:—

ALLISON, H... Parkend, Lockerbie.
APPLEBY, J... East Benridge, Morpeth.
BERRY, T... Walkden, Bolton-le-Moors.
BLACKBURNE, R. I... Hale Hall, Liverpool.
BOOTH, J. G... Shady Nook, Knutsford.
BROWN, A... Mobberley, Knutsford.
BURKITT, W., Jnr... Chesterfield.
CAIRNES, F. E... Worsley, Manchester.
CARMICHAEL, G. H. G... Callands, Mountain Cross, N.B.
CLARKE, G. T. F... Colworth, Bedford.
CROCKER, T. E .. Draxmont, Wimbledon.
DACOMBE, W. H... Little Pan Farm, Newport, Isle of Wight.
DUNN, E... Kelfield Lodge, York.
ELLIS, C. H. B. Heaton.. Buntingford.

ELWESS, F. H...Scawthorpe, Doncaster.
FRENCH, J. S...Chesterton Road, Cambridge.
GREENOUGH, T. R...Leigh, Lancs.
GRIGG, E. F. J...Longbeach, Canterbury, N.Z.
HALAHAN, Col.S. H...Haighlands, Forest Hill.
HARE, Sir G. R. L., Bt...Gressenhall, Dereham.
HARRISON, T. F...King's Walden, Hitchin.
HARVEY, C. W...76 Rodney St., Liverpool.
HUTCHINSON, B...The Poole, Hereford.
HUTTON, F...Awkley, Doncaster.
JENKS, A...Orton, Wolverhampton.
JONES, W. Pride...Downend, Glos.
KITCHENER, G...Potton, Sandy.
LODER, Sir E. G., Bt...Whittlebury, Towcester.
LYON, A. J...Mill Road, Cambridge.
MANSEL-PLEYDELL, Col...Longthorns, Blandford.
PROBERT, W. G...Linton, Cambs.
SAMUEL, H. L...3 Kensington Palace Gardens, London, W.
SHERSTON, Major..Evercreech, Bath.
SKIPWORTH, Rev. A. B...Hollesley Bay.
SPARK, C. G. S...Wembdon, Bridgwater.
SPEAKMAN, T. F...Church Hill, Knutsford.
TOLLEMACHE, A. F. C...10 Lennox Gdns., S.W.
TYSON, Hy..Parrock Hall, Gravesend.
VIZARD, Wm..Glyn, Neath.
WELLINGHAM, H. L...Southacre, Swaffham.
WILLOUGHBY, Hon. T. L. F...Settrington, York.
WILTON, H. S...Braywick, Maidenhead.
WRIGHT, John..Polesworth, Tamworth.

Finance.

On the motion of Mr. SANDAY, the Report of the Finance Committee, containing recommendations of payments amounting to 1,904*l.* 10*s.* 3*d.*, was received and adopted.

Veterinary.

The following report was presented by Professor BROWN upon the veterinary examination of the horses under Regulation 44:—

The total number of horses sent by the Judges for inspection was 217. Of this number 36 were certified to be affected with some form of hereditary disease.

From the hunter and hackney classes (1 to 24), 71 animals were examined, and only three were found to be unsound: one was affected with ringbone, one with spavin, and one with a malignant form of tumour (melanosis).

From the Shire horses (Classes 27 to 37), 77 animals were examined, and 15 of them, or nearly 20 per cent., were certified to be unsound: one from cataract, two from diseased feet, five from ringbone, three from sidebone, one from spavin, and three from roaring.

From the Clydesdales (Classes 38 to 42), seven horses were examined, and one was rejected as unsound from ringbone.

From the Suffolks (Classes 43 to 53), 56 horses were examined. Of these 15 were certified to be unsound: nine from sidebone, one from ringbone, one from spavin, one from ophthalmia, and three from roaring.

In addition to the above, six horses were sent for examination from Class 54 (Agricultural Geldings), and two of them were found to be unsound: one from ringbone and one from sidebone.

(Signed) G. T. BROWN.

June 25, 1894.

Votes of Thanks in connection with the Cambridge Meeting.

On the motion of the Hon. CECIL T. PARKER (Hon. Director), seconded by Lord BROUGHAM and VAUX (Steward of Stock), it was unanimously resolved:—

That the best thanks of the Society are due, and are hereby tendered to—

(*a*) The Master and Fellows of Jesus College, for their kindness in placing rooms at the College at the disposal of the Society for the accommodation of the Stewards and other officials during the Cambridge Meeting.

(*b*) To Messrs. Foster & Co. (the Local Bankers of the Society), the Borough Police, and the Cambridgeshire Constabulary, for the efficient assistance rendered by them during the Cambridge Meeting.

(*c*) To the Great Eastern, Great Northern, Midland, and London and North-Western Railway Companies, for the facilities afforded by them in connection with the Meeting.

(*d*) To the St. John Ambulance Association, for the ambulance arrangements in the Showyard.

(*e*) To the National Telephone Company (Limited), for their efficient arrangements in the provision of telephonic communication in the Showyard and with the town of Cambridge.

(*f*) To Messrs. J. R. & J. Brown, of 23 Harrington Street, Hampstead Road, N.W., for furnishing and decorating the Royal Pavilion.

(*g*) To Mr. George Villers, of Trumpington Road, Cambridge, for providing the floral decorations in and around the pavilions in the Showyard.

A letter was ordered to be addressed to the Home Secretary, after the conclusion of the Meeting, conveying the appreciation of the Council of the very efficient services rendered by the A Division of the Metropolitan Police at the Cambridge Meeting.

Suggestions of Stewards.

A number of suggestions made by Stewards and other members of Council, relating to details in connection with the Cambridge Meeting, were ordered to be referred to the several Committees concerned.

Darlington Meeting of 1895.

On the motion of Mr. CRUTCHLEY, seconded by Mr. PELL, it was resolved that the General Darlington Committee be composed of the whole Council, with six representatives of the Local Committee to be nominated by the Mayor of Darlington, the Committee to sit for the first time at 11 A.M. on Wednesday, July 25, 1894.

It was arranged that a deputation from the National Pig Breeders' Association should be received by the Stock Prizes Committee at 10 o'clock on Tuesday, July 24, 1894, "to suggest that the conditions of age for boars be the same as for sows, instead of as at present, under eighteen months old."

The Hon. C. T. PARKER (Hon. Director) submitted a preliminary plan of the Showyard at Darlington, which was approved, with a view to the necessary works at Darlington being proceeded with as early as possible.

Country Meeting of 1896.

Communications were received from the authorities of Leicester and Northampton, inviting the Society to hold its Country Meeting of 1896 in their respective towns. The Secretary was directed to acknowledge the receipt of these invitations with the cordial thanks of the Council, and to say that they would be duly considered at the next meeting, to be held in Hanover Square on Wednesday, July 25, 1894.

The Hon. C. T. PARKER gave notice that at the next meeting of the Council he would move for the appointment of a Committee of Inspection to visit and examine the various sites and other accommodation offered by different towns for the purposes of the Country Meeting of 1896, and to report thereon to the Council at their meeting to be held on Wednesday, November 7, 1894.

Suggestions at General Meeting.

The following suggestions made by members at the General Meeting were referred to the Stock Prizes and Dairy Committees for consideration and report:—

(1) The Hon. and Rev. A BAILLIE-HAMILTON:—

That the breed of Guernsey cattle should be restored to its former position in the prize-sheet as regards the number and value of the prizes offered.

(2) Mr. C. F. HOPE:—

That the rules relating to the exhibition of cheese should be altered to admit of the entry of cheesemakers who are accustomed to hire cows from farmers, for the purpose of turning the milk of such cows into cheese.

Date of next Meeting.

Various letters and other documents having been laid upon the table, the Council adjourned until Wednesday, July 25, 1894, at 12 Hanover Square, at noon.

WEDNESDAY, JULY 25, 1894.

SIR JOHN H. THOROLD, BART. (PRESIDENT), IN THE CHAIR.

Present:

Trustees.—Earl Cathcart, Mr. John Dent Dent, Lord Egerton of Tatton, Col. Sir Nigel Kingscote, K.C.B., Sir A. K. Macdonald, Bart.

Vice-Presidents. — Right Hon. Henry Chaplin, M.P., Viscount Emlyn, Lord Moreton, Mr. Charles Whitehead.

Other Members of Council.—Mr. Alfred Ashworth, Mr. J. Bowen-Jones, Lord Brougham and Vaux, Mr. J. A. Caird, Earl of Coventry, Mr. Percy E. Crutchley, Lieut.-Col. J. F. Curtis-Hayward, Mr. J. Marshall Dugdale, Mr. C. S. Mainwaring, Mr. Joseph Martin, Mr. T. H. Miller, Hon. Cecil T. Parker, Mr. Dan. Pidgeon, Mr. J. E. Ransome, Mr. James Rawlence, Mr. S. Rowlandson, Mr. Howard P. Ryland, Mr. G. H. Sanday, Mr. W. T. Scarth, Mr. A. J. Smith, Mr. Henry Smith, Mr. E. W. Stanyforth, Mr. Martin J. Sutton, Mr J. P. Terry, Mr. John Tremayne, Mr. R. A. Warren, Mr. E. V. V. Wheeler, Sir Jacob Wilson.

Officers.—Mr. Ernest Clarke, Secretary; Dr. Fream, Editor of the Journal; Dr. J. Augustus Voelcker, Consulting Chemist; Professor Brown, C.B., Consulting Veterinary Surgeon.

The following members of the Darlington Local Committee were also present:—Captain Gerald Walker, the Borough Surveyor (Mr. Thomas Smith), and Mr. F. Raymond Steavenson (Secretary of the Local Committee).

Apologies for non-attendance were received from the Duke of Westminster, K.G., Viscount Bridport, G.C B., Sir J. L. E. Spearman, Bart., Mr. F. S. W. Cornwallis, M.P., Mr. W. Frankish, Mr. James Hornsby, Mr. Charles Howard, Mr. P. A. Muntz, M.P., Mr. Albert Pell, Mr. C. W. Wilson, and Professor J. B. Simonds.

Confirmation of Minutes.

The Minutes of the last Ordinary Meeting of the Council held in the Showyard at Cambridge on June 28, 1894, were taken as read and approved. The Minutes of the two Special Council Meetings, held in the Showyard at Cambridge on Monday, June 25, and Friday, June 29, 1894, were read and confirmed. The Minutes of the Special Council on June 25 related to the enforcement of one of the Society's regulations and to the Trials of Oil Engines. Those of June 29 included a report from Professor Brown and Mr. Duguid, certifying that none of the animals exhibited at Cambridge showed any indications of contagious or infectious disease, and that no outbreak of such disease had occurred during the Show; and votes of thanks to the Rev. E. H. Morgan and Professor Liveing for services kindly rendered by them in connection with the Cambridge Meeting.

Election of New Governors and Members.

The election of the following three Governors and forty-three Members was then proceeded with:—

Governors.

DIGBY, Lord..Cerne Abbas, Dorchester.
DULEEP SINGH, Prince Frederick..White's Club, S.W.
MORRELL, Lieut.-Col. G. H...Headington Hill Hall, Oxon.

Members.

AMOS, G. W...Lillington, Leamington.
BALLAM, E. J. C...The Ashes, Stowmarket.
BARNETT, W...Court Street, Faversham.
BELL, H...Bridge House, Grantham.
BIRCH, F. J. L...Delamere Ho., Wylye, Bath.
BIRCH, Mrs. May..Kirk Hammerton, York.
BLAKE, A. M...Danesbury, Welwyn.
BLYTH, Audley..Wool House, Stausted.
BRIGGS, Robert E...Lennel Hill, Coldstream, N.B.
BROCKLEBANK, J...Carlton-le-Moorland, Newark.
CAMPBELL, Hugh..Kingston, Halifax.

CANT, Walter..Myland, Colchester.
CAPPER, Prof. D. S...King's College, W.C.
CAVENDISH, R. F...6 Carlos Place, W.
CHAMPION, W. N. L...Riddlesworth Hall, Thetford.
CLEEVE, U. A...Hartford, Cheshire.
COODE, Harold..64 Dyer's St., Cirencester.
COUPLAND, S. J...Long Sutton, Wisbech.
DARLING, F...Eldon, Bishop Auckland.
DENISON, J. B...Balure, Bembridge, I. of W.
EASTWOOD, J. R...Littleover Grange, Derby.
GILBERTSON, A. H...Glanrhyd, Swansea Vale.
GOODLIFF, Richard..Huntingdon.
GREGORY, T. S. P...Harlaxton, Grantham.
GRODZKI, S...33 Senatorska, Warsaw.
HACKETT, W. C...Adelaide, S. Australia.
HAMILTON, C. E...44 Stratford Road, W.
HENEAGE, J. W...Bovill's Hall, Gazeley.
LEE, E...Fowley, Liphook.
MACKEY, Wm. J...New Brompton.
MALCOLM, I. Z...Poltalloch, N.B.
MANNSELL, F...21 Portland St., Southampton.
MILLS, W. R...Castle Meadow, Norwich.
PARMETER, P. J...Harwood Ansty, Salisbury.
PHILLIPS, Maj.-Gen...Ashenhurst Hall, Staffs.
SHERSTON, T. P. D...R. A. College, Cirencester.
STILWELL, H...Steepleton Manor, Dorchester.
THORNBORROW, J...Penrith.
WATT, W. H...R.A. College, Cirencester.
WELCH, J. K...Sopley Park, Ringwood.
WENN, T. H...Downham Market.
WHIPPLE, A. H...Riverside, Grantham.
WHITAKER, W. I...Pylewell Park, Lymington.

New Member of Council.

Earl CATHCART, Chairman of the Committee of Selection, formally introduced Mr. Howard P. Ryland, who attended as a member of Council for the first time.

Bicentenary of the University of Halle.

The PRESIDENT said that before commencing the ordinary business of the reception of the reports of Committees, there was a matter of some importance to bring under the notice of the Council. The University of Halle, which was perhaps the most famous in the world for its teaching of agriculture, and at which agriculture was one of the faculties, would celebrate its bicentenary next week. The Senate had issued invitations to foreign universities and other leading educational institutions to send delegates to the official celebration of the bicentenary; and Cambridge, Dublin, London, Oxford, and others of their own universities had recognised the importance of the occasion by sending representatives and addresses of congratulation. Their Society had had the high compliment paid it of being included in the list of educational institutions invited; but the original invitation having been unfortunately lost in the post, it had not been possible to take the opinion of the Council at an earlier date. He was sorry that his own personal engagements forbade the hope that he could attend himself as President, as had been suggested; and he regretted to learn that his noble friend, the Chairman of the Education Committee—who would be the most appropriate person to represent the Society—would also be unable to go. At the same time, the Council would doubtless agree that, in view of the specially agricultural character of the University of Halle, it was not desirable that the bicentenary about to be celebrated should be allowed to pass without notice by the Society.

Earl CATHCART said that this was a matter which had been considered on the previous day by the Committee of Selection. He was excessively sorry that the President would be unable to go himself, but, as that could not be, perhaps some other members of Council would attend as representing the Society. Halle was an important educational establishment, and it was a compliment to the Society to be asked to send there a delegation upon such a very interesting occasion. Germany had a Royal Agricultural Society of its own, founded upon the model of that Society, imitation being the sincerest form of flattery. The feeling of the Committee, who had considered the whole matter, was that the Society should be represented by the Secretary, and, perhaps, two or three members of the Council might consent to go also. He (Lord Cathcart) was decidedly of opinion that the Secretary ought to be delegated to attend the bicentenary of the Halle University on behalf of the Society, and he moved a formal resolution to that effect.

The Earl of COVENTRY seconded the motion, which was carried unanimously.

The reports of the various Standing Committees were then presented and adopted as below :—

Finance.

Sir NIGEL KINGSCOTE (Chairman) reported that the accounts for the period ended June 30, 1894, as certified by the Society's Accountants, showed receipts amounting to 1,639*l.* 17*s.* 9*d.*, and expenditure to 6,093*l.* 3*s.* 6*d.* The balance at the bankers' on June 30, allowing for cheques outstanding, was 2,701*l.* 12*s.* 9*d.* The accounts for the period ended July 21, 1894, showed receipts amounting to 10,427*l.* 14*s.* 1*d.*, and expenditure to 1,904*l.* 10*s.* 3*d.*, with a balance at the bank, allowing for cheques outstanding, of 11,224*l.* 16*s.* 7*d.* Accounts relating to the Cambridge Meeting, amounting in all to 11,022*l.* 8*s.*, and relating to the ordinary business of the Society, amounting to 3,758*l.* 8*s.* 10*d.*, had been passed, and were recommended for payment. The quarterly statement of subscriptions and arrears, and of the Society's property, as at June 30, 1894, had been laid upon the table.

On the motion of Sir NIGEL KINGSCOTE, seconded by the Hon. CECIL T. PARKER, it was resolved:—

That, in view of the desirableness of winding up as early as possible the accounts for the Cambridge Meeting, and also the accounts connected with the transference of the Society's offices to Harewood House, authority be given to the President, the Chairman of the Finance Committee, and the Secretary to issue during the recess orders upon the Society's bankers for the payment of accounts connected with the Show and the new offices.

House.

Sir NIGEL KINGSCOTE (Chairman) reported that the Committee had given instructions as to the fittings, floor-coverings, electric lighting, and other matters connected with Harewood House, and as to the transference of the Society's offices to the new premises.

Journal.

Earl CATHCART (Chairman) reported the publication on June 30 of Vol. V., Part 2, of the Journal, the copies of which had been duly distributed to the members. Various accounts in respect of literary contributions and printing had been passed and referred to the Finance Committee for payment. Applications for permission to reprint Professor Yeo's paper on the "Pathology of Pleuro-pneumonia," in Vol. XIV. of the Journal, and the article on anthrax in the current number of the Journal, had been granted on the usual conditions. Directions had been given to the Editor as to the contents of the next number of the Journal, and as to a variety of suggestions for articles and notes.

Chemical.

Viscount EMLYN (Chairman) reported the receipt of a letter from the Permanent Nitrate Committee, complaining of a paragraph in the quarterly report of the Chemical Committee, published in the last number of the Journal, on the subject of the alleged deterioration of the quality of nitrate of soda: as to which the Committee had to remark that the statement in question was based upon the results of analyses made for members of the Society during 1893 and the first five months of 1894. During 1893 the percentage of analyses which showed less than 95 per cent. of nitrate was 17·6, and during 1894 the percentage of analyses showing this deficiency was 53·3.

The Committee presented their usual quarterly report, and the report of the Woburn Sub-Committee.

On the motion of Viscount EMLYN, the quarterly report of the Chemical Committee was adopted, and ordered to be published in the next number of the Journal (see page 541).

Botanical.

Mr. WHITEHEAD (Chairman) reported that the question of the continuance of the offer of prizes for jams and preserved fruits had been discussed. After careful consideration, the Committee had unanimously agreed to recommend the continuance of these prizes at the Darlington Meeting, and they proposed, if this recommendation were approved by the Council, to reconsider the detailed regulations after the autumn recess, subject to a schedule being submitted to the Stock Prizes Committee. The

Committee recommended that prizes for cider and perry be offered at Darlington as at Cambridge.

Mr. WHITEHEAD said that he was unavoidably absent from the meeting of the Committee on the previous day, and it was quite unwittingly that he appeared to be in opposition to his colleagues on the Committee in regard to the proposed continuance of prizes for jams and preserved fruits. He had been led to think that the prizes for jams and preserved fruits should be discontinued, because in his capacity as judge at Cambridge he had been much struck with the few and inferior entries that were then exhibited. A great deal of the jam was of such indifferent quality that he felt at the time that some alteration ought to be made, or that the prizes should be discontinued altogether. He might say that in a local show at Maidstone they had a very much larger entry of jams and preserves than they had ever had at the Royal Agricultural Society's Meetings, and the reason, perhaps, might be that the large jam manufacturers did not care about competing, and that the private manufacturers did not like to run the chance of competing against the large manufacturers at the "Royal." Probably if the regulations were reconsidered, and the large manufacturers eliminated altogether, or if different classes were made for them and for the private manufacturers, they might have a larger competition. He would be very sorry to appear to throw cold water upon any efforts to encourage industries affecting agriculture, especially at this crisis, but it was evident that some alterations would have to be made with regard to the prizes for jams.

Mr. SANDAY said that he expressed no opinion on the subject now, but would point out that the Stock Prizes Committee would have to be consulted before these prizes could be inserted in the prize-sheet.

Finger-and-Toe in Turnips.

Earl CATHCART, referring to the question of finger-and-toe in turnips, said that Mr. Rawlence had very kindly taken a great deal of pains in supplying Mr. Carruthers with interesting specimens of infected roots, and had also invited Mr. Carruthers to pay him a visit for the purpose of investigating the disease upon the spot. He should be glad to know when Mr. Carruthers was likely to present a report on this disease.

Mr. WHITEHEAD said that Mr. Carruthers was at present away on holiday, but that he (Mr. Whitehead) would write to him with a view to a report upon the subject being presented at as early a date as possible.

Veterinary.

Mr. ASHWORTH (Chairman) reported that a desire had been expressed by the Chairman of the Gloucestershire County Council that a separate reprint should be made of the articles on anthrax by Professors Brown and McFadyean in the current number of the Journal. The Committee had referred the matter to the Journal Committee, with the expression of their opinion that such a reprint would be desirable, but that the authors should be asked to revise their articles so as to adapt them for publication in pamphlet form. The Committee had discussed the question of the advisability of in future publishing the reasons for the veterinary rejection of stallions and brood mares under Regulation 44 of the prize-sheet; and eventually it had been agreed to recommend that at future Country Meetings the owner of an animal rejected under this regulation, upon his application, be furnished with a copy of the veterinary certificate. The Committee also recommended that in future the names of the veterinary surgeons who were to be engaged in the examination of the horses to be exhibited at the Society's Country Meeting should be previously submitted to the Veterinary Committee for approval, and then published in the Journal, together with the names of the judges. Letters had been read from the Farriers' Company, communicating the following resolutions of the Registration Committee under the scheme for the National Registration of Farriers or

Shoeing Smiths, which had been adopted by the Court of the Company, and asking for the Council's approval thereof, in order that the scheme might be revised accordingly:—

1. That provision be made for registering "doormen" in a special list as registered doormen, at a reduced fee.

2. That the Registration Committee consist of ten members of the Farriers' Company, six registered men, six members appointed by the Council of the Royal Agricultural Society of England, and six members appointed by the Royal College of Veterinary Surgeons.

The Committee recommended that the Secretary be instructed to reply that the Council would not raise any objection to the alterations proposed. Under Clause 4 of the scheme, half of the Society's six representatives now retired from the Registration Committee, but they were eligible for re-appointment, and the Committee accordingly recommended the re-appointment of Sir Nigel Kingscote, Sir Jacob Wilson, and Mr. Ernest Clarke.

Professor Brown had presented the following report:—

PLEURO-PNEUMONIA.—In connection with the outbreak of this disease discovered near Margate in April last, 311 cattle were slaughtered, of which eight were found affected with the disease. A few days ago another outbreak of pleuro-puenmonia was discovered in Middlesex, in the Hendon district, close to premises where the disease existed last year. The history of this case has not yet been made out.

SWINE FEVER.—This disease is still very prevalent in many parts of England, in some parts of Wales, and has recently been reported in several counties of Scotland. During the seven weeks ended July 14, 1,112 pigs died from swine fever, while 12,765 pigs were slaughtered as diseased or having been exposed to the risk of infection. In addition to the above, 222 were slaughtered as suspected. but on post-mortem were found free from the disease.

ANTHRAX.—During the seven weeks above referred to, 53 outbreaks of this disease were reported in Great Britain, and 122 animals were attacked, of which 113 died and eight recovered.

RABIES.—Of this disease 32 cases were reported in Great Britain in seven weeks; 27 of these were in England and five in Scotland.

ABORTION.—It is proposed to commence the scientific investigation at once by placing under observation at the College some cows from an infected herd, and others from a herd in which epizootic abortion has not appeared.

INVESTIGATIONS.—Since the Committee last met, investigations have been made regarding serious losses among cattle from parasitic gastritis and enteritis. Anthrax vaccine has been supplied for the inoculation of all the animals (horses and cattle) in one farm, and the operations were carried out without any fatality. Experiments have been made with a view to ascertaining the protective value of the Pasteurian inoculation, and further experiments and observations are being made regarding the effect of putrefaction in the virulence of anthrax carcasses.

National Registration of Shoeing Smiths.

Sir JACOB WILSON asked to be relieved from the duty of acting as one of the Society's representatives upon the Registration Committee of the Farriers' Company, and moved that Mr. Stanyforth be elected in his place.

The Hon. CECIL T. PARKER seconded the motion, which was adopted.

Disposal of Anthrax Carcasses.

Sir NIGEL KINGSCOTE, in reference to the proposal of the Committee that a reprint should be made of the article on anthrax in the current number of the Journal, said it was desirable that if such a reprint were made at all, it should be undertaken by the Society rather than by any other body.

Earl CATHCART thought the article was hardly adapted for publication as a pamphlet in its present form.

Professor BROWN explained that Professor McFadyean and himself, as the writers of the short notes on anthrax, had contemplated revising the whole article and putting it into proper form for the purpose of being published at once, so that the local authorities and everybody concerned might be made aware that they need not cut open the bodies of animals suspected to be dead of anthrax, which was a dangerous and deadly thing to do; but that if they cut off an ear or a foot and sent it to the Royal Veterinary College Laboratory it was easy to find out whether the animal had died of anthrax or not. Most of the proposed devices for the disposal of anthrax carcasses involved cutting them up, but the safest thing to do was to bury the carcass absolutely untouched, with the exception of the amputated ear or foot, which might be sent to the College for examination. Within a short time, certainly within three weeks, all risk of danger of infection from the buried carcass would have disappeared. Those were the two points to which it was desired that as much publicity as possible should be given.

Earl CATHCART said that there would not be the least objection on the part of the Journal Committee to the publication of this information in the form of a leaflet.

It was accordingly decided that Professor Brown should be asked to prepare a leaflet giving the desired information, for immediate distribution by the Society amongst those interested in the subject.[1]

Veterinary Inspection of Horses.

Professor BROWN, in reference to the proposed submission of the names of the veterinary inspectors to the Veterinary Committee, said it was perfectly agreeable to him that such a course should be adopted. He had always endeavoured to obtain the best professional skill at the Society's Meetings. At the Cambridge Meeting he had engaged the services of Professor Axe, who had had more than a score of years' experience in the examination of horses; Professor Penberthy and Professor Macqueen, who were also constantly engaged in the same way at the Royal Veterinary College; the President of the Royal College of Veterinary Surgeons (Mr. Wragg), who was a London practitioner of large experience; Mr. Lepper, whose name was historical in connection with horses; and Mr. Duguid, who had long been associated in work for their Society. In the majority of the cases he (Professor Brown) himself had also had the opportunity of seeing and noting the unsoundness certified by the veterinary surgeons.

Mr. ASHWORTH said that the Veterinary Committee not only had not the slightest objection to publish the names of the veterinary surgeons in advance, but were desirous of sharing with Professor Brown the responsibility for their selection.

Mr. DENT said that he had moved in Committee that the names should be published. They had recently taken upon themselves to publish the names of the judges, and it was desirable that the names of the veterinary inspectors should also be published. It was important to have all possible publicity in these matters, in order that people might not go about the Showyard saying that the horses were examined by nobody knew whom, and were rejected for nobody knew what.

[1] Copies of this leaflet, which has now been published, may be obtained on application to the Secretary at 13 Hanover Square, London, W.

Stock Prizes.

Mr. SANDAY (Chairman) reported that the Committee had received a deputation, consisting of Captain Heaton, Mr. John Barron, and Mr. Norman, from the National Pig Breeders' Association, to suggest "that the age for boars be the same as for sows, instead of as at present, under eighteen months old." Captain Heaton, on behalf of the deputation, had explained that the present conditions limiting the exhibition of boars to those farrowed in the year previous to the Show compelled exhibitors to force their animals from the day of their birth, and thus practically keep the animals for exhibition only, and had pointed out that under present conditions it was impossible for the public to see a mature boar in the Society's Showyards. The Committee, having considered the matter, recommended that the classes for boars (if offered in connection with the Darlington Meeting next year) should be for boars farrowed in 1893 and 1894. Letters had been read from the Secretaries of the National Sheep Breeders' Association and the Shropshire Sheep Breeders' Association as to double fees for second entries of stock, but the Committee recommended that the scale of entry fees as settled last year be adhered to for the Darlington Meeting. Various letters respecting classes and prizes for the Darlington prize-sheet had been considered, and the Committee recommended that the date of lambing of Dorset Horned sheep be altered from December 1 to November 1. Various suggestions by Stewards and Judges at the Cambridge Meeting had also been considered by the Committee. The following suggestion made by Stewards and other members of Council, "that in future no member of Council shall act as judge at the Society's Meetings," had been carefully considered; and the Committee had decided to recommend that it be an instruction from the Council to the Committee for the selection of judges, when appointed, that no member of Council be selected as a judge.

Selection of Judges.

Mr. TERRY said that unfortunately he was not present at the Stock Prizes Committee on the previous day, and he therefore wished to know whether the Stewards were unanimous in their suggestion that in future no member of Council should act as judge at the Society's Country Meetings.

Mr. SANDAY explained that he had put this suggestion in the Stewards' Suggestion Book, but he had not in his mind anything that had taken place at the Cambridge Meeting. The suggestion had been inserted by him in the Stewards' Book, and other Stewards and members of Council who had seen it had also added their names.

Mr. TERRY said that his only object was information. He thought that if they were going to change the practice which had existed for a considerable number of years, some reason ought to be given why the step should be taken.

Sir JACOB WILSON said that, in his capacity as a former Chairman of the Stock Prizes Committee, and as Honorary Director for some years, he had persistently protested against members of Council being elected as judges at their Shows, and he had done so on various grounds. In this view he had been supported by the Highland and many other societies, who did not permit it. He was perfectly aware that by passing such a resolution they would be depriving themselves of the services of many eminent judges who were members of the Council, but their services might be utilised in other and, perhaps, more useful ways. Since their Showyard had assumed such large proportions it became a very hard task for the Honorary Director to get that assistance which he really required in order to have the judging carried out upon the first day of the Show. Thus, members of Council who were now occupied as judges would be of more use to the Society as supplementary Stewards on the first morning of the Show; and it was not right that the Honorary Director should be compelled to go outside when he could utilise the services of the gentlemen who were members of the Council. He hoped, however, that no member of Council who had acted as judge at Cambridge would entertain the idea that there had been any reflection upon anyone who had been judging there. He should certainly support the recommendation of the Stock Prizes Committee, because he had been a consistent advocate of such a policy for the last twenty years.

Mr. PIDGEON asked whether the rule was intended to apply to the judges of implements, and was answered in the affirmative.

The report of the Committee was then adopted.

Implement.

Mr. ROWLANDSON presented various accounts in connection with the trials at the Cambridge Meeting, which had been passed for payment. In view of the fact that eight of the twenty-five oil-engines entered for competition for the Society's prizes at Cambridge were absent from the trials, thus causing the Society great and unnecessary expense in preparations, the Committee thought that a deposit considerably larger in amount than at present (1*l.*) should be required in connection with future trials; and they recommended that the amount of deposit payable in respect of the haymaking machines and clover-making machines to be entered in connection with the Darlington Meeting be fixed at 5*l.* The Committee also recommended that, having regard to the great number of exhibits entered as "New Implements," a non-returnable entry fee be charged for every exhibit entered as a "New Implement," and that, in the event of any such implement being considered by the Stewards and judges not to come within the meaning of the regulations governing the entry of new implements, a fine of 1*l.* be imposed upon the exhibitor. Resolutions had been considered from the Agricultural Exhibitors' Association, and from a meeting of exhibitors and their representatives, held on the Showground at Cambridge on June 29, respecting

No. 41 of the Implement Regulations, governing the issue of handbills by exhibitors, and the Committee had decided that, in view of the great annoyance caused to visitors in the Showyard, and the consequent trouble entailed upon the Stewards, the regulation in question be retained, and that any exhibitor wilfully contravening the rule be debarred from exhibiting at future Meetings of the Society. Letters from a number of exhibitors expressing regret for infringing this regulation at Cambridge had been laid upon the table.

General Darlington.

Mr. DENT reported that at the meeting of Council held in the Showyard on June 28, the General Darlington Committee had been constituted of the whole Council, together with six representatives of the Local Committee. The Mayor having nominated the following gentlemen, they had been duly elected members of the Committee:—Lord Barnard, the Mayor of Darlington for the time being, Captain Gerald Walker, Mr. Robert Bruce, the Borough Surveyor, and Mr. F. Raymond Steavenson as Local Secretary. After discussion it had been agreed to recommend that the date of the Darlington Meeting be fixed for Monday, June 24, to Friday, June 28, 1895, the implement yard only being opened on the previous Saturday, June 22. A memorial from the High Gosforth Park Company, asking that the date of the Darlington Meeting might not be fixed during the race meeting held in that week, had been carefully considered, but it had been found impracticable to change the dates on which the Society's Meeting was usually held. The dates for the closing of the entries for implements and stock had been fixed as usual—April 1 (implements) and May 1 (stock), with post entries for stock up to Saturday, May 11.

After discussion, it was resolved, on the motion of the Hon. CECIL T. PARKER, seconded by Mr. ROWLANDSON, that the Darlington Meeting be held in the week commencing Monday, June 24, 1895.

Showyard Works.

Sir JACOB WILSON (Chairman) reported that the greater portion of the shedding at Cambridge had been taken down, and the permanent plant had been removed to Darlington and stored away. He also reported that two sales of materials had been held, which realised fair prices. The concluding sales would take place on August 7 and 8, by which time all the permanent plant would have been removed to Darlington. The arrangements for prevention of fire at the Darlington Meeting had been discussed, and instructions given thereon. The Committee had received an intimation that Messrs. Kent & Brydon, seedsmen, of Darlington, would be willing to provide the floral decorations for the pavilions in the Darlington Showyard free of charge, and they recommended that this offer be accepted with thanks.

Education Life Memberships.

Mr. RANSOME then moved the following resolution, of which he had given notice:—" That the resolution of the Council of March 7, 1894, by which the granting of Life Memberships to successful candidates at the Society's Senior Examination was abolished, be rescinded." He said that this matter was brought prominently forward at their Annual Meeting, held on May 22 last, by Mr. T. A. Dickson (himself an Education Life Member), who was strongly supported by Professor Wallace, and the President promised that the matter should be reconsidered by the Council. This resolution to discontinue the granting of Life Memberships to successful candidates was brought forward independently by Mr. Pell, and was not based upon the recommendation of the Education Committee. It was carried at the latter end of the Council Meeting, when, comparatively, there was only a small number of members present, and he ventured to say that the subject did not have that full and thorough consideration which its importance deserved. He felt that if the Council had had the facts before them at that time they would not have accepted Mr. Pell's motion, or they would have referred the whole question back to the Education

Committee for consideration. One of the reasons urged by Mr. Pell, perhaps the strongest, was that those members of the Society who had become members by examination did not devote their lives to agriculture to any large extent. That was the impression at the time. Since then Mr. Dickson had put into his hands answers which he had received from the various examinees who were Life Members. He (Mr. Ransome) found, on the whole, that less than 5 per cent. were not directly connected with agriculture or were not closely connected with agricultural education. He thought this was a very strong argument. Mr. Dickson said at the General Meeting that "he had taken some little trouble to find out what was the present occupation of these members. From fourteen he had as yet no return whatever, owing to their residence abroad or in the colonies, but of the remaining seventy, only two wrote to say that they were not at the present time intimately connected with agriculture. Ten were engaged in farming, twenty-three were land agents, eighteen were teachers at different centres, such as Edinburgh University, Newcastle-on-Tyne, Reading, Cairo, Poonah, &c., and seventeen were either small landowners or were otherwise intimately connected with the agricultural industry." It appeared, therefore, that a very small percentage were not directly connected with agriculture. When they remembered that one of the objects of their Society was "to take measures for the improvement of the education of those who depend upon the cultivation of the soil for their support," and when they considered the value placed upon scientific education in the present day, and the great necessity there was that agriculture should have the benefit of scientific education as well as other industries in this country, they would feel that a great Society like the "Royal" ought not to do anything at any time—and more especially at this time—to detract from the value of the examinations, which he believed certainly stood at the very top of the tree. Although the money prizes were valuable, and he would not advocate their being discontinued, yet he thought that there was no question whatever that these Education Life Memberships were very much more highly esteemed than anything in the shape of money. The fact that successful candidates had their names in the list of members of the Society with a special mark, indicating that they had received their Life Memberships after having passed a very severe and stringent examination, gave a much greater value to them than any money prizes could possibly have. He hoped the Council would understand that he was merely moving that the former resolution should be rescinded. The Council would remember that the Education Committee had proposed that the number of Life Memberships should be reduced from an unlimited number to five per annum, and that this was the first year in which that resolution had come into force. Perhaps he might be allowed to say that the Education Committee had considered this matter yesterday, and they were prepared with some suggestions in their report, provided that his resolution was carried. He would not say more, but move the resolution that stood in his name.

Mr. MAINWARING seconded the resolution.

Sir NIGEL KINGSCOTE said he held in his hand a letter from Mr. Pell, saying how much he regretted to be unable to be present to support him in his contention that this resolution ought not to be rescinded. With all deference to Mr. Ransome, he would say that when Mr. Pell's motion was brought forward there were more people in the room than there were now. It was true there was no discussion, but there was every opportunity for discussion. He did not wish to repeat what he had said when Mr. Pell brought forward his motion, but he strongly objected to giving these Life Memberships to scholars who came up for their examinations. There were prizes of 25*l.*, 15*l.*, 10*l.*, and 5*l.* given, which he considered quite sufficient for the purpose of fostering emulation. He did not see why the Society should hamper itself with these Life Members, nor did he consider that they were called upon to give away Life Memberships at all. He trusted that the Council would not rescind the resolution, and he should certainly vote against Mr. Ransome's motion.

Sir JACOB WILSON said that since the resolution was passed there appeared to have arisen a very strong feeling, both inside and outside that building, that the question had not been completely discussed; therefore, if there should be any doubt about the matter, the present gave an opportunity for having it thoroughly threshed out *de novo*, and it was only fair and just that it should be reconsidered. Let them not make a mistake for want of time in the discussion of this matter.

Colonel CURTIS-HAYWARD, speaking as one with an open mind upon this question, asked what was the opinion of the Education Committee upon the subject.

Lord MORETON said that to simplify matters he might say that, in case Mr. Ransome's motion for the rescinding of the resolution were carried out, the Committee intended to propose that in future there should be five Life Memberships given annually, but that those who received them would have to gain at least two-thirds of the maximum number of marks.

Earl CATHCART said that they should not lose sight of what was done by the Surveyors' Institution. Young men intending to become land agents especially desired to pass the examination of that Institution, because it was very strict, and because of the importance attached to it in courts of law.

After some further discussion, in which Lord EGERTON of TATTON, the PRESIDENT, Sir JACOB WILSON, Mr. CRUTCHLEY, Viscount EMLYN, Mr. DUGDALE, Lord MORETON, and Mr. SUTTON took part, Mr. Ransome's motion was put, and declared carried by fourteen votes to thirteen. It was then decided that the whole matter should be postponed for consideration after the autumn recess, and that meanwhile facts and statistics on the subject should be printed and circulated amongst the members of the Council.

Dairy.

The Hon. CECIL T. PARKER (Chairman) reported that the Committee had considered the following suggestion made by Mr. Hope at the General Meeting in the Showyard at Cambridge on Tuesday, June 26, 1894:—"That the rules relating to the exhibition of cheese should be altered to admit of the entry of cheesemakers who are accustomed to hire cows from farmers for the purpose of turning the milk of such cows into cheese," and, seeing no objection to this alteration, recommended that the rule be altered accordingly. The Steward of Dairying had been requested to give effect at future Country Meetings to a suggestion made by the judges of butter at Cambridge, that the butter at future shows should be left exposed as cut by the judges, in order that the public might be in a position to appreciate the differences between the respective exhibits.

Country Meeting of 1896.

Invitations from the authorities of Leicester and Northampton for the holding of the Society's Country Meeting of 1896 were laid before the Council, and, on the motion of the Hon. CECIL T. PARKER, seconded by Sir JACOB WILSON, it was resolved:—"That a Committee of Inspection be appointed to visit and examine the various sites and other accommodation offered by different towns for the purposes of the Country Meeting of 1896, and to report thereon to the Council at their meeting to be held on November 7, 1894."

Upon the recommendation of the Committee of Selection, and on the motion of Earl CATHCART, the Committee of Inspection was constituted of the President, the Earl of Coventry, the Hon. C. T. Parker, Mr. E. V. V Wheeler, Mr. S. Rowlandson, Mr. J. P. Terry, and the Secretary.

Miscellaneous.

Various letters and other documents having been laid upon the table, and the date of the General Meeting in December having been fixed for Thursday, December 13, 1894, the Council adjourned over the autumn recess until Wednesday, November 7, next, at noon.

Proceedings at General Meeting of Governors and Members,

HELD IN THE LARGE TENT IN THE

SHOWYARD AT CAMBRIDGE.

TUESDAY, JUNE 26, 1894.

THE DUKE OF DEVONSHIRE, K.G. (PRESIDENT), IN THE CHAIR.

Present on the Platform:

H.R.H. the Prince of Wales, K.G., H.R.H. Prince Christian, K.G., the Duke of Richmond and Gordon, K.G., the Duke of Westminster, K.G., Earl Cathcart, Earl Cadogan, K.G., the Earl of Feversham, the Earl of Lathom, G.C.B., the Earl of Ravensworth, the Earl of Sefton, Lord Brougham and Vaux, Lord Moreton, the Hon. Cecil T. Parker, Right Hon. Sir Massey Lopes, Bart., Sir W. Gilstrap, Bart., Sir J. L. E. Spearman, Bart., Sir J. H. Thorold, Bart., Colonel Sir Nigel Kingscote, K.C.B., Sir Jacob Wilson, Messrs. J. H. Arkwright, Alfred Ashworth, J. Bowen-Jones, Charles Clay, H. Chandos-Pole-Gell, Lieut.-Col. J. F. Curtis-Hayward, Messrs. John Dent Dent, A. B. Freeman-Mitford, C.B., M.P., J. J. Colman, M.P., W. Frankish, A. Hamond, James Hornsby, Charles Howard, J. Martin, P. Albert Muntz, M.P., J. E. Ransome, S. Rowlandson, A. J. Smith, Henry Smith, E. W. Stanyforth, Martin J. Sutton, Garrett Taylor, John Tremayne, E. V. V. Wheeler, C. Whitehead, &c.

There were also present, as representatives of the Local Committee, the Mayor of Cambridge (Mr. E. H. Parker, J.P.), Mr. George Foster (Chairman of the Local Committee), and Mr. R. Peters (Local Secretary).

The officers of the Society present included Mr. Ernest Clarke, Secretary; Dr. Fream, Editor of the Journal; Dr. J. Augustus Voelcker, Consulting Chemist; Professor Brown, C.B., Consulting Veterinary Surgeon; and Mr. Cecil Warburton, Zoologist.

A large number of the general body of members were also present in the tent.

The Birth of a Prince.

The PRESIDENT, at the commencement of the proceedings, said that before he called upon H.R.H. the Prince of Wales to move the first resolution, he wished to submit a proposal, which he was sure was quite unnecessary should be either moved or seconded, but which would be carried by acclamation. Considering the interest which had been taken in the Society by the Royal Family, he was sure that the meeting would agree with him that they could not more appropriately commence their proceedings that day than by passing the following resolution:—

> The Royal Agricultural Society of England, in General Meeting assembled, desires with every feeling of loyal attachment to the Royal Family to tender its hearty congratulations to His Royal Highness the Duke of York upon the happy and auspicious national event which has just taken place.

The resolution, having been carried by acclamation, was duly telegraphed by the President to H.R.H. the Duke of York.[1]

Vote of Thanks to Mayor and Corporation of Cambridge.

H.R.H. the PRINCE of WALES then said:—I have been asked to move the following resolution: "That the best thanks of the Society are due, and are hereby tendered, to the Mayor and Corporation of Cambridge for their cordial reception of the Society." I feel sure that all of you will agree with me that this is a resolution which ought to come before all others, and we shall all most unanimously tender our thanks to the Mayor and Corporation for what they have done in their reception of the Society at Cambridge. It may be interesting to remark that the last Meeting of the Royal Agricultural Society at Cambridge was held fifty-four years ago—a year before I was born. The amount of the prizes then offered was 900*l.*; at this Show it is 5,433*l.* I can only say that it has given me great pleasure to attend here again at Cambridge—a place which is full of agreeable associations for me, as I lived here for a year at Trinity College. I hope that the fine weather may last, and that the Show may continue to be a great success throughout the whole of the week. I have great pleasure in moving this resolution. (Cheers.)

Mr. E. V. V. WHEELER (Senior Steward of Stock) seconded the resolution. He said that without the assistance of the Mayors and Corporations of the different towns visited by the Society, there would be considerable difficulty in carrying out that great Show. The success of the present Meeting was in large measure due to the Mayor and Corporation of that town. The Mayor of Cambridge had in no way been behind the Mayors of other towns in the hospitality which he had extended to the Society, and he (Mr. Wheeler) had great pleasure in seconding the resolution.

The vote of thanks having been put and carried unanimously,

The MAYOR of CAMBRIDGE (Mr. Edmund H. Parker), in replying, said, in the first place, he should like to add the congratulations of the town to His Royal Highness on the birth of another representative of his Royal line. They all heard the good news on Sunday in that very tent, and "God save the Queen" was immediately sung. On behalf of the Corporation of Cambridge, he cordially thanked His Royal Highness for proposing this resolution, and the meeting for the unanimous way in which they had adopted it. He need scarcely tell them that Corporations had their difficulties, and they had had theirs. They would not be surprised to hear that the chief one was of a financial character; but, thanks to the liberality of their townsmen, helped nobly by the University, the county, and others from far and near, he trusted that their exchequer would be found quite equal to the requirements. He would like to make mention of one or two gentlemen in this connection. Messrs. Foster & Co., the well-known bankers at Cambridge, headed their subscription list with a most liberal donation, and Mr. George Newnes, M.P. for East Cambridgeshire, came forward and guaranteed any deficit there might be. This enabled them to work with a light heart. He had had put into his hands a copy of the *Cambridge Advertiser* of 1840, which gave an account of the Society's Show held in that year. He had set himself to see if he could find anything unchanged at the present day. At first sight everything seemed altered, but he did find two things which were the same in 1840. The Royal Agricultural Society appeared to have been more given to dinners than they were now, for he read of a large dinner in the Quadrangle of Downing College, when 3,000 people sat down in a pavilion erected at the cost of 1,300*l.* After dinner, the Duke of Richmond, who was then President of the Society, called upon the assembly to rise and drink to the Queen, whereupon the whole vast assembly rose, and with enthusiastic cheering drank the toast. He would like to point out that there was the same spirit of loyalty in this country

[1] For the terms of the reply received in answer to this telegram see page lxxvii.

dent undergraduate, would feel real pleasure in responding to a vote like that, because the University of Cambridge always extended the most brotherly welcome to any great enterprise which was taken in hand by the civic authorities, and no man knew better than their present Mayor —himself a distinguished member of King's College—what his brother King's man the Vice-Chancellor felt on this occasion. Each one of them deeply felt not only what they owed to the Cambridge Corporation, but also what they owed to the great science of agriculture itself. He would not attempt to measure their comparative antiquities; he would not attempt to foresee which of them would outlive the other; but he might say that the University of Cambridge had only within the last few years given special proof of its interest in agriculture, and of its deep sense of the paramount importance of that great art or science—call it what they would—by incorporating it as one of the branches of the University curriculum. He begged to return them, on behalf of the University and on behalf of the Vice-Chancellor, their most sincere and hearty thanks for the kindness with which their vote had been passed.

Suggestions of Members.

In response to the usual inquiry as to whether any Governor or member had any remarks to make or suggestions to offer for the consideration of the Council,

The Hon. and Rev. A. Baillie-Hamilton drew attention to the diminution in the number and value of the prizes allotted by the Society to the breed of Guernsey cattle, and hoped that the Council would take the matter into consideration in preparing the prize-sheet for the next year's Meeting.

Mr. Christopher Stephenson supported these views.

Mr. C. F. Hope advocated a slight revision of the regulations for the exhibition of cheese.

Vote of Thanks to retiring President.

On the motion of Earl Cadogan, seconded by Mr. A. B. Freeman-Mitford, C.B., M.P., a vote of thanks was unanimously accorded to His Grace the Duke of Devonshire, K.G., for his services as President during the past year.

The President, in reply, said:—I rise for the purpose of returning, in the fewest possible words, my very sincere and grateful thanks to my friends Lord Cadogan and Mr. Mitford for the kind way in which they have proposed this vote of thanks, and to you, gentlemen, for the manner in which you have been pleased to receive it. As to the services of which the resolution speaks, they have been of a very light and almost nominal character; but it has given me great pleasure and satisfaction to have obtained some insight into and knowledge of the manner in which the work of this great Society is conducted. That work is carried on almost entirely by the Council through the agency of numerous Committees, and I believe that few even of the members of this Society are fully aware of the great amount of conscientious work which is voluntarily undertaken by the members of the Council in their Committees. The work of organising these great annual Country Meetings, of making all the arrangements for their success, and for the proper distribution of the funds at your disposal—that work of organisation is in itself of no light character. But, in addition to the large amount of labour which devolves upon the Committees and the Council in organising and making the preparations for these Meetings, a very large amount of useful work is also done by the Veterinary, the Chemical, the Education, the Journal, and other numerous Committees, which are occupied through a very large portion of the year in obtaining, arranging, collecting, and publishing information of all kinds of a most useful and practical character for the agricultural community. The duties of the President, as I have said, are little more than nominal. They are simply to preside at the monthly meetings of the Council, where the work which has been done by the Committees is brought together and recorded for the use of the members of the Society. But although the share of these labours which have devolved upon me has been of a very slight and insignificant character, I can assure you that it has given me the greatest satisfaction to be able personally to see how well the business of this Society is transacted by the members of the Council, and by its admirable permanent officials. Of course much of the present success of our Meetings is due to the increased facilities of locomotion which have been given by the railways, and to other causes; but I do not think that a Society which has made such great and striking progress during the last half-century can be said to be representative of so backward and unenergetic a race of men as the farmers of England are sometimes represented to be. I wish, gentlemen, that I could congratulate you upon the progress and prosperity of agriculture having been commensurate with the progress and prosperity of this Society. I am afraid that at few periods have you been suffering more acutely than you are at present from a period of chronic depression; but I think we may safely say that, gloomy in some respects as are the existing prospects of agriculture, they would have been far worse but for the assistance and the efforts of this Society and its members, which have been the means of placing the best knowledge and the best ability at the disposal of the agricultural community. I can have no doubt that the Society has been of the utmost value to the farmers and to all who are connected with agriculture in this country; and, in leaving the chair which I have had the honour to occupy during the present year, I can only express my best wishes for its continued success and prosperity, and my satisfaction that I am able to announce to you the fact that I leave the chair of this Society when the number of its members is greater than at any former period of its history. I beg to thank you most cordially for the vote of thanks you have been pleased to pass to me, and at the same time the Council and its permanent officials for the unwearying assistance they have given me through the year.

President for 1894–95.

The Earl of DERBY, in moving "That Sir John Thorold, Bart., do take the Chair after the conclusion of the present Meeting," said that most of them knew how hard Sir John had worked in the interests of the Society, and the excellent and practical acquaintance he had with agriculture, and how he had been ready for the last fifteen years to work in all departments and upon all the Committees of which their noble President had spoken, and how on all occasions he had worked with advantage to the Society, and with the cordial goodwill of all his colleagues.

Mr. J. J. COLMAN, M.P., said he had great satisfaction in seconding the resolution. Lord Derby had said in appropriate language what they all felt with regard to Sir John Thorold. He had borne the burden and heat of the day in a less conspicuous way than as President, and had shown how fitted he was for the honour now proposed to be bestowed upon him.

The motion having been carried by acclamation,

Sir JOHN THOROLD, in reply, thanked the meeting very much for the cordial way in which they had accepted his nomination to this responsible office. What work he had been able to do for the Society had been to him a labour of love. He had met with the greatest kindness and assistance from all his colleagues. He would not detain them longer than to say that the same sentiment which animated him animated them: they could not do too much or work too hard to ensure the success of that great Society.

The proceedings then terminated.

CAMBRIDGE MEETING.

JUNE 23 TO 29, 1894.

PRESIDENT:

THE DUKE OF DEVONSHIRE, K.G.,
Chatsworth, Derbyshire.

OFFICIALS:

Honorary Director.

The Hon. CECIL T. PARKER, Eccleston, Chester.

Stewards of Live Stock.

E. V. V. WHEELER, Newnham Court, Tenbury, Worcestershire.
C. W. WILSON, Rigmaden Park, Kirkby Lonsdale, Westmoreland.
Lord BROUGHAM AND VAUX, Brougham Hall, Penrith.
Mr. GARRETT TAYLOR, Trowse House, Norwich.

Stewards of Implements.

S. ROWLANDSON, Newton Morrell, Darlington.
Sir J. L. E. SPEARMAN, Bart., The Hall, Wem, Salop.
E. W. STANYFORTH, Kirk Hammerton Hall, York.

Steward of Dairying, Poultry, and Produce.

ALFRED DARBY, Little Ness, Shrewsbury.

Steward of Forage.

JOSEPH MARTIN, Highfield House, Littleport, Isle of Ely.

Stewards of Finance.

G. H. SANDAY, Langdale Lodge, Clapham Park, Surrey.
ALFRED ASHWORTH, Tabley Grange, Knutsford, Cheshire.

Secretary.

ERNEST CLARKE, 13 Hanover Square, London, W.

JUDGES OF IMPLEMENTS.

Oil Engines.—*Classes* I. & II.

Professor D. S. CAPPER, M.A., King's College, London.

Professor EWING, M.A., Cambridge.

J. B. DENISON, Balure, Bembridge, Isle of Wight.

Spraying Machines.—*Classes* III. & IV.

CHARLES WHITEHEAD, F.L.S., Barming House, Maidstone.

Sheep Dipping Apparatus.—*Class* V.

J. B. ELLIS, W. Barsham, Walsingham.
ALFRED J. SMITH, Rendlesham, Woodbridge.

Churns.—*Classes* VI. & VII.

PERCY E. CRUTCHLEY, Sunninghill Lodge, Ascot.
DOUGLAS A. GILCHRIST, University Extension College, Reading.

Miscellaneous Implements.

CALEB BARKER, Shadwell, Thetford.
T. STIRTON, West Stratton, Hants.

JUDGES OF STOCK, &c.

(*As finally corrected.*)

HORSES.

Hunters.—*Classes* 1–7.

J. B. COOKSON, Meldon Park, Morpeth.

Sir R. D. GREEN PRICE, Bart., Kingsland, Shrewsbury.

Cleveland Bays and Coach Horses, Ponies and Harness Horses and Ponies.

Classes 8 & 9; 23–26.

G. ROBSON, Easingwold.

ROMER WILLIAMS, 58 Gt. Cumberland Place, W.

Hackneys.—*Classes* 10–22.

WM. CASE, Tuttington, Aylsham.

FRANK USHER, Middlethorpe, Market Weighton.

Shire and Agricultural.

Classes 27–37; 54.

H. G. BURKITT, Grange Hill, Bishop Auckland.

JOHN MORTON, West Rudham Hall, Swaffham.

Clydesdales.—*Classes* 38–42.

R. CRAIG, Crondon Park, Ingatestone.

W. R. TROTTER, S. Acomb, Stocksfield-on-Tyne.

Suffolks.

Classes 43–53.

D. A. GREEN, East Donyland, Colchester.

J. A. HEMPSON, Erwarton Hall, Ipswich.

CATTLE.

Shorthorn.—*Classes* 56–64.

C. HOWARD, Biddenham, Bedford.

T. H. HUTCHINSON, Catterick, Yorks.

Hereford.—*Classes* 65–71.

R. S. OLVER, Trescowe, Washaway, Cornwall.

J. P. TERRY, Berry Field, Aylesbury.

Devon.—*Classes* 72–77.

J. JACKMAN, Glanville Road, Tavistock.

H. SIMMONS, Bearwood Farm, Wokingham.

Sussex.—*Classes* 78–83.

P. GORRINGE, Westham, Hastings.

A. HEASMAN, Court Wick, Littlehampton.

Welsh.—*Classes* 84–88.

H. ELLIS, Tairmeibion, Bangor, N. Wales.

J. W. GRIFFITHS, Penally Court, S. Wales.

Red Polled.—*Classes* 89–95.

C. S. READ, Honingham Thorpe, Norwich.

R. WALKER, Altyre, Forres, N.B.

Aberdeen Angus and Galloway.

Classes 96–99 & 100–103.

J. CRANSTON, Nunwood, Dumfries.

W. ROBERTSON, Linkwood, Elgin.

Ayrshire, Kerry, and Dexter Kerry.

Classes 104 & 105; 117–122.

A. ALLAN, North Kirkland, Dalry, N.B.

R. MCCLURE, Glenhazel, Kenmare, co. Kerry.

Jersey.—*Classes* 106–111.

WM. ARKWRIGHT, Sutton Scarsdale, Chesterfield.

JAMES BLYTH, Wood House, Stansted, Essex.

Guernsey.—*Classes* 112–116.

W. A. GLYNN, Seagrove, Seaview, I.W.

J. W. MOSS, Feering, Kelvedon, Essex.

SHEEP.

Leicester.—*Classes* 125–128.

B. PAINTER, Burley-on-the-Hill, Oakham.

H. SMITH, Cropwell Butler, Nottingham.

Cotswold.—*Classes* 129–132.

T. BROWN, Marham Hall, Downham Market.

T. S. TAYLOR, Compton Abdale, Glos.

Lincoln.—*Classes* 133–137.

R. FISHER, Leconfield, Beverley.

J. T. NEEDHAM, Gt. Carlton House, Louth.

Oxford Down.—*Classes* 138–142.

J. B. ELLIS, W. Barsham, Walsingham.

J. T. HOBBS, Maisey Hampton, Fairford.

Shropshire. (Rams.)

Classes 143–145.

T. A. Buttar, Corston, Coupar Angus, N.B.
J. E. Farmer, Felton, Ludlow, Salop.

Shropshire. (Ewes.)

Classes 146 & 147.

C. Coxon, Elford Park, Tamworth.
T. S. Minton, Montford, Salop.

Southdown.—*Classes* 148–152.

G. Hampton, Findon, Worthing.
H. Penfold, Selsey, Chichester.

Hampshire Down.—*Classes* 153–157.

F. P. Brown, Compton, Newbury.
Wm. Newton, Crowmarsh Battle, Wallingford.

Suffolk.—*Classes* 158–162.

J. W. Eagle, The Hall, Walton-on-Naze.
C. S. Wolton, Ixworth, Suffolk.

Wensleydale.—*Classes* 163–165.

W. Carr, Langden Holme, Clitheroe.
T. F. King, Edgley, Leyburn, Yorks.

Border Leicester and Kentish or Romney Marsh.

Classes 166–168; 172 & 173.

T. Bain, Legars, Kelso, N.B.
J. J. Bowman, Netherby, Carlisle.

Somerset and Dorset Horned.

Classes 169–171.

J. Chick, Compton Valence, Dorset.
J. Farthing, Yarford, Kingston, Taunton.

Cheviot, Black-faced Mountain, Lonk, Herdwick, and Welsh Mountain.

Classes 174–183.

John Ingleby, Austwick, Lancaster.
Edward Nelson, Gatesgarth, Cockermouth.

POULTRY.

Classes 208–283.

W. F. Addie, Powis Castle Estate Office, Welshpool.
O. E. Cresswell, Morney Cross, Hereford.
J. W. Ludlow, Vauxhall Road, Birmingham.

PRODUCE.

Butter and Soft Cheese.

Classes 284–286; 292–294.

Prof. T. Carroll, Glasnevin, Dublin.
C. Prideaux, Motcombe, Shaftesbury.

Cheese.—*Classes* 287–291.

G. Aldridge, Station Road, Gloucester.
G. Lewis, Ercall Park, Wellington, Salop.

Cider and Perry.—*Classes* 295–298.

Thomas Maye, Mount Elwell, Totnes.

Jams and Fruits.—*Classes* 299–301.

Charles Whitehead, F.L.S., Barming House, Maidstone.

Hives and Honey.—*Classes* 302–319.

W. B. Carr, Orpington, Kent.
F. J. Cribb, Morton, Gainsborough.
J. M. Hooker, 9, Beaufort Gardens, S.E.

COMPETITIONS.

Butter-making.

Prof. T. Carroll, Glasnevin, Dublin.
C. Prideaux, Motcombe, Shaftesbury.

Horse-shoeing.

H. G. Lepper, M.R.C.V.S., Aylesbury.
C. Stephenson, F.R.C.V.S., Sandyford Villa, Newcastle-on-Tyne.

OFFICIAL REPORTER.

W. Fream, B.Sc., LL.D., 13 Hanover Square, London, W.

AWARDS OF PRIZES AT CAMBRIDGE.

ABBREVIATIONS.

I., First Prize. II., Second Prize. III., Third Prize. R. N., Reserve Number. H. C., Highly Commended. Com., Commended.

N.B.—The responsibility for the accuracy of the description, pedigree, or eligibility to compete of the animals mentioned below rests solely with the Exhibitors.

Unless otherwise stated, each Prize Animal in the Classes for Horses, Cattle, and Sheep was "bred by Exhibitor."

HORSES.

Thoroughbred Stallions.

Winners of the Three Queen's Premiums of £150 *offered by the Royal Commission on Horse Breeding, and the Gold Medals, value* £10 *each, offered by the Cambridge Local Committee, at the* SPRING SHOW, *held at* THE ROYAL AGRICULTURAL HALL, LONDON, *March* 6 *to* 8, 1894.

A. HIS ROYAL HIGHNESS THE PRINCE OF WALES, K.G., Sandringham, for **Serpa Pinto**, bay, foaled 1890; *s.* Galliard, *d.* Pinbasket *by* Hampton, *g. d.* Berceaunette *by* Blair Athol.

B. DONALD FRASER, Tickford Park, Newport Pagnell, for **Mount Gifford**, brown, foaled 1886; *s.* Lord Hastings, *d.* Blue Ruin *by* Blue Peter, *g. d.* Lena Rivers *by* Brockley; bred by J. Byrne, Mount Gifford, co. Cork.

C. THE DUKE OF HAMILTON AND BRANDON, K.T., Easton Park, Wickham Market, for **Persistive**, chestnut, foaled 1889; *s.* Fitz-James, *d.* Persistence *by* Orest, *g. d.* Perseverance *by* General Peel; bred by Thomas Acres.

Hunters.

No. in Catalogue.

Class 1.—*Hunter Mares and Foals, capable of carrying* 15 *stone and upwards.* [6 entries, 1 absent.]

3 **I.** (£20.)—SIR GILBERT GREENALL, BT., Walton Hall, Warrington, for **Scarlet** 873, chestnut, foaled 1886 [foal *by* Ruddigore], bred by Col. Grimston, Beverley; *s.* Lambton.

1 **II.** (£10.)—WM. CARTER, Ailesworth, Peterborough, for **Lady Betsy** 559, brown, foaled 1877 [foal *by* Havoc], bred by H. Stokes, Nassington, Northants; *s.* Outfit, *d. by* Rivet.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

Class 2.—*Hunter Mares and Foals, capable of carrying weights between* 12 *and* 15 *stone.* [12 entries, 2 absent.]

9 I. (£20.)—SIR GILBERT GREENALL, BT., Walton Hall, Warrington, for **Dorothy** 319, chestnut, foaled 1888 [foal *by* Ruddigore], bred by late Jas. Martin, Wainfleet; *s.* Fabius, *d.* Yorkshire Lassie 141 *by* The Mallard.

17 II. (£10.)—F. B. WILKINSON, Blyth Spital, Rotherham, for **Happy Girl**, bay, foaled 1879 [foal *by* Johnny Morgan], bred by E. C. Godfrey; *s.* Rotherhill, *d.* Tranquility *by* Orest.

15 III. (£5.)—C. I. TAYLOR & CO., Newbound, Pleasley, Mansfield, for **Jessie** 60, bay, foaled 1877 [foal *by* Sir Kenneth], breeder unknown; *s.* Boliver, *d. by* Poynton.

10 R. N. & H. C.—ALFRED HARRIS, Thetford, for **Brunette**.

16 Com.—ALEXANDER WEBB, Teversham, Cambridge, for **Clear the Way**.

Class 3.—*Hunter Mares or Geldings, up to* 15 *stone, foaled in* 1890.[1] [4 entries, 1 absent.]

21 I. (£20.)—J. S. DARRELL, West Ayton, York, for **Bruno**, brown gelding, bred by Mrs. Thomas, Pinchinthorpe, Yorks; *s.* Bourbaki, *d.* Fanny *by* Favourite.

19 II. (£10.)—J. T. CLIFFORD, Geddington, Northants. for **Stormer**, chestnut gelding, bred by John Singlehurst, Weldon, Northants; *s.* Iceland, *d.* Lady Teazle.

22 R. N.—G. W. GIBSON, Conington, St. Ives, Hunts, for **Limerick**.

Class 4.—*Hunter Mares or Geldings, up to* 12 *stone, foaled in* 1890.[1] [9 entries, 2 absent.]

25 I. (£20.)—S. & H. GALE, Sealford, Melton Mowbray, for **Monarch**, brown gelding, bred by A. Humphries, Melton Mowbray; *s.* Pax, *d. by* Lord Hastings.

23 II. (£10.)—BASIL J. CHAPLIN, Fulbourn, Cambridge, for **Cherry Bounce**, brown mare, breeder and pedigree unknown.

24 III. (£5.)—JAMES CHRISTY, Writtle, Chelmsford, for **Crusader**, chestnut gelding; *s.* Baldur, *d.* Daffodil 37 *by* Mainstone.

31 R. N. & H. C.—JOSEPH PAISLEY, Waresley, Sandy, for **Dorothy**.

Class 5.—*Hunter Fillies, foaled in* 1891. [6 entries, none absent.]

33 I. (£15.)—THOMAS BRADLEY, Uffington, Stamford, for **Stella** 892, brown; *s.* Havoc, *d.* Sally.

32 II. (£10.)—F. J. COLERIDGE BOLES, Baraset, Stratford-on-Avon, for **Zest**, bay; *s.* Zeal, *d.* Huntress 355.

34 III. (£5.)—FRANK A. JEEVES, Fenstanton, St. Ives, Hunts, for **Princess** 857, brown; *s.* Second Attempt, *d.* Lady 374.

35 R. N. & H. C.—JAMES JOICEY, Poulton Priory, Fairford, Glos, for **Pepsatia**.

[1] Prizes given by the Cambridge Local Committee.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

Class 6.—*Hunter Fillies, foaled in* 1892. [12 entries, 1 absent.]

45 **I.** (£15.)—James Joicey, Poulton Priory, Fairford, Glos, for **Piperita**, bay; *s.* Peppermint, *d.* Amicia *by* Hollywood.

49 **II.** (£10.)—F. B. Wilkinson, Blyth Spital, Rotherham, for **Lady Kilmarth**, brown, bred by A. Over, Rugby; *s.* Kilmarth, *d.* My Lady *by* Nuneham.

39 **III.** (£5.)—James Flower, Chilmark, Salisbury, for **Marigold**, chestnut; *s.* Marioni, *d.* Lottery.

42 **R. N. & H. C.**—Sir Gilbert Greenall, Bt., for **Philo.**
40 **Com.**—Wolverley A. Fordham, for **Humming Bird.**

Class 7.—*Hunter Fillies, foaled in* 1893. [7 entries, 1 absent.]

53 **I.** (£15.)—Richard Hoddinott, Springfield, Gillingham, for **Lady Marion**, bay; *s.* Marioni, *d.* Ladybird 560 *by* Master Ned.

52 **II.** (£10.)—The Hon. T. W. Fitzwilliam, The Ferry, Peterborough, for **Olivette**, bay; *s.* Oliver Twist, *d.* Hit or Miss *by* Lord Gough.

50 **III.** (£5.)—F. J. Coleridge Boles, Baraset, Stratford-on-Avon, for **Fable**, bay; *s.* Fabius, *d.* Huntress 355.

Cleveland Bays and Coach Horses.

Class 8.—*Cleveland Bays or Coaching Stallions, foaled in* 1891 *or* 1892. [8 entries, 1 absent.]

60 **I.** (£15.)—John Lett, Rillington, York, for **First Favourite**, bay, foaled 1891, bred by M. Rudsdale, Danby, Grosmont, Yorks; *s.* Prince George 367 Y.C.S.B., *d. by* Favourite 581.

58 **II.** (£10.)—Thomas Darrell, Spiker's Hill, West Ayton, Yorks, for **Lord Raincliffe** 1290 C.B.S.B., bay, foaled 1891; *s.* Prince George 235, *d.* Chloris 609 *by* Roseberry 265.

64 **III.** (£5.)—J. White, Appleton Roebuck, Bolton Percy, for **Onyx** 2107 Y.C.S.B., bay, foaled 1891; *s.* Golden King 1336, *d.* Star 153 *by* Emperor 145.

61 **R. N. & H. C.**—John Lett, for **Stamina.** 57 **Com.**—F. P. Baker, for **Courtier.**

Class 9.—*Cleveland Bays or Coaching Mares and Foals.* [6 entries, none absent.]

68 **I.** (£15.)—Henry C. Stephens, M.P., Cholderton, Salisbury, for **Beauty** 5 C.B.S.B., bay, foaled 1879 [foal *by* Shylock 1121], bred by G. Barker, Bedale; *s.* Prince Frederick 234, *d.* Trimmer *by* Wellington 353.

70 **II.** (£10.)—John White, Appleton Roebuck, Bolton Percy, for **Ainsty Queen** 367 Y.C.S.B., bay, foaled 1889 [foal *by* Appleton Turk 1667], bred by Thomas Nicholson, Danby Howe, Castleton, Yorks; *s.* Favourite 581, *d. by* General Gordon 182.

69 **III.** (£5.)—Henry C. Stephens, M.P., for **Countess of Salton** 315 C.B.S.B., bay, foaled 1887 [foal *by* Luck's All 189], bred by Christopher Wood, Sparrow Hall, Kirbymoorside; *s.* Fidius Dius 107, *d.* Bonny 16 *by* Sportsman 297.

66 **R. N. & H. C.**—Alfred Lomas, for **Nellie Farren.**
67 **Com.**—Thomas Radcliffe, for **Wath Belle.**

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

Hackneys.

Class 10.—*Hackney Stallions, foaled in* 1891, *above* 15 *hands.* [13 entries, 2 absent.]

74 I. (£15, & Champion.[1])—SIR WALTER GILBEY, BT., Elsenham Hall, Essex, for **Hedon Squire** 4306, bay, bred by Arthur Fewson, Hedon, Hull; *s.* Rufus 1343, *d.* Polly 494 *by* Fireaway 249.

71 II. (£10.)—JOHN N. ANTHONY, Sedgeford, King's Lynn, for **Sir Hugo 2nd** 4507, bay; *s.* Assurance 2nd 2350, *d.* Sheila 982 *by* Broad Arrow 1436.

72 III. (£5.)—W. J. BAILEY, Morley, Wymondham, for **All Fours 3rd** 4111, bay; *s.* Vigorous 1215, *d.* Bess 911 *by* Confidence 158.

77 R. N. & H. C.—JOHN ROWELL, Bury, Huntingdon, for **Bury Stanley.**

Class 11.—*Hackney Stallions, foaled in* 1891, *above* 14 *hands and not exceeding* 15 *hands.* [9 entries, 1 absent.]

91 I. (£15.)—JOHN L. RUTTER, 78A Fitzroy Street, Cambridge, for **Recherché** 4466, roan; *s.* Reality 665, *d.* Zazel 3391 *by* Hue and Cry Shales 379.

86 II. (£10.)—WILLIAM BOON, JUN., Holme, Downham Market, for **Holme Cadet** 4313, chestnut; *s.* Cadet 1251, *d.* Nelly 5924 *by* Hero 2nd 2106.

92 III. (£5.)—JOHN SINDALL, Mile End, Prickwillow, Ely, for **Mile End** 4903, black; *s.* Reality, 665, *d.* Nellie 1741 *by* Royal George 683.

90 R. N. & H. C.—R. G. HEATON, Chatteris, for **Resolution 2nd.**

Class 12.—*Hackney Stallions, foaled in* 1892. [23 entries, 5 absent.]

109 I. (£15, & R. N. for Champion.[1])—HENRY MOORE, Burn Butts, Cranswick, Yorks, for **Countryman** 4716, chestnut; *s.* Copernicus 2912, *d.* Snowdrop 324 *by* Denmark 177.

104 II. (£10.)—THOMAS HALL, Langton, Malton, for **Langton Duke** 4843, chestnut; *s.* Garton Duke of Connaught 3009, *d.* Queen of the Hills 4618 *by* Eddlethorpe Fireaway 1768.

103 III. (£5.)—C. E. GALBRAITH, Ayton Castle, N.B., for **Danebury** 4724, chestnut, bred by H. Livesey, Rotherfield; *s.* Evolution 2058, *d.* Lily 219 *by* Lord Derby 2nd 417.

107 R. N. & H. C.—ALFRED LEWIS, Heacham, Lynn, for **Master Lovely Shot.**

114 H. C.—HENRY WHITTICK, for **Lord Grimston.**
Com.—H.R.H. THE PRINCE OF WALES, for No. 93, **Golden Promise**; WM. FLANDERS, for No. 99, **Witcham Fireaway**; J. W. PEACOCK, for No. 112, **Alan.**

Class 13.—*Hackney Stallions, foaled in* 1893. [10 entries, 4 absent.]

121 I. (£15.)—GEO. JACKSON, King's Heath, Birmingham, for **Manfred**, chestnut; *s.* Connaught 1453, *d.* Minnie 2308 *by* Cadet 1251.

118 II. (£10.)—C. E. COOKE, Litcham, Swaffham, for **Caliban**, bay; *s.* Cadet 1251, *d.* Belle 5th 406 *by* Confidence 158.

---

[1] Gold Medal given by the Hackney Horse Society, and prize of Twenty Guineas given by the Cambridge Local Committee, for the best Hackney Stallion.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

117 **III.** (£5.)—ROBERT BALDING, Snettisham, King's Lynn, for **Snettisham Swell**, bay, bred by Wm. Brown, Snettisham; *s.* Heacham Swell 3664, *d.* Lady Dagmar 2889 *by* Great Shot 329.

125 **R. N. & H. C.**—J. W. TEMPLE, Leyswood, Groombridge, for **Lord Marton.**

Class 14.—*Hackney Mares & Foals, above* 15 *hands.* [20 entries, 2 absent.]

141 **I.** (£15, & **R. N. for Champion.**[1])—J. W. TEMPLE, Leyswood, Groombridge, for **Lady Dereham** 2891, chestnut, foaled 1889 [foal *by* Doncaster 2949], bred by H. Livesey, Rotherfield; *s.* Ritualist 1542, *d.* Dorothy 2016 *by* Lord Derby 2nd 417. (*Foal entered in Class* 20, *No.* 223.)

137 **II.** (£10.)—HENRY MOORE, Cranswick, Yorks, for **Countess** 424, brown, foaled 1882 [foal *by* Agility 2799]; *s.* Denmark 177, *d.* Empress 95 *by* Fireaway 249. (*Foal entered in Class* 20, *No.* 220.)

134 **III.** (£5.)—C. E. GALBRAITH, Ayton Castle, N.B., for **Lola** 4248, chestnut, foaled 1890 [foal *by* Evolution 2058], bred by C. E. Cooke, Litcham; *s.* Cadet 1251, *d.* Cordelia 618 *by* Canvasser 114. (*Foal entered in Class* 20, *No.* 216.)

144 **R. N. & H. C.**—WALTER WATERHOUSE, Edenbridge, Kent, for **Kathleen.** **Com.**—C. E. COOKE, for No. 129, **Florence**; J. A. COULSON, for No. 130, **Twilight.**

Class 15.—*Hackney Mares and Foals, above* 14 *hands, and not exceeding* 15 *hands.* [15 entries, 1 absent.]

158 **I.** (£15.)—HENRY MOORE, Cranswick, Yorks, for **Levity** 2247, chestnut, foaled 1888 [foal *by* Chocolate Junior 4185]; *s.* Lord Derby 2nd 417, *d.* Primrose 827 *by* Denmark 177.

160 **II.** (£10.)—WALTER WATERHOUSE, Edenbridge, Kent, for **Lady Alice** 1604, black, foaled 1885 [foal *by* Saxon 2674], bred by Exors. of late W. Leonard, Out Newton, Yorks; *s.* Lord Derby 2nd 417, *d.* Lady Newton 1656 *by* Prince of Wales 1117. (*Foal entered in Class* 20, *No.* 225.)

150 **III.** (£5.)—C. EDWARD E. COOKE, Hinxton Grange, Saffron Walden, for **Mandolin** 5747, bay, foaled 1890 [foal *by* Danegelt 174], bred by Jas. Rivett, Wellingham, Litcham; *s.* Cadet 1251, *d.* Aunt Sally 2533 *by* Confidence 939. (*Foal entered in Class* 19, *No.* 200.)

153 **R. N. & H. C.**—C. E. GALBRAITH, Ayton Castle, N.B., for **Lady Alice.** **Com.**—E. C. CHAPMAN, for No. 147, **Miss Colchester**; SIR WALTER GILBEY, BT., for No. 154, **County Lily**; J. W. TEMPLE, for No. 159, **Lady Gordon.**

Class 16.—*Hackney Fillies, foaled in* 1891.[2] [7 entries, 1 absent.]

165 **I.** (£15, & **Champion.**[1])—SIR GILBERT GREENALL, BT., Walton Hall, Warrington, for **Orange Blossom** 5957, chestnut, bred by Wm. Baxter, Burton Pidsea, Hull; *s.* Connaught 1453, *d. by* General Gordon 2084.

162 **II.** (£10.)—GEORGE BURTON, Thorpe Willoughby, Selby, for **Royal Lady** 6117, chestnut; *s.* Connaught 1453, *d.* Lofty 2nd No. 83 Inspected F.S.

161 **III.** (£5.)—GEORGE BURTON, for **Lady Rufus** 5640, chestnut; *s.* Rufus 1343, *d.* Lofty 1st No. 81 Inspected F.S.

163 **R. N. & H. C.**—LORD EGERTON OF TATTON, Quidenham Hall, Thetford, for **Bird's Eye View.**

---

[1] Gold Medal given by the Hackney Horse Society, and Prize of Twenty Guineas given by the Cambridge Local Committee, for the best Hackney Mare or Filly.

[2] Prizes given by the Cambridge Local Committee.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

Class 17.—*Hackney Fillies, foaled in* 1892. [15 entries, 4 absent.]

172 I. (£15.)—E C. CHAPMAN, Alethorpe, Fakenham, for **Alethorpe Maud** 6352, black; *s.* Ruby 1342, *d.* Fanny 1532 *by* Rifleman 670.

179 II. (£10.)—THOMAS KIRK, Owstwick Hall, Burstwick, Hull, for **Dark Polyanthus** 6564, chestnut; *s.* Danegelt 174, *d.* Lady Norah 1657 *by* Lord Derby 2nd 417.

182 III. (£5.)—HENRY WHITTICK, The Newlands, Hull, for **Fairy Queen** 6643, bay, bred by Exors. of late W. Buttle, Thirkleby, Yorks; *s.* Curfew 1755, *d.* Miss Fireaway 4391 *by* Fireaway 249.

171 R. N. & H. C.—AUSTIN C. CARR, The Firs, Rainhill, Lancs, for **Odd Spats.**
Com.—J. G. BROWNE, for No. 170, **Titania**; A. & A. COLLEN, for No. 173, **Duchess Fireaway.**

Class 18.—*Hackney Fillies, foaled in* 1893. [13 entries, 4 absent.]

184 I. (£15.)—H.R.H. THE PRINCE OF WALES, K.G., Sandringham, for **Bellona**, bay; *s.* Field Marshal 2986, *d.* Mia Bella 3071 *by* Great Shot 329.

191 II. (£10.)—HENRY MOORE, Burn Butts, Cranswick, Yorks, for **Venetia**, brown; *s.* Lord Derby Junior 3472, *d.* Affable 1869 *by* Confidence 163.

190 III. (£5.)—A. B. HOW, Broughton, Hunts, for **Pousette**, brown; *s.* Reality 665, *d.* Fanny 2nd 2740 *by* Baronet.

195 R. N. & H. C.—WALTER WATERHOUSE, Edenbridge, Kent, for **Applause.**

Class 19.—*Hackney Colt Foals, foaled in* 1894, *the produce of Mares exhibited in Class* 14 *or* 15.[1] [14 entries, 2 absent.]

199 I. (£15.)—JOHN CONCHAR, Wylde Green, Birmingham, for chestnut; *s.* Agility 2799, *d.* Sweet Briar 3304 *by* Model 1054. (*Exhibited with No.* 149.)

200 II. (£10.)—C. E. E. COOKE, Hinxton Grange, Saffron Walden, for **Valentine**, bay; *s.* Danegelt 174, *d.* Mandolin 5747 *by* Cadet 1251. (*Exhibited with No.* 150.)

206 III. (£5.)—A. B. HOW, Broughton, Hunts, chestnut; *s.* Agility 2799, *d.* Fanny 3rd 3779 *by* Lord of the Manor of Broughton 2165. (*Exhibited with No.* 135.)

197 R. N. & H. C.—E. C. CHAPMAN, Alethorpe, Fakenham.
207 Com.—H. V. SHERINGHAM, South Creake, Fakenham.

Class 20.—*Hackney Filly Foals, foaled in* 1894, *the produce of Mares exhibited in Class* 14 *or* 15.[1] [16 entries, none absent.]

220 I. (£15.)—HENRY MOORE, Burn Butts, Cranswick, Yorks, chestnut; *s.* Agility 2799, *d.* Countess 424 *by* Denmark 177. (*Exhibited with No.* 137.)

210 II. (£10.)—H.R.H. THE PRINCE OF WALES, K.G., Sandringham, for **Dagmar**, bay; *s.* Field Marshal 2986, *d.* Star of Denmark 3286 *by* Donowitz 1272. (*Exhibited with No.* 126.)

225 III. (£5.)—WALTER WATERHOUSE, Edenbridge, Kent, brown; *s.* Saxon 2674, *d.* Lady Alice 1601 *by* Lord Derby 2nd 417. (*Exhibited with No.* 160.)

218 R. N. & H. C.—SIR WALTER GILBEY, BT., Elsenham Hall, Essex.

---

[1] Prizes given by the Cambridge Local Committee.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

Class 21.—*Hackney Mares or Geldings, above* 14 *hands, up to* 15 *stone, foaled in* 1888, 1889, *or* 1890.[1] [5 entries, 2 absent.]

226 I. (£15.)—SIR GILBERT GREENALL, BT., Walton Hall, Warrington, for **Amazement**, roan gelding, foaled 1889, bred by J. Scott, Pocklington; *s.* Wildfire 1224, *d. by* Superior 1410.

227 II. (£10.)—TOM JAY, Holmwood, Putney Hill, for **Graceful** 6741, chestnut mare, foaled 1890, bred by Anelay Hart, Howden; *s.* Golden Star 989, *d.* Skelton Rose 6153 *by* 3rd Sir Charles 1562.

229 III. (£5.)—T. ROBERTS, 41 Ranelagh St., Liverpool, for **Belle of the Ball**, roan mare, foaled 1888, bred by Mr. Sands, Stody; *s.* Roan Confidence 1133, *d. by* Lord Derby 2nd 417.

Class 22.—*Hackney Mares or Geldings, above* 14 *hands, up to* 12 *stone, foaled in* 1888, 1889, *or* 1890.[1] [7 entries, 2 absent.]

231 I. (£15.)—WILLIAM FLANDERS, Witcham House, Ely, for **Folly** 3825, brown mare, foaled 1889, bred by Joseph Pearson, Mepal; *s.* Reality 665, *d.* Mepal Polly No. 675 Inspected F.S.

232 II. (£10.)—SIR GILBERT GREENALL, BT., Walton Hall, Warrington, for **Lady Alice II.**, bay mare, foaled 1888, bred by R. G. Ingham, Hullen Edge, Elland; *s.* Lord Derby II. 417, *d.* Lady Alice *by* Star of the West.

233 III. (£5.)—TOM JAY, Holmwood, Putney Hill, for **Lincoln Swell**, roan gelding, foaled 1889, bred by Thomas Bentley, Driffield; *s.* Stanley.

236 R. N. & H. C.—ALFRED ROWELL, Bury, Huntingdon, for **Florrie** 6695.

Ponies.

Class 23.—*Pony Stallions, not exceeding* 14 *hands.* [10 entries, none absent.]

240 I. (£15.)—WM. HOLLINS, Pleasley Vale, Mansfield, for **Portwood Confidence** 3201, brown, foaled 1888, bred by A. W. Clarke, Portwood Farm, Gt. Ellingham, Norfolk; *s.* Confidence 158, *d.* Kitty by Prickwillow 623.

246 II. (£10.)—A. J. SCOTT, Rotherfield Park, Alton, for **Sir Horace**, bay, foaled 1891, bred by C. W. Wilson, Rigmaden Park, Kirkby Lonsdale; *s.* Little Wonder 2nd 1610, *d.* Dorothy Derby 1081 *by* Lord Derby 2nd 417.

241 III. (£5.)—ALFRED LEWIS, Heacham, King's Lynn, for **Heacham Surprise** 4305, bay, foaled 1890, bred by Henry Hudson, Langham, Blakeney; *s.* Monarch 463, *d.* Peggy Sure 4526 *by* Model 1054.

244 R. N. & H. C.—JOHN PAGE, Dilham, Smallburgh, for **Dilham Prime Minister.**

245 H. C.—D. W. E. ROWLANDS & GEORGE FRED BOWDEN, for **Beauty Boy.**

Class 24.—*Pony Mares and Foals, not exceeding* 14 *hands.* [5 entries, none absent.]

250 I. (£15.)—SIR HUMPHREY F. DE TRAFFORD, BT., Long Stratton, Norfolk, for **Snorer 2nd** 4703, brown, foaled 1887 [foal *by* Cassius 2397], bred by C. W. Wilson, Rigmaden Park, Kirkby Lonsdale; *s.* Sir George 778, *d.* Snorer 2456 *by* Sir George 778.

---

[1] Prizes given by the Cambridge Local Committee.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

251 II. (£10.)—WM. POPE, Cannon House, Downham Market, for **Prima Donna** 6019, chestnut, foaled 1891 [foal *by* Doctor Syntax 877], bred by C. E. Cooke, Litcham; *s.* Cassius 2397, *d.* Lady of Fashion 2951 *by* Improver 1498.

249 III. (£5.)—SIR HUMPHREY F. DE TRAFFORD, BT., for **Dorothy Derby 2nd**, bay, foaled 1890 [foal *by* Cassius 2397], bred by C. W. Wilson, Rigmaden Park, Kirkby Lonsdale; *s.* Little Wonder 2nd 1610, *d.* Dorothy Derby 1081 *by* Lord Derby 2nd 417.

252 R. N. & H. C.—GEORGE STRATTON, Wheler Lodge, Husbands Bosworth, Rugby, for **Fan.**

Harness Horses and Ponies.

Class 25.—*Harness Mares or Geldings, of any age, above 14 hands.*[1] [17 entries, 7 absent.]

256 I. (£15.)—SIR GILBERT GREENALL, BT., Walton Hall, Warrington, for **Lady Lofty** 5594, bay mare, foaled 1888, bred by James Coker, Beetley Hall, E. Dereham; *s.* White Stockings 1415, *d.* Beauty 16 *by* A 1 1.

262 II. (£10.)—WM. MILES, Woodbridge, for **Gipsy Queen**, black mare, foaled 1886, breeder unknown.

260 III. (£5.)—FRED KELLEY, Broomhall Park, Sheffield, for **Lady Gonville** 5564, bay mare, foaled 1890, bred by G. Bowhill, Suton, Wymondham; *s.* Wymondham Gentleman 2781, *d.* Lady Grace 1194 *by* Confidence 158.

258 R. N. & H. C.—THOMAS HARPER, Northgate Road, Bury St. Edmunds, for **Guinea Gold.**

269 H. C.—RICHARD WRIGHT, 74 Regent Street, Salford, for **His Lordship.**

Class 26.—*Harness Mares or Geldings, of any age, not exceeding 14 hands.*[1] [8 entries, 1 absent.]

276 I. (£15.)—WM. POPE, Cannon House, Downham Market, for **Magpie** 228, black and white mare, foaled 1878, bred by Mr. Cooke, Litcham; *s.* Confidence 1743, *d.* Spot 237 *by* Premier.

272 II. (£10.)—SIR HUMPHREY F. DE TRAFFORD, BT., Long Stratton, for **Dorothy Derby** 1081, bay mare, foaled 1887, bred by W. J. Taaffe, Cheadle; *s.* Lord Derby 2nd 417, *d.* Burton Agnes 608 *by* Danegelt 174.

273 III. (£5.)—SIR GILBERT GREENALL, BT., Walton Hall, Warrington, for **Valentine**, dun mare, foaled 1888, breeder unknown.

270 R. N. & H. C.—J. D. CHARRINGTON, Gifford House, Roehampton, for **Lady Auckland.**

Shires.

Class 27.—*Shire Stallions, foaled in* 1888, 1889, *or* 1890.[1] [5 entries, 1 absent.]

279 I. (£20, & R. N. for Champion.[2])—A. GRANDAGE, Bramhope, *viâ* Leeds, for **Bar None Conqueror** 14467, bay, foaled 1890, bred by C. T. Part, St. Albans; *s.* Hitchin Duke 9586, *d.* Hitchin Fashion 10151 *by* Hitchin Conqueror 4458.

---

[1] Prizes given by the Cambridge Local Committee.

[2] Gold Medal given by the Shire Horse Society, and prize of Twenty Guineas given by the Cambridge Local Committee, for the best Shire Stallion.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

280 II. (£10.)—WM. HOLLINS, Pleasley Vale, Mansfield, for **Calwich Marksman** 12873, bay, foaled 1890, bred by Henry Salt, Snelstone, Ashbourne; *s.* Harold 3703, *d. by* Conway 3045.

281 III. (£5.)—JOHN P. KIDSTON & ARTHUR RANSOM, Nyn Park, Potter's Bar, for **Cœur-de-Lion IV.** 11233, brown, foaled 1888, bred by B. Chambers, Draycott, Moreton-in-Marsh; *s.* Hitchin Conqueror 4458, *d.* Bonny *by* A1 1.

278 **R. N.**—A. B. FREEMAN-MITFORD, C.B., M.P., Batsford Park, Moreton-in-Marsh, for **Monroy.**

Class 28.—*Shire Stallions, foaled in* 1891. [18 entries, 4 absent.]

297 I. (£20.)—W. CECIL SALT, Willington, Burton-on-Trent, for **Willington Sir Edwin** 14438, bay, bred by Edwin Riley, Barton, Burton-on-Trent; *s.* Albert Edward 5467, *d.* Flower *by* Marshman 1485.

299 II. (£10.)—R. N. SUTTON-NELTHORPE, Scawby Hall, Lincs., for **Double X. William** 13994, black, bred by Lord Wantage; *s.* Prince William 3956, *d.* Barmaid 3787 *by* Stonton 2065.

295 III. (£5.)—JOHN ROWELL, Bury, Huntingdon, for **Royal Salute of Bury** 14255, chestnut; *s.* Bury King William 6871, *d.* Black Diamond 2076 *by* Royal Active 3289.

290 **R. N. & H. C.**—THE STEWARDS OF THE JOCKEY CLUB, Newmarket, for **Oak Post II.**
Com.—FRED CRISP, for No. 286, **Southgate Royal Albert**; EDWARD FEW, for No. 287, **Laughing Stock III.**

Class 29.—*Shire Stallions, foaled in* 1892. [12 entries, 1 absent.]

303 I. (£20, & Champion.[1])—LORD BELPER, Kingston Hall, Derby, for **Rokeby Harold**, brown, bred by A. C. Rogers, Buckingham; *s.* Harold 3703, *d.* Poppy 5266 *by* Morning Star 1589.

301 II. (£10.)—J. A. BARRS, Hinckley, for **Nailstone Royal Ensign** 14755, bay, bred by the late Sir W. H. Salt, Bt.; *s.* Honest Tom 5123, *d.* Maplewell Shamrock 5332 *by* Northern King 2635.

307 III. (£5.)—THE EARL OF ELLESMERE, Worsley Hall, Manchester, for **Duke of Worsley II.** 14602, bay; *s.* Lancashire Lad II. 6031, *d.* Bellona 4561 *by* Garnet 2787.

311 **R. N. & H. C.**—MAJOR FRANK SHUTTLEWORTH, Biggleswade, for **Nailstone Conquering Hero** 14752.

306 **H. C.**—CAPT. W. H. O. DUNCOMBE, Waresley Pk., Sandy, for **Moonraker.**

Class 30.—*Shire Stallions, foaled in* 1893. [19 entries, 5 absent.]

329 I. (£20.)—MAJOR FRANK SHUTTLEWORTH, Biggleswade, for **Sowerby Boy**, bay, bred by Fred Crisp, New Southgate, N.; *s.* Hazlewood 11578, *d.* Sowerby Lass 10942 *by* Garnet 2787.

322 II. (£10.)—EDWARD GREEN, The Moors, Welshpool, for **Moors Thumper**, brown, *s.* Potentate 12086, *d.* Weston Blossom 7271 by Mepal Wonder 3227.

317 III. (£5.)—LORD EGERTON OF TATTON, Tatton Park, Cheshire, for **Tartar**, black; *s.* Royal William II. 12207, *d.* Tartan 13627 by Royal Sandy 3993.

---

[1] Gold Medal given by the Shire Horse Society, and Prize of Twenty Guineas given by the Cambridge Local Committee, for the best Shire Stallion.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

319 **R. N. & H. C.**—SIR WALTER GILBEY, BT., Elsenham Hall, Essex, for **Saxon Harold.**

324 **H. C.**—JOHN P. KIDSTON, Nyn Park, Potter's Bar, for **Nyn Conqueror William.**

Com.—THOMAS HARDY, for No. 323, **Mere Duke**; P. ALBERT MUNTZ, M.P., for No. 326, **Dunsmore Earl.**

Class 31.—*Shire Mares and Foals.* [29 entries, 9 absent.]

352 **I. (£20, & Champion.[1])**—JOHN PARNELL, Rugby, for **Rokeby Fuchsia** 15507, grey, foaled 1887 [foal *by* Rokeby Rajah 13520], bred by W. H. & J. Spalton, Denby, Derby; *s.* Lincolnshire Boy 3188, *d.* Lady Grey 15068 *by* Noble Devonshire 10064. (*Foal entered in Class* 36, *No.* 462.)

347 **II. (£10.)**—J. P. KIDSTON, Nyn Park, Potter's Bar, for **Nyn Calwich Queen** 11843, bay, foaled 1890 [foal *by* Nyn Pride of Thicket 14783], bred by A. C. Duncombe, Calwich Abbey, Ashbourne; *s.* Harold 3703, *d.* Florrie 2362 *by* Premier 2646. (*Foal entered in Class* 36, *No.* 459.)

332 **III. (£5.)**—H.R.H. THE PRINCE OF WALES, K.G., Sandringham, for **Ethel** 9950, bay, foaled 1889 [foal *by* Joceline 14116], bred by A. H. Clark, Moulton Eaugate, Spalding; *s.* Salisbury 5324, *d.* Moulton Beauty *by* Thumper 2136. (*Foal entered in Class* 36, *No.* 450.)

342 **R. N. & H. C.**—THE EARL OF ELLESMERE, for **Golden Drop.**

337 **H. C.**—JOHN CONCHAR, for **Flower of May.**

336 **Com.**—HON. MRS. COLVILE, for **Lullington Queen.**

Class 32.—*Shire Mares, foaled before* 1891, *not with foals at foot, but stinted in* 1891.[2] [14 entries, 2 absent.]

371 **I. (£20.)**—P. ALBERT MUNTZ, M.P., Dunsmore, Rugby, for **Daisy** 14490, black, foaled 1890, bred by Jos. Robinson, Westfield, Selby; *s.* Albert Victor III. 13815, *d.* Jet 14992 *by* Lincolnshire Tom 1367.

361 **II. (£10.)**—WILLIAM BOUCH, Ashorne, Warwick, for **Cornflower** 9716, black, foaled 1889; *s.* Prince William 3956, *d.* Wildflower 3743 *by* Reality 2882.

367 **III. (£5.)**—A. B. FREEMAN-MITFORD, C.B., M.P., Batsford Park, Moreton-in-Marsh, for **Minnehaha** 12989, bay, foaled 1889; *s.* Laughing Stock 4516, *d.* Horbling Beauty 2462 *by* Honest Tom 3731.

366 **R. N. & H. C.**—A. B. FREEMAN-MITFORD, C.B., M.P., for **Melody.**

H. C.—FRED CRISP for No. 362, **Scarsdale Sparkle**; JOHN PARNELL for No. 372, **Rokeby Dame.**

Class 33.—*Shire Fillies, foaled in* 1891. [12 entries, 2 absent.]

383 **I. (£15, & R. N. for Champion.[1])**—LORD LLANGATTOCK, The Hendre, Monmouth, for **Dunsmore Cui Bono** 14653, brown, bred by J. Salt, Upper Whittle, Longnor, Buxton; *s.* Regent II. 6316, *d.* Berry *by* Lincolnshire Lad 1364.

382 **II. (£10.)**—LORD LLANGATTOCK, for **Alvaston Rose** 13917, brown, bred by R. B. Bonsall, Narrowdale, Alstonfield, Ashbourne; *s.* Regent II. 6316, *d.* Flower *by* Honest Tom XIX. 11646.

---

[1] Gold Medal given by the Shire Horse Society, and prize of Twenty Guineas given by the Cambridge Local Committee, for the best Shire Mare or Filly.

[2] Prizes given by the Cambridge Local Committee.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

378 III. (£5.)—JAMES FORSHAW, Carlton-on-Trent, for **Queen of the Roses** 15475, bay, bred by Robert Armstrong, Burnt Leys, Whitwell, Chesterfield; *s.* Bar None 2388, *d. by* Don Carlos 2416.

381 **R. N. & H. C.**—JOHN P. KIDSTON, Nyn Park, Potter's Bar, for **Nyn Pink.**
H. C.—LORD EGERTON OF TATTON, for No. 376, **Aurea**; T. H. MILLER, for No. 384, **Misalliance.**

379. **Com.**—SIR WALTER GILBEY, BT., for **Agnes.**

Class 34.—*Shire Fillies, foaled in* 1892. [30 entries, 13 absent.]

411 **I. (£15.)**—LORD ROTHSCHILD, Tring Park, for **Vulcan's Flower**, chestnut; *s.* Vulcan 4145, *d.* Stibbington Flower 8939 *by* Prince Imperial 4619.

398 **II. (£10.)**—CAPT. W. H. O. DUNCOMBE, Waresley Park, Sandy, for **Waresley Dona**, brown; *s.* Bury Victor Chief 11105, *d.* Alice 7372 *by* Premier 2646.

407 **III. (£5.)**—JOHN PARNELL, Rugby, for **Rokeby Hannah**, brown; *s.* Harold 3703, *d.* Bittesby 7492 *by* Gay Lad 3665.

400 **R. N. & H. C.**—LORD EGERTON OF TATTON, Tatton Park, Cheshire, for **Tatton Poplin.**

H. C.—LORD EGERTON OF TATTON, for No. 399, **Tatton Baroness**; LORD HOTHFIELD, for No. 405, **Satin of Hothfield**; JOHN ROWELL, for No. 412, **Bury Abbess.**

Com.—HENRY BULTITAFT, for No. 394, **Bedwell Pride**; CANNOCK AGRICULTURAL COMPANY, LIMD., for No. 395, **Queen of Cresswell**; FRED CRISP, for No. 396, **Scarsdale Marabou**; C. T. PART, for No. 408, **Aldenham Princess.**

Class 35.—*Shire Fillies, foaled in* 1893. [33 entries, 9 absent.]

449 **I. (£15.)**—A. H. E. WOOD, Newbold Revel, Rugby, for **Revel Bride**, black, bred by Wm. Baker, Moor Barns, Atherstone; *s.* Albert Edward 5467, *d.* Smiler *by* Welborn Sweep 2315.

422 **II. (£10.)**—J. P. CROSS, Catthorpe Towers, Rugby, for **Catthorpe Clemency**, black, bred by John Cooper, E. Haddon, Northants; *s.* Moulton Briton 7829, *d.* Bonny *by* Spark 2497.

440 **III. (£5.)**—LORD ROTHSCHILD, Tring Park, Herts, for **Golden Grain**, chestnut; *s.* Carbonite 11173, *d.* Fairy Tale 4892 *by* Aladdin 2969.

434 **R. N. & H. C.**—P. ALBERT MUNTZ, M.P., Dunsmore, Rugby, for **Dunsmore Elegance.**

H. C.—SIR WALTER GILBEY, BT., for No. 427, **Ercall Dora**; LORD HOTHFIELD, for No. 432, **Topsy of Hothfield**; G. D. & W. J. THODY, for No. 446, **Baldock Rose**; HAMER TOWGOOD, for No. 448, **Shelford Satin.**

Com.—A. GRANDAGE, for No. 429, **Lady Clare**; LORD HOTHFIELD, for No. 431, **Tambourine of Hothfield**; MAJOR FRANK SHUTTLEWORTH, for No. 442, **Old Warden Fashion.**

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

Class 36.—*Shire Colt Foals, foaled in* 1894, *the produce of Mares exhibited in Class* 31.[1] [16 entries, 5 absent.]

457 **I.** (£15.)—THE EARL OF ELLESMERE, Worsley, Manchester, for black; *s.* Vulcan 4145, *d.* Princess Louisa 6884 *by* Royal Albert 1885. (*Exhibited with No.* 343.)

456 **II.** (£10.)—THE EARL OF ELLESMERE, for bay; *s.* Vulcan of Worsley IX. 13736, *d.* Golden Drop 4115 *by* Bar None 2388. (*Exhibited with No.* 342.)

455 **III.** (£5.)—CAPTAIN W. H. O. DUNCOMBE, Waresley Park, Sandy, for bay; *s.* Duke of Worsley 13002, *d.* Alice 7372 *by* Premier 2646. (*Exhibited with No.* 341.)

454 **R. N. & H. C.**—FRED CRISP, New Southgate, N., for brown; *s.* Marmion II.

H. C.—JAMES BLYTH, for No. 451; HON. MRS. COLVILE, for No. 452; JOHN PARNELL, for No. 462.

Com.—SIR WALTER GILBEY, BT., for No. 458; JOHN P. KIDSTON, for No. 459; C. T. PART, for No. 463, **Aldenham Harold.**

Class 37.—*Shire Filly Foals, foaled in* 1894, *the produce of Mares exhibited in Class* 31.[1] [10 entries, 1 absent.]

470 **I.** (£15.)—P. ALBERT MUNTZ, M.P., Dunsmore, Rugby, for bay; *s.* Dunsmore Willington Boy 13021, *d.* Dunsmore Bracelet 12197 *by* The Boy 3358. (*Exhibited with No.* 351.)

469 **II.** (£10.)—F. W. GRIFFIN, Boro' Fen, Peterborough, for bay; *s.* Premier Tom II. 13451, *d.* Boro' Gipsy 5862 *by* King John 4502. (*Exhibited with No.* 346.)

468 **III.** (£5.)—THOMAS GEE, JUN., Gothic House, Thorney, Cambs, for brown; *s.* Marmion II. 9885, *d.* Gipsy 8114 *by* Master of Arts III. 3220. (*Exhibited with No.* 344.)

467 **R. N. & H. C.**—J. P. CROSS, Catthorpe Towers, Rugby, for **Lusitania.**

473 **H. C.**—GEORGE SYMONDSON, for **Upshire Magna.**

Com.—JOHN CONCHAR, for No. 466; S. WAYMAN, for No. 474.

Clydesdales.

Class 38.—*Clydesdale Stallions, foaled in* 1891. [5 entries, 1 absent.]

477 **I.** (£20, & Champion, £20.[2])—THE MARQUIS OF LONDONDERRY, K.G., Seaham Hall, for **Holyrood** 9546, bay; *s.* Gallant Prince, *d.* Jeanie Darnley 8668 *by* Darnley 222.

479 **II.** (£10.)—T. SMITH, Blacon Point, Chester, for **Montrave Kenneth** 9622, brown, bred by John Gilmour, Montrave, Leven, Fife; *s.* Prince of Albion 6178, *d.* Keepsake 10624 *by* Macgregor 1487.

480 **III.** (£5.)—MISS EMILY C. TALBOT, Margam, Port Talbot, for **Montrave Major** 9623, brown, bred by John Gilmour, Montrave, Leven, Fife; *s.* Prince of Albion 6178, *d.* Maggie V. 10627 *by* Macgregor 1487.

---

[1] Prizes given by the Cambridge Local Committee.
[2] Given by the Clydesdale Horse Society for the best Clydesdale Stallion.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

Class 39.—*Clydesdale Stallions, foaled in* 1892. [4 entries, 2 absent.]

482 **I. (£20, & R. N. for Champion.**[1]**)**—A. J. MARSHALL, Bridgebank, Stranraer, for **Vanguard**, brown, bred by J. F. Murdoch, East Hallside, Newton Lanark; *s.* Flashwood 3604, *d.* Anita 7359 *by* Darnley 222.

Class 40.—*Clydesdale Mares and Foals.* [5 entries, 1 absent.]

487 **I. (£20.)**—THE MARQUIS OF LONDONDERRY, K.G., Seaham Hall, for **Susie** 8669, brown, foaled 1885 [foal *by* Gallant Prince], bred by W. Agnew, Balwherrie; *s.* Darnley 222, *d.* Nannie of Balwherrie 4362 *by* Glenlee 363.
485 **II. (£10.)**—LORDS A. AND L. CECIL, Orchardmains, Tonbridge, for **Pride of Auchentoshan**, brown, foaled 1890 [foal *by* Claymore 3522], bred by A. McLachlan, Cuilt, N.B.; *s.* Lord Ailsa 5974, *d.* Jess of Cuilt 8792 *by* His Royal Highness 2165.
488 **III. (£5.)**—THOMAS SMITH, Blacon Point, Chester, for **Daisy**, brown, foaled 1890 [foal *by* Prince of Scotland 8926], bred by W. Montgomery, Banks, Kirkcudbright; *s.* Darnley's Hero 5697, *d.* Phyllis 10038 *by* Tom 877.

Class 41.—*Clydesdale Fillies, foaled in* 1891. [5 entries, none absent.]

490 **I. (£15, & R. N. for Champion.**[2]**)**—WM. GRAHAM, Eden Grove, Penrith, for **Royal Rose**, bay, bred by A. Montgomery, Nether Hall, Castle Douglas, N.B.; *s.* Macgregor 1487, *d.* Black Sally 7652 *by* Top Gallant 1850.
493 **II. (£10.)**—THOMAS SMITH, Blacon Point, Chester, for **Belle of Fashion**, bay, bred by Sir James Duke, Bart., Laughton, Hawkhurst; *s.* Prince of Fashion, *d.* La Belle, 8325 *by* Loudoun Laird 5182.
491 **III. (£5.)**—JOHN KERR, Red Hall, Wigton, for **Lady Kate**, bay; *s.* Queensferry 7175, *d.* Kate Macgregor 6325 *by* Macgregor 1487.
492 **R. N. & H. C.**—L. PILKINGTON, Cavens, Dumfries, N.B., for **Rival Belle**.
494 **H. C.**—THOMAS SMITH, for **Francesca**.

Class 42.—*Clydesdale Fillies, foaled in* 1892. [10 entries, 3 absent.]

499 **I. (£15, & Champion, £20.**[2]**)**—WM. GRAHAM, Eden Grove, Penrith, for bay, bred by R. & J. Shennan, Balig, N.B.; *s.* Patrician 8095, *d.* Bet Macgregor 9071 *by* Macgregor 1487.
501 **II. (£10.)**—THE MARQUIS OF LONDONDERRY, K.G., Seaham Hall, for **Lady Helen**, brown; *s.* Castlereagh, *d.* Lady Susan 11442 *by* Callendar.
500 **III. (£5.)**—JOHN KERR, Red Hall, Wigton, for **Sonsie Girl**, bay; *s.* Royal George 8205, *d.* Sonsie Lass 11401 *by* Stonehenge 4039.
503 **R. N. & H. C.**—T. SMITH, for **Leezie Lindsay**; & **H. C.** for No. 504, **Red Rose**

Suffolks.

Class 43.—*Suffolk Stallions, foaled in* 1888, 1889, *or* 1890.[3] [10 entries, 1 absent.

505 **I. (£20, & Champion, £21.**[4]**)**—C. H. BERNERS, Woolverstone Park, Ipswich, for **Windsor Chieftain** 2025, chestnut, foaled 1889, bred by Robt. Wrinch, Harkstead, Ipswich; *s.* Chieftain 1354, *d.* Juno 1500 *by* Cupbearer 3rd 566.

---

[1] Given by the Clydesdale Horse Society for the best Clydesdale Stallion.
[2] Given by the Clydesdale Horse Society for the best Clydesdale Mare or Filly.
[3] Prizes given by the Cambridge Local Committee.
[4] Given by the Cambridge Local Committee for the best Suffolk Stallion.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

511 II. (£10, & R.N. for Champion.[1])—I. PRATT & SON, Melton, Woodbridge, for **Eclipse** 2010, chestnut, foaled 1889, bred by Edwin Capon, Aldeby Hall, Suffolk; *s.* Cupbearer 3rd 566, *d.* Grace 335 *by* Viceroy 570.

512 III. (£5.)—A. J. SMITH, Rendlesham, Woodbridge, for **Democrat** 2044, chestnut, foaled 1889, bred by Wm. Davy, Athelington, Suffolk; *s.* Prosperity 1843, *d.* Diamond *by* Wantisden Duke 534.

506 R. N. & H. C.—MANFRED BIDDELL, Playford, Ipswich, for **Baron Playford.** Com.—I. PRATT & SON, for No. 510, **Earl**; HORACE WOLTON for No. 514, **Chieftain's Champion.**

Class 44.—*Suffolk Stallions, foaled in* 1891. [5 entries, none absent.]

515 I. (£20.)—MANFRED BIDDELL, Playford, Ipswich, for **Bramfield Lad** 2272, chestnut, bred by J. G. Kersey, Bramfield, Suffolk; *s.* Bar None 1514, *d. by* Dunwich 1055.

516 II. (£10.)—GEORGE PETTIT, Friston, Saxmundham, for **Fearless** 2399, chestnut, bred by Arthur Rope, Leiston, Suffolk; *s.* Oriental 1337, *d.* Jewel 1804 *by* Verger 1550.

Class 45.—*Suffolk Stallions, foaled in* 1892. [8 entries, 1 absent.]

523 I. (£20.)—ROBERT EDGAR, Knight's Hill, Cockfield, Suffolk, for **Tittle Tattle** 2367, chestnut; *s.* Rattle 1776, *d.* Prattle 2213 *by* Cupbearer 3rd 566.

521 II. (£10.)—MANFRED BIDDELL, Playford, Ipswich, for **Valiant** 2359, chestnut; *s.* Venture 1883, *d.* Meg 2603 *by* Condor 1483.

526 III. (£5.)—THE EARL OF STRADBROKE, Henham Hall, Wangford, Suffolk, for **Henham Duke II.** 2449, chestnut; *s.* Farmer 2145, *d.* Smart *by* Champion 1262.

522 R. N. & Com.—NATHANIEL CATCHPOLE, Bramford, Ipswich, for **Voyager.**

Class 46.—*Suffolk Stallions, foaled in* 1893. [11 entries, 1 absent.]

533 I. (£15.)—W. H. HEWITT, West Hill, Copdock, Ipswich, for **Mars** 2434, chestnut; *s.* Wedgewood 1749, *d.* Juno 1500 *by* Cupbearer 3rd 566.

537 II. (£10.)—W. E. S. & P. H. WILSON, Hadleigh, Suffolk, for **Ruler** 2453, chestnut; *s.* Prince Arthur 2268, *d.* Scott 2221.

538 III. (£5.)—HORACE WOLTON, Newbourn Hall, Woodbridge, for **Newbourn Hero** 2462, chestnut; *s.* Stanley 2173, *d.* Violet 1971 *by* Diadem 1553.

534 R. N. & H. C.—EDWARD PACKARD, JUN., Bramford, Ipswich, for **Jupiter.**

532 Com.—THE DUKE OF HAMILTON AND BRANDON, K.T., for **Lord de Grey.**

Class 47.—*Suffolk Mares and Foals.* [15 entries, 1 absent.]

544 I. (£20, & Champion, £21.[2])—ROBERT EDGAR, Knight's Hill, Cockfield, Suffolk, for **Prattle** 2213, chestnut, foaled 1887 [foal *by* Hardware 2249], bred by Caleb Kersey, Framsden, Suffolk; *s.* Cupbearer 3rd 566, *d.* Brag 1895 *by* Statesman 657. (*Foal entered in Class* 53, *No.* 601.)

546 II. (£10, & R.N. for Champion.[2])—THE DUKE OF HAMILTON AND BRANDON, K.T., Easton Park, Wickham Market, for **Morella** 2375, chestnut, foaled 1888 [foal *by* Wedgewood 2nd 2045], bred by C. A. Kersey, Monewden, Wickham Market; *s.* Cupbearer 3rd 566, *d.* Lucy 1175 *by* Bismarck 729. (*Foal entered in Class* 53, *No.* 603.)

---

[1] Given by the Cambridge Local Committee for the best Suffolk Stallion.
[2] Given by the Cambridge Local Committee for the best Suffolk Mare or Filly.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

549 **III.** (£5.)—H. SHOWELL, Playford, Ipswich, for **Dainty Dolly** 3009, chestnut, foaled 1890 [foal *by* Eclipse 2010], bred by A. J. Smith, Rendlesham, Woodbridge; *s.* Wedgewood 1749, *d.* Dorcas 2021 *by* Foxhall 1423. (*Foal entered in Class* 53, *No.* 604.)

553 **R. N. & H. C.**—HORACE WOLTON, Newbourn Hall, Woodbridge, for **Patience.**

551 **Com.**—WM. WILSON, Baylham Hall, Ipswich, for **Victoria.**

Class 48.—*Suffolk Mares, foaled before* 1891, *not with foal at foot, but stinted in* 1894.[1] [4 entries, none absent.]

555 **I.** (£20.)—THE DUKE OF HAMILTON AND BRANDON, K.T., Easton Park, Wickham Market, for **Queen of Trumps** 2702, chestnut, foaled 1889, bred by C. Austin, Brandeston Hall, Wickham Market; *s.* Cupbearer 3rd 566, *d.* Queen of Diamonds 1859 *by* Vanguard 1327.

556 **II.** (£10.)—THE DUKE OF HAMILTON AND BRANDON, K.T., for **Valiant** 2051, chestnut, foaled 1886, bred by James Toller, Blaxhall, Wickham Market; *s.* Verger 1550, *d.* Venus 923 *by* Hercules 1167A.

Class 49.—*Suffolk Fillies, foaled in* 1891. [12 entries, none absent.]

564 **I.** (£15.)—THE DUKE OF HAMILTON AND BRANDON, K.T., Easton Park, Wickham Market, for **Violet** 3172, chestnut, bred by Sir A. S. Gooch, Benacre Hall, Suffolk; *s.* Wedgewood 1749, *d.* Valiant 2051 *by* Verger 1550.

563 **II.** (£10.)—THE DUKE OF HAMILTON AND BRANDON, K.T., for **Memory** 3108, chestnut, bred by Wm. Wilson, Baylham Hall, Ipswich; *s.* Old Times 1902, *d.* Victoria 2251 *by* Punch 898.

567 **III.** (£5.)—A. J. SMITH, Rendlesham, Woodbridge, for **Guinea Gold** 3234, chestnut, bred by the Exors. of S. Walton, Butley Abbey, Suffolk; *s.* Wedgewood 1749, *d.* Smart 1763 *by* Chieftain 1354.

565 **R. N. & H. C.**—W. R. HUSTLER, Earls Hall, Cockfield, Suffolk, for **Pearl.**
H. C.—WM. BIDDELL, for No. 560, **Lassie**; WM. BYFORD, for No. 561, **Rosa**; WM. TOLLER, for No. 569, **Gossip.**

Class 50.—*Suffolk Fillies, foaled in* 1892. [14 entries, 3 absent.]

583 **I.** (£15.)—HORACE WOLTON, Newbourn Hall, Woodbridge, for **The Lady** 3297, chestnut; *s.* Warrior 1938, *d.* Diadem's Empress 1977 *by* Diadem 1553.

579 **II.** (£10.)—W. CUTHBERT QUILTER, M.P., Bawdsey Manor, Woodbridge, for **Bawdsey Dolly** 3611, chestnut; *s.* The Czar 1754, *d.* Sprite *by* Checkmate 1566.

580 **III.** (£5.)—W. CUTHBERT QUILTER, M.P., for **Bawdsey Queen** 3610, chestnut; *s.* The Czar 1754, *d.* Brag *by* Checkmate 1566.

576 **R. N. & H. C.**—THE DUKE OF HAMILTON AND BRANDON, K.T., for **Trump Card.**
H. C.—WM. BYFORD, for No. 572, **Foxey**; ROBERT EDGAR, for No. 574, **Cockfield Belle.**

Class 51.—*Suffolk Fillies, foaled in* 1893. [9 entries, 4 absent.]

589 **I.** (£15.)—THE DUKE OF HAMILTON AND BRANDON, K.T., Easton Park, Wickham Market, for **Actress** 3579, chestnut; *s.* Wedgewood 1749, *d.* Easton Belle 2497 *by* Wanderer 1463.

---

[1] Prizes given by the Cambridge Local Committee.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

590 II. (£10.)—B. A. POSFORD, Falkenham Hall, Ipswich, for **Falkenham Martha** 3490, chestnut; *s.* Wedgewood 1749, *d.* Blossom 1248 *by* Royalty 1339.

586 III. (£5.)—COLONIAL COLLEGE AND TRAINING FARMS, LIMITED, Hollesley Bay, for **Winnipeg** 3494, chestnut; *s.* The Czar 1754, *d.* Matchless 2401 *by* Volunteer 1241.

591 R. N. & Com.—A. J. SMITH, Rendlesham, Woodbridge, for **Princess Wedge.**

585 Com.—E. LE HEUP COCKSEDGE, for **Glitter.**

Class 52.—*Suffolk Colt Foals, foaled in* 1894, *the produce of Mares exhibited in Class* 47. [5 entries, none absent.]

595 I. (£15.)—W. H. HEWITT, West Hill, Copdock, Ipswich, for **Wrangler,** chestnut; *s.* Wedgewood 1749, *d.* Juno 1500 *by* Cupbearer 3rd 566. (*Exhibited with No.* 547.)

597 II. (£10.)—W. E. S. & P. H. WILSON, Hadleigh, Suffolk, for chestnut; *s.* Eclipse 2010, *d.* Darling 2699 *by* Chieftain 1354. (*Exhibited with No.* 552.)

596 R. N.—EDWARD PACKARD, JUN., Bramford, Ipswich, for chestnut.

Class 53.—*Suffolk Filly Foals, foaled in* 1894, *the produce of Mares exhibited in Class* 47.[1] [10 entries, none absent.]

604 I. (£15.)—H. SHOWELL, Playford, Ipswich, for chestnut; *s.* Eclipse 2010, *d.* Dainty Dolly 3009 *by* Wedgewood 1749. (*Exhibited with No.* 549.)

603 II. (£10.)—THE DUKE OF HAMILTON AND BRANDON, K.T., Easton Park, Wickham Market, for chestnut; *s.* Wedgewood 2nd 2045, *d.* Morella 2375 *by* Cupbearer 3rd 566. (*Exhibited with No.* 546.)

598 III. (£5.)—SIR W. N. ABDY, BT., Manifold Wick, Kelvedon, for chestnut; *s.* Champagne 2300, *d.* Smart 3300 *by* Banker 1444. (*Exhibited with No.* 539.)

600 R. N. & H. C.—NATHANIEL CATCHPOLE, Bramford, Ipswich.
H. C.—ROBERT EDGAR, for No. 601, **Gossip**; HORACE WOLTON, for No. 607. Com.—606, WM. WILSON.

Agricultural Horses.[1]

Class 54.—*Agricultural Geldings, foaled in* 1890 *or* 1891. [10 entries, 1 absent.]

608 I. (£10.)—S. B. CHADWICK, Crofton Lodge, Runcorn, for **Leo,** bay, foaled in 1891, bred by Wm. Whinnerah, Warton Hall, Carnforth; *s.* Norman IV. 10075, *d.* Peggie 6838 *by* Cardinal 2407.

610 II. (£5.)—CHARLES COXON, Elford Park, Tamworth, for **Elford Victor,** roan, foaled 1891; *s.* Hatherton 4443, *d.* Elford Blossom *by* Ploughboy.

611 III. (£3.)—GEORGE GIFFORD, Flempton Hall, Bury St. Edmunds, for **Boxer,** bay, foaled 1890; *s.* Vulcan II., *d.* Depper *by* Matchless 1531.

613 R. N. & H. C.—LORD MIDDLETON, Birdsall House, York, for **Calendar.**

Class 55.—*Agricultural Geldings, foaled in* 1890 *or* 1891, *got by a Registered Suffolk Stallion.* [No entries.]

[1] Prizes given by the Cambridge Local Committee.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

CATTLE.

Shorthorns.

Class 56.—*Shorthorn Bulls, calved in* 1889, 1890, *or* 1891. [14 entries, 1 absent.]

623 **I. (£15, & R. N. for Champion.**[1]**)**—WM. GRAHAM, Eden Grove, Kirkby-thore, Penrith, for **Fairy King** 62570, roan, born Mar. 1, 1891, bred by the Duke of Northumberland; *s.* Royal Arthur 59806, *d.* Fairy Rosebud *by* King Hal 49808.

631 **II. (£10.)**—J. DEANE WILLIS, Bapton Manor, Codford, for **Count Lavender** 60545, roan, born Mar. 3, 1889, bred by W. Duthie, Tarves, N.B.; *s.* Norseman 56233, *d.* Sweet Lavender *by* Earl of March 33807.

618 **III. (£5.)**—HER MAJESTY THE QUEEN, The Prince Consort's Shaw Farm, Windsor, for **Fairfax** 60792, roan, born Jan. 5, 1890; *s.* Field Marshal 47870, *d.* Fräulein *by* Admiral 39353.

629 **R. N. & H. C.**—ROBERT THOMPSON, Inglewood, Penrith, for **British Cheer.**

H. C.—WM. ATKINSON, for No. 619, **Asterisk**; HENRY WILLIAMS, for No. 630, **Major.**

Com.—GEORGE HARRISON, for No. 624, **Royal Ury**; G. F. KING, for No. 625, **Blair Athol.**

Class 57.—*Shorthorn Bulls, calved in* 1892. [14 entries, 1 absent.]

645 **I. (£15, & Champion, £20.**[1]**)**—J. DEANE WILLIS, Bapton Manor, Codford, for **Czarowitz** 63850, red & white, born Jan. 13; *s.* Count Lavender 60545, *d.* Crown Princess *by* Golden Crown 54370.

632 **II. (£10.)**—C. W. BRIERLEY, The Lydiates, Brimfield, Herefordshire, for **Joe Ingram** (vol. xxxix. p. 408), roan, born Apr. 4, bred by the late J. Harrison, Much Hoole, Preston; *s.* Harry Ingram 54417, *d.* Derwent Princess *by* British General 50916.

638 **III. (£5.)**—G. HARRISON, Underpark, Lealholm, Grosmont, for **Lord Conyers** 64304, red & little white, born Aug. 30, bred by D. Cooper, Bainesse, Catterick; *s.* Cincinnatus 58652, *d.* Lady Conyers *by* Lord Godolphin 36065.

642 **R. N. & H. C.**—J. J. SHARP, Broughton, Kettering, for **Lambert.**

H. C.—JOHN HANDLEY, for No. 637, **Vice Admiral**; THE EARL OF ROSEBERY, K.G., for No. 641, **Sittyton Seal.**

Com.—LORD BROUGHAM AND VAUX, for No. 634, **Maximus.**

Class 58.—*Shorthorn Bulls, calved in* 1893. [30 entries, 7 absent.]

675 **I. (£15.)**—J. DEANE WILLIS, Bapton Manor, Codford, for **Vain Robin,** roan, born Jan. 17; *s.* Roan Robin 57992, *d.* Vain Girl (vol. xxxvii. p. 724) *by* Golden Crown 54370.

657 **II. (£10.)**—G. HARRISON, Underpark, Lealholm, Grosmont, for **Champion Cup,** roan, born Jan. 16, bred by J. Deane Willis; *s.* Challenge Cup 57029, *d.* Cineraria (vol. xxxviii. p. 675) *by* Commodore 54118.

646 **III. (£5.)**—WM. ATKINSON, Overthwaite, Milnthorpe, Westmoreland, for **Major Munro** (vol. xl.), white, born Jan. 21; *s.* Asterisk 62094, *d.* Emblem *by* Ruling Star 58098.

---

[1] Given by the Shorthorn Society for the best Male Shorthorn exhibited in Classes 56–59.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

672 **R. N. & H. C.**—Richard Stratton, The Duffryn, Newport, Mon., for **Excelsior.**

H. C.—John Handley, for No. 655, **Duke of York**; Evan Jones, for No. 660, **Golden Bulb**; G. F. King, for No. 662, **Vain Knight**; Thomas Stokes, for No. 671, **Prince of Roses.**

Com.—Thomas Stokes, for No. 670, **Earl of Torwood 10th**; Jonas Webb, No. 674, for **Earl of Clarence 6th.**

Class 59.—*Shorthorn Bulls, calved in* 1894.[1] [14 entries, 2 absent.]

689 **I.** (£10.)—J. Deane Willis, Bapton Manor, Codford, for **Count Victor**, roan, born Jan. 20; *s.* Count Lavender 60545, *d.* Victoria 84th (vol. xxxix. p. 641) *by* Gondolier 52956.

688 **II.** (£5.)—Richard Stratton, The Duffryn, Newport, Mon, for **First Fiddle**, roan, born Jan. 21; *s.* Medallion 56175, *d.* Timbrel 8th (vol. xxxv. p. 592) *by* Acropolis 47316.

678 **R. N. & H. C.**—William Atkinson, Overthwaite, Milnthorpe, Westmoreland, for **British Chief.**

H. C.—H.R.H. the Prince of Wales, K.G., for No. 676, **Honey Duke**; Evan Jones, for No. 684; Philo L. Mills, for No. 685, **Scottish Charmer.**

Class 60.—*Shorthorn Cows (in-milk or in-calf), calved before* 1891. [12 entries, 3 absent.]

691 **I.** (£15.)—C. W. Brierley, The Lydiates, Brimfield, Herefordshire, for **Softlaw Rose** (vol. xxxix. p. 268), red & white, born May 10, 1886, in-milk, calved July 17, 1893, & in-calf, bred by James Scott, Softlaw East Mains, Kelso, N.B.; *s.* Prince Charming 50197, *d.* Fairnington Rose *by* Mountain Prince 61343.

698 **II.** (£10.)—Lord Polwarth, Mertoun House, St. Boswells, N.B., for **Wave of Loch Leven** (vol. xxxix. p. 530), red & white, born Feb. 14, 1886 [calved Aug. 23, 1894]; *s.* King David 43417, *d.* Wave of Pacific *by* Rapid Rhone 35205.

695 **III.** (£5.)—E. Ecroyd, Lowhouse, Armathwaite, Carlisle, for **Armathwaite Rose** (vol. xxxix. p. 348), roan, born Sept. 18, 1890, in-milk, calved Apr. 8, 1893, & in-calf; *s.* Duke of Chatsworth 3rd 57185, *d.* Well Heads Rose 13th *by* Duke of Holker 38153.

690 **R. N. & H. C.**—T. Atkinson, Redvales Farm, Bury, for **Lady Faithful.**

H. C.—J. J. Sharp, for No. 699, **Oxford Rosette 5th**; F. C. Le G. Starkie, for No. 700, **Carol.**

Class 61.—*Shorthorn Heifers (in-milk or in-calf), calved in* 1891. [11 entries, 1 absent.]

702 **I.** (**£15, & Champion, £20.**[2])—Her Majesty the Queen, The Prince Consort's Shaw Farm, Windsor, for **Bouquet** (vol. xxxviii. p. 201), roan, born Apr. 12, in-milk, calved Feb. 26, 1894; *s.* New Year's Gift 57796, *d.* Bracelet *by* Royal Norseman 45540.

708 **II.** (£10.)—G. Harrison, Underpark, Lealholm, Grosmont, for **Warfare** (vol. xxxviii. p. 419), roan, born Jan. 20, in-milk, calved Apr. 18, 1894, bred by S. Campbell, Kinellar, Aberdeen; *s.* First Consul 57314, *d.* Roan Rosebud 2nd *by* Gravesend 46461.

---

[1] Prizes given by the Cambridge Local Committee.
[2] Given by the Shorthorn Society for the best Female Shorthorn exhibited in Classes 60–64.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

706 **III.** (*£5.*)—EDWARD ECROYD, Lowhouse, Armathwaite, Carlisle, for **Armathwaite Butterfly 10th** (vol. xxxix. p. 346), red & little white, born Nov. 5, in-calf; *s.* Duke of Chatsworth 3rd 57185, *d.* Belle of Butterflies 5th *by* Duke of Oxford 72nd 51143.

712 **R. N. & H. C.**—R. STRATTON, The Duffryn, Newport, Mon., for **Jubilant.**

710 **H. C.**—LORD POLWARTH, for **Wave Mist.**
Com.—F. W. BOND, for No. 703, **Gertrude 2nd**; R. BYGOTT, for No. 704, **Baroness Creake 7th.**

Class 62.—*Shorthorn Heifers, calved in* 1892. [14 entries, 3 absent.]

719 **I.** (*£15*, **& R. N. for Champion.**[1])—LORD POLWARTH, Mertoun House, St. Boswells, N.B., for **Bridal Robe** (vol. xxxix. p. 530), red & white, born Jan. 20; *s.* Crested Knight 54137, *d.* Wedding Gift *by* Sir Arthur Irwin 44016.

726 **II.** (*£10.*)—J. DEANE WILLIS, Bapton Manor, Codford, for **Miranda** (vol. xxxix. p. 639), red & white, born Aug. 24; *s.* Count Lavender 60545, *d.* Missie 125th *by* William of Orange 50694.

715 **III.** (*£5.*)—C. W. BRIERLEY, The Lydiates, Brimfield, Herefordshire, for **Welsh Maid**, roan, born Apr. 1, bred by the Marquis of Bute, Cardiff Castle; *s.* Unionist 60093, *d.* Royal Butterfly's Duchess 7th (vol. xxxv. p. 423) *by* Baron Oxford 3rd 42737.

725 **R. N. & H. C.**—ROBERT THOMPSON, Inglewood, Penrith, for **Sweet Shape.**
H. C.—HER MAJESTY THE QUEEN, for No. 713, **Vera**; SIR H. F. DE TRAFFORD, BT., for No. 717, **Minstrel Girl.**
Com.—LORD POLWARTH, for No. 720, **Windsor's Queen.**

Class 63.—*Shorthorn Heifers, calved in* 1893. [27 entries, 6 absent.]

732 **I.** (*£10.*)—C. W. BRIERLEY, The Lydiates, Brimfield, Herefordshire, for **Belle of the Season**, roan, born Feb. 2; *s.* Martinet 59455, *d.* Amy Robsart *by* Handel 46477.

752 **II.** (*£7.*)—J. DEANE WILLIS, Bapton Manor, Codford, for **Red Quadroon**, red, born Jan. 1; *s.* Roan Robin 57990, *d.* Quadroon 3rd (vol. xxxvii. p. 722) *by* Young Briton 49201.

751 **III.** (*£5.*)—J. DEANE WILLIS, for **Edna Ailesbury**, roan, born Feb. 19; *s.* Roan Robin 57992, *d.* Emily Ailesbury (vol. xxxix. p. 637) *by* Gracchus.

727 **R. N. & H. C.**—HER MAJESTY THE QUEEN, for **Frederica.**
H. C.—G. HARRISON, for No. 740, **Blanche**, & No. 741, **Gratia**; W. J. HOSKEN, for No. 742, **Rose of Oxford 14th.**
Com.—H.R.H. THE PRINCE OF WALES, K.G., for No. 728, **York Rose**; G. F. KING, for No. 743, **Countess 21st**, & No. 744, **Hilda Daisy 5th**; PHILO L. MILLS, for No. 745, **Barrington Kirklevington Craggs**; ROBERT THOMPSON, for No. 750, **Belgravia Butterfly.**

Class 64.—*Shorthorn Heifers, calved in* 1894.[2] [5 entries, 3 absent.]

756 **I.** (*£10.*)—G. HARRISON, Underpark, Lealholm, Grosmont, for **Princess Mary**, roan, born Jan. 8; *s.* Royal Ury 63302, *d.* Princess Annie (vol. xxxviii. p. 419) *by* Prince Waterloo 3rd 45422.

757 **II.** (*£5.*)—THOMAS STOKES, Warmington, Oundle, for **Sunbeam**, red, born Jan. 25; *s.* Rosedale Carlo 64700, *d.* Sunshine 2nd *by* Gladys Hero 52940.

---

[1] Given by the Shorthorn Society for the best Female Shorthorn exhibited in Classes 60–64.
[2] Prizes given by the Cambridge Local Committee.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

Herefords.

Class 65.—*Hereford Bulls, calved in* 1889, 1890, *or* 1891. [3 entries, 1 absent.]

760 I. (£15.)—A. E. Hughes, Wintercott, Leominster, for **Albion** 15027, born Jan. 5, 1890, bred by N. F. Moore, Sutton, Hereford; *s.* Bruce 13646, *d.* Milenda *by* Recorder 7205.

759 II. (£10.)—J. H. Arkwright, Hampton Court, Leominster, for **Happy Hampton** 16097, born Jan. 22, 1891; *s.* Hilarity 8734, *d.* Pearl 9th *by* Good Boy 7668.

Class 66.—*Hereford Bulls, calved in* 1892. [6 entries, 1 absent.]

767 I. (£15.)—Edward Yeld, Endale, Leominster, for **Lead-on** 16800, born March 31, bred by A. E. Hughes, Wintercott, Leominster; *s.* Seabreeze 14153, *d.* Lofty *by* Rudolph 6660.

766 II. (£10.)—William Tudge, Leinthall, Ludlow, for **Silurian** 16993, born Feb. 16; *s.* Excelsior 13778, *d.* Togus *by* Auctioneer 5194.

763 III. (£5.)—The Earl of Coventry, Croome Court, Severn Stoke, for **Courtier** 16656, born June 18; *s.* Royal Ruler 13406, *d.* Counterfeit *by* Adelbert 8185.

765 R. N. & Com.—Ralph Palmer, Nazeing, Waltham Cross, for **Prospero.**

Class 67.—*Hereford Bulls, calved in* 1893. [14 entries, 3 absent.]

774 I. (£15.)—A. E. Hughes, Wintercott, Leominster, for **Liberty** (vol. xxv.), born March 7; *s.* Albion 15027, *d.* Lofty *by* Rudolph 6660.

779 II. (£10.)—William Tudge, Leinthall, Ludlow, for **Bold Briton** (vol. xxv.), born Jan. 3; *s.* Ancient Briton 15034, *d.* Jubilee *by* Viscount Wilton 11824.

768 III. (£5.)—Wm. Barneby, Saltmarshe Castle, Bromyard, for **Depositor,** born Jan. 7; *s.* Banker 14316, *d.* Rebecca (vol. xx. p. 196) *by* Prince Arthur 11554.

777 R. N. & H. C.—John Price, Pembridge, for **Duke of York.**
Com.—The Earl of Coventry, for No. 772, **Tiptop**; Thomas Fenn, for No. 773, **Downton Symmetry**; E. Yeld, for No. 781, **Prince Hope.**

Class 68.— *Hereford Cows (in-milk or in-calf), calved before* 1891. [3 entries, none absent.]

783 I. (£15.)—The Earl of Coventry, Croome Court, Severn Stoke, for **Ranee,** born Jan. 21, 1889, in-milk, calved Mar. 3, 1894; *s.* Rare Sovereign 10499, *d.* Rarity 13th *by* Archduke 4312.

782 II. (£10.)—W. H. Cooke, Shelsley Kings, Worcester, for **Miss Severn 22nd** (vol. xxiii. p. 259), born Jan. 25, 1888, in-milk, calved Feb. 14, 1894, bred by W. E. de Winton, Hillhampton Farm, Stourport; *s.* Grove Wilton 3rd 11295, *d.* Miss Severn 18th *by* Robin Adair 9137.

784 R. N. & Com.—The Earl of Lisburne, Crosswood, Aberystwith, for **Wild Cherry.**

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

Class 69.—*Hereford Heifers (in-milk or in-calf), calved in* 1891. [3 entries, none absent.]

786 **I. (£15.)**—RICHARD GREEN, The Whittern, Kington, for **Rachel** (vol. xxiii. p. 251), born Feb. 9, in-milk, calved Dec. 31, 1893, bred by George Child, Pembridge; *s.* Cleveland 13696, *d.* Lydia *by* Warrior True 10804.

787 **II. (£10.)**—RALPH PALMER, Nazeing, Waltham Cross, for **Whiskey** (vol. xxv.), born Mar. 5, in-milk, calved Mar. 19, 1894; *s.* Crown Prince 8464, *d.* Wellingtonia 4th *by* Landlord 7073.

785 **R. N. & Com.**—COL. BRIDGFORD, Kinnersley, Hereford, for **Princess 2nd.**

Class 70.—*Hereford Heifers, calved in* 1892. [9 entries, 1 absent.]

796 **I. (£15.)**—A. P. TURNER, The Leen, Pembridge, for **Gwendoline** (vol. xxiv. p. 677), born Jan. 8; *s.* Merlin 7851, *d.* Olive *by* Sir Edward 10631.

793 **II. (£10.)**—W. E. LEARNER, Dilham Hall, Norwich, for **May Queen** (vol. xxiv. p. 553), born Feb. 15, bred by John Price, Pembridge; *s.* Pioneer 14025, *d.* Grace Darling *by* Monarch 7858.

790 **III. (£5.)**—THE EARL OF COVENTRY, Croome Court, Severn Stoke, for **Rose**, born Feb. 8; *s.* Rare Sovereign 10499, *d.* Rosemary *by* Grove 3rd, 5051.

795 **R. N. & H. C.**—H. W. TAYLOR, Showle Court, Ledbury, for **Tweenie.**

788 **H. C.**—HER MAJESTY THE QUEEN, for **Patricia.**
Com.—THE EARL OF COVENTRY, for No. 789, **Geneva**; T. FENN, for No. 791, **Downton Heiress**; R. O. REES, for No. 794, **Marion.**

Class 71.—*Hereford Heifers, calved in* 1893. [15 entries, 5 absent.]

800 **I. (£10.)**—RICHARD GREEN, The Whittern, Kington, for **Sister Perilla** (vol. xxv.), born Jan. 10; *s.* Whittern Grove 10843, *d.* Miss Perfection *by* Lord Wilton 4740.

799 **II. (£7.)**—RICHARD GREEN, for **Mildmay** (vol. xxv.), born Jan. 17; *s.* Pioneer 16269, *d.* Maggie 2nd *by* Alexander 8193.

801 **III. (£5.)**—A. HUGHES, Wintercott, Leominster, for **Barbara 3rd** (vol. xxv.), born Jan. 10; *s.* Albion 15027, *d.* Baroness 2nd *by* Cheerful 6351.

798 **R. N. & H. C.**—W. H. COOKE, Shelsley Kings, Worcester, for **Hyoscyamus.**

807 **Com.**—H. W. TAYLOR, for **Damietta.**

Devons.

Class 72.—*Devon Bulls, calved in* 1889, 1890, *or* 1891. [7 entries, 2 absent.]

818 **I. (£15.)**—SIR WM. WILLIAMS, BT., Heanton, Barnstaple, for **Pretty Middling** 2859, born Oct. 18, 1889, bred by Viscount Falmouth, Tregothnan, Truro; *s.* Lord Wolseley 2063, *d.* Quadrille 5800 *by* Sirloin 1443.

817 **II. (£10.)**—J. C. WILLIAMS, M.P., Werrington Park, Launceston, for **Marmion** 2642, born Dec. 3, 1889; *s.* Mario 2279, *d.* Mouse 8791 *by* Druid 1317.

815 **III. (£5.)**—A. C. SKINNER, Bishop's Lydeard, Som., for **Compensator** 2942, born May 31, 1891; *s.* Baron Golsoncott 4th 2193, *d.* Crape 4th 9830 *by* Lord Currypool, 1589.

813 **R. N. & H. C.**—H. B. BLACKBURN, Tounleigh, Lew Down, Devon, for **Star.**

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

Class 73.—*Devon Bulls, calved in* 1892. [4 entries, none absent.]

821 I. (£15.)—Sir Wm. Williams, Bt., Heanton, Barnstaple, for **Pretty Middling 2nd** 3172, born June 10; *s.* Pretty Middling 2859, *d.* Rosebud 4th *by* Foreman 2nd 1969.

820 II. (£10.)—A. C. Skinner, Bishop's Lydeard, Som., for **Lord Punchard** 3148, born Jan. 14, bred by Exors. of W. H. Punchard, Bourton Hall, Totnes; *s.* Lord Wolseley 2063, *d.* Lady Jane 10373 *by* Champion 1696.

822 R. N. & H. C.—Sir Wm. Williams, Bt., for **Pretty Middling 3rd.**

819 H. C.—Her Majesty the Queen, Flemish Farm, Windsor, for **Dragoon.**

Class 74.—*Devon Bulls, calved in* 1893. [4 entries, 1 absent.]

823 I. (£10.)—A. C. Skinner, Bishop's Lydeard, Som., for **Royalist of Pound** 3350, born Feb. 5; *s.* Masterpiece 2837, *d.* Rosalie 10175 *by* Rob Roy 1831.

824 II. (£5.)—E. J. Stanley, M P., Quantock Lodge, Bridgwater, Som., for **Duke of Bridgwater** 3258, born Jan. 16; *s.* Baronet 1897, *d.* Lady Currypool 6th 12120 *by* Duke of Wellington 1955.

825 R. N. & H. C.—P. H. Tamlyn, Boode House, Braunton, Devon, for **Duke of Cambridge.**

Class 75.—*Devon Cows or Heifers (in-milk or in-calf), calved before or in* 1891. [4 entries, none absent.]

827 I. (£15.)—A. C. Skinner, Bishop's Lydeard, Som., for **Duchess 29th** 11727, born Aug. 27, 1890, in-milk, calved Aug. 21, 1893, & in-calf; *s.* Baron Golsoncott 4th 2193, *d.* Duchess 17th 8988 *by* Lord Currypool 1589.

830 II. (£10.)—Sir Wm. Williams, Bt., Heanton, Barnstaple, for **Flame 4th** 11891, born May 26, 1890, in-milk, calved May 3, 1894; *s.* Captain 2204, *d.* Flame *by* Duke of Flitton 17th 1544.

828 III. (£5.)—A. C. Skinner, for **Fancy 17th**, 12430, born Jan. 25, 1891, in-milk, calved Apr. 20, 1894; *s.* General Gordon 1974, *d.* Fancy 7th 8991 *by* Lord Currypool 1589.

829 R. N. & H. C.—E. J. Stanley, M.P., Quantock Lodge, Bridgwater, for **Moss Rose 15th.**

Class 76.—*Devon Heifers, calved in* 1892. [4 entries, none absent.]

833 I. (£15.)—Sir Wm. Williams, Bt., Heanton, Barnstaple, for **Fiction 5th** 13191, born Jan. 13; *s.* Pretty Middling 2859, *d.* Fiction 2nd *by* Foreman 2nd 1969.

831 II. (£10.)—A. C. Skinner, Bishop's Lydeard, Som., for **Myrtle 38th** 13081, born Jan. 13; *s.* Lord Passmore 2nd 2628, *d.* Myrtle 25th 9834 *by* Lord Currypool 1589.

832 R. N. & H. C.—E. J. Stanley, M.P., Quantock Lodge, Bridgwater, for **Moss Rose 18th.**

834 H. C.—John Wortley, Frettenham, Norwich.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

Class 77.—*Devon Heifers, calved in* 1893. [4 entries, none absent.]

836 **I.** (£10.)—A. C. Skinner, Bishop's Lydeard, Som., for **Fancy 19th of Pound** 13602, born May 13; *s.* Compensator 2942, *d.* Fancy 14th 11729 *by* General Gordon 1974.

835 **II.** (£7.)—Her Majesty the Queen, Flemish Farm, Windsor, for **Fairy** 13196, born Feb. 4; *s.* Roger Golsoncott 2485, *d.* Fancy 5th 5293 *by* Lily's Robin 1582.

838 **R. N. & H. C.**—Sir Wm. Williams, Bt., Heanton, Barnstaple, for **May.**

837 **H. C.**—J. C. Williams, M.P., Werrington Pk., Launceston, for **Victress 3rd.**

Sussex.

Class 78.—*Sussex Bulls, calved in* 1889, 1890, *or* 1891. [6 entries, 2 absent.]

843 **I.** (£15.)—F. Warde, Aldon, Addington, West Malling, for **Headley** 1201, born Jan. 22, 1891, bred by J. S. Hodgson, Lythe Hill, Haslemere; *s.* Dog Daisy 1112, *d.* Young Emily 1st *by* Prince Alfred 555.

841 **II.** (£10.)—Joseph Godman, Park Hatch, Godalming, for **Goldlink** 1099, born Mar. 1, 1890; *s.* Gold 815, *d.* Noble Lady 2911 *by* Napoleon 3rd 396.

840 **III.** (£5.)—W. S. Forster, Gore Court, Maidstone, for **Gondolier** 1001, born Apr. 19, 1889; *s.* Careful 741, *d.* Tidy *by* Barton.

844 **R. N. & H. C.**—Earl Winterton, Shillinglee Pk., Sussex, for **Stanhope.**

Class 79.—*Sussex Bulls, calved in* 1892. [7 entries, none absent.]

847 **I.** (£15.)—Joseph Godman, Park Hatch, Godalming, for **Prince John** 1261, born Mar. 6, bred by C. T. Lucas, Warnham Court, Horsham; *s.* Lord John 934, *d.* Reeve 3818 *by* Drungewick 456.

849 **II.** (£10.)—Louis Huth, Possingworth Manor, Waldron, for **Lord Beckley 19th** 1270, born Feb. 9; *s.* Lord Beckley 6th 700, *d.* Virgin 15th 3856 *by* Sir William 2nd 520.

846 **III.** (£5.)—The Earl of Derby, Birtley, Witley, Godalming, for **Proud Prince** 1249, born Jan. 19, bred by the late Earl of Derby; *s.* Dog Daisy 1112, *d.* Pride of the Family 2nd 2469 *by* Young Hartley 444.

845 **R. N. & H. C.**—The Earl of Derby, for **Beacon.**

850 **Com.**—Sir F. A. Montefiore, Bt., for **Cherry Duke.**

Class 80.—*Sussex Bulls, calved in* 1893. [7 entries, 2 absent.]

856 **I.** (£10.)—Jos. Godman, Park Hatch, Godalming, for **Nobleman 7th** 1315, born Jan. 25; *s.* Nobility 838, *d.* Noble Lady 5th 4419 *by* Nobleman 707.

857 **II.** (£5.)—Earl Winterton, Shillinglee Park, Petworth, for **Shylock,** born Mar. 18, bred by J. Stewart Hodgson, Lythe Hill, Haslemere; *s.* Dog Daisy 1112, *d.* Laura 7th 3268 by Lord Oxford 461.

858 **R. N. & H. C.**—William Wood, Jun., Hassocks, Sussex, for **King William.**

853 **H. C.**—T. Bannister, for **Limehurst Duke 2nd.**
Com.—Wm. Beldam, for No. 854, **Snowstorm**; The Earl of Derby, for No. 855, **Lord O. Napier.**

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

Class 81.—*Sussex Cows or Heifers (in-milk or in-calf), calved before or in* 1891. [7 entries, none absent.]

862 **I. (£15.)**—W. S. FORSTER, Gore Court, Maidstone, for **Crown Princess** 5483, born Feb. 27, 1891, in-milk, calved Jan. 17, 1894; *s.* Mikado 705, *d.* Princess 2nd 3325 *by* Pacific 514.

861 **II. (£10.)**—W. S. FORSTER, for **Blackeyes** 4388, born Aug. 5, 1888, in-calf; *s.* Goldsmith 391, *d.* Surprise 3116 *by* Archduke 381.

864 **III. (£5.)**—LOUIS HUTH, Possingworth Manor, Waldron, for **Virgin 20th** 4451, born June 7, 1887, in-milk, calved Feb. 11, 1894; *s.* Lord Beckley 6th 700, *d.* Virgin 17th 3856 *by* Fitzgerald 498.

859 **R. N. & H. C.**—MAJOR BEST, Boxley, Maidstone, for **Dahlia 3rd.**
H. C.—THE EARL OF DERBY, for No. 860, **Lady Napier 2nd**; J. E. A. GWYNNE, for No. 863, **Dahlia 5th.**

Class 82.—*Sussex Heifers, calved in* 1892. [10 entries, 2 absent.]

870 **I. (£15.)**—W. S. FORSTER, Gore Court, Maidstone, for **Flo** 5879, born Jan. 1; *s.* Gondolier 1001, *d.* Wadhurst Marigold 5050 *by* Lord Charles.

872 **II. (£10.)**—C. T. LUCAS, Warnham Court, Horsham, for **Jubilee 2nd,** born Feb. 8; *s.* Lord John 934, *d.* Jubilee 4826 *by* Beresford 489.

866 **III. (£5.)**—MAJOR BEST, Boxley, Maidstone, for **Grandissimo** 5771, born Feb. 1; *s.* Oxford Duke 1st 840, *d.* Grandiflora 4627 *by* Frankfort 1st 811.

875 **R. N. & H. C.**—FREDERICK WARDE, Aldon, Addington, West Malling, for **Aldon Prebble C.**

H. C.—JOSEPH GODMAN, for No. 871, **Dahlia 8th**; F. WARDE, for No. 874, **Aldon Cherry 1st.**

869 **Com.**—THE EARL OF DERBY, for **Dulcimer.**

Class 83.—*Sussex Heifers, calved in* 1893. [15 entries, 4 absent.]

889 **I. (£10.)**—F. WARDE, Aldon, Addington, West Malling, for **Aldon Emily** 6362, born Jan. 15, bred by J. S. Hodgson, Lythe Hill, Surrey; *s.* Headley 1201, *d.* Young Emily 5th *by* Silversmith.

882 **II. (£7.)**—JOSEPH GODMAN, Park Hatch, Godalming, for **Christmas Dark 4th** 6215, born Jan. 13; *s.* Nobility 838, *d.* Christmas Dark 2nd 4729 *by* Oxford Duke 1st 840.

890 **III. (£5.)**—WILLIAM WOOD, JUN., Hassocks, Sussex, for **Berry 13th,** born Feb. 11; *s.* Tosser 1007, *d.* Berry 12th 4835 *by* Sir John 851.

880 **R. N. & H. C.**—THE EARL OF DERBY, Birtley, Witley, Godalming, for **Turtle Dove.**

879 **H. C.**—F. CAMPBELL, Brantridge Park, Sussex, for **Brantridge Vera.**
Com.—W. S. FORSTER, for No. 881, **Biscuit**; P. SAILLARD, for No. 887, **Wind 2nd,** and No. 888, **Woodmancote Mayflower 2nd.**

Welsh.

Class 84.—*Welsh Bulls, calved in* 1889, 1890, *or* 1891. [3 entries, none absent.]

893 **I. (£10.)**—WM. E. OAKELEY, The Plâs, Tan-y-Bwlch, for **Ardudwy** (vol. iv.), born Jan. 1, 1891; *s.* Latimer 188, *d.* Netty 306.

[Unless otherwise stated, each prize animal named be ow was "bred by exhibitor."]

892 II. (£5.)—R. M. GREAVES, Wern, Tremadoc, for **Brenhin Morfa** 233, born Jan. 3, 1891; *s.* Ulundi 238, *d.* Morwyn Morfa 686 *by* Einion 92.

891 **R. N. & H. C.**—D. EVANS-HUGHES, Cae Mawr, Dwyran, Anglesea, for **Caswallon.**

Class 85.—*Welsh Bulls, calved in* 1892 *or* 1893.
[3 entries, none absent.]

896 I. (£10.)—MAJOR S. SANDBACH, Hafodunos, Abergele, for **Lord Salisbury** (vol. v.), born July 21, 1892; *s.* Sir Mona, *d.* Pride of Merioneth 443 *by* Duke of Chester 20.

894 II. (£5.)—R. M. GREAVES, Wern, Tremadoc, for **Welsh Fusilier** (vol. v.), born Feb. 7, 1892, bred by W. E. Oakeley, The Plâs, Tan-y-Bwlch; *s.* Baron of Tan-y-Bwlch 256, *d.* Famous 300 *by* Duke of Chester 20.

895 **R. N. & Com.**—MAJOR S. SANDBACH, for **Ben Battle.**

Class 86.—*Welsh Cows (in-milk or in-calf), calved before or in* 1891.
[2 entries, 1 absent.]

898 I. (£10.)—WM. E. OAKELEY, The Plâs, Tan-y-Bwlch, for **Gem** 738, born Jan. 18, 1888, in-milk, calved Sept. 23, 1893, and in-calf; *s.* Harlech 96, *d.* Jewel 549.

Class 87.—*Welsh Heifers, calved in* 1892. [2 entries, none absent.]

899 I. (£10.)—R. M. GREAVES, Wern, Tremadoc, for **Seren Ddu** (vol. v.), born Jan. 8, bred by H. Ellis, Tairmeibion, Bangor; *s.* Fron 230, *d.* Enid 674 *by* Cadwaladr 151.

900 II. (£5.)—WM. E. OAKELEY, The Plâs, Tan-y-Bwlch, for **Tiara** (vol v.), born Jan. 6; *s.* Latimer 188, *d.* Gem 738 *by* Harlech 96.

Class 88.—*Welsh Heifers, calved in* 1893. [2 entries, none absent.]

901 I. (£10.)—R. M. GREAVES, Wern, Tremadoc, for **May Queen** (vol v.), born May 1; *s.* Sir Roger (vol. v.), *d.* Towyn 7th 687 *by* Sir Watkin 2nd 126.

902 II. (£5.)—WM. E. OAKELEY, The Plâs, Tan-y-Bwlch, for **Mair 5th** (vol. v.), born Feb. 27; *s.* Rhaiadr Dû 257, *d.* Mair 3rd 740 *by* Harlech 96.

Red Polled.

Class 89.—*Red Polled Bulls, calved in* 1889, 1890, *or* 1891.
[8 entries, none absent.]

906 I. (£15, & Champion, £15.[1])—J. J. COLMAN, M.P., Carrow House, Norwich, for **Red Prince** 2902, born Feb. 11, 1891; *s.* Laureate 1563, *d.* Prize 5077 *by* Cromwell 647.

904 II. (£10, & R. N. for Champion.[1])—LORD AMHERST OF HACKNEY, Didlington Hall, Brandon, for **Didlington Davyson 5th** 2263, born May 16, 1890; *s.* Monk 1573, *d.* Didlington Davy 2148 *by* Davyson 7th 476.

905 III. (£5.)—F. E. COLMAN, Nork Park, Epsom, for **Ruby King** 2925, born Feb. 26, 1891, bred by J. J. Colman, M.P., Carrow House, Norwich; *s.* Iago 1025, *d.* Doris 4532 *by* Falstaff 303.

907 **R. N. & H. C.**—LORD HASTINGS, Melton Constable, Norfolk, for **Broadbent.**

[1] Given by the Red Polled Society for the best Red Polled Male animal exhibited.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

Class 90.—*Red Polled Bulls, calved in* 1892. [6 entries, none absent.]

913 I. (£15.)—THE HON. A. E. FELLOWES, M.P., Honingham Hall, Norwich, for **Young Alfred** 3354, born Oct. 11; *s.* Starston Jew 2084, *d.* Nancy 3598 *by* Tit 1088.

915 II. (£10.)—HENRY SPURLING, 14 Lower Brook Street, Ipswich, for **Boss** 3009, born Sept. 23; *s.* Randolph 1603, *d.* Shotley Daisy 4353 *by* Over Hall, 1252.

916 III. (£5.)—C. H. WRIGHT, Cromwell House, Trumpington, Cambridge, for **Trumpington Hero**, born Sept. 25, bred by R. E. Lofft, Troston Hall, Suffolk; *s.* Dandy 1768, *d.* Gloss 11th 6395 *by* Straight Star 945.

911 **R. N. & H. C.**—H.R.H. THE DUKE OF YORK, K.G., Sandringham, for **Melton 2nd** 3213.

Class 91.—*Red Polled Bulls, calved in* 1893. [9 entries, none absent.]

920 I. (£15.)—THOMAS BROWN & SON, Marham Hall, Downham Market, for **Uncas**, born Mar. 5; *s.* Didlington Davyson 2nd 657, *d.* Poppinette 2455 *by* Davyson 3rd 48.

922 II. (£10.)—MRS. E. PERKINS, Saham Hall, Watton, for **Fat Boy**, born Feb. 1; *s.* Mr. Pickwick 1953, *d.* Ivy 3rd 5563 *by* Davyson 15th 652.

923 III. (£5.)—MRS. E. PERKINS, for **Sir Toney**, born Mar. 3; *s.* Mr. Pickwick, 1953, *d.* Ivy 2nd 3520 *by* Davyson 15th 652.

919 **R. N. & Com.**—T. BROWN & SON, Marham Hall, Downham Market, for **Fugleman.**

921 **Com.**—G. E. HAWKINS, for **Sir John.**

Class 92.—*Red Polled Cows (in-milk or in-calf), calved before* 1891. [11 entries, 1 absent.]

930 I. (£15, & **Champion**, £15.[1])—J. J. COLMAN, M.P., Carrow House, Norwich, for **Dorena** 6308, born Feb. 26, 1890, in-milk, calved Feb. 7, 1894; *s.* Iago 1025, *d.* Doris 4532 *by* Falstaff 303.

929 II. (£10.)—LORD AMHERST OF HACKNEY, Didlington Hall, Brandon, for **Saltarella 3rd** 6730, born Oct. 25, 1890, in-milk, calved Jan. 14, 1894, & in-calf; *s.* Monk 1573, *d.* Satanella 3732 *by* Cortes 645.

928 III. (£5.)—LORD AMHERST OF HACKNEY, for **Poppety 2nd** 4289, born Feb. 22, 1887, in-milk, calved Feb. 2, 1894, & in-calf; *s.* Didlington Davyson 2nd 657, *d.* Poppinette 2455 *by* Davyson 3rd 48.

936 **R. N. & H C.**—GARRETT TAYLOR, Trowse House, Norwich, for **Topsy.**

934 **Com.**—MRS. PERKINS, for **Marchioness.**

Class 93.—*Red Polled Heifers (in-milk or in-calf), calved in* 1891. [5 entries, 1 absent.]

938 I. (£15, & **R. N. for Champion.**[1])—J. J. COLMAN, M.P., Carrow House, Norwich, for **Rose Alba** 7468, born Jan. 19, in-milk, calved Jan. 2, 1894; *s.* Laureate 1563, *d.* Midsummer Rose 2976 *by* Othello 713.

---

[1] Given by the Red Polled Society for the best Red Polled Female animal exhibited.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

941 **II.** (£10.)—G. E. HAWKINS, Holt House, Leziate, King's Lynn, for **Necklace Grand** 6594, born Sept. 6, in-milk, calved Mar. 9, 1894, bred by A. J. Smith, Rendlesham; *s.* Grand Duke 1388, *d.* Necklace 4234 *by* Davyson 7th 476.

937 **R. N.**—H.R.H. THE DUKE OF YORK, K.G., Sandringham, for **Midnight.**

Class 94.—*Red Polled Heifers, calved in* 1892. [10 entries, 2 absent.]

943 **I.** (£15.)—J. J. COLMAN, M.P., Carrow House, Norwich, for **Jewel 2nd,** born Apr. 21; *s.* Negro 1956, *d.* Jewel 5575 *by* Iago 1025.

945 **II.** (£10.)—THE HON. A. E. FELLOWES, M.P., Honingham Hall, Norwich, for **Honeymoon** 7923, born Jan. 8, bred by H. P. Green, Caister; *s.* Starlight 2531, *d.* Bride Elect 6215 *by* Combination 1150.

942 **III.** (£5.)—H.R.H. THE DUKE OF YORK, K.G., Sandringham, for **Ashlyns Phyllis** 7647, born Jan. 4, bred by Lieut.-Col. A. G. Lucas, Ashlyns Hall, Herts; *s.* Priney 1602, *d.* Annie 1985 *by* Bounty 460.

950 **R. N. & H. C.**—THE HON. W. F. D. SMITH, M.P., Great Thurlow, Suffolk, for **Jura.**

944 **Com.**—J. J. COLMAN, M.P., for **Telba.**

Class 95.—*Red Polled Heifers, calved in* 1893. [11 entries, 1 absent.]

955 **I.** (£10.)—J. J. COLMAN, M.P., Carrow House, Norwich, for **Barbelle,** born Mar. 19; *s.* Game Boy 2315, *d.* Barmaid 3860 *by* Falstaff 303.

953 **II.** (£7.)—LORD AMHERST OF HACKNEY, Didlington Hall, Brandon, for **Gold Dust,** born July 8; *s.* Marcus, *d.* Goldmine 7150 *by* Red Shirt 2014.

956 **III.** (£5.)—J. J. COLMAN, M.P., for **Brinhilda,** born Feb. 12; *s.* Jupiter 2380, *d.* Brindy 3896 *by* Falstaff 303.

954 **R. N. & H. C.**—LORD AMHERST OF HACKNEY, for **Popsey 2nd.**

958 **Com.**—LIEUT.-COL. LUCAS, for **Marguerite 3rd.**

Aberdeen Angus.

Class 96.—*Aberdeen Angus Bulls, calved in* 1889, 1890, *or* 1891. [8 entries, 3 absent.]

964 **I.** (£10, & **Champion.**[1])—FRED CRISP, New Southgate, for **Gilderoy** 9208, born Mar. 2, 1891, bred by Sir G. Macpherson Grant, Bt., Ballindalloch Castle; *s.* Iliad 2843, *d.* Georgina 2nd of Aberlour *by* Whig 1867.

963 **II.** (£5, & **R. N. for Champion.**[1])—REV. C. BOLDEN, Preston Bissett, Buckingham, for **Esmond of Ballindalloch** 8304, born Mar. 1, 1890, bred by Sir G. Macpherson Grant, Bt., Ballindalloch Castle; *s.* Iliad 2843, *d.* Edelweiss 5605 *by* Young Viscount 736.

967 **R. N. & H. C.**—THE EARL OF ROSEBERY, K.G., Dalmeny Park, Edinburgh, for **Marquis of Moray.**

Class 97.—*Aberdeen Angus Bulls, calved in* 1892 *or* 1893. [6 entries, 1 absent.]

973 **I.** (£10.)—G. S. GRANT, Auchorachan, Glenlivet, Ballindalloch, for **Boaz of Ballindalloch** 10672, born Dec. 15, 1892, bred by Sir G. Macpherson Grant, Bt., Ballindalloch Castle; *s.* Zenophon 8028, *d.* Bouncing Maid 13700 *by* Iliad 2843.

---

[1] Gold Medal given by the Polled Cattle Society for the best Aberdeen Angus animal exhibited.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

974 II. (£5.)—THE MARQUIS OF HUNTLY, Aboyne Castle, N.B., for **Birsemore** 9805, born Feb. 26, 1892; *s.* Paris 1473, *d.* Pride of Birse 11329 *by* Monarch 1182.

972 R. N. & H. C.—T. DIXON, JUN., Leadhill, Stocksfield, for **Angus Mac donald.**

Class 98.—*Aberdeen Angus Cows or Heifers (in-milk or in-calf), calved before or in* 1891. [8 entries, none absent.]

977 I. (£10.)—HER MAJESTY THE QUEEN, Abergeldie Mains, Ballater, N.B., for **Eurya** 13708, born May 21, 1888, in-milk, calved Jan. 21, 1894, bred by Sir G. Macpherson Grant, Bt., Ballindalloch Castle; *s.* Provost 1259, *d.* Eugénie of Ballindalloch 4170 *by* Judge 1150.

981 II. (£5.)—G. S. GRANT, Auchorachan, Glenlivet, Ballindalloch, Banffshire, for **Legend** 16518, born Jan. 20, 1890, in-milk, calved Apr. 16, 1894; *s.* Rover 6th 7161, *d.* Latonia 9942 *by* Prince of Livet 2303.

984 R. N. & H. C.—C. P. SYKES, West Ella, Hull, for **Witch of Endor 19th.**
Com.—T. DIXON, JUN., for No. 980, **Julia of Leadhill**; W. B. GREENFIELD, for No. 983, **Queen of Haynes 2nd.**

Class 99.—*Aberdeen Angus Heifers, calved in* 1892 *or* 1893. [11 entries, 1 absent.]

991 I. (£10.)—THE EARL OF ROSEBERY, K.G., Dalmeny Park, Edinburgh, for **Grace of Dalmeny** 19733, born Jan. 25, 1892; *s.* Esquire 5346, *d.* Lady Grace 5th *by* Paris 1473.

992 II. (£5.)—THE EARL OF ROSEBERY, K.G., for **Princess of Dalmeny** 19740, born Mar. 15, 1892; *s.* Esquire 5346, *d.* Paris Princess *by* Paris 1473.

988 R. N. & H. C.—THE MARQUIS OF HUNTLY, Aboyne Castle, N.B., for **Lady Elena.**
Com.—THE REV. C. BOLDEN, for No. 986, **Pride of Preston 4th**; T. DIXON, JUN., for No. 987, **Jubilee May**; C. W. SCHROETER, for No. 993, **Tedfold Favourite 2nd.**

Galloways.

Class 100.—*Galloway Bulls, calved in* 1889, 1890, *or* 1891. [1 entry.]

996 I. (£10.)—LEONARD PILKINGTON, Cavens, Dumfries, for **Cedric 2nd of Tarbreoch** 5483, born Jan. 20, 1891, bred by J. Cunningham, Tarbreoch, Dalbeattie; *s.* Lucky Times 3058, *d.* Tarbreoch Lizzie 3rd *by* Harden 1151.

Class 101.—*Galloway Bulls, calved in* 1892 *or* 1893. [2 entries, none absent.]

998 I. (£10.)—WM. PARKIN-MOORE, Whitehall, Mealsgate, Cumberland, for **Macdougall 3rd of Tarbreoch** 5840, born Jan. 15, 1892, bred by James Cunningham, Tarbreoch, Dalbeattie; *s.* Royal Liberty 4140, *d.* Maggie of Tarbreoch 8613 *by* Scottish Borderer 669.

997 II. (£5.)—JAMES CUNNINGHAM, Tarbreoch, Dalbeattie, for **Scottish Knight of Durhamhill** 5924, born Jan. 10, 1893, bred by John Cunningham, Durhamhill, N.B.; *s.* Campfollower 5052, *d.* Madonna of Tarbreoch 10427 *by* Harden 1151.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

Class 102.—*Galloway Cows or Heifers (in-milk or in-calf), calved before or in* 1891. [4 entries, none absent.]

1002 I. (£10.)—LEONARD PILKINGTON, Cavens, Dumfries, for **Tidy 5th of Drumlanrig**, born Apr. 11, 1890, in-calf, bred by the Duke of Buccleuch; *s.* Bosphorus 4693, *d.* Tidy of Drumlanrig 9615 *by* Mackintosh 3rd 2646.

1000 II. (£5.)—JAMES CUNNINGHAM, Tarbreoch, Dalbeattie, for **Madonna 2nd of Tarbreoch** 11056, born Feb. 23, 1888 [calved Sept. 6, 1894]; *s.* Statesman 3rd of Drumlanrig 2624, *d.* Madonna 2nd 8696 *by* Stanley 2nd of Drumlanrig 1675.

1001 R. N. & H. C.—JAMES CUNNINGHAM, for **Scottish Queen.**

999 Com.—THE COUNTESS OF CARLISLE, for **Lady Queen 3rd of Tarbreoch.**

Class 103.—*Galloway Heifers, calved in* 1892 *or* 1893. [4 entries, none absent.]

1005 I. (£10.)—LEONARD PILKINGTON, Cavens, Dumfries, for **Mabel of Castlemilk** 12950, born Jan. 17, 1892, bred by Sir Robert Jardine, Bt., Castlemilk Lockerbie; *s.* Black Douglas of Castlemilk 5002, *d.* Maggie 4th of Garliestown 10053 *by* Ivanhoe 3080.

1003 II. (£5.)—THE COUNTESS OF CARLISLE, Naworth Castle, Brampton, for **Primrose 2nd of Drumlanrig** 12928, born Jan. 16, 1892, bred by the Duke of Buccleuch; *s.* Vich Ian Vhor 4121, *d.* Peeress 6th 10953 *by* Squire 3737.

1006 R. N. & H. C.—LORD POLWARTH, Mertoun House, St. Boswells, for **Tidy Betty.**

1004 Com.—THE COUNTESS OF CARLISLE, for **Vaudeville 4th of Naworth.**

Ayrshires.

Class 104.—*Ayrshire Bulls, calved in* 1891, 1892, *or* 1893. [4 entries, 1 absent.]

1010 I. (£10.)—SIR MARK J. STEWART, BT., M.P., Southwick, Dumfries, for **Hovers Heir of Southwark** 2690, white & brown spots, born Mar. 20, 1891; *s.* Hover-a-Blink 892, *d.* Betty 2nd of Orchardton *by* Black Prince.

1009 II. (£5.)—LEONARD PILKINGTON, Cavens, Dumfries, for **Field Marshal**, white & brown, born Mar. 9, 1892, bred by Thomas Scott, Netherhall, Sandilands, N.B.; *s.* Adjutant 1819, *d.* Susy *by* Jumbo.

1008 R. N. & H. C.—ANDREW MITCHELL, Barcheskie, Kirkcudbright, for **Lord Stair.**

Class 105.—*Ayrshire Cows or Heifers (in-milk or in-calf).* [3 entries, none absent.]

1013 I. (£10.)—SIR MARK J. STEWART, BT., M.P., Southwick, Dumfries, for **Trim 4th of Castlehill** 6940, yellow-brown & white, born June, 1888, in-milk, calved May 25, 1894, bred by A. Kerr, Castlehill; *s.* Peter of Whitehill 1397, *d.* Trim of Castlehill 5219.

1011 II. (£5.)—LEONARD PILKINGTON, Cavens, Dumfries, for **Braw Lass**, white & brown, born 1892, in-calf, bred by A. Frater, Westhawksland, N.B.; *s.* Adjutant 1819, *d.* Nellie of Westhawksland *by* Craigs of Kyle 1793.

1012 R. N. & H. C.—LEONARD PILKINGTON, for **Brown Duchess.**

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

Jerseys.

N.B.—In the Jersey Classes, the number inserted within brackets after the name of an animal indicates the number of such animal in the Island Herd Book. A number without brackets indicates that the animal is registered in the English Jersey Herd Book.

Class 106.—*Jersey Bulls, calved in* 1890, 1891, *or* 1892. [19 entries, 1 absent.]

1032 I. (£15.)—MRS. C. H. WILSON, Warter Priory, Pocklington, for **Sultan**, whole colour, born Apr. 4, 1892, bred by Lord Londesborough, Londesborough Park, Yorks; *s.* Grouville's Dairyman 4183, *d.* Sultana (vol. v. p. 692) *by* Rainbow 1943.

1028 II. (£10.)—R. J. POPE, Beresford Manor, Plumpton, Lewes, for **Devotion's Lad**, whole colour, born Mar. 1, 1892, bred by J. E. Grandin, St. Owen's, Jersey; *s.* Distinction's Pride (1486), *d.* Devotion 6th (3261).

1019 III. (£5.)—SIR R. GRAHAM, BT., Norton Conyers, Ripon, for **Tiger Lily**, black, born June 7, 1892; *s.* Grouville Dairyman 4153, *d.* Diana 2nd (vol. v. p. 300) *by* Nero du Coin 1849.

1023 R. N. & H. C.—G. C. KNIGHT, Baldhorns Pk., Horsham, for **William Tell**.

H. C.—F. BRADSHAW, for No. 1014, **Grouville's Clyde**; EARL CADOGAN, K.G., for No. 1016, **Golden Fluke**; SIR GILBERT GREENALL, BT., for No. 1020, **Rosa's Fortescue 2nd**; R. H. LORD, for No. 1024, **Grouville's Phil**; A. E. MCMULLEN, for No. 1026, **Marquis**; LORD ROTHSCHILD, for No. 1029, **Flora's Lad**.

1017 Com.—SIR H. F. DE TRAFFORD, BT., for **Rosy Jock**.

Class 107.—*Jersey Bulls, calved in* 1893. [34 entries, 3 absent.]

1037 I. (£10.)—EARL CADOGAN, K.G., Culford Hall, Bury St. Edmunds, for **Nevada**, fawn, born May 24; *s.* Columbus 3184, *d.* Neroline (vol. iv. p. 449) *by* Victor 2131.

1052 II. (£5.)—MRS. C. MCINTOSH, Havering Park, Romford, for **Morning Star**, dark grey, born Apr. 12, bred by W. Alexander, St. Mary's, Jersey; *s.* Lowland King (1673), *d.* Jubilee Star (4607) *by* Rosy's Wonder (835).

1062 R. N. & H. C.—MRS. E. E. STARKIE, Mitchells, Saffron Walden, for **Groufille's Lad**.

H. C.—J. R. CORBETT, for No. 1038, **Little Goldie**; SIR GILBERT GREENALL, BT., for No. 1045, **Gay Lord**; THE HON. MRS. CECIL HOWARD, for No. 1049, **Hucklebury**; G. C. KNIGHT, for No. 1050, **Guardian**; A. E. MCMULLEN, for No. 1053, **Egyptian Nigger**; E. MATHEWS, for No. 1055, **Noirmont's Boy**; MRS. C. H. WILSON, for No. 1066, **Warter Grouville**.

Com.—CAPT. THE HON. T. S. BRAND, for No. 1036, **Correze**; J. W. CROOKES, for No. 1039, **Blackwood**; F. FREEMAN-THOMAS, for No. 1041, **Wigton's Boy**; C. GLYN, for No. 1042, **Goree**; SIR R. GRAHAM, BT., for No. 1044, **Viscount Grouville**; THE COUNTESS OF LONSDALE, for No. 1051, **Busy Boy**.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

Class 108.—*Jersey Cows (in-milk), calved before or in* 1890. [20 entries, 4 absent.]

1081 I. (£15.)—LORD ROTHSCHILD, Tring Park, Herts, for **Oxford Dahlia**, fawn, born Feb. 8, 1887, in-milk, calved Apr. 6, 1894, bred by J. P. Marett, St. Saviour's, Jersey; *s.* Sultan's Cicero (398), *d.* Oxford Daisy (6616).

1074 II. (£10.)—SIR GILBERT GREENALL, BT., Walton Hall, Warrington, for **Mona 7th**, fawn & white, born Apr. 13, 1889, in-milk, calved Apr. 25, 1894, bred by F. P. Haequoil, St. Owen's, Jersey; *s.* Leonidas (881), *d.* Mona 3rd (1447) *by* Wolseley (401).

1083 III. (£5.)—MRS. E. E. STARKIE, Mitchells, Saffron Walden, for **Flora's Pearl** (3688), fawn & white, born Mar. 2, 1889, in-milk, calved Apr. 15, 1894, bred by C. De Gruchy, Trinity, Jersey; *s.* Standard (1056), *d.* Flora's Pride (954).

1082 R. N. & H. C.—LORD ROTHSCHILD, Tring Park, Herts, for **Spot**.
H. C.—EARL CADOGAN, K.G., for No. 1071, **Fancy's Beauty**; J. W. CROOKES, for No. 1072, **Black Bess 2nd**; MRS. MCINTOSH, for No. 1078, **Jubilee Star**.

1085 Com.—W. G. M. TOWNLEY, for **May Queen 2nd**.

Class 109.—*Jersey Cows (in-milk), calved in* 1891. [20 entries, 2 absent.]

1099 I. (£15.)—SIR GILBERT GREENALL, BT., Walton Hall, Warrington, for **Silver Bell** (7999) F.S., grey, born Apr., in-milk, calved Apr. 23, 1894, bred by J. N. Falle, Grouville, Jersey.

1100 II. (£10.)—SIR GILBERT GREENALL, BT., for **Surprise**, fawn, born Apr. 2, in-milk, calved May 6, 1894, bred by J. E. Grandin, St. Owen's, Jersey; *s.* Golden Lad (1242), *d.* Devotion 6th (3261).

1093 III. (£5.)—EARL CADOGAN, K.G., Culford Hall, Bury St. Edmunds, for **J. G. Bess**, fawn, born July 1, in-milk, calved May 20, 1894; bred by P. L. S. Mourant, St. Saviour's, Jersey; *s.* Golden Lad (1242), *d.* Brookhill Bess (7245).

1092 R. N. & H. C.—JOSEPH BRUTTON, Yeovil, for **Golden Lass 5th**.
H. C.—JOSEPH FLINN, for No. 1095, **Tit's Promise**; MRS. E. E. STARKIE, for No. 1105, **Grand-daughter**.
Com.—JOSEPH BRUTTON, for No. 1091, **Brown Fern 6th**; MRS. MCINTOSH, for No. 1101, **Primrose Wonder**.

Class 110.—*Jersey Heifers (in-milk or in-calf), calved in* 1892. [25 entries, 5 absent.]

1119 I. (£15.)—SIR GILBERT GREENALL, BT., Walton Hall, Warrington, for **Science 2nd**, brown, born Feb. 24, in-milk, calved Apr. 30, 1894, bred by F. Le Lièvre, St. Clement's, Jersey; *s.* Golden Lad (1242), *d.* Science (3793).

1108 II. (£10.)—LORD BRAYBROOKE, Audley End, Saffron Walden, for **Lemon Queen 2nd**, fawn, born Apr. 15, in-milk, calved Apr. 23, 1894; *s.* Old Port 3600, *d.* Lemon Queen *by* Loyal Baron 2638.

1127 III. (£5.)—LORD ROTHSCHILD, Tring Park, Herts, for **Farewell**, fawn, born Jan. 10, in-milk, calved May 20, 1894, bred by A. Gautier, St. Saviour's, Jersey; *s.* Golden Lad (1242), *d.* Wigton (7198) F.S.C. *by* Sir Robert (2061).

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

1113 **R. N. & H. C.**—JOSEPH FLINN, Tednambury, Bishop's Stortford, for **Grouville's Ode.**

H.C.—LORD BRAYBROOKE for No. 1109, **Speck 5th**; J. R. CORBETT, for No. 1111, **Bessie 7th**; SIR GILBERT GREENALL, BT., for No. 1118, **Butterfly**; MRS. E. E. STARKIE, for No. 1130, **Goldfinch.**

Com.—P. H. FOWLER, for No. 1115, **Pretty Lady Superior 4th**; FOWLER & DE LA PERRELLE, for No. 1117, **Maitland Buttercup 2nd**; LORD ROTHSCHILD, for No. 1128, **Jessamine.**

Class 111.—*Jersey Heifers, calved in* 1893. [33 entries, 5 absent.]

1150 **I.** (£10.)—SIR GILBERT GREENALL, BT., Walton Hall, Warrington, for **Daisy's Pride**, fawn, born Apr. 12; *s.* Zulu's Pride (4459), *d.* Daisy of the Valley *by* Count Wolseley (928).

1143 **II.** (£7.)—F. FREEMAN-THOMAS, Little Ratton, Eastbourne, for **Hyacinth**, fawn, born May 4; *s.* Butterfly 4006, *d.* Harebell B. (vol. v. p. 392) *by* Martin's Duke 3523.

1159 **III.** (£5.)—LORD ROTHSCHILD, Tring Park, Herts, for **Tulip 3rd**, fawn, born Apr. 26; *s.* Spots Lad 4389, *d.* Marigold *by* Columbus 3184.

1149 **R. N. & H. C.**—SIR GILBERT GREENALL, BT., for **Belvira's Lassie.**

H. C.—J. R. CORBETT, for No. 1140, **Ellen**; J. W. CROOKES, for No. 1141, **Footlight**; A. T. GRAIN, for No. 1147, **Lady Margaret**; R. H. LORD, for No. 1153, **Juno 2nd**; A. E. MCMULLEN, for No. 1156, **Trust 4th**; MRS. E. E. STARKIE, for No. 1161, **Grand-daughter's Pearl**; MRS. C. H. WILSON, for No. 1163, **Sultana 2nd.**

Com.—CAPT. THE HON. T. S. BRAND, R.N., for No. 1135, **Romp**; J. BRUTTON, for No. 1139, **Cloud 2nd**; R. H. LORD, for No. 1154, **Mabel**; LORD ROTHSCHILD, for No. 1158, **Fern.**

Guernseys.

Class 112.—*Guernsey Bulls, calved in* 1890, 1891, *or* 1892. [5 entries, 2 absent.]

N.B.—Unless otherwise stated, the numbers refer to the English Guernsey Herd Book.

1165 **I.** (£10.)—LORD MONTAGU, Beaulieu, Southampton, for **Beaulieu King**, red & white, born Sept. 30, 1892; *s.* Red Prince 430, *d.* Maysie 1387.

1168 **II.** (£5.)—THE HON. MRS. LATIMER NEVILLE, Magdalene Lodge, Cambridge, for **Hopeful 4th** 550, orange, fawn & white, born Sept. 7, 1892, bred by W. Glynn, Sea Grove, Ryde; *s.* The General 444, *d.* Flora 117.

1167 **R. N.**—SIR F. A. MONTEFIORE, BT., Worth Park, Crawley, for **Sir Francis 2nd.**

Class 113.—*Guernsey Bulls, calved in* 1893. [9 entries, 1 absent.]

1172 **I.** (£10.)—THE EXPRESS DAIRY CO., LTD., Finchley, for **Benefactor** 864 P.S., R.G.A.S., orange, fawn & white, born Jan. 8, bred by John Bourgaise, St. Saviour's, Guernsey; *s.* Willing Lad 754 P.S., *d.* Benefactress 4th 381 P.S.

1171 **II.** (£5.)—THE EXPRESS DAIRY CO., LTD., for **Ambassador** 857 P.S., R.G.A.S., orange, fawn & white, born Jan. 3, bred by J. W. Martel, Castel, Guernsey; *s.* Meridian 735 P.S., *d.* Hilda 2nd 2035 P.S.

Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

1173 **R. N. & H. C.**—P. H. FOWLER, Watford, Herts, for **Robinson 2nd.**
1177 **H. C.**—JULIAN STEPHENS, for **Mountaineer.**
1176 **Com.**—SIR F. A. MONTEFIORE, BT., for **Lord Worth 3rd.**

Class 114.—*Guernsey Cows or Heifers (in-milk), calved before or in* 1891. [9 entries, none absent.]

1183 **I. (£10.)**—SIR F. A. MONTEFIORE, BT., Worth Park, Crawley, for **Fortuna** 758, fawn & white, born Apr. 18, 1886, in-milk, calved Mar. 1 1894, bred by A. Rintoul, London; *s.* Hopeful 25, *d.* Blossom 21.

1187 **II. (£5.)**—JULIAN STEPHENS, Finchley, for **Muriel** 1132, orange, fawn & white, born Sept. 12, 1885, in-milk, calved Aug. 21, 1893, bred by Henry Abrahams, Bronet, Guernsey; *s.* Climax 14, *d.* Whitey 1603 G.H.B.

1185 **R. N. & H. C.**—THE HON. MRS. LATIMER NEVILLE, Magdalene Lodge, Cambridge, for **Matilda.**

1186 **H. C.**—JULIAN STEPHENS, for **Mountain Maid 2nd.**

1181 **Com.**—J. F. HICKS, for **Kate 7th.**

Class 115.—*Guernsey Heifers, calved in* 1892. [8 entries, none absent.]

1189 **I. (£10.)**—THE EXPRESS DAIRY CO., LTD., Finchley, for **College Daisy** 4526 G.H.B., orange, fawn & white, born June 10, bred by J. Simon, St. Andrew's, Guernsey; *s.* Goldfern, *d.* Daisy.

1188 **II. (£5.)**—THE HON. MRS. A. BAILLIE-HAMILTON, Combs, Stowmarket, for **Rosemary 2nd** 2301, fawn & white, born Apr. 12; *s.* Serapis 364, *d.* Rosemary 273 *by* Loyal 37.

1190 **R. N. & H. C.**—THE EXPRESS DAIRY CO., LTD., for **Polly 7th.**

Class 116.—*Guernsey Heifers, calved in* 1893. [9 entries, none absent.]

1196 **I. (£10.)**—THE HON. MRS. A. BAILLIE-HAMILTON, Combs, Stowmarket, for **Sweet Marjoram**, fawn & little white, born Feb. 15; *s.* Jesse 328, *d.* Sweet Silage 1458 *by* Mercury 197.

1204 **II. (£5.)**—JULIAN STEPHENS, Finchley, for **Muriel 5th** 2524, light red & white, born Aug. 21; *s.* May Boy 346, *d.* Muriel 1132.

1198 **R. N. & H. C.**—THE EXPRESS DAIRY CO., LTD, Finchley, for **Nora 8th**
H. C.—THE EXPRESS DAIRY CO., LTD., for No. 1197, **East Lynne 5th**; H. C. STEPHENS, M.P., for No. 1202, **Citron Blossom 8th**; and No. 1203 **Citron Blossom 9th.**

Kerries.

Class 117.—*Kerry Bulls, calved in* 1891, 1892, *or* 1893. [9 entries, none absent.]

1208 **I. (£10, & R. N. for Champion.[1])**—VISCOUNT DE VESCI, Abbeyleix House, for **King Conn**, born Apr. 12, 1893; *s.* Gort Admiral 140, *d.* Lady Castletown 2nd *by* Feale 8.

1211 **II. (£5.)**—THE MARQUIS OF LANSDOWNE, Bowood, Calne, for **O'Dugan** 214, born Feb. 4, 1892, bred by Viscount de Vesci, Abbeyleix; *s.* Gort Admiral 140, *d.* Lady Georgina 523 *by* Feale 8.

[1] Given by the Kerry and Dexter Cattle Society for the best animal exhibited in Classes 117–119

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

1212 **R. N. & H. C.**—THE MARQUIS OF LANSDOWNE, for **Pat O'Hara.**
Com.—C. ADEANE, for No. 1205, **Babraham Beau** ; J. ROBERTSON, for No. 1213, **Canterbury.**

Class 118.—*Kerry Cows (in-milk or in-calf), calved before or in* 1891. [8 entries, 2 absent.]

1221 **I. (£10, & Champion, £10 10*s*.[1])**—JAMES ROBERTSON, Hatton, Warwick, for **Beryl**, born 1889, in-milk, calved May 12, 1894; breeder unknown.

1216 **II. (£5.)**—THE EXPRESS DAIRY CO., LTD., Finchley, for **Nair** 667, born 1888, in-milk, calved Feb. 17, 1894 ; breeder unknown.

1218 **R. N. & H. C.**—SIR MAURICE FITZ-GERALD, BT., Severals House, Newmarket, for **Valencia Dorothy.**
H. C.—C. ADEANE, for No. 1214, **Blackberry 2nd**, and No. 1215, **Lesbia** ; SIR MAURICE FITZ-GERALD, BT., for No. 1217, **Nesta 3rd** ; THE REV. H. F. KNIGHTLEY, for No. 1219, **Drought.**

Class 119.—*Kerry Heifers, calved in* 1892 *or* 1893.[2] [5 entries, none absent.]

1223 **I. (£10.)**—C. ADEANE, Babraham Hall, Cambridge, for **Bride 1511**, born Apr. 4, 1892 ; *s.* Mentmore 90, *d.* Blackberry 2nd 161.

1224 **II. (£5.)**—THE MARQUIS OF LANSDOWNE, Bowood, Calne, for **Belle of Kenmare**, born Oct. 14, 1892 ; *s.* Dan O'Connell 68, *d.* Belle of the Lake 956.

1222 **III. (£3.)**—C. ADEANE, for **Blenheim** 1505, born July 17, 1893 ; *s.* Blackamoor 246, *d.* Denham Dinah 302.

1225 **R. N. & H. C.**—THE MARQUIS OF LANSDOWNE, for **Enda 4th.**
Com.—J. ROBERTSON, for No. 1226, **The Bébé.**

Dexter Kerries.

Class 120.—*Dexter Kerry Bulls, calved in* 1891, 1892, *or* 1893. [5 entries, none absent.]

1227 **I. (£10, & R. N. for Champion.[3])**—H.R.H. THE PRINCE OF WALES, K.G., Sandringham, for **Pat**, red, born Nov. 30, 1892 ; *s.* Kidmore Paradox 2nd 59, *d.* Kidmore Lady Lisburn 2nd 278 *by* Busaco 3rd.

1231 **II. (£5.)**—T. R. ROBINSON, Kensworth, Dunstable, for **Kensworth Model**, born Oct. 24, 1893 ; *s.* Blackcap 31, *d.* Dorcas 411 *by* Buffalo Bill.

1230 **R. N. & H. C.**—JAMES ROBERTSON, Hatton, Warwick, for **The Parson.**

1228 **H. C.**—LORD ASHBURTON, The Grange, Alresford, Hants, for **The Grange Hero.**

Class 121.—*Dexter Kerry Cows (in-milk or in-calf), calved before or in* 1891. [12 entries, none absent.]

1235 **I. (£10.)**—N. C. COOKSON, Oakwood, Wylam, Northumberland, for **First Love** (vol. iv.), born 1890, in-milk, calved Apr. 25, 1894, breeder unknown.

1232 **II. (£5.)**—LORD ASHBURTON, Alresford, Hants, for **Mavourneen** 132, born 1886 [calved July 8, 1894], breeder unknown.

[1] Given by the Kerry and Dexter Cattle Society for the best animal exhibited in Classes 117-119.
[2] Prizes given by the Cambridge Local Committee.
[3] Given by the Kerry and Dexter Cattle Society for the best animal exhibited in Classes 120-122.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

1239 **R. N. & H. C.**—JAMES ROBERTSON, for **Abutilon.**

H. C.—JAMES ROBERTSON, for No. 1240, **Crypomtria**; R. TAIT ROBERTSON, for No. 1241, **Jessie**; G. F. ROUMIEU, for No. 1242, **Balsam.**

Com.—N. C. COOKSON, for No. 1236, **Nemophila**; HERBERT LLOYD, for No. 1237, **Sorrel.**

Class 122.—*Dexter Kerry Heifers, calved in* 1892 *or* 1893.[1] [9 entries, none absent.]

1244 **I.** (**£10, & Champion,** £**10 10s.**[2])—H.R.H. THE PRINCE OF WALES, K.G., Sandringham, for **Baba** 2371, born about 1892; breeder unknown.

1247 **II.** (**£5.**)—JAMES ROBERTSON, Hatton, Warwick, for **Little Mascotte,** born May 13, 1893; *d.* First Love.

1250 **III.** (**£3.**)—G. F. ROUMIEU, Farnham, for **Picotee** (vol. iii.), born May 8, 1892; *s.* Fascination 6, *d.* Royal Windsor 311 *by* Limelight 12.

1251 **R. N. & H. C.**—HAROLD SWITHINBANK, for **Denham Milkmaid 2nd.**

DAIRY CATTLE.

Class 123.—*Dairy Cows, in-milk, of any weight, breed, or cross, giving the largest quantity of milk, provided the milk be, on the average of two milkings, up to the standard adopted by the Society of Public Analysts.* [10 entries, 1 absent.]

1254 **I.** (**£15.**)—SALISBURY BAXENDALE, Bonningtons, Ware, for **Marsh Marigold** (Shorthorn), red & white, born about 1889, in-milk, calved May 6, 1894; breeder unknown.

1259 **II.** (**£10.**)—SANDERS SPENCER, Holywell Manor, St. Ives, Hunts, for **Miss Strawberry** (Shorthorn), red & white, born 1887, in-milk, calved June 2, 1894; *s.* Bright Andrew 49186, *d.* Strawberry.

1253 **III.** (**£5.**)—SALISBURY BAXENDALE, for **Bess** (Shorthorn), red & white, born about 1886, in-milk, calved Mar. 15, 1894; breeder unknown.

1261 **R. N.**—THOMAS STOKES, Warmington, Oundle, for **Milky.**

Class 124.—*Dairy Cows, in-milk, of any weight, breed, or cross, giving the greatest weight of Butter-fat, as ascertained by Chemical Analysis, provided the yield of milk obtained in two milkings be not less than* 25 *lb.* [13 entries, 3 absent.]

1266 **I.** (**£15.**)—MRS. E. ROSE BLACKWELL, Cowden Hall, Heathfield, for **Greek Maid 7th** (Jersey), yellow fawn, born May 18, 1891, in-milk, calved May 11, 1894; *s.* Jessie's Boy 3403, *d.* Greek Maid 4th *by* St. John's Baron 3769.

1275 **II.** (**£10.**)—DR. HERBERT WATNEY, Buckhold, Pangbourne, for **Vesta 2nd** (vol. v. p. 736) (Jersey), whole fawn, born June 21, 1885, in-milk, calved Apr. 16, 1894, bred by W. H. Campion, Little Danny, Sussex; *s.* Goldfield 2480, *d.* Vesta *by* Lord Somers 507.

1268 **III.** (**£5.**)—LORD BRAYBROOKE, Audley End, Saffron Walden, for **Mistral** (vol. v. p. 546) (Jersey), light fawn, born Dec. 10, 1887, in-milk, calved Dec. 4, 1893; *s.* Loyal Baron 2638, *d.* Guss *by* Sir Garnet 1239.

1271 **R. N.**—J. R. CORBETT, Moor Place, Betchworth, for **Stargazer C.**

---

[1] Prizes given by the Cambridge Local Committee.

[2] Given by the Kerry and Dexter Cattle Society for the best animal exhibited in Classes 120–122.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

SHEEP.

Leicesters.

Class 125.—*Leicester Two-Shear Rams.* [5 entries, none absent.]

1280 **I.** (£10.)—T. H. HUTCHINSON, Catterick, born Mar. 1892.
1277 **II.** (£5.)—G. HARRISON, Underpark, Lealholm, Yorks, born Mar. 1892.
1281 **R. N.**—E. F. JORDAN, Eastburn, Driffield, born Mar. 1892.

Class 126.—*Leicester Shearling Rams.* [7 entries, 1 absent.]

1286 **I.** (£15.)—E. F. JORDAN, Eastburn, Driffield, born Mar. 1893.
1282 **II.** (£10.)—G. HARRISON, Underpark, Lealholm, Yorks, born Mar. 1893.
1284 **III.** (£5.)—T. H. HUTCHINSON, Catterick, born Mar. 1893.
1283 **R. N.**—G. HARRISON, born Mar. 1893.

Class 127.—*Pens of Three Leicester Ram Lambs.* [4 entries, 1 absent.]

1290 **I.** (£10.)—E. F. JORDAN, Eastburn, Driffield, born Mar. 1894.
1289 **II.** (£5.)—G. HARRISON, Underpark, Lealholm, Yorks, born Mar. 1894.
1292 **R. N.**—MRS. PERRY-HERRICK, Beau Manor Park, Loughborough, born about Mar. 16, 1894.

Class 128.—*Pens of Three Leicester Shearling Ewes, of the same Flock.* [7 entries, 1 absent.]

1293 **I.** (£15.)—G. HARRISON, Underpark, Lealholm, Yorks, born Mar. 1893.
1295 **II.** (£10) & 1296 **III.** (£5.)—E. F. JORDAN, Eastburn, Driffield, born Mar. 1893.

1298 **R. N. & H. C.**—MRS. PERRY-HERRICK; & **H. C.** for No. 1299.
1294 **Com.**—GEORGE HARRISON.

Cotswolds.

Class 129.—*Cotswold Two-Shear Rams.* [4 entries, none absent.]

1301 **I.** (£10.) & 1300 **II.** (£5.)—R. GARNE, Aldsworth, Northleach, born Feb. 1892.

1302 **R. N. & H. C.**—T. THORNTON, Cavenham Ho., Wereham, Stoke Ferry.

Class 130.—*Cotswold Shearling Rams.* [10 entries, none absent.]

1306 **I.** (£15.)—R. GARNE, Aldsworth, Northleach, born Feb. 1893.
1310 **II.** (£10) & 1311 **III.** (£5.)—RUSSELL SWANWICK, R. A. C. Farm, Cirencester, born Feb. 18, 1893.

1307 **R. N. & H. C.**—R. GARNE, Aldsworth, born Feb. 1893.
1308 **Com.**—T. R. HULBERT.

Class 131.—*Pens of Three Cotswold Ram Lambs.* [5 entries, none absent.]

1315 **I.** (£10) & 1314 **II.** (£5.)—R. GARNE, Aldsworth, born Jan. 1894.
1318 **R. N. & H. C.**—R. SWANWICK, Cirencester, born Jan 10, 1894.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

Class 132.—*Pens of Three Cotswold Shearling Ewes of the same Flock.* [5 entries, none absent.]

1321 I. (£15) & 1322 II. (£10.)—T. R. HULBERT, North Cerney, Cirencester, born Mar. 5, 1893.

1323 III. (£5.)—RUSSELL SWANWICK, R. A. C. Farm, Cirencester, born Feb. 10, 1893.

1319 **R. N. & H. C.**—G. BAGNALL & SON, Westwell Manor, Burford, born Feb. 1893.

Lincolns.

Class 133.—*Lincoln Two-Shear Rams.* [5 entries, none absent.]

1326 I. (£10.)—JOHN PEARS, Mere, Lincoln, for **Riby Sovereign** 1208, born Feb. 1892, bred by H. Dudding, Riby Grove, Stallingborough; *s.* Young Scopwick 506.

1328 II. (£5.)—ROBERT WRIGHT, Nocton Heath, Lincoln, for **The Rejected** 1250, born Feb. or Mar. 1892; *s.* Melton 254.

1327 **R. N. & H. C.**—ROBERT WRIGHT, for **Nocton Choice.**

Class 134.—*Lincoln Shearling Rams.* [17 entries, none absent.]

1344 I. (£15) & 1345 II. (£10.)—ROBT. WRIGHT, Nocton Heath, Lincoln, born Feb. or Mar. 1893.

1330 III. (£5.)—TOM CASSWELL, Pointon, Folkingham, for **Hero,** born Feb. 1893.

1333 **R N. & H. C.**—H. DUDDING, Riby Grove, Stallingborough.

H. C.—WM. HESSELTINE, for No. 1335; HENRY SMITH, JUN., for Nos 1341 & 1342.

Class 135.—*Pens of Three Lincoln Ram Lambs.* [5 entries, none absent.]

1349 I. (£10.)—JOHN WESTROPE, Morden Hall, Royston, born Jan. 1894; *s.* Coat of Arms 610, *ds. by* Windsor Boy 885.

1348 II. (£5.)—G. T. MELBOURN, Nocton Heath, Lincoln, born Feb. 1894; *s.* Cropwell King 1006, *d. by* Nocton King.

1347 **R. N. & H. C.**—H. DUDDING, born about Feb. 20, 1894.

Class 136.—*Pens of Three Lincoln Shearling Ewes, of the same Flock.* [6 entries, 2 absent.]

1351 I. (£15.)—H. DUDDING, Riby Grove, Stallingborough, born about Feb. 20, 1893.

1354 II. (£10.)—JOHN PEARS, Mere, Lincoln, born Feb. 1893.

1352 III. (£5.)—H. DUDDING, born about Feb. 20, 1893.

1353 **R. N. & H. C.**—G. T. MELBOURN, Nocton Heath, Lincoln, born Feb. 1893.

Class 137.—*Pens of Three Lincoln Ewe Lambs.*[1] [4 entries, none absent.]

1358 I. (£15.)—H. DUDDING, Riby Grove, Stallingborough, born about Feb. 20, 1894.

---

[1] Prizes given by the Cambridge Local Committee.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

1359 II. (£10.)—JOHN PEARS, Mere, Lincoln, born Feb. 1894.

1360 III. (£5.)—JOHN WESTROPE, Morden Hall, Royston, born Jan. 1894 *s.* Coat of Arms 610, *ds. by* Windsor Boy 885.

1357 R. N.—H. DUDDING, born about Feb. 20, 1894.

Oxford Downs.

Class 138.—*Oxford Down Two-Shear Rams.*
[2 entries, none absent.]

1361 I. (£10.)—J. C. EADY, Irchester Grange, Wellingborough, born Feb. 10, 1892; *s.* Young Cultivator 540, *d. by* Lord Irchester Oxford 394.

1362 II. (£5.)—E. GUY FENWICK, Alconbury, Huntingdon, for **Alconbury Duke**, born Feb. 1892, bred by Charles Howard, Biddenham, Bedford; *s.* Biddenham 201.

Class 139.—*Oxford Down Shearling Rams.*
[16 entries, none absent.]

1363 I. (£15.)—GEORGE ADAMS, Pidnell, Faringdon, for **Monarch**, born Jan. 7, 1893; *s.* Keepsake 881.

1372 II. (£10.)—J. T. GREEN, King's Langley, for **Langleybury**, born Jan. 29, 1893; *s.* Langley 2nd 1167.

1371 III. (£5.)—J. T. GREEN, King's Langley, for **Cassiobury**, born Feb. 2, 1893; *s.* Langley 2nd 1167.

1364 R. N. & H. C.—GEORGE ADAMS, for **Oriel**, born Jan 4, 1893; *s.* Keepsake 881.

1374 H. C.—CHARLES HOWARD.

Com.—THE COUNTESS OF CAMPERDOWN, for No. 1366; CHARLES HOWARD, for No. 1373; H. W. STILGOE, for No. 1376.

Class 140.—*Pens of Three Oxford Down Ram Lambs.*
[4 entries, 1 absent.]

1379 I. (£10.)—GEORGE ADAMS, Pidnell, Faringdon, born Jan. 11, 1894 *s.* Oxford Hero 912.

1380 II. (£5.)—GEORGE ADAMS, born Jan. 13, 1894; *s.* Oxford Hero 912.

1381 R. N.—THOMAS CHALK, Linton, Cambs, born about Feb. 12, 1894; *s* Linton No. 15.

Class 141.—*Pens of Three Oxford Down Shearling Ewes, of the same Flock.* [12 entries, 1 absent.]

1389 I. (£15.)—J. C. EADY, Irchester Grange, Wellingborough, born Feb. 14, 1893; *s.* Treadwell's No. 8 of 1891 1306, *d. by* Young Cultivator 540.

1391 II. (£10.)—J. T. GREEN, King's Langley, born Feb. 1893; *ss.* Langley 2nd 1167 & Langley Hero 1491.

1393 III. (£5.)—CHARLES HOWARD, Biddenham, Bedford, born Jan. 1893; *ss.* Brassey's No. 20 1402 & Treadwell's No. 20 1562.

1384 R. N. & H. C.—GEORGE ADAMS, born Jan. 5, 1893; *s.* Keepsake 881.

H. C.—THE COUNTESS OF CAMPERDOWN, for No. 1385; J. C. EADY, for No. 1388.

Com.—E. GUY FENWICK, for No. 1390.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

Class 142.—*Pens of Three Oxford Down Ewe Lambs.*[1]
[4 entries, 1 absent.]

1395 I. (£15) & 1396 II. (£10.)—GEORGE ADAMS, Pidnell, Faringdon, Berks, born Jan. 10, 1894; *s.* Oxford Hero 912.

1397 III. (£5.)—THOMAS CHALK, Linton, Cambs, born about Feb. 12, 1894; *s.* Linton No. 15.

Shropshires.

Class 143.—*Shropshire Two-Shear Rams.* [20 entries, 2 absent.]

1406 I. (£10, & R. N. for Champion.[2])—THOMAS FENN, Stonebrook House, Ludlow, born about Mar. 15, 1892.

1411 II. (£5.)—W. F. INGE, Thorpe Hall, Tamworth, born Feb. 1892.
1402 R. N. & H. C.—A. S. BERRY, Great Barr, Birmingham, born Mar.
H. C.—JOSEPH BEACH, for No. 1399; J. BOWEN-JONES, for No. 1403; R. P. COOPER, for No. 1405; JOHN HARDING, for No. 1410; P. L. MILLS, for No. 1414.
Com.—JOSEPH BEACH, for No. 1400; A. S. BERRY, for No. 1401; T. FENN, for No. 1407; H. TOWNSHEND, for No. 1416.

Class 144.—*Shropshire Shearling Rams.* [47 entries, 7 absent.]

1450 I. (£15, & Champion.[2])—A. E. MANSELL, Shifnal, born Feb. 1893.

1422 II. (£10.)—JOSEPH BEACH, The Hattons, Wolverhampton, born Feb. 25, 1893.

1449 III. (£5.)—A. E. MANSELL, Harrington Hall, Shifnal, born Feb. 1893.
1444 R. N. & H. C.—W. F. INGE, Thorpe Hall, Tamworth, born Feb. 1893.
H. C.—MRS. BARRS, for No. 1420; A. S. BERRY, for Nos. 1423 & 1424; J. BOWEN-JONES, for No. 1426; T. FENN, for Nos. 1438 & 1439; JOHN HARDING, for Nos. 1440 & 1441; W. F. INGE, for No. 1445; P. A. MUNTZ, M.P., for Nos. 1453 & 1454; J. L. NAPER, for No. 1455; M. WILLIAMS, for No. 1465.
Com.—T. F. CHEATLE, for No. 1430; R. P. COOPER, for No. 1434; W. KIRKHAM, for No. 1447; P. L. MILLS, for No. 1451; J. L. NAPER, for No. 1456; H. TOWNSHEND, for No. 1462; M. WILLIAMS, for No. 1464.

Class 145.—*Pens of Three Shropshire Ram Lambs.*
[17 entries, 5 absent.]

1470 I. (£10.)—T. & S. BRADBURNE, Wheeley Moor Hall, Coleshill, born Feb. 28, 1894; *ss.* Precentor and Lord Kington.

1476 II. (£5.)—A. E. MANSELL, Harrington Hall, Shifnal, born Feb. 1894.
1478 R. N. & H. C.—PHILO L. MILLS, Ruddington Hall, Notts, born Mar.
H. C.—T. & S. BRADBURNE, for No. 1469; R. P. COOPER, for No. 1472; W. F. INGE, for No. 1473; A. E. MANSELL, for No. 1477; H. C. G. PARKER, for No. 1479; A. TANNER, for No. 1482.

---

[1] Prizes given by the Cambridge Local Committee.
[2] Gold Medal given by the Shropshire Sheep Breeders' Association for the best Shropshire Ram in Classes 143 and 144.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

Class 146.—*Pens of Three Shropshire Shearling Ewes, of the same Flock.* [23 entries, 6 absent.]

1483 **I. (£15.)**—MRS. M. BARRS, Odstone Hall, Atherstone, born Mar. 1893.
1496 **II. (£10.)**—PHILO L. MILLS, Ruddington Hall, Notts, born Mar.
1486 **III. (£5.)**—J. BOWEN-JONES, Ensdon House, Montford Bridge, born Feb. 1893.

1503 **R. N. & H. C.**—ALFRED TANNER, Shrawardine, Shrewsbury, born about Mar. 15, 1893.
H. C.—JOS. BEACH, for No. 1484; T. & S. BRADBURNE, for No. 1487; W. F. INGE, for Nos. 1493 & 1494; P. A. MUNTZ, M.P., for No. 1497; J. L. NAPER, for No. 1499; M. WILLIAMS, for No. 1505.
Com.—R. P. COOPER, for No. 1488; G. H. DAVISON, for No. 1490; W. KIRKHAM, for No. 1495; H. P. RYLAND, for No. 1502; H. TOWNSHEND, for No. 1504.

Class 147.—*Pens of Three Shropshire Ewe Lambs.*[1] [13 entries, 4 absent.]

1514 **I. (£15.)**—A. E. MANSELL, Harrington Hall, Shifnal, born Mar. 1894.
1515 **II. (£10.)**—PHILO L. MILLS, Ruddington Hall, Notts, born Mar. 1894.
1508 **III. (£5.)**—T. & S. BRADBURNE, Wheeley Moor Hall, Coleshill, born Feb. 28, 1894; *s.* Precentor.
1512 **R. N. & H. C.**—W. F. INGE, Thorpe Hall, Tamworth, born Feb. 1894.
H. C.—R. BROWN, for No. 1510; R. P. COOPER, for No. 1511.
Com.—T. & S. BRADBURNE, for No. 1509; H. C. G. PARKER, for No. 1516; A. TANNER, for No. 1518.

Southdowns.

Class 148.—*Southdown Two-Shear Rams.* [14 entries, 2 absent.]

1532 **I. (£10.)**—WILLIAM TOOP, Aldingbourne, Chichester, born Mar. 1, 1892.
1523 **II. (£5.)**—J. J. COLMAN, M.P., Carrow House, Norwich, born Feb. 1892.
1531 **R. N. & H. C.**—THE DUKE OF RICHMOND AND GORDON, K.G., Goodwood, born Feb. 1892.
1521 **H. C.**—J. BLYTH, Wood House, Stansted.
Com.—E. ELLIS, for No. 1525; THE DUKE OF HAMILTON AND BRANDON, K.T., for No. 1527; THE DUKE OF RICHMOND AND GORDON, K.G., for No. 1530.

Class 149.—*Southdown Shearling Rams.* [33 entries, 5 absent.]

1540 **I. (£15.)**—JAMES BLYTH, Wood House, Stansted, born about Feb. 15, 1893.

1560 **II. (£10.)**—PAGHAM HARBOUR CO., Selsey, Chichester, born about Feb. 15, 1893.

1534 **III. (£5.)**—H.R.H. THE PRINCE OF WALES, K.G., Sandringham, born Mar. 1893.

1539 **R. N. & H. C.**—JAMES BLYTH, Wood House, Stansted, born about Feb. 15, 1893.

1562 **H. C.**—THE DUKE OF RICHMOND AND GORDON, K.G.
Com.—J. J. COLMAN, M.P., for No. 1544; E. ELLIS, for Nos. 1546 & 1547; PAGHAM HARBOUR CO., for No. 1559.

[1] Prizes given by the Cambridge Local Committee.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

Class 150.—*Pens of Three Southdown Ram Lambs.* [19 entries, 5 absent.]

1575 **I.** (£10.)—EDWIN ELLIS, Summersbury, Guildford, born about Feb. 7, 1894.
1583 **II.** (£15.)—PAGHAM HARBOUR CO., Selsey, Chichester, born about Feb. 9, 1894.
1572 **R. N. & H. C.**—J. J. COLMAN, M.P., Carrow House, Norwich, born Feb. 1894.
1584 **H. C.**—WILLIAM TOOP, Aldingbourne, Chichester, born Feb. 7, 1894.
Com.—H.R.H. THE PRINCE OF WALES, K.G., for No. 1566; J. J. COLMAN, M.P., for No. 1573.

Class 151.—*Pens of Three Southdown Shearling Ewes, of the same Flock.* [23 entries, 5 absent.]

1590 **I.** (£15.)—JAMES BLYTH, Wood House, Stansted, born about Feb. 15, 1893.
1605 **II.** (£10.)—THE DUKE OF RICHMOND AND GORDON, K.G., Goodwood, Chichester, born Feb. 1893.
1594 **III.** (£5.)—EDWIN ELLIS, Summersbury, Guildford, born about Feb. 14, 1893.
1592 **R. N. & H. C.**—J. J. COLMAN, M.P., Carrow House, Norwich, born Feb. 1893.
1607 **H. C.**—WM. TOOP, Aldingbourne, Chichester.
Com.—THE DUKE OF HAMILTON AND BRANDON, K.T., for No. 1598; SIR F. A. MONTEFIORE, BT., for No. 1603; SIR WM. THROCKMORTON, BT., for No. 1606.

Class 152.—*Pens of Three Southdown Ewe Lambs.*[1] [20 entries, 3 absent.]

1617 **I.** (£15.)—EDWIN ELLIS, Summersbury, Guildford, born about Feb. 7, 1894.
1623 **II.** (£10.)—C. T. LUCAS, Warnham Court, Horsham, born Feb. 15, 1894.
1627 **III.** (£5.)—W. TOOP, Aldingbourne, Chichester, born Feb. 7, 1894.
1614 **R. N & H. C.**—J. J. COLMAN, M.P., Carrow House, Norwich, born Feb. 1894.
1608 **H. C.**—H.R.H. THE PRINCE OF WALES, K.G.
Com.—C. ADEANE, for No. 1610; SIR H. F. DE TRAFFORD, BT., for No. 1615.

Hampshire Downs.

Class 153.—*Hampshire Down Two-Shear Rams.* [6 entries, 1 absent.]

1629 **I.** (£10.)—T. FOWELL BUXTON, Ware, Herts, born about Jan. 30, 1892.
1633 **II.** (£5.)—HENRY LAMBERT, Babraham, Cambridge, born Jan. 1892.
1628 **R. N.**—T. FOWELL BUXTON, Ware, Herts.

Class 154.—*Hampshire Down Shearling Rams.* [9 entries, 2 absent.]

1635 **I.** (£15.)—T. FOWELL BUXTON, Ware, born Jan. 25, 1893.
1642 **II.** (£10.)—W. T. TWIDELL, Mays Farm, Crowmarsh, Wallingford, for **Twidell's No. 5**, born Feb. 1, 1893.

[1] Prizes given by the Cambridge Local Committee.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

1634 **III.** (£5.)—JOHN BARTON, Hackwood Farm, Basingstoke, born Jan. 1893.
1639 **R. N. & H. C.**—HENRY LAMBERT, Babraham, Cambridge, born Jan. 1893.
1636 **Com.**—T. FOWELL BUXTON, born Jan. 24, 1893.

Class 155.—*Pens of Three Hampshire Down Ram Lambs.* [15 entries, 4 absent.]

1643 **I.** (£10.)—JOHN BARTON, Hackwood Farm, Basingstoke, born Jan. 1894.
1652 **II.** (£5.)—J. A. & T. PALMER, Berry Court, Wallop, Stockbridge, born Jan. 1894.
1648 **R. N. & H. C.**—JOSHUA EAST, Longstock House, Stockbridge, born Jan. 1894.
H. C.—H. LAMBERT, for No. 1651; W. T. TWIDELL, for No. 1656.
Com.—T. FOWELL BUXTON, for No. 1645; J. FLOWER, for No. 1649; R. PORTSMOUTH, for No. 1653.

Class 156.—*Pens of Three Hampshire Down Shearling Ewes, of the same Flock.* [7 entries, none absent.]

1660 **I.** (£15.)—JAMES FLOWER, Chilmark, Salisbury, born Jan. 1893.
1658 **II.** (£10.)—T. FOWELL BUXTON, Ware, Herts, born Jan. 1893.
1664 **III.** (£5.)—LORD ROTHSCHILD, Tring Park, Herts, born about Jan. 20, 1893.
1661 **R. N. & H. C.**—JAS. FLOWER, Chilmark, Salisbury, born Jan. 1893.
1659 **Com.**—T. FOWELL BUXTON, born Jan. 1893.

Class 157.—*Pen of Three Hampshire Down Ewe Lambs.*[1] [15 entries, 4 absent.]

1665 **I.** (£15.)—JOHN BARTON, Hackwood Farm, Basingstoke, born Jan. 1894.
1673 **II.** (£10.)—HENRY LAMBERT, Babraham, Cambridge, born Jan. 1894.
1678 **III.** (£5.)—W. T. TWIDELL, Mays Farm, Crowmarsh, Wallingford, born Jan. 21, 1894.
1674 **R. N. & H. C.**—J. A. & T. PALMER, Berry Court, Wallop, Stockbridge, born Jan. 1894.
H. C.—JAMES FLOWER, for No. 1672; R. PORTSMOUTH, for No. 1675.
Com.—LL. H. BAXENDALE, for No. 1666; T. FOWELL BUXTON, for No. 1667; H. N. CARLISLE, for No. 1669; JAMES FLOWER, for No. 1671.

Suffolks.

Class 158.—*Suffolk Two-Shear Rams.* [10 entries, 1 absent.]

1689 **I.** (£10, & **R. N. for Champion.**[2])—JOSEPH SMITH, Walton, Suffolk, born Feb. 1892.
1683 **II.** (£5.)—THE MARQUIS OF BRISTOL, Ickworth Park, Bury St. Edmunds, for **Vandellia 4th** 2726, born Jan. 29, 1892; *s.* Vandellia 1635.
1686 **R. N. & H. C.**—H. LINGWOOD, The Chestnuts, Needham Market, for **Wait-a-bit.**
1685 **H. C.**—LORD DE SAUMAREZ. 1687 **Com.**—JOHN PALEY.

Class 159.—*Suffolk Shearling Rams.* [16 entries, 1 absent.]

1704 **I.** (£15, & **Champion,** £20[2]) & 1703 **II.** (£10.)—JOSEPH SMITH, Walton, Suffolk, born Feb. 1893.

[1] Prizes given by the Cambridge Local Committee.
[2] Given by the Suffolk Sheep Society for the best Suffolk Ram in Classes 158 and 159.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

1696 **III. (£5.)**—The Earl of Ellesmere, Stetchworth Park, Newmarket, born Feb. 1893.

1702 **R. N. & H. C.**—Major James Scott, Ardeley Bury, Stevenage, born Jan. 22, 1893.

H. C.—The Earl of Ellesmere, for No. 1695; H. Lingwood, for No 1697, **Just-in-time.**

1694 **Com.**—Robert Burrell, for **The Laird.**

Class 160.—*Pens of Three Suffolk Ram Lambs.* [10 entries, 2 absent.]

1713 **I. (£10.)**—Joseph Smith, Walton, Suffolk, born Feb. 1894.
1709 **II. (£5.)**—The Earl of Ellesmere, Stetchworth Park, Newmarket, born Feb. 1894.

1710 **R. N. & H. C.**—H. Lingwood, Needham Market, born Feb. 1894.
1707 **H. C.**—The Marquis of Bristol. 1708 **Com.**—Robert Burrell.

Class 161.—*Pens of Three Suffolk Shearling Ewes, of the same Flock.* [16 entries, 1 absent.]

1723 **I. (£15.)**—The Earl of Ellesmere, Stetchworth Park, Newmarket, born Feb. 1893.

1724 **II. (£10.)**—The Earl of Ellesmere, born Feb. 1893.
1730 **III. (£5)** & 1729 **R. N. & H. C.**—Joseph Smith, Walton, Suffolk, born Feb. 1893.

1721 **H. C.**—Robert Burrell. **Com.**—Sir R. Affleck, Bt., for Nos. 1716 & 1717; The Marquis of Bristol, for No. 1719; H. Lingwood, for No. 1725; W. V. Paley, for No. 1727; W. Whitlock, for No. 1731.

Class 162.—*Pens of Three Suffolk Ewe Lambs.*[1] [19 entries, 2 absent.]

1738 **I. (£15.)**—The Earl of Ellesmere, Stetchworth Park, Newmarket, born Feb. 1894.

1746 **II. (£10.)** & 1747 **III. (£5.)**—Joseph Smith, Walton, Suffolk, born Feb. 1894.
1739 **R. N. & H. C.**—H. Lingwood, Needham Market, born Feb. 1894.
H. C.—John Paley, for No. 1741; Major James Scott, for No. 1745.
Com.—The Marquis of Bristol, for No. 1735; Robert Burrell, for No. 1736.

Wensleydales.

Class 163.—*Wensleydale Two-Shear or Shearling Rams.* [12 entries, none absent.]

1758 **I. (£10.)**—William Rhodes, Lundholme, Westhouse, Kirkby Lonsdale, for **True Blue** 233, born Mar. 25, 1892, bred by A. Ewan, Gooda, Kirkby Lonsdale; *s.* Sir Thomas 178, *d. by* Feudalist 26.

1757 **II. (£5.)**—James Rhodes, Stockeld, Wetherby, born Mar. 2, 1893; *s.* Mudd Fields 351, *d. by* Young Reuben.

1754 **R. N. & H. C.**—John Heugh, Mudd Fields, Bedale, born Mar. 1, 1893.
H. C.—W. Cleasby, for No. 1752; Jas. Rhodes, for No. 1756, **Dewsbury Lad.**
Com.—W. Cleasby, for No. 1751.

[1] Prizes given by the Cambridge Local Committee.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

Class 164.—*Pens of Three Wensleydale Ram Lambs.* [6 entries, 1 absent.]

1767 **I. (£10.)**—T. THOMPSON, Hest Bank, Lancaster, born Mar. 1894; *ss.* Viking and Blue Prince.

1764 **I. (£5.)**—JOHN HEUGH, Mudd Fields, Bedale, born Mar. 2 & 5, 1894; *ss.* Eton 326 and Dewsbury Lad 397, *d. by* Royal Windsor 75.

1763 **R. N. & H. C.**—F. E. C. DOBSON, Dromonby House, Carlton-in-Cleveland.

Class 165.—*Pens of Three Wensleydale Shearling Ewes, of the same Flock.* [6 entries, none absent.]

1772 **I. (£10.)**—WILLIAM RHODES, Lundholme, Westhouse, Kirkby Lonsdale, born Mar. 29, 1893, bred by Exhibitor & J. Dargue, Beaumont Grange, Lancaster; *ss.* Wellington 236 and Bolivar 146.

1771 **II. (£5.)**—JOHN HEUGH, Mudd Fields, Bedale, born Mar. 5, 1893; *s.* Eton 326, *d. by* Royal Windsor 75.

1774 **R. N. & H. C.**—JOHN O. TROTTER, Holtby Grange, Bedale.
1770 **H. C.**—F. E. C. DOBSON, Carlton-in-Cleveland.

Border Leicesters.

Class 166.—*Border Leicester Two-Shear Rams.* [2 entries.]

1775 **I. (£10.)** & 1776 **II. (£5.)**—THE RT. HON. A. J. BALFOUR, M.P., Whittinghame, Prestonkirk, born Mar. 1892.

Class 167.—*Border Leicester Shearling Rams.* [10 entries, none absent.]

1784 **I. (£10.)**—JOHN TWENTYMAN, Wigton, born Mar. 16, 1893.
1777 **II. (£5.)**—THE RT. HON. A. J. BALFOUR, M.P., Whittinghame, Prestonkirk, Haddingtonshire, born Mar. 1893.

1783 **R. N. & H. C.**—JOHN TWENTYMAN, Wigton.
1778 **H. C.**—THE RT. HON. A. J. BALFOUR, M.P.
Com.—DAVID COOPER, for No. 1779; T. WINTER, for No. 1785.

Class 168.—*Pens of Three Border Leicester Shearling Ewes, of the same Flock.* [5 entries, none absent.]

1790 **I. (£10.)**—JOHN TWENTYMAN, Wigton, born Mar. 1893.
1787 **II. (£5.)** & 1788 **R. N. & H. C.**—THE RT. HON. A. J. BALFOUR, M.P., Whittinghame, Prestonkirk, born Mar. 1893.
Com.—D. COOPER, for No. 1789; T. WINTER, for No. 1791.

Somerset and Dorset Horned.

Class 169.—*Somerset and Dorset Horned Shearling Rams.* [7 entries, 2 absent.]

1794 **I. (£10.)**—H. FARTHING, Thurloxton, Taunton, born about Jan. 1, 1893; *s.* Blagroves 331.

1797 **II. (£5.)**—SAMUEL KIDNER, Bickley Farm, Milverton, for **Bickley Cambridge No. 1**, born Dec. 1892; *s.* Preston Boy 396.

1792 **R. N. & H. C.**—W. J. CULVERWELL, Durleigh Farm, Bridgwater.
1793 **Com.**—S. KIDNER, for Bickley Cambridge No. 2.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

Class 170.—*Pens of Three Somerset and Dorset Horned Ram Lambs, dropped after Dec.* 1, 1893. [4 entries, none absent.]

1801 **I.** (£10.) & 1802 **II.** (£5.)—W. C. Groves, Whitcombe Farm, Dorchester, born Dec. 1893; *s.* Whitcombe 12th 350, *d. by* Whitcombe Major 93.

1799 **R. N. & H. C.**—W. J. Culverwell, Durleigh Farm, Bridgwater.
1800 **Com.**—Herbert Farthing, Thurloxton, Taunton.

Class 171.—*Pens of Three Somerset and Dorset Horned Shearling Ewes, of the same Flock.* [6 entries, none absent.]

1804 **I.** (£10.)—Herbert Farthing, Thurloxton, Taunton, born about Jan. 1, 1893.

1803 **II.** (£5.)—W. J. Culverwell, Durleigh Farm, Bridgwater, born Dec. 20, 1892, bred by Culverwell Bros., Durleigh Farm, Bridgwater.

1806 **R. N. & H. C.**—Samuel Kidner, Bickley Farm, Milverton, Som., born Dec. 1892.

1808 **H. C.**—Edward G. Legg. 1805 **Com.**—Wm. C. Groves.

Kentish or Romney Marsh.

Class 172.—*Kentish or Romney Marsh Shearling Rams.* [6 entries, 2 absent.]

1809 **I.** (£10.) & 1810 **II.** (£5.)—G. W. Finn, Westwood Ct., Faversham, born about Mar. 1893.

1813 **R. N. & H. C.** & 1814 **Com.**—Henry Rigden.

Class 173.—*Pens of Three Kentish or Romney Marsh Shearling Ewes, of the same Flock.* [9 entries, 6 absent.]

1816 **I.** (£10.) & 1815 **II.** (£5.)—G. W. Finn, Westwood Ct., Faversham, born about Mar. 12, 1893.

1820 **R. N. & H. C.**—Henry Rigden, Lyminge, Hythe, born Apr. 1893.

Cheviots.

Class 174.—*Cheviot Two-Shear or Shearling Rams.* [6 entries, none absent.]

1829 **I.** (£10.)—John Robson, Newton, Bellingham, born Apr. 1893.
1826 **II.** (£5.)—Jacob Robson, Byrness, Otterburn, for **Hopey**, born Apr 1892; *s.* The Danish King 263.

1824 **R. N. & H. C.**—John T. Dodd, Riccarton, Newcastleton, N.B.
1827 **H. C.**—Jacob Robson, born Apr. 1893.

Class 175.—*Pens of Three Cheviot Shearling Ewes, of the same Flock.* [3 entries, none absent.]

1832 **I.** (£10.)—John Robson, Newton, Bellingham, born Apr. 1893.
1831 **II.** (£5.) & 1830 **R. N. & Com.**—Jacob Robson, Byrness, Otterburn, born Apr. 1893.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

Black-Faced Mountain.

Class 176.—*Black-Faced Mountain Two-Shear or Shearling Rams.* [5 entries, 1 absent.]

1833 I. (£10.)—T. DARGUE, Burneside Hall, Kendal, for **Lingcropper**, born Apr. 15, 1892.

1834 II. (£5.)—WM. GRAHAM, Eden Grove, Kirkbythore, born Mar. 1893.
1836 R. N. & H. C.—R. RAWLINSON, Docker Hall, Kendal, for **Macbeth**.

Class 177.—*Pens of Three Black-Faced Mountain Shearling Ewes, of the same Flock.* [3 entries, none absent.]

1839 I. (£10.)—ROBERT RAWLINSON, Docker Hall, Kendal, for **Queen of Kendal, Katherine Parr, and Northern Queen**, born Apr. 1893; *ss.* Bar None and Cornie, *ds. by* Peter Earnscleugh and Overshiels.

1838 II. (£5.)—WM. GRAHAM, Eden Grove, Kirkbythore, born Mar. 1893.
1840 R. N. & H. C.—JOHN ROBSON, Newton, Bellingham, born Apr. 1893.

Lonks.

Class 178.—*Lonk Two-Shear or Shearling Rams.* [2 entries.]

1841 I. (£10.)—JOHN BLACKBURN, Slack Booth, Trawden, Lancs, for **Young Flock Master**, born Apr. 4, 1892, bred by J. Blackburn, Hollin Hall, Trawden; *s.* Flock Master.

1842 II. (£5.)—JOSIAH PARKER, Back Cawm, Whitworth, Lancs, for **Whitworth Wonder**, born Mar. 18, 1893, bred by J. Blackburn, Hollin Hall, Trawden.

Class 179.—*Pens of Three Lonk Shearling Ewes, of the same Flock.* [3 entries.]

1843 I. (£10.)—JOHN BLACKBURN, Slack Booth, Trawden, Lancs, born Mar. & Apr. 1893, bred by Joseph Blackburn, Hollin Hall, Trawden.

1844 II. (£5.)—BENJAMIN DOBSON, Carr House, Askwith, Otley, born about Mar. 15, 1893.

1845 R. N. & H. C.—JAMES PARKER, Cawm, Whitworth, Lancs, born Mar. 27, 1893.

Herdwicks.

Class 180.—*Herdwick Two-Shear or Shearling Rams.* [6 entries, none absent.]

1848 I. (£10.)—LORD MUNCASTER, Muncaster Castle, Ravenglass, Carnforth, for **Fell Guide**, born Apr. 21, 1893.

1846 II. (£5.)—WILLIAM ABBOTT, Hart Head, Rydal, Ambleside, for **Bouncing Boy**, born Apr. 3, 1893.

1851 R. N. & H. C.—JOHN ROBSON, Brennand, Clitheroe, born Apr. 1893.
Com.—WM. ABBOTT, for No. 1847; TOM NEWBY, for No. 1849.

Class 181.—*Pens of Three Herdwick Shearling Ewes, of the same Flock.* [4 entries, none absent.]

1852 I. (£10.)—WILLIAM ABBOTT, Hart Head, Rydal, Ambleside, born Apr. 1893.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

1853 **II.** (£5.) & 1854 **R. N. & Com.**—LORD MUNCASTER, Muncaster Castle, Carnforth, born Apr. 1893.

Welsh Mountain.

Class 182.—*Welsh Mountain Shearling Rams.* [4 entries, none absent.]

1858 **I.** (£10.)—GODFREY PARRY, Carrog, Corwen, Merioneth, born Mar. 12, 1893.

1859 **II.** (£5.)—COL. HENRY PLATT, Gorddinog, Llanfairfechan, for **Madryn Hero**, born Mar. 1893, bred by John Jones, Llandudno; *s.* Brehnin-y-Defaid.

1857 **R. N. & Com.**—J. MARSHALL DUGDALE, Llwyn, Llanfyllin, for **Pendalog Hero**, born Mar. 19, 1893.

Class 183.—*Pens of Three Welsh Mountain Shearling Ewes, of the same Flock.* [5 entries, none absent.]

1863 **I.** (£10.) & 1864 **II.** (£5.)—COL. HENRY PLATT, Gorddinog, Llanfairfechan, born Mar. 1893, bred by John Jones, Llandudno.

1861 **R. N. & Com.**—GODFREY PARRY, Carrog, Corwen, Merioneth.

PIGS.

[Owing to the prevalence of Swine Fever, the entries of Pigs (Classes 184–207) were cancelled.]

POULTRY.

By "Cock," "Hen," "Drake," "Duck," "Gander," and "Goose" are meant birds hatched previous to January 1st, 1894; and by "Cockerel," "Pullet," "Young Drake," and "Duckling" are meant birds hatched in 1894, previous to June 1st.

FOWLS.

Dorkings.

Class 208.—*Coloured Dorking Cocks.* [13 entries, none absent.]

9 **I.** (30*s.*)—H. PADWICK, Thorney, Emsworth, Hants. 1893.
8 **II.** (15*s.*)—G. E. B. MUZEEN, Douthwaite Lodge, Kirby Moorside.
3 **III.** (10*s.*)—ANDREW CRICHTON, Glamis, N.B. 1893.
6 **R. N. & H. C.**—CAPT. G. S. P. HORNBY, Sandley Ho., Gillingham, Dorset.
H. C.—LEONARD PILKINGTON, for No. 10; LEONARD RAWNSLEY, for No. 11.

Class 209.—*Coloured Dorking Hens.* [18 entries, 2 absent.]

26 **I.** (30*s.*)—LEONARD PILKINGTON, Cavens, Dumfries, N.B. 1893.
24 **II.** (15*s.*)—G. E. B. MUZEEN, Douthwaite Lodge, Kirby Moorside.
25 **III.** (10*s.*)—HERBERT PADWICK, Thorney, Emsworth, Hants. 1892.
19 **R. N. & H. C.**—CAPTAIN G. S. P. HORNBY, Sandley House, Gillingham, Dorset.
H. C.—JAMES CRANSTON, for No. 15; HERBERT REEVES, for No. 28; MRS ROWLAND WOOD, for No. 30.

Class 210.—*Coloured Dorking Cockerels.* [11 entries, 1 absent.]

33 I. (30*s.*)—James Cranston, Nunwood, Dumfries, N.B. Feb. 3.
41 II. (15*s.*)—Leonard Pilkington, Cavens, Dumfries, N.B. Jan. 6.
36 III. (10*s.*)—W. O. Hayward, 30 Hertford Street, Cambridge.
37 R. N. & H. C.—Capt. G. S. P. Hornby, Sandley Ho., Gillingham, Dorset.
35 H. C.—Andrew Crichton, Glamis, N.B. Feb. 7.

Class 211.—*Coloured Dorking Pullets.* [15 entries, none absent.]

52 I. (30*s.*)—Herbert Padwick, Thorney, Emsworth, Hants. Jan. 25.
43 II. (15*s.*)—Henry Britten, Skirwith, Culgaith, Cumberland. Jan.
57 III. (10*s.*)—T. & J. Woodward, Clotton, Tarporley. Jan. 25.
46 R. N. & H. C.—James Cranston, Nunwood, Dumfries, N.B. Jan. 15.
H. C.—Andrew Crichton, for No. 48; E. Wilson Parker, for No. 53.

Class 212.—*Silver Grey Dorking Cocks.* [3 entries, none absent.]

59 I. (30*s.*)—Capt. G. S. P. Hornby, Sandley Ho., Gillingham, Dorset.
58 II. (15*s.*)—James Cranston, Nunwood, Dumfries, N.B. June 1893.
60 R. N. & H. C.—Herbert Reeves, Emsworth, Hants. Mar. 1893.

Class 213.—*Silver Grey Dorking Hens.* [6 entries, none absent.]

62 I. (30*s.*) & 63 II. (15*s.*)—James Clunas, Elgin, N.B. 2 years old.
65 R. N.—Capt. G. S. P. Hornby, Sandley Ho., Gillingham, Dorset.

Class 214.—*White Dorking Cocks.* [3 entries, 1 absent.]

68 I. (30*s.*)—Herbert Reeves, Emsworth, Hants. Mar. 1892.
69 III. (10*s.*)—J. J. G. Woodcock, Briston, Melton Constable.

Class 215.—*White Dorking Hens.* [3 entries, 1 absent.]

72 I. (30*s.*)—J. J. G. Woodcock, Briston, Melton Constable.
71 III. (10*s.*)—Thomas Turner, Halifax Road, Cambridge. 2 years old.

Class 216.—*Silver Grey or White Dorking Cockerels.* [11 entries, 1 absent.]

80 I. (30*s.*)—Capt. G. S. P. Hornby, Sandley House, Gillingham, Dorset. Silver grey.
79 II. (15*s.*)—James Cranston, Nunwood, Dumfries, N.B. Silver grey. Feb. 3.
78 III. (10*s.*)—James Clunas, Elgin, N.B. Silver grey. 4 months old.
73 R. N. & H. C.—Hon. Florence Amherst, Didlington Hall, Brandon. Silver grey.

Class 217.—*Silver Grey or White Dorking Pullets.* [10 entries, none absent.]

85 I. (30*s.*)—Hon. Florence Amherst, Didlington Hall, Brandon. Silver grey.
90 II. (15*s.*)—Captain G. S. P. Hornby, Sandley House, Gillingham, Dorset. Silver grey.
84 III. (10*s.*)—Hon. Florence Amherst. Silver grey.
87 R. N. & H. C.—James Clunas, Elgin, N.B. Silver grey. 4 months old.

Game.

Class 218.—*Old English Game Cocks.* [15 entries, 1 absent.]

102 I. (30*s.*)—William Nixon, Boustead Hill, Burgh-by-Sands.
96 II. (15*s.*)—John Brough, 22 London Road, Carlisle. Apr. 1, 1893.
99 III. (10*s.*)—John P. Law, Eden Mount, Stanwix, Carlisle. Apr. 1891.

94 **R. N. & H. C.**—Charles H. Allan, Skinburness, Silloth, Cumberland. Apr. 1892.
95 **H. C.**—E. Barnes. 100 **Com.**—R. Little.

Class 219.—*Old English Game Hens.* [12 entries, none absent.]

113 **I.** (30*s.*)—John P. Law, Eden Mount, Stanwix, Carlisle. Apr. 1891.
111 **II.** (15*s.*)—John Brough, Carlisle. Mar. 20, 1893.
115 **III.** (10*s.*)—James Nixon, Front St., Brampton, Cumberland.
114 **R. N. & H. C.**—R. Little, Dickstree, Longtown, Carlisle.
H. C.—Wm. Nixon, for No. 116; T. Roper, for No. 119.

Class 220.—*Old English Game Cockerels.* [9 entries, 1 absent.]

127 **I.** (30*s.*)—J. W. Simpson, Sun Inn, Bootle, *viâ* Carnforth. Jan. 3.
128 **II.** (15*s.*)—J. W. Simpson, Bootle. Jan. 7.
122 **III.** (10*s.*)—John Brough, Carlisle. Jan. 26.
124 **R. N. & H. C.**—Little & Barnes, Abbey Town, Silloth, Cumberland, Jan. 2.

Class 221.—*Old English Game Pullets.* [9 entries, 1 absent.]

131 **I.** (30*s.*)—John Brough, 22 London Road, Carlisle. Jan. 26.
133 **II.** (15*s.*)—Little & Barnes, Abbey Town, Silloth, Cumberland. Jan. 2.
136 **III.** (10*s.*)—J. W. Simpson, Sun Inn, Bootle, *viâ* Carnforth. Jan. 3.
134 **R. N. & H. C.**—John T. Organ, Kimsbury Farm, Gloucester. Jan. 20.

Class 222.—*Indian Game Cocks.* [8 entries, none absent.]

143 **I.** (30*s.*)—H. Paynter, Lezant, Callington.
139 **II.** (15*s.*)—Wm. Brent, Clampit Farm, Callington.
142 **III.** (10*s.*)—James Frayne, Pipers Pool, Launceston.
140 **R. N. & H. C.**—John Edwards, Well Street, Callington.
145 **H. C.**—R. Walter, South Street, Ponders End. Mar. 1893.

Class 223.—*Indian Game Hens.* [6 entries, none absent.]

150 **I.** (30*s.*)—H. Paynter, Lezant, Callington.
147 **II.** (15*s.*)—William Brent, Clampit Farm, Callington.
148 **III.** (10*s.*)—William Bygott, Rye Hill House, Ulceby, Lincs. Apr. 1893.
151 **R. N. & H. C.**—R. Walter, South Street, Ponders End. Mar. 1893.
149 **Com.**—James Frayne, Pipers Pool, Launceston.

Class 224.—*Indian Game Cockerels.* [6 entries, none absent.]

158 **I.** (30*s.*)—C. Radford, Barnstaple Street, Winkleigh, Devon.
153 **II.** (15*s.*)—Wm. Brent, Clampit Farm, Callington.
154 **III.** (10*s.*)—T. Brook, Vine Street, Winkleigh, Devon. Jan. 5.
157 **R. N. & H. C.**—James Frayne, Pipers Pool, Launceston. Jan. 6.

Class 225.—*Indian Game Pullets.* [5 entries, 1 absent.]

160 **I.** (30*s.*)—John Edwards, Well Street, Callington. Jan. 6.
159 **II.** (15*s.*)—Wm. Brent, Clampit Farm, Callington.
163 **III.** (10*s.*)—C. Radford, Barnstaple Street, Winkleigh, Devon.
161 **R. N. & H. C.**—John Frayn, St. Stephens, Launceston.

French (Any Variety).

Class 226.—*French Cocks.* [7 entries, none absent.]

167 **I.** (30*s.*)—J. P. W. Marx, Old Basford, Nottingham. (Houdan.) 1892.
165 **II.** (15*s.*)—P. F. Fordham, Bank House, Royston. (Crêve Cœur.) 1892

170 **III.** (**10s.**)—FRANCIS VALPY, St. Heliers, Jersey. (La Flèche.) Apr. 1893.
168 **R. N. & H. C.**—S. W. THOMAS, Glasfryn, Forest Fach, Swansea. (Crêve Cœur.)

Class 227.—*French Hens.* [6 entries, 1 absent.]

174 **I.** (**30s.**)—S. W. THOMAS, Glasfryn, Forest Fach, Swansea. (Crêve Cœur.)
176 **II.** (**15s.**)—FRANCIS VALPY, St. Heliers, Jersey. (La Flèche.) Apr. 1893.
175 **III.** (**10s.**)—S. W. THOMAS, Swansea. (Houdan.)
171 **R. N. & H. C.**—GEORGE F. BODDY, Edenbridge, Kent. (Houdan.)

Class 228.—*French Cockerels.* [5 entries, none absent.]

177 **I.** (**30s.**)—J. HILL, Bridgend Mills, Lostwithiel. (Houdan.)
178 **II.** (**15s.**)—JAMES HOLT, 347 Manchester Road, Clifton, Manchester. (Houdan.) Feb. 12.
180 **R. N. & H. C.**—FRANCIS VALPY, St. Heliers, Jersey. (La Flèche.) Mar. 22.

Class 229.—*French Pullets.* [5 entries, none absent.]

182 **I.** (**30s.**)—J. HILL, Bridgend Mills, Lostwithiel, Cornwall. (Houdan.)
186 **II.** (**15s.**) & 185 **R. N. & H. C.**—FRANCIS VALPY, St. Heliers, Jersey. (La Flèche.) Mar. 22.

Brahmas and Cochins.

Class 230.—*Brahma Cocks.* [7 entries, none absent.]

188 **I.** (**30s.**)—G. W. HENSHALL, Urmston, Manchester. 1893.
192 **II.** (**15s.**) & 193 **III.** (**10s.**)—A. E. WARD, Ivy Lea, Sale, Cheshire. 2 yrs. old
191 **R. N. & H. C.**—S. W. THOMAS, Glasfryn, Forest Fach, Swansea.

Class 231.—*Brahma Hens.* [8 entries, none absent.]

201 **I.** (**30s.**)—JOSEPH WOOD, Withnell Hall, Chorley.
197 **II.** (**15s.**)—MRS. R. HOLLAND, Brahma Lodge, Buckingham. 1893.
196 **III.** (**10s.**)—A. T. GRAIN, Oakfield, Great Shelford, Cambridge. 1892.
199 **R. N. & H. C.**—J. TOMLINSON, Great Eccleston, Garstang.
H. C.—DR. P. L. BENSON, for No. 194; A. E. WARD, for No. 200.

Class 232.—*Cochin Cocks.* [11 entries, 1 absent.]

202 **I.** (**30s.**)—MRS. S. R. HARRIS, Meneage Street, Helston.
212 **II.** (**15s.**)—JOSEPH WOOD, Withnell Hall, Chorley.
206 **III.** (**10s.**)—EDWARD LINNELL, Redstone Wood, Redhill.
207 **R. N. & H. C.**—GEO. H. PROCTER, Flass House, Durham.
H. C.—MRS. R. HOLLAND, for No. 204; I. F. THODAY, for No. 209.

Class 233.—*Cochin Hens.* [10 entries, none absent.]

218 **I.** (**30s.**)—GEO. H. PROCTER, Flass House, Durham.
214 **II.** (**15s.**)—MRS. S. R. HARRIS, Meneage Street, Helston.
216 **III.** (**10s.**)—EDWARD LINNELL, Redstone Wood, Redhill.
213 **R. N. & H. C.**—MRS. S. R. HARRIS, Meneage Street, Helston.
H. C.—MRS. R. HOLLAND, for No. 215; J. PARTINGTON, for No. 217; JOSEPH WOOD, for No. 222.

Class 234.—*Brahma or Cochin Cockerels.* [14 entries, 1 absent.]

224 **I.** (**30s.**)—MARSHALL EWBANK, Cawton, Gilling East, Yorks. (Brahma.) Jan. 3.
230 **II.** (**15s.**) WM. MITCHELL, Park Hill, Idle, Bradford. (Cochin.) Jan. 7.
234 **III.** (**10s.**)—J. A. SLATTER, Hill House, Somerton, Banbury, Oxon. (Cochin.)

226 **R. N. & H. C.**—MRS. R. HOLLAND, Brahma Lodge, Buckingham. (Cochin.) Jan. 3.
H. C.—E. LINNELL, for No. 228; TOM LONGBOTTOM, for No. 229; J. H. NICHOLLS, for No. 232.

Class 235.—*Brahma or Cochin Pullets.* [16 entries, 2 absent.]

239 **I.** (**30***s.*)—MRS. S. R. HARRIS, Meneage Street, Helston. (Cochin.) Feb. 1
237 **II.** (**15***s.*)—MRS. A. CAMPBELL, Rose Villa, Uley, Dursley. (Brahma.) Jan.
242 **III.** (**10***s.*)—EDWARD LINNELL, Redstone Wood, Redhill. (Cochin.) Jan. 1.
238 **R. N. & H. C.**—MARSHALL EWBANK, Cawton, Gilling East. (Brahma.) Jan. 3.
H. C.—MRS. R. HOLLAND, for No. 240; WM. MITCHELL, for No. 241.

Langshans.

Class 236.—*Langshan Cocks.* [12 entries, none absent.]

255 **I.** (**30***s.*)—P. MARSH, 4 Fairfield Place, Bedminster, Bristol. 13 mos.
253 **II.** (**15***s.*)—FRED. HART, St. Andrew's, Leighton Buzzard. Mar. 1893.
261 **III.** (**10***s.*)—J. W. WALKER, Upton Lodge, Henley-on-Thames. 1893.
258 **R. N. & H. C.**—ABEL NEILD, Longfield Lane, Poulton-le-Fylde. 1893.
H. C.—MISS F. LUCAS, for No. 254; W. WILLIAMS, for No. 263; R. WRIGHT WYLES, for No. 264.

Class 237.—*Langshan Hens.* [10 entries, 1 absent.]

267 **I.** (**30***s.*)—MISS FLORENCE LUCAS, Broadlow Ash, Ashbourne. 1893.
270 **II.** (**15***s.*)—ABEL NEILD, Longfield Lane, Poulton-le-Fylde. 1893.
265 **III.** (**10***s.*)—S. BROWN, Hursley Hill, Whitchurch, Bristol.
266 **R. N. & H. C.**—GEORGE FIELDER, 28 Hill Road, Wimbledon.
271 **H. C.**—E. PROCTER, Cantsfield, Kirkby Lonsdale. 1893.

Class 238.—*Langshan Cockerels.* [5 entries, none absent.]

276 **I.** (**30***s.*)—R. MATHEWS, Elm House, Dumfries, N.B. Jan. 1.
277 **II.** (**15***s.*)—E. PROCTER, Cantsfield, Kirkby Lonsdale. Jan.
275 **R. N. & H. C.**—ABBOT BROS., Thuxton, Hingham, Norfolk. Jan.

Class 239.—*Langshan Pullets.* [6 entries, none absent.]

281 **I.** (**30***s.*)—R. MATHEWS, Elm House, Dumfries, N.B. Jan. 1.
282 **II.** (**15***s.*)—E. PROCTER, Cantsfield, Kirkby Lonsdale. Jan.
284 **III.** (**10***s.*)—J. W. WALKER, Upton Lodge, Henley-on-Thames.
280 **R. N. & H. C.**—ABBOT BROS., Thuxton, Hingham, Norfolk. Jan.

Wyandottes.

Class 240.—*Wyandotte Cocks.* [11 entries, none absent.]

296 **I.** (**30***s.*)—W. A. SPENCER, Chelmscote, Shipston-on-Stour.
290 **II.** (**15***s.*)—W. W. & C. D. LOW, Clifton Road, Shefford, Beds. 1893.
287 **III.** (**10***s.*) & 286 **R. N. & H. C.**—ABBOT BROS., Thuxton, Hingham, Norfolk. 1893.
288 **H. C.**—MISS S. GRAHAM. 294 **Com.**—W. H. READWIN.

Class 241.—*Wyandotte Hens.* [10 entries, 1 absent.]

298 **I.** (**30***s.*)—ABBOT BROS., Thuxton, Hingham. 1893.
301 **II.** (**15***s.*)—W. EVERINGTON, Weasenham, Swaffham. 1893.
297 **III.** (**10***s.*)—ABBOT BROS., Thuxton, Hingham, 1893.
305 **R. N.**—W. H. READWIN, Guiltcross, Foxley, East Dereham. 1893.

Class 242.—*Wyandotte Cockerels.* [13 entries, none absent.]

317 **I.** (30*s.*)—R. Solly, Penwith, Hills Road, Cambridge. Jan.
309 **II.** (15*s.*)—P. A. Farrer, Eccles, Attleborough. Feb.
319 **III.** (10*s.*)—A. & W. Wood, Brinscall Hall, Chorley, Lancs. Jan. 28.
318 **R. N. & H. C.**—W. A. Spencer, Chelmscote, Shipston-on-Stour. Jan. 30.
H. C.—Mrs. Franklin, for No. 311; G. A. Mace, for No. 314.
312 **Com.**—Mrs. E. Grimwade.

Class 243.—*Wyandotte Pullets.* [22 entries, 1 absent.]

341 **I.** (30*s.*)—A. & W. Wood, Brinscall Hall, Chorley. Feb. 6.
326 **II.** (15*s.*)—P. A. Farrer, Eccles, Attleborough. Feb.
324 **III.** (10*s.*)—W. Everington, Weasenham, Swaffham. Feb. 21.
321 **R. N. & H. C.**—George Aldridge, 1 Queen Street, Walsall. Feb. 14.
H. C.—Mrs. Franklin, Syston Old Hall, Grantham, for Nos. 327 & 328.
Com.—F. W. Gentle, for No. 329; G. A. Mace, for No. 333.

Plymouth Rocks.

Class 244.—*Plymouth Rock Cocks.* [15 entries, 2 absent.]

353 **I.** (30*s.*) & 354 **II.** (15*s.*)—A. Vizetelly, Heatherlands, Farnham.
356 **III.** (10*s.*)—R. Walter, Ponders End. April 1893.
348 **R. N. & H. C.**—Luke Hitchin, 14 Graham Road, Lower Edmonton. April. 1892.
H. C.—Leonard Pilkington, for No. 350; R. Walter, for No. 355.
Com.—Dr. Hampton Brewer, for No. 342.

Class 245.—*Plymouth Rock Hens.* [11 entries, none absent.]

367 **I.** (30*s.*)—R. Walter, South Street, Ponders End. Mar. 1892.
364 **II.** (15*s.*)—W. Slater, Bigland House, Silverdale, Carnforth. April 20, 1893.
363 **III.** (10*s.*)—Leonard Pilkington, Cavens, Dumfries, N.B.
361 **R. N. & H. C.**—W. Everington, Weasenham, Swaffham.
360 **H. C.**—A. & S. Donkin. 358 **Com.**—The Countess of Aberdeen.

Class 246.—*Plymouth Rock Cockerels.* [12 entries, 3 absent.]

378 **I.** (30*s.*)—W. Slater, Bigland House, Silverdale, Carnforth. Jan. 12.
375 **II.** (15*s.*)—P. A. Farrer, Eccles, Attleborough. Feb.
373 **III.** (10*s.*)—A. & S. Donkin, Four Oaks, Sutton Coldfield. Jan. 8.
368 **R. N. & H. C.**—Abbot Bros.
369 **H. C.**—J. W. Adlington. 376 **Com.**—R. Garlick.

Class 247.—*Plymouth Rock Pullets.* [9 entries, none absent.]

381 **I.** (30*s.*)—J. W. Adlington, Kirk Langley, Derby. Jan. 28.
385 **II.** (15*s.*)—Benjamin Hydes, Egginton, Burton-on-Trent. Jan. 11.
387 **III.** (10*s.*)—Edward Skurr, Railway Station, Kirkby Lonsdale. Jan. 4.
382 **R. N.**—A. & S. Donkin, Four Oaks, Sutton Coalfield, Warwick. Jan. 8.

Minorcas.

Class 248.—*Minorca Cocks.* [7 entries, none absent.]

392 **I.** (30*s.*) & 391 **II.** (15*s.*)—A. G. Pitts, The Firs, Highbridge, Som. Apr. 1893.
394 **III.** (10*s.*)—W. P. Ryland, Anstey House, Erdington, Birmingham. 1893.
395 **R. N. & H. C.**—William Snell. 390 **H. C.**—S. Brown.

Class 249.—*Minorca Hens.* [11 entries, none absent.]

400 **I.** (**30***s.*)—A. G. PITTS, The Firs, Highbridge, Som. Apr. 1891.
399 **II.** (**15***s.*)—FURSLAND BROS., Connaught Villa, Bridgwater.
397 **III.** (**10***s.*)—WM. CHAMBERS, 27 Armitage Road, Rugeley. 1893.
403 **R. N. & H. C.**—WALTER P. RYLAND, Anstey House, Erdington, Birmingham. 1893.
405 **H. C.**—W. WILSON, Kimberley, Notts. May 10, 1893.

Class 250.—*Minorca Cockerels.* [6 entries, none absent.]

407 **I.** (**30***s.*)—ABBOT BROS., Thuxton, Hingham, Norfolk.
412 **II.** (**15***s.*)—WILLIAM SNELL, 129 High Street, Crediton, Devon. Jan. 4.
409 **III.** (**10***s.*) L. & T. FAWKES, Hammond's Farm, Stroud. Jan. 15.
410 **R. N. & H. C.**—GEORGE MASTER, Morley Hall, Wymondham. Jan. 2.
408 **H. C.**—J. W. CROSSMAN, Galphay, Ripon. Jan.

Class 251.—*Minorca Pullets.* [8 entries, none absent.]

413 **I.** (**30***s.*)—ABBOT BROS., Thuxton, Hingham, Norfolk.
416 **II.** (**15***s.*)—L. & T. FAWKES, Hammond's Farm, Stroud. Jan. 15.
414 **III.** (**10***s.*)—J. W. CROSSMAN, Galphay, Ripon. Jan.
419 **R. N.**—SUDDICK MIDGLEY, 15 Queen Street, Windhill, Shipley. Jan. 10.

Leghorns.

Class 252.—*Leghorn Cocks.* [10 entries, none absent.]

429 **I.** (**30***s.*)—WADE BROS., Silsden, *viâ* Keighley, Yorks.
428 **II.** (**15***s.*)—L. C. VERREY, Oak Lawn, Leatherhead.
424 **III.** (**10***s.*)—MRS. LISTER-KAY, Burley Manor, Ringwood, Hants. 1893.
426 **R. N. & H. C.**—H. & A. P. SIMPSON, 266 Nottingham Road, Ilkeston, Derby. 1893.
H. C.—COOK & FLETCHER, for No. 421; CHARLES HEATH, for No. 422.
Com.—MRS. LISTER-KAY, for No. 425.

Class 253.—*Leghorn Hens.* [10 entries, 1 absent.]

437 **I.** (**30***s.*)—MRS. LISTER-KAY, Burley Manor, Ringwood, Hants. 1893.
440 **II.** (**15***s.*)—WADE BROS., Silsden, *viâ* Keighley, Yorks.
431 **III.** (**10***s.*)—COOK & FLETCHER, Market Street, Chapel-en-le-Frith. 1893.
438 **R. N. & H. C.**—MRS. LISTER-KAY.
H. C.—JAMES ENGLAND, for No. 432; C. W. KELLOCK, JUN., for No. 436; L. C. VERREY, for No. 439.

Class 254.—*Leghorn Cockerels.* [13 entries, none absent.]

451 **I.** (**30***s.*)—MRS. SINKINS, Aldermoor House, Southampton. Jan.
453 **II.** (**15***s.*)—WADE BROS., Silsden, *viâ* Keighley, Yorks. Jan. 14.
446 **III.** (**10***s.*) & 447 **R. N. & H. C.**—MRS. LISTER-KAY, Burley Manor, Ringwood, Hants. Jan.
450 **H. C.**—JOHN SHEPPARD, Soundwell, Bristol. Jan. 19.

Class 255.—*Leghorn Pullets.* [13 entries, none absent.]

464 **I.** (**30***s.*)—R. SOLLY, Penwith, Hills Road, Cambridge. Jan.
466 **II.** (**15***s.*)—WADE BROS., Silsden, *viâ* Keighley, Yorks. Jan. 14.
463 **III.** (**10***s.*)—MRS. SINKINS, Aldermoor House, Southampton. Jan.
461 **R. N. & H. C.**—MRS. LISTER-KAY, Burley Manor, Ringwood, Hants.
H. C.—COOK & FLETCHER, for No. 454; W. HINSON, for No. 459; MRS. LISTER-KAY, for No. 462.

Andalusians.

Class 256.—*Andalusian Cocks.* [7 entries, 1 absent.]

471 **I.** (**30***s*.)—Robert Keen, Rothbury, Northumberland. Apr. 14, 1892.
472 **II.** (**15***s*.)—I. W. Morriss, Chiefs Street, Ely, Cambs. June 12, 1893.
473 **III.** (**10***s*.)—Rev. J. H. B. Wollocombe, Lamerton Vicarage, Tavistock. May 1893.
467 **R. N. & H. C.**—Rev. E. R. O. Bridgeman.
470 **H. C.**—W. W. Greenwood.

Class 257.—*Andalusian Hens.* [10 entries, 1 absent.]

480 **I.** (**30***s*.)—Joseph McMillan, Hamp, Bridgwater. Apr. 1892.
482 **II.** (**15***s*.)—T. Saunders, Durrington Manor, Worthing. 2 yrs. old.
475 **III.** (**10***s*.)—Abbot Bros., Thuxton, Hingham, Norfolk. 1893.
476 **R. N. & H. C.**—Rev. E. R. O. Bridgeman, Blymhill Rectory, Shifnal.
H. C.—Abbot Bros., for No. 474; I. W. Morriss, for No. 481; Rev. J. H. B. Wollocombe, for No. 483.

Hamburghs.

Class 258.—*Hamburgh Cocks, any variety.* [5 entries, none absent.]

487 **I.** (**30***s*.)—H. Pickles, Kayfield House, Earby, Leeds. (Silver Spangled.) May 6, 1893.
486 **II.** (**15***s*.)—J. & A. Lincoln, Hertford Street, Cambridge. (Black.) 1 yr. 2 wks. old.
484 **III.** (**10***s*.)—Rev. S. Ashwell, Finmere Rectory, Buckingham. (Silver Spangled.) Mar. 1893.
485 **R. N. & H. C.**—Charles Holt. 488 **H. C.**—J. W. E. Smith.

Class 259.—*Hamburgh Hens, any variety.* [4 entries, none absent.]

491 **I.** (**30***s*.)—H. Pickles, Earby, Leeds. (Black.) May 6, 1893.
489 **II.** (**15***s*.)—Walter Glossop, Ambergate, near Derby. (Gold Pencilled.) 1893.
490 **III.** (**10***s*.)—Charles Holt, Kettering, Northamptonshire.
492 **R. N. & H. C.**—J. W. E. Smith, Marsh Lane, Bootle, Liverpool.

Any Other Recognized Breed.

(*Bantams excepted.*)

Class 260.—*Cocks.* [17 entries, 3 absent.]

504 **I.** (**30***s*.)—H. R. Plattin, Fakenham, Norfolk. (Black-red Game.)
505 **II.** (**15***s*.)—John Powell, Myrtle Royd, Bingley. (Spanish.) Mar. 1893.
498 **III.** (**10***s*.)—S. H. Hyde, Kempton Park, Sunbury-on-Thames. (Spanish.) 1893.
508 **R. N. & H. C.**—Thomas Turner, Halifax Road, Cambridge. (Polish.) 2 yrs. old.
H. C.—W. W. & C. D. Low, for No. 501; J. Partington, for No. 502; Mrs. Ricketts, for No. 506; Lady Dora Yeoman, for No. 509.

Class 261.—*Hens.* [13 entries, none absent.]

516 **I.** (**30***s*.)—S. H. Hyde, Kempton Park, Sunbury-on-Thames. (Spanish.) 1893.
519 **II.** (**15***s*.)—John Powell, Myrtle Royd, Bingley. (Spanish.) Mar. 1893.
513 **III.** (**10***s*.)—Hon. Mrs. E. A. Fitzroy, Fox Hill, West Haddon, Rugby. (Scotch Grey.) 1893.
511 **R. N. & H. C.**—Wm. R. Bull, Ouse Bank, Newport Pagnell. (Spanish.) Mar. 25, 1893.

H. C.—Hon. Mrs. E. A. Fitzroy, for No. 512; Mrs. Franklin, for No. 514; J. Partington, for No. 518; J. C. Shanks, for No. 520; T. Turner, for No. 521.

Class 262.—*Cockerels.* [7 entries, none absent.]

526 **I.** (**30***s.*)—S. H. Hyde, Kempton Park, Sunbury-on-Thames. (Spanish.) Jan.
528 **II.** (**15***s.*)—H. M. Pollett, Fernside, Bickley, Kent. (Orpington.) Jan.
524 **III.** (**10***s.*)—J. W. Brown, Brookland Terrace, Oakham. (Brown-red Game.) Jan. 21.
525 **R. N. & H. C.**—T. Hammett, Swimbridge, Newland, Barnstaple. (Malay.) Feb. 1.
H. C.—Arbot Bros., for No. 523; J. W. Simpson, for No. 529.

Class 263.—*Pullets.* [9 entries, none absent.]

534 **I.** (**30***s.*)—S. H. Hyde, Kempton Park, Sunbury-on-Thames. (Spanish.) Jan.
531 **II.** (**15***s.*)—J. W. Brown, Brookland Terrace, Oakham. (Brown-red Game.) Jan. 21.
537 **III.** (**10***s.*)—H. M. Pollett, Fernside, Bickley, Kent. (Orpington.) Jan.
538 **R. N. & H. C.**—T. Saunders, Durrington Manor, Worthing. (Andalusian.) Jan. 25.
H. C.—T. Hammett, for No. 533; M. Jackson, for Nos. 535 & 536.

DUCKS.

Aylesbury.

Class 264.—*Aylesbury Drakes.* [2 entries.]

539 **I.** (**30***s.*)—S. Brown, Hursly Hill, Whitchurch, Bristol.
540 **II.** (**15***s.*)—Leonard Rawnsley, King's Head Hotel, Bingley, Yorks. 3 yrs. old.

Class 265.—*Aylesbury Ducks.* [4 entries, none absent.]

541 **I.** (**30***s.*)—S. Brown, Hursly Hill, Whitchurch, Bristol.
544 **II.** (**15***s.*)—William Weston, 31 Mount Street, Aylesbury.
543 **III.** (**10***s.*)—Leonard Rawnsley, King's Head Hotel, Bingley, Yorks. 5 yrs. old.

Class 266.—*Aylesbury Young Drakes.* [8 entries, none absent.]

546 **I.** (**30***s.*)—S. Brown, Hursly Hill, Whitchurch, Bristol. April 7.
550 **II.** (**15***s.*) & 549 **III.** (**10***s.*)—J. D. Goy, Swallowbeck, Lincoln. Mar.
548 **R. N. & H. C.**—David Garton, Layland House, Golborne, Lancs.

Class 267.—*Aylesbury Ducklings.* [8 entries, 1 absent.]

556 **I.** (**30***s.*)—David Garton, Layland House, Golborne, Lancs.
558 **II.** (**15***s.*)—J. D. Goy, Swallowbeck, Lincoln. Mar.
554 **III.** (**10***s.*)—Edward Barnes, Fern Bank, Godalming. Mar. 8.
555 **R. N.**—S. Brown, Hursly Hill, Whitchurch, Bristol.

Rouen.

Class 268.—*Rouen Drakes.* [8 entries, none absent.]

567 **I.** (**30***s.*)—J. Partington, Malkins Wood, Boothstown, Manchester. 1 yr. old.

563 **II.** (15*s.*)—Wm. Bygott, Rye Hill House, Ulceby, Lincs. 1893.
562 **III.** (10*s.*)—Daniel Bragg, Southwaite Hall, Carlisle. 1893.
566 **R. N.**—J. Partington, Malkins Wood, Boothstown, Manchester. 1 yr.

Class 269.—*Rouen Ducks.* [9 entries, none absent.]

576 **I.** (30*s.*) & 575 **II.** (15*s.*)—J. Partington, Malkins Wood, Boothstown, Manchester. 1 yr. old.
571 **III.** (10*s.*)—William Bygott, Rye Hill House, Ulceby, Lincs. 1892.
570 **R. N.**—Daniel Bragg, Southwaite Hall, Carlisle. 1892.

Any Other Useful Breed.

Class 270.—*Drakes.* [10 entries, none absent.]

583 **I.** (30*s.*)—P. F. Fordham, Bank House, Royston. (Pekin.) 1893.
578 **II.** (15*s.*)—Thomas Allen, Crookwood Farm, Devizes. (Pekin.) 1893.
587 **III.** (10*s.*)—Lady Wilson, Chillingham Barns, Belford. (Cayuga.) 1892.
582 **R. N. & H. C.**—S. Brown. (Pekin.) 580 **H. C.**—Hon. Sybil Amherst. (Cayuga.)

Class 271.—*Ducks.* [7 entries, none absent.]

591 **I.** (30*s.*)—S. Brown, Hursly Hill, Whitchurch, Bristol. (Pekin.)
592 **II.** (15*s.*)—P. F. Fordham, Bank House, Royston. (Pekin.) 1893.
590 **III.** (10*s.*)—S. Brown. (Pekin.)
589 **R. N. & H. C.**—Hon. Sybil Amherst. (Cayuga.)
594 **H. C.**—Lady Wilson. (Cayuga.)

Class 272.—*Young Drakes.* [4 entries, none absent.]

595 **I.** (30*s.*)—Hon. Sybil Amherst, Didlington Hall, Brandon. (Pekin.)
596 **II.** (15*s.*)—Hon. Sybil Amherst. (Cayuga.)
597 **III.** (10*s.*)—William Bygott, Rye Hill House, Ulceby, Lincs. (Rouen.) Feb. 10.
598 **R. N. & H. C.**—Manor Poultry Farm, Highgate, London, N. (Pekin.) About Apr. 2.

Class 273.—*Ducklings.* [5 entries, 1 absent.]

599 **I.** (30*s.*)—Hon. Sybil Amherst, Didlington Hall, Brandon, Norfolk. (Pekin.)
601 **II.** (15*s.*)—William Bygott, Rye Hill House, Ulceby, Lincs. (Rouen.) Feb. 10.
600 **III.** (10*s.*)—Hon. Sybil Amherst, Didlington. (Cayuga.)
602 **R. N. & H. C.**—Thomas F. Horsley, South Grove, Highgate, N. (Pekin.) Apr. 3.

Geese.

Class 274.—*Ganders.* [10 entries, none absent.]

605 **I.** (£2.)—Hon. Sybil Amherst, Didlington Hall, Brandon, Norfolk. (Embden.)
608 **II.** (£1.)—Wm. E. Dainton, Rudge Farm, Frome, Som. (Toulouse.) 1892.
606 **III.** (10*s.*)—Hon. Sybil Amherst. (Embden.) 1893.
612 **R. N. & H. C.**—John Kerr, Red Hall, Wigton. (Toulouse.)
H. C.—Abbot Bros., for No. 604; P. T. Gardner, for No. 610.

Class 275.—*Geese.* [8 entries, none absent.]

620 **I.** (£2.)—John Kerr, Red Hall, Wigton. (Toulouse.)
618 **II.** (£1.)—Wm. E. Dainton, Rudge Farm, Frome. (Toulouse.) 1892.

616 **III.** (10*s.*) & 615 **R. N. & H. C.**—HON. SYBIL AMHERST, Didlington, Brandon, Norfolk. (Embden.) 1893.
621 **H. C.**—EDWARD SHAW, Plâs Wilmot, Oswestry. (Toulouse.)

Turkeys.

Class 276.—*Turkey Cocks.* [19 entries, 3 absent.]

634 **I.** (£2.)—EDWARD KENDRICK, Weeford House, Lichfield. (Bronze.)
639 **II.** (£1.)—LADY WILSON, Chillingham Barns, Belford. (American Bronze.) 1892.
635 **III.** (10*s.*)—J. W. LILL, Martin Dales, Lincoln. (American Bronze.) June 1892.
626 **R. N. & H. C.**—D. T. ARMES, E. Tuddenham, E. Dereham. (American Mammoth Bronze.)
H. C.—T. SAUNDERS, for No. 636; R. SOLLY, for No. 638.

Class 277.—*Turkey Hens.* [9 entries, 1 absent.]

642 **I.** (£2.) & 641 **II.** (£1.)—ABBOT BROS., Thuxton, Hingham. (American Bronze.) 1893.
648 **III.** (10*s.*)—EDWARD KENDRICK, Weeford House, Lichfield. (Bronze.) Over 1 year.
649 **R. N. & H. C.**—LADY WILSON, Chillingham Barns, Belford. (American Bronze.) 1892.
H. C.—HON. SYBIL AMHERST, for No. 643; D. T. ARMES, for No. 645.

Table Poultry.

Class 278.—*Pair of Cockerels of* 1894, *of any Pure Breed.* [7 entries, 1 absent.]

652 **I.** (30*s.*)—WM. BRENT, Clampit Farm, Callington. (Indian Game.)
655 **II.** (15*s.*)—R. SOLLY, Penwith, Hills Road, Cambridge. (Wyandotte.) Jan.
653 **III.** (10*s.*)—MISS M. DOLBEN, Ipsley Rectory, Redditch. (Old English Game.) Jan. 8.
656 **R. N. & H. C.**—MRS. STANYFORTH, Kirk Hammerton Hall, York. (Silver Grey Dorking.) Jan.

Class 279.—*Pair of Pullets of* 1894, *of any Pure Breed.* [10 entries, 3 absent.]

661 **I.** (30*s.*)—JOHN EDWARDS, Well Street, Callington. (Indian Game.) Jan. 6.
660 **II.** (15*s.*)—HENRY BRITTEN, Skirwith, Culgaith, Cumberland. (Coloured Dorking.) Jan.
664 **III.** (10*s.*)—WM. HAMBLY, Cutlinwith, St. Germans. (Dark Dorking.) Feb. 7.
665 **R. N. & H. C.**—R. SOLLY. (Wyandotte.)
659 **H. C.**—WM. BRENT. (Indian Game.)

Class 280.—*Pair of Cockerels of* 1894, *of a First Cross from any Pure Breeds.* [14 entries, 1 absent.]

679 **I.** (30*s.*)—LADY WILSON, Chillingham Barns, Belford. (Indian Game & Dorking.) Jan. 17.
670 **II.** (15*s.*)—RALPH ARTHUR, Torbryan Rectory, Newton Abbot. (Indian Game & Langshan.) Feb. 24.
674 **III.** (10*s.*)—MISS M. DOLBEN, Ipsley Rectory, Redditch. (Indian Game & Plymouth Rock.) Jan. 8.
680 **R. N. & H. C.**—LADY WILSON. (Indian Game & Dorking.)
H. C.—J. W. ADLINGTON, for No. 667; REV. J. A. G. BIRCH, for No. 672.

Class 281.—*Pair of Pullets of* 1894, *of a First Cross from any Pure Breeds.* [9 entries, 2 absent.]

689 **I.** (**30***s.*)—Lady Wilson, Chillingham Barns, Belford. (Indian Game & Dorking.) Feb. 21.
685 **II.** (**15***s.*)—Mrs. E. Rose Blackwell, Cowden Hall, Heathfield, Sussex. (Indian Game & Dorking.) Jan.
682 **III.** (**10***s.*) & 683 **R. N. & H. C.**—Hon. Florence Amherst, Didlington Hall, Brandon, Norfolk. (Indian Game & Dorking.)

Table Ducklings.

Class 282.—*Pair of Ducklings of* 1894, *of any Pure Breed.* [10 entries, none absent.]

699 **I.** (**30***s.*)—H. G. Weston, Mount Street, Aylesbury. (Aylesbury.)
696 **II.** (**15***s.*)—Harry Rodwell, 22 California, Aylesbury. (Aylesbury.) Apr. 30.
693 **III.** (**10***s.*)—J. L. Luddington, Audley House, Littleport, Cambs. (Pekin.) Mar. 14.
690 **R. N. & H. C.**—Hon. Sybil Amherst, Didlington Hall, Brandon, Norfolk. (Cayuga.)
H. C.—Hon. Sybil Amherst, for No. 691. (Pekin.) Mrs. W. H. Mitchell, for No. 694. (Aylesbury.)

Class 283.—*Pair of Ducklings of* 1894, *of a First Cross from any Pure Breeds.* [6 entries, 2 absent.]

705 **I.** (**30***s.*)—H. G. Weston, Mount Street, Aylesbury. (Aylesbury & Pekin.)
702 **II.** (**15***s.*)—H. T. Goodenough, 1 Belgrave Villas, Slough. (Aylesbury & Pekin.) Apr. 18.
703 **III.** (**10***s.*)—Harry Rodwell, 22 California, Aylesbury. (Aylesbury & Pekin.) Apr. 30.
704 **R. N. & H. C.**—Mrs. Stanyforth, Kirk Hammerton Hall, York. (Aylesbury & Pekin.) Mar.

FARM AND DAIRY PRODUCE OF THE UNITED KINGDOM.

Butter.

Class 284.—*One Keg or other Package of Butter, not less than* 14*lb. and under* 40*lb. in weight, delivered to the Society on February* 1, 1894. [21 entries, 1 absent.]

[No Award.]

Class 285.—*Two pounds Fresh Butter, slightly Salted.* [72 entries, none absent.]

26 (**£5.**)—S. F. Berry, Old Wellbury, Hitchin.
67 (**£5.**)—Mrs. C. McIntosh, Havering Park, Romford,
85 (**£5.**)—Charles C. Tudway, Walcombe Dairy, Wells, Somerset.
92 (**£5.**)—William Wood, The Knoll, Hurstpierpoint.
32 (**£3.**)—Lord Braybrooke, Audley End, Saffron Walden.
46 (**£3.**)—Mrs. Arthur Deane, Minster House, Winchester.
59 (**£3.**)—Hon. A. H. Holland-Hibbert, Munden, Watford.
91 (**£3.**)—Miss Wood, Singleton Vicarage, Poulton-le-Fylde.
23 (**£1.**)—Salisbury Baxendale, Bonningtons, Ware.

42 (£1.)—MRS. MARY CUSTANCE, Woodlands, Southwater, Horsham.
49 (£1.)—F. J. DOUGLAS, Catherington, Horndean, Hants.
51 (£1.)—MRS. ELIZABETH FRANCE, Spurstow, Tarporley.
70 **R. N. & H. C.**—LORD MORETON, Sarsden House, Chipping Norton.
H. C.—CATHEDRAL DAIRY CO., for No. 36; MRS. E. CHILDS, for No. 38; MRS. C. DAVIES, for No. 44; T. & H. GEORGE, for No. 52; R. W. HANBURY, M.P., for No. 55; J. HANSON, for No. 56; C. W. H. COZENS-HARDY, for No. 57; MISS M. JEFFERSON, for No. 61; J. LANCASTER, for No. 63; REV. O. THOMPSON, for No. 81; W. G. M. TOWNLEY, for No. 82.
Com.—W. BODY, for No. 30; T. GOOCH, for No. 53; DR. H. WATNEY, for No. 87.

Class 286.—*Two pounds Fresh Butter, slightly Salted, made from Milk drawn from Cows other than Channel Islands, or Cows crossed with the Channel Islands Breeds.* [69 entries, 4 absent.]

99 (£5.)—S. F. BERRY, Old Wellbury, Hitchin.
125 (£5.)—HON. A. H. HOLLAND-HIBBERT, Munden, Watford.
145 (£5.)—HENRY SHEPHERD, Hailstone Farm, Wrington, Somerset.
154 (£5.)—ARTHUR M. TREE, Ashorne Hill, Leamington.
97 (£3.)—GEO. BAYNES, Broxted Hall, Dunmow.
130 (£3.)—DAVID LONGWILL, Kendieshill, Linlithgow, N.B.
136 (£3.)—MRS. T. H. MILLER, Singleton Park, Poulton-le-Fylde,
143 (£3.)—EARL OF ROSEBERY, K.G., Mentmore, Leighton Buzzard.
119 (£1.)—R. W. HANBURY, M.P., Ilam Hall, Ashbourne.
120 (£1.)—JOSEPH HANSON, Botham Hall Farm, Huddersfield.
127 (£1.)—JOHN ROBERTS JONES, Bodfeirig, Ty Croes, Anglesea.
133 (£1.)—JOHN MARTIN, Papworth Everard, St. Ives, Hunts.
153 **R. N. & H. C.**—HENRY TOWNSHEND, Caldecote Hall, Nuneaton.
H. C.—S. BAXENDALE, for No. 96; MRS. E. BEECHENER, for No. 98; MISS E. GRIFFITHS, for No. 118; MISS A. HEDLEY, for No. 123; G. WALLACE, for No. 158.
Com.—THE COUNTESS OF CRAWFORD, for No. 107; T. & H. GEORGE, for. No. 116; MISS E. GLENN, for No. 117; C. W. H. COZENS-HARDY, for No. 121; MRS. JONES, for No. 126; H. LLOYD, for No. 129; J. W. LORD, for No. 131; MRS. JOHN MASTIN, for No. 135; LORD MORETON, for No. 137; A. W. OUTRAM, for No. 140; W. WHITLOCK, for No. 159.

Cheese.

Class 287.—*Three Cheddar Cheeses, of not less than 50lb. each, made in* 1894. [16 entries, none absent.]

163 **I.** (£10.)—H. G. ASHMAN, Beacon Farm, Shepton Mallet.
175 **II.** (£5.)—NATHANIEL J. SIMS, Manor Dairy, Mere, Wilts.
170 **III.** (£3.)—JOHN HILLARD, Church Farm, Wincanton, Som.
167 **R. N. & H. C.**—H. KER COLVILLE, Bellaport Hall, Market Drayton.
Com.—T. C. CANDY, for No. 165; H. RABBETTS, for No. 173.

Class 288.—*Three Cheshire Cheeses, of not less than 40lb. each, made in* 1894. [10 entries, none absent.]

188 **I.** (£10.)—RICHARD MULLOCK, Guy Lane Farm, Waverton, Chester.
182 **II.** (£5.)—THOMAS DUTTON, Ash House, Brindley, Nantwich.
186 **III.** (£3.)—GEORGE MOSFORD, Tattenhall, Cheshire.
181 **R. N. & H. C.**—BENJAMIN DUTTON. 183 **H. C.**—WM. DUTTON.

Class 289.—*Three Stilton Cheeses, made in* 1894.
[11 entries, none absent.]

199 I. (£5.)—J. H. WALE, Burton Bandalls, Loughborough.
193 II. (£3.)—A. W. HURST, Hungarton, Leicester.
198 III. (£2.)—JOHN SMITH, Gaddesby, Leicester.
195 R. N. & H. C.—HENRY MORRIS, Saxelby, Melton Mowbray.
H. C.—ALBERT HULL, for No. 192; E. T. MOORE, for No. 194; JOHN PRESTON, for No. 196.
Com.—MRS. C. FAIRBROTHER, for No. 191.

Class 290.—*Three Cheeses of any other British make, made in* 1894.
[14 entries, none absent.]

212 I. (£5.)—C. W. PROUT, Elm Court Farm, Coaley, Dursley. (Single Gloucester.)
213 II. (£3.)—MRS. W. T. S. TILLEY, North Wootton, Shepton Mallet. (Sage Truckles.)
209 III. (£2.)—JOHN HILLARD, Wincanton, Som. (Small Cheddar.)
202 R. N. & H. C.—T. C. CANDY, Woolcombe Farm, Cattistock, Dorset. (Somerset.)
Com.—W. GILMAN, for No. 206 (Derby); S. J. MARTIN, for No. 211. (Cheddar Loaf.)

Class 291.—*Three Double Cottenham Cheeses.*[1] [1 entry.]
[No Award.]

Class 292.—*Three Cream Cheeses (Victoria), under 2lb. weight each.*[1]
[14 entries, none absent.]

220 I. (£3.)—HENRY GOODALL, Overseal, Ashby-de-la-Zouch.
218 II. (£2.)—ELIAS FLANDERS, 84 Regent Street, Derby.
216 III. (£1.)—MRS. CATHERINE DAVIES, Pontfaen Farm, Rhuddlan, Flint.
225 R. N. & H. C.—ALFRED ROWNTREE. 228 Com.—C. C. TUDWAY.

Class 293.—*Three Curd and Cream Cheeses (Double York), under 2lb. weight each.*[1] [2 entries.]

230 I. (£3.)—C. C. TUDWAY, Walcombe Dairy, Wells, Som.
229 II. (£2.)—ARTHUR HEPHER, Haddenham, Cambs.

Class 294.—*Three Curd Cheeses (Single York), under 2lb. weight each.*[1]
[4 entries, none absent.]

234 I. (£3.)—C. C. TUDWAY, Walcombe Dairy, Wells, Som.
232 II. (£2.)—ARTHUR HEPHER, Haddenham, Cambs.
233 III. (£1.)—NOBLE ROBINSON, Lordship Terrace, Willingham, Cambs.

CIDER AND PERRY.

Class 295.—*Cask of not less than* 18, *and not more than* 30, *gallons of Cider, made in the Autumn of* 1893. [19 entries, 1 absent.]

240 I. (£5.)—WILLIAM EVANS & Co., Widemarsh, Hereford.
246 II. (£3.)—JOSEPH M. PARRY, Lawton Hall, Leominster.
252 III. (£2.)—JOHN WATKINS, Pomona Farm, Withington, Hereford.
248 R. N.—R. ROUT & SON, Banham, Attleborough.

[1] Prizes offered by the Cambridge Local Committee.

Class 296.—*One Dozen Bottles of Cider, made in the Autumn of* 1893. [30 entries, none absent.]

281 **I.** (£5.)—E. VINCENT V. WHEELER, Newnham Court, Tenbury.
266 **II.** (£3.)—R. NEVILLE GRENVILLE, Butleigh Court, Glastonbury.
274 **III.** (£2.)—R. ROUT & SON, Banham, Attleborough.
280 **R. N. & H. C.**—JAMES WATTS. 257 **Com.**—BOSLEY & CO.

Class 297.—*One Dozen Bottles of Cider, made in any year before* 1893. [12 entries, none absent.]

287 **I.** (£5) & 286 **III.** (£2.)—H. P. BULMER & CO., Ryelands, Hereford.
292 **II.** (£3.)—R. ROUT & SON, Banham, Attleborough.
293 **R. N.**—HENRY THOMSON, Southends, Newent.

Class 298.—*One Dozen Bottles of Perry.* [13 entries, none absent.]

304 **I.** (£5.)—HENRY THOMSON, Southends, Newent.
305 **II.** (£3.)—THOMAS TUDGE, Lyde Court, Hereford.
308 **III.** (£2.)—JOHN H. WOOTTON, Byford, Hereford.
297 **R. N. & H. C.**—H. P. BULMER & CO.; and **Com.** for No. 298.

JAMS AND PRESERVED FRUITS.

Class 299.—*Collection of Whole Fruit Jams.* [5 entries, none absent.]

313 **I.** (£3.)—T. G. TICKLER, 47 Hainton Street, Grimsby.
312 **II.** (£2.)—GRANGER'S FRUIT PRESERVING CO., LTD., Ely.
309 **III.** (£1.)—BRITANNIA FRUIT PRESERVING CO., LTD., Tiptree Heath, Kelvedon.

Class 300.—*Collection of Bottled Fruits.* [4 entries, none absent.]

317 **I.** (£3.)—JOHN WEAVER, Little Heath, Christleton, Chester.
315 **II.** (£2.)—OWEN ROBERTS, Rowton Grange, Chester.
316 **III.** (£1.)—T. G. TICKLER, 47 Hainton Street, Grimsby.
314 **R. N. & H. C.**—BRITANNIA FRUIT PRESERVING CO., LTD., Tiptree Heath, Kelvedon.

Class 301.—*Collection of Preserved Fruits for Dessert Purposes.* [1 entry.]

318 **I.** (£3.)—BRITANNIA FRUIT PRESERVING CO., LTD., Tiptree Heath, Kelvedon.

HIVES, HONEY, AND BEE APPLIANCES.[1]

Class 302.—*Collection of Hives and Appliances.* [2 entries.]

319 **I.** (£5.)—W. P. MEADOWS, Syston, Leicester.
320 **II.** (£2 10*s.*)—C. REDSHAW, South Wigston, Leicester.

Class 303.—*Observatory Hive, stocked with Bees and Queen.* [5 entries, none absent.]

325 **I.** (£1 10*s.*)—T. B. BLOW, Welwyn, Herts. Price £5 5*s.*
322 **II.** (£1.)—W. DIXON, Belmont House, Beckett Street, Leeds. Price £4.
321 **H. C.**—C. REDSHAW, South Wigston, Leicester. Price £3 3*s.*

[1] Prizes given by the British Bee-Keepers' Association.

Class 304.—*Frame-hive for General Use, unpainted.* [9 entries, none absent.]

328 I. (£1.)—W. P. Meadows, Syston, Leicester. Price £1 1*s*.
331 II. (15*s*.) & 332 III. (10*s*.)—C. Redshaw, South Wigston, Leicester. Prices £1 4*s*. and 18*s*. 6*d*.

Class 305.—*Frame-hive for Cottager's Use, unpainted.* [4 entries, none absent.]

335 I. (£1.)—W. P. Meadows, Syston, Leicester. Price 8*s*. 6*d*.
338 II. (15*s*.) & 337 III. (10*s*.)—C. Redshaw, South Wigston, Leicester. Price 10*s*. 6*d*.

Class 306.—*Honey Extractors.* [5 entries, none absent.]

341 I. (15*s*.), 340 II. (10*s*.), & 339 H. C.—W. P. Meadows, Syston, Leicester. Prices £2 10*s*., £2, and £1 7*s*. 6*d*.

Class 307.—*Pair of Section Racks, completely fitted for use and interchangeable.* [4 entries, none absent.]

347 I. (15*s*.)—C. Redshaw, South Wigston, Leicester. Price 8*s*. 6*d*.
346 II. (10*s*.)—W. Dixon, Belmont House, Beckett Street, Leeds. Price 9*s*. 6*d*.
345 III. (5*s*.)—W. P. Meadows, Syston, Leicester. With hanging sections. Price 8*s*.

Class 308.—*Rapid Feeders.* [3 entries, none absent.]

348 I. (10*s*.)—W. P. Meadows, Syston, Leicester. Price 3*s*.
350 II. (5*s*.)—C. Redshaw, South Wigston, Leicester. Price 2*s*.

Class 309.—*Bingham Smoker of British Manufacture.*[1] [4 entries, none absent.]

352 I. (15*s*.)—W. P. Meadows, Syston, Leicester. Price 3*s*. 6*d*.
353 II. (10*s*.)—W. Dixon, Belmont House, Beckett Street, Leeds. Price 4*s*.

Class 310.—*Twelve Sections of Comb Honey, gathered in* 1894. [30 entries, 26 absent.]

377 I. (£–.)—W. H. Woods, Hemingford Grey, St. Ives.
378 II. (10*s*.)—W. Woodley, Beedon, Newbury, Berks. Price 1*s*. 2*d*. each.
373 III. (5*s*.)—J. Blyth Clarke, Braughing, Herts.

Class 311.—*Six Sections of Comb Honey, gathered in* 1894. [23 entries, 19 absent.]

400 I. (£1.)—W. Woodley, Beedon, Newbury, Berks. Price 1*s*. 2*d*. each.
389 II. (10*s*.)—Miss M. L. Gayton, Much Hadham, Herts. Price 7*s*. 6*d*.
399 III. (5*s*.)—W. H. Woods, Hemingford Grey, St. Ives.

Class 312.—*Run or Extracted Honey, gathered in* 1894. [39 entries, 21 absent.]

441 I. (£1.)—E. B. Cooper, St. Nicholas Square, Leicester. Price 1*s*. 6*d*. each.
416 II. (10*s*.)—Rev. R. S. Routh, Longstock Vicarage, Stockbridge. Price 12*s*.
444 III. (5*s*.)—B. G. Brocklehurst, Brocklehurst House, Ludlow. Price 16*s*.
H. C.—E. C. R. White, for No. 413; W. Woodley, for No. 438.

---

[1] Prizes given by Mr. T. W. Cowan.

Class 313.—*Twelve Sections of Comb Honey, gathered before or in* 1893. [12 entries, none absent.]

454 **I.** (£1.)—W. Woodley, Beedon, Newbury, Berks. Price 1*s.* 1*d.* each.
449 **II.** (10*s.*)—E. C. R. White, Woodford Mills, Salisbury. Price 12*s.*
451 **III.** (5*s.*)—W. Dixon, Belmont House, Beckett Street, Leeds.
H. C.—Rev. G. W. Bancks, for No. 448; T. H. Jackson, for No. 456.

Class 314.—*Three Shallow Frames of Comb Honey, for Extracting, gathered in* 1894. [17 entries, 14 absent.]

475 **I.** (£1.)—George Wells, Aylesford, near Maidstone. Price 12*s.* 6*d.*
464 **II.** (10*s.*)—G. E. Fancourt, 6 St. Paul's Street, Stamford.
461 **III.** (5*s.*)—C. R. Pigott, Landbeach, Cambridge. Price 12*s.*

Class 315.—*Run or extracted Honey, gathered before or in* 1893. [17 entries, none absent.]

482 **I.** (£1.)—T. B. Widdowson, 22 Lincoln St., Leicester. Price 1*s.* 6*d.* per lb.
484 **II.** (10*s.*)—W. Dixon, Belmont House, Beckett Street, Leeds.
491 **III.** (5*s.*)—W. Woodley, Beedon, Newbury, Berks. Price 1*s.* each.
H. C.—Capt. W. S. Ord, for No. 476; Lieut. H. C. Hawker, R.N., for No. 480; H. Wood, for No. 486.

Class 316.—*Granulated Honey.* [18 entries, 3 absent.]

507 **I.** (£1.)—S. J. Cooper, St. Nicholas Square, Leicester. Price 1*s.* 6*d.* each.
497 **II.** (10*s.*)—Lieut. H. C. Hawker, R.N., House Croft, Longparish. Price 1*s.* each.
504 **III.** (5*s.*)—E. Oakes, Lower Church Street, Broseley, Salop.

Class 317.—*Best and most Attractive Display of Honey in any Form and of any Year.* [11 entries, 5 absent.]

521 **I.** (£2 10*s.*)—W. P. Meadows, Syston, Leicester.
516 **II.** (£1 10*s.*)—W. H. Woods, Hemingford Grey, St. Ives.
514 **III.** (10*s.*)—G. E. Fancourt, 6 St. Paul's Street, Stamford.

Class 318.—*For any Practically Useful Invention connected with Bee-keeping introduced since* 1892. [10 entries, none absent.]

Bronze Medal of British Bee-Keepers' Association.

524 W. P. Meadows, Syston, Leicester. Reversible Super Clearer, with adapting slide. Price 2*s.*
527 **H. C.**—J. Walton, Weston, Leamington. Slow Bottom Feeder.

Class 319.—*Most Interesting and Instructive Exhibit of any kind connected with Bee-culture not mentioned in the foregoing Classes, and to which Prizes have not been previously awarded.* [9 entries, none absent.]

Bronze Medal of British Bee-Keepers' Association.

538 H. W. Brice, 9 Heathfield Villas, Thornton Heath. Specimens showing modifications of American methods of queen rearing in artificially prepared cups, to meet the exigencies of the English climate.

Certificates.

532 C. N. White, Somersham; 539 T. B. Blow, Welwyn. Collection of honey vessels in glass and pottery.

Com.—W. Dixon, for No. 535 (swarming arrangement); H. Seamark, for No. 536 (Cottager's Combination Hive).

IMPLEMENTS.

Oil Engines.

Class I.—*Fixed Oil Engines of* 4–8 *Brake H.P.* [16 entries, 5 absent.]

No. in Implement Catalogue.

5972 **I.** (**£50.**)—RICHARD HORNSBY & SONS, LTD., Grantham. (Hornsby-Akroyd, 8 H P.)
5827 **II.** (**£25.**)—CROSSLEY BROS., LTD., Openshaw, Manchester. ($6\frac{1}{2}$ H.P.)

Class II.—*Portable Oil Engines of* 9–16 *Brake H.P.* [9 entries, 3 absent.]

5973 **I.** (**£50.**)—RICHARD HORNSBY & SONS, LTD., Grantham. (Hornsby-Akroyd, $12\frac{1}{2}$ H.P.)

Spraying Machines.

Class III.—*Horse Power Machine for Distributing Bouillie Bordelaise or other Mixture on Potatoes.* [4 entries, 1 absent.]

4654 (**£10.**)—STRAWSONS, LTD., 77 Queen Victoria Street, E.C.

Class IV.—*Machines for Distributing Insecticides and Fungicides upon Fruit Trees and Bushes.* [13 entries, none absent.]

4982 (**£10.**)—BOULTON & PAUL, Rose Lane Works, Norwich. (No. 14.)
4669 **H. C.**—STOTT FERTILISER & INSECTICIDE DISTRIBUTOR CO., LTD., Barton House, Deansgate, Manchester. (Hop and Plant Washer.)

Sheep Dipping Apparatus.

Class V.—*Sheep Dipping Apparatus.* [6 entries, none absent.]

1037 (**£5.**)—FLETCHER BROS. & CO., Grimsby. (Portable.)
4481 **R. N.**—HILL & SMITH, Brierley Hill.
4435 **H. C.**—RAINFORTH & HAYWARD, Lincoln. (Fixed.)
4436 **H. C.**—RAINFORTH & HAYWARD, Lincoln. (Portable.)

Churns.

Class VI.—*Churns capable of dealing with* 10 *quarts and upwards of cream, not exceeding one man power.* [13 entries, 2 absent.]

3395 **I.** (**£10.**)—THOMAS BRADFORD & CO., Crescent Ironworks, Salford, Manchester. (Diaphragm End over End Barrel Churn, No. 12A.)
4877 **II.** (**£6.**)—G. LLEWELLIN & SON, Haverfordwest. (Eccentric End over Churn, No. 3.)
4876 **III.** (**£4.**)—G. LLEWELLIN & SON, Haverfordwest. (Royal Triangular Churn, No. 3.)

Class VII.—*Churns capable of dealing with from* 5 *to* 10 *quarts of cream, not exceeding one man power.* [11 entries, 3 absent.]

3396 **I.** (**£5**).—THOMAS BRADFORD & CO., Crescent Ironworks, Salford, Manchester. (Diaphragm End over End Barrel Churn, No. 11A.)

Second and Third Prizes equally divided:

903 (£2 10*s.*)—DAIRY SUPPLY CO., LTD., Museum Street, Bloomsbury, W.C. (Victoria Churn.)
4878 (£2 10*s.*)—G. LLEWELLIN & SON, Haverfordwest. (Royal Triangular Churn, No. 1.)

Silver Medals.

Awarded for Articles entered as " New Implements for Agricultural or Estate Purposes."

No. in Implement Catalogue.

1641 Ben Reid & Co., Bon Accord Works, Aberdeen: for Spreader for Farm-yard Manure.

2266 John Fowler & Co., Ltd., Leeds: for "Turnwrest" Plough, 8-Furrows.

BUTTER-MAKING COMPETITIONS.

Class 1.—*Open to the United Kingdom.* [10 entries, none absent.]

4 **I.** (£6.)—Miss Edith Glenn, Little Barford, St. Neots.
3 **II.** (£4.)—Miss Frances M. Cole, The Dairy Home Farm, Tring.
7 **III.** (£3.)—Miss Florence M. Knight, 75 Castle Street, Farnham.
6 **IV.** (£2.)—George Haslem, Grange Farm, Singleton, Poulton-le-Fylde.
9 **V.** (£1.)—Mrs. H. Shepherd, Hailstone Farm, Wrington, Somerset.
10 **R. N.**—Miss Winifred M. Trimmer, The Pavement, Alton, Hants.
1 **H. C.**—Mrs. M. A. Cambridge, High Hall, Blymhill, Shifnal.
2 **H. C.**—William A. Chappell, Greet's Green, West Bromwich.
5 **H. C.**—Miss C. Griffiths, Penally Court, Tenby.
8 **H. C.**—Miss Mabel C. Martin, The Hollies, Muxton, Newport, Salop.

Class 2.—*Female Members of a Farmer's Family not in Service or Working for Wages.* [18 entries, 1 absent.]

24 **I.** (£6.)—Miss Agnes A. Walker, Ockington Farm, Dymock, Gloucester.
11 **II.** (£4.)—Miss Hetty Baynes, Broxted Hall, Dunmow.
27 **III.** (£3.)—Miss Edith S. Wright, Appleby, Doncaster.
22 **IV.** (£2.)—Miss Rose Powell, Westry House, March, Cambs.
14 **V.** (£1.)—Miss Gertrude Connell, South Croxton, Leicester.
26 **R. N. & H. C.**—Miss Mary Wilson, Stone Broom Lane, Alfreton, Derby.
12 **H. C.**—Miss Mary Beechener, The Green Farm, Barton, Ampthill.
13 **H. C.**—Mrs. E. Rose Blackwell, Cowden Hall, Heathfield, Sussex.
16 **H. C.**—Miss Mary L. Farrin, Coleshill.
18 **H. C.**—Miss Nora Jones, Bodfeirig, Ty Croes, Anglesea.
20 **H. C.**—Miss Hettie Pedly, Great Barford, St. Neots.
21 **H. C**—Miss Sarah Portway, Thorndon Hill, Eye.
23 **H. C.**—Miss Kathleen Sharman, Lyddington, Uppingham.
28 **H. C.**—Miss Winifred Wright, Thrapston, Northamptonshire.
17 **Com.**—Miss Rosa George, Sharpenhoe Bury, Ampthill.
19 **Com.**—Miss Maria Milner, Stretton, Alfreton.
25 **Com.**—Miss E. A. Wesley, Grove House, Stretham, Isle of Ely.

Class 3.—*Dairymaids and others resident in the Society's District A., consisting of the Counties of Bedford, Buckingham, Cambridge, Essex, Hertford, Huntingdon, London, Middlesex, Norfolk, Oxford, and Suffolk. (Open only to those who have not been Prize Winners at previous Country Meetings of the Royal Agricultural Society.)* [4 entries.]

30 **I.** (£6.)—Miss Elsie G. Cook, Clock House Farm, Ashford, Staines.
32 **II.** (£4.)—Miss Agnes Mary Watts, Fairgreen, Chipping Norton, Oxon.
31 **R. N. & H. C.**—Miss H. Stoten, Old Wellbury, Hitchin, Herts.
29 **H. C.**—Alfred Baynes, Broxted Hall, Dunmow.

Class 4.—*Dairymaids and others resident in the Isle of Ely or Counties of Cambridge, Suffolk, Norfolk or Huntingdon. (Open only to those who have not been Prize Winners at previous Country Meetings of the Royal Agricultural Society.*[1]*)*
[12 entries, none absent.]

36 **I.** (£6.)—MISS HANNAH ELLINGHAM, Littleport, Ely.
41 **II.** (£4.)—MISS KATE E. NEWTON, Buckworth, Huntingdon.
43 **III.** (£3.)—MISS ADA SHEMILT, Culford Home Farm, Bury St. Edmunds.
38 **IV.** (£2.)—MRS. FLORENCE M. GREEN, The Hoo, Buckden, Huntingdon.
37 **V.** (£1.)—MISS MAY FREEMAN, The Grove Farm, Framlingham.
35 **R. N. & H. C.**—MISS ALYS E. BROWN, Witnesham Rectory, Ipswich.
33 **H. C.**—MISS KATHLEEN ANNESS, Brockford Hall, Stonham, Suffolk.
39 **H. C.**—MISS ELLEN HEWES, 81 Prince of Wales Road, Norwich.
40 **H. C.**—MISS ALICE E. MARGETTS, Cowper House, Huntingdon.
44 **H. C.**—MRS. ELIZA TAYLOR, Quanea Farm, Ely.

Champion Class.—*Limited to Prize Winners in Classes* 1–4.

30 (£5, **& Society's Silver Medal.**)—MISS ELSIE G. COOK, Clock House Farm, Ashford, Staines.
11 **R. N. & H. C.**—MISS HETTY BAYNES, Broxted Hall, Dunmow.

HORSESHOEING COMPETITIONS.

Class 1.—*Roadsters.* [13 entries, none absent.]

12 **I.** (£6.[2])—ARTHUR RAYNER, 3 Highbury Terrace, Head Street, Halstead.
13 **II.** (£4.)—RICHARD STACEY, Old Warden, Biggleswade.
10 **III.** (£3.)—JOHN THOMAS LEWINGTON, 6 Short Street, Cambridge.
9 **IV.** (£2.)—HARRY GREENBANK, The Forge, Whitton, Hounslow.
3 **V.** (£1.)—GEORGE DEAN, Earith, St. Ives.
8 **R. N. & H. C.**—WILLIAM GOODSON, 12 Hockliffe Street, Leighton Buzzard.

Class 2.—*Agricultural Horses.* [13 entries, none absent.]

26 **I.** (£6.[2])—THOMAS WOODS, Elstow, Bedford.
25 **II.** (£4.)—EDWARD SINFIELD, Old Warden, Biggleswade.
18 **III.** (£3.)—FREDERICK GREENBANK, The Forge, Harlington, Middlesex.
16 **IV.** (£2.)—ALBERT JOHN EDWARDS, Denham, Bury St. Edmunds.
21 **V.** (£1.)—WALTER LIDDAMORE, Westley, Bury St. Edmunds.
14 **R. N. & H. C.**—JOHN ARMSTRONG, Elstow, Bedford.
15 **H. C.**—THOMAS DENNY, Stechworth, near Newmarket.

[1] Prizes given by the Cambridge Local Committee.
[2] Given by the Worshipful Company of Farriers, in addition to the FREEDOM OF THEIR GUILD.

ROYAL AGRICULTURAL SOCIETY OF ENGLAND.

Proceedings of the Council.

WEDNESDAY, NOVEMBER 7, 1894.

SIR JOHN H. THOROLD, BART. (PRESIDENT), IN THE CHAIR.

Present:

Trustees.—Earl Cathcart, Mr. John Dent Dent, Lord Egerton of Tatton, Col. Sir Nigel Kingscote, K.C.B., Sir A. K. Macdonald, Bart., Rt. Hon. Sir W. M. Ridley, Bart., M.P.

Vice-Presidents. — Sir Walter Gilbey, Bart., Lord Moreton, Earl Spencer, K.G., Mr. Charles Whitehead.

Other Members of Council.—Mr. J. H. Arkwright, Mr. Alfred Ashworth, Mr. J. Bowen-Jones, Lord Brougham and Vaux, Mr. J. A. Caird, Mr. Charles Clay, Mr. F. S. W. Cornwallis, M.P., Lieut.-Col. J. F. Curtis-Hayward, Mr. Alfred Darby, Mr. J. Marshall Dugdale, Mr. S. P. Foster, Mr. W. Frankish, Mr. Hugh Gorringe, Mr. Anthony Hamond, Mr. James Hornsby, the Earl of Jersey, Mr. C. S. Mainwaring, Mr. Joseph Martin, Mr. T. H. Miller, Hon. Cecil T. Parker, Mr. Albert Pell, Mr. Dan. Pidgeon, Mr. J. E. Ransome, Mr. S. Rowlandson, Mr. Howard P. Ryland, Mr. G. H. Sanday, Mr. A. J. Smith, Mr. Henry Smith, Mr. E. W. Stanyforth, Mr. Richard Stratton, Mr. Martin J. Sutton, Mr. J. P. Terry, Mr. John Tremayne, Mr. R. A. Warren, the Duke of Westminster, K.G., Mr. E. V. V. Wheeler, Sir Jacob Wilson.

Officers.—Mr. Ernest Clarke, Secretary; Dr. Fream, Editor of the Journal; Dr. J. Augustus Voelcker, Consulting Chemist; Professor Simonds and Professor Brown, C.B., Consulting Veterinary Surgeons.

The following members of the Darlington Local Committee were also present:—Captain Gerald Walker, the Borough Surveyor (Mr. Thomas Smith), and Mr. F. Raymond Steavenson (Secretary of the Local Committee).

Apologies for non-attendance were received from the Earl of Coventry, Viscount Bridport, G.C.B., Right Hon. Sir Massey Lopes, Bart., Mr. Joseph Beach, Mr. Chandos-Pole-Gell, Sir J. L. E. Spearman, Bart., and Mr. Charles Howard.

The Society's New House.

The PRESIDENT, in opening the proceedings, expressed his pleasure at being in the chair on this the first meeting of the Council in that beautiful house. He was also very glad at being supported by those who had enabled the Society to obtain it. As they were aware, on the occasion of the complimentary dinner given by Members of Council to the Duke of Westminster and Sir Walter Gilbey, on Monday evening, the following telegram had been despatched by him to his Royal Highness the Prince of Wales at Livadia:—"The Council of the Royal Agricultural Society deeply deplore the sad cause of your Royal Highness's absence from their gathering to-day, and they desire to express their respectful sympathy with the Princess, your Royal Highness, and the Imperial Family." He (the President) had yesterday received the following telegraphic reply from his Royal Highness:—"We thank the Royal Agricultural Society for their kind sympathy. I deeply regret my absence from your gathering yesterday.—ALBERT EDWARD."

Death of a Member of Council.

The minutes of the last meeting of the Council, held at 12, Hanover Square, on July 25, having been approved,

The PRESIDENT said it was with deep regret that he had to officially announce to the Council the death of their colleague Mr. James Rawlence, who died on September 15 last, at the great age of eighty-four. Mr. Rawlence had been a member of the Council since 1871. He had been a regular attendant at their meetings, and had rendered active assistance in many ways. He would be greatly missed by his colleagues on the Council.

Election of New Governors and Members.

The election of the following two Governors and thirty-eight Members was then proceeded with:—

Governors.

ROLLE, Hon. Mark..Bicton, Devon.
THOMPSON, H. Yates..26a Bryanston Sq., W.

Members.

BATHURST, Charles, jun...Lydney Park, Glos.
BAZLEY, G. S...Hatherop Castle, Fairford.
BRADDON, S. V...Cheetham Hill, Manchester.
BRUN, Hofjægermester O...Soeddingegaard, Denmark.
CALVERT, J. H...Masham, Yorks.
CARRICK, W. L...Stokesley, Yorks.
COCKBURN, C. E. S...Sutton Rock, Chesterfield.
CRAFTON, R. C...Bulkeley Station, Ramleh, Alexandria, Egypt.
CROSSLEY, Gerald B...Radford Hall, Leamington.
CUBITT, E. G...Honing Hall, Smallburgh, Norwich.
CURRY T...Morton Carr. Nunthorpe, Yorks.
CUTLACK, W...Littleport, Ely.
DAVISON, Col. T...Lea Park, Godalming.
DICKIN, Lt.-Col. J. Lloyd...Junior U.S. Club, S.W.
FOSTER, W. R. The Grove, Horley, Surrey.
HOFFMAN, Dr. J. W...Tuskegee Institute, Ala., U.S.A.
HORSFIELD. H...Arun Bank, Rudgwick, Sussex.
HUTCHINSON, Thos...Bambro' Hall, Belford.
JAMES, W. D...West Dean Park, Chichester.
LANCASTER, P. J...Sec. Agr. & Hort. Soc. of Ind., Calcutta.
LANE, F...26 Great St. Helens, E.C.
LEETE, T. A...Bradley Gate, Northenden.
LYNE, R. N...Wellingore Hall, Lincoln.
MOORHOUSE, S. H...The Woodlands, Stockport.
MORAN, J. A...22 Furnival Street, E.C.
PAYNE, A. L...Mobberley, Knutsford.
PHILLIPS, C. J...Staunton Hall, Newark.
PHIPPS, Thomas, 169 Bridge Street, Northampton.
POWNEY, Cecil, Fyfield House, Andover.
PYM, Guy, Cæsar's Camp, Sandy.
RICHARDS, J...41 England's Lane, N.W.
RIDLEY, W. C...Hollington, Newbury.
ROBINSON, J...Wouldham Court, Rochester.
ROGERS, Geo...Loughton, Essex.
SOWERBY, J. P...Stokesley, Yorks.
VUIGNER, Louis A. R...46 Rue de Lille, Paris.
WHITEBREAD, G...Higham. Rochester.
WILLIS, Mrs..Carperby, Yorks.

Country Meeting of 1896.

The Hon. CECIL T. PARKER read the report of the Committee of Inspection appointed by the Council at their last meeting to examine and report upon the sites and other accommodation offered by the towns of Leicester and Northampton for the Society's Country Meeting of 1896. The Committee, after describing the various sites examined by them, reported that they did not see their way to present a definite recommendation in favour of either of the towns from which the invitations had been received; but they pointed out, with regard to Leicester, that the Society last visited it in 1868; that it was in the centre of a thickly populated district, and had itself a population of 187,000 inhabitants. Northampton, which had not been visited since 1847, had, on the other hand, a more eligible site, but was a town of 65,000 inhabitants only, with no large centres of industry near it, though it was in the midst of an important agricultural district.

Invitation from Leicester.

Mr. JAMES HORNSBY then introduced a deputation from Leicester, consisting of the Marquis of Granby, M.P., the Mayor of Leicester (Mr. Alderman Hart), Mr. Alderman Green (Mayor-elect of Leicester), Mr. Walter Hazell, M.P., Mr W. H. Heygate, Mr. J. W. Logan, M P, Mr. J. H. Marshall, Mr. Thomas Nuttall, Mr. Samuel Patey (Chairman of the Parks Committee), Mr. J. F. L. Rolleston, Mr. G. W. Ward (Vice-Chairman of the Leicestershire Agricultural Society), Mr. Alderman Wood, Alderman Sir Thomas Wright, Mr. R. A. Yerburgh, M.P., the Town Clerk of Leicester (Mr. James Bell), the Borough Surveyor (Mr. E. G. Mawby), and Mr. J. T. Ardron (Secretary of the Leicestershire Agricultural Society).

The Marquis of GRANBY said they had come that day for the purpose of bringing before the Council the claims of the town and county of Leicester for their favourable consideration, as the place for the holding of the Society's Country Meeting of 1896. There was no doubt whatever in the county as to their strong feeling of hope that they might be able to induce the Council to visit the town of Leicester in 1896. He would point out that it would be some thirty years since Leicester was last visited by the Royal Agricultural Society. Since 1868 an enormous increase had taken place in the borough itself, which had now a population of 187,000. He believed he was justified in saying that, perhaps with the exception of Cardiff, there was no town in Great Britain that had increased in population so rapidly as Leicester. They therefore felt that, in the borough of Leicester itself, there was an enormous population upon which they could rely. In the county the greatest possible interest was excited in the Show, and they would be prepared to offer every hospitality to the Society. The town of Leicester was extremely well off in the way of railway accommodation. They were in a far better position than they were five years ago, because, in addition to the railways which then came into the town, they now had an extra branch of the Great Northern Railway. The station accommodation had been enormously increased, and was in a very satisfactory condition. They were on the main line at Leicester to practically nearly all the large towns in the southern portion of Yorkshire, Nottinghamshire, Derbyshire, &c., as well as to the South, and communication was easy and rapid, by means of the Midland Railway, with towns of the size of Birmingham, Derby, Leeds, and Sheffield, as well as with the Lincolnshire side of Leicestershire, which was, as they knew, very easily accessible to the borough. No other towns in that part of the centre of England could, he thought, compete with Leicester as it stood now for ease of access by railway. He had spoken on behalf of the borough, but they would hear from those more directly representing the municipal body. He would merely say that they were anxious to do everything they possibly could from a county point of view for the interests of the Royal Agricultural Society. They claimed to be one of the largest agricultural districts in England, and he hoped they would be able to see the Royal Agricultural Society's Show of 1896 held at Leicester.

The MAYOR OF LEICESTER (Mr. Alderman Hart) said that if the Society decided to hold its Show of 1896 at Leicester, the inhabitants would give a most hearty and genial welcome. The Show was held on the last occasion at Leicester in 1868, and he believed that it was then a success. As they were aware, the town had doubled its population since that period, and now presented many more attractions that it did at that time. There were greater facilities by the railway lines to Leicester, which would, no doubt, attract a very large number of persons to visit their Royal Show, and he presumed that their aim was to interest as large a number of persons as they could in the district. There were about 200,000 inhabitants in the borough, and another 200,000 inhabitants in the county — making altogether a population of about 400,000. Situated as they were in the heart and centre of the country, they were within two and a-half hours of something like a population of ten millions. He thought that fact was worthy of consideration. The Council would be best able to judge of the fitness of the sites offered by the Corporation; and he would say that they were prepared to do all that was necessary to render the sites suitable for the purposes of the Show. They were willing to do all that was required with regard to the water supply, although, as they were aware, they had their difficulties. One of the sites, however, would not require very much water, because there was the river close to it. He was quite sure that the inhabitants generally would lend ready help to welcome the Society's Show, if they decided to come to Leicester. He understood that Northampton was competing in the desire to have the Royal Agricultural Society's Show in 1896, and he might, perhaps, mention that the Society held its show at Cambridge last year, which was very near to Northampton. He could only repeat that they would do everything in their power to welcome the Society, and he predicted that, as Leicester had become of such importance, they would realise all they could hope for from the Show being held there.

Mr. J. F. L. ROLLESTON, as a member of the Committee representing the country districts of Leicestershire, stated that the motive of the Committee of the Corporation for cordially extending an invitation to the Society to hold its Show at Leicester in 1896 was not, as at first might be thought, a purely selfish one. There might or there might not be certain advantages conferred upon the town by bringing to Leicester such a magnificent exhibition as that which the Royal Agricultural Society yearly spread before the world. Whoever might or might not be benefited as heads of commercial interests, the visit would be of importance to the great sister industry of agriculture ; and they were anxious to welcome its chief organisation and to extend hospitality to its leaders. It would undoubtedly be a great cost to the public, and a great cost and labour to individuals. That view, however, was quite dismissed from their minds ; and if the Council accepted the invitation given, they would receive, in point of dignity and in point of enthusiasm, as cordial a welcome as had ever been extended by any town in the United Kingdom. That might be regarded as the sentimental side of the question. In regard to the practical side, there were 187,000 people in Leicester. So large and central a population, with such excellent railway facilities, would mean a considerable "gate"—probably the largest "gate" since Windsor. Leicester was in the heart of England, and in the centre of a district which had not been for some years past favoured by a visit from the Society. He would respectfully submit that at no part of the United Kingdom could a greater number of people from all parts of the country be afforded an opportunity of witnessing their exhibition than at Leicester.

Mr. J. W. LOGAN, M.P., as representing the Harborough Division of Leicestershire, had very much pleasure in cordially supporting the invitation extended to them. He had nothing to add to what had been said, but would content himself by cordially endorsing the invitation.

Alderman Sir THOMAS WRIGHT said that if there were any doubts as to the spirit in which the Royal Agricultural Society would be received at Leicester, he hoped that the deputation that morning would have removed them. In 1896 Leicester would have an additional supply of water, which would cost them 300,000*l.*, and would remove the possibility of any doubt on this point. The chart on the wall would give an idea of the position which Leicester occupied in relation to other towns in the county, from which they might expect to draw a large number of people, and large supplies of stock. The population of Leicester was large, but the chief point was that Leicester was half-way between London and Manchester, and occupied about as central a position as any town in England. The railway accommodation in the town was increasing from day to day. The Midland Railway Company were now making large alterations, which would be finished by 1896, and altogether there were advantages not possessed by other towns. There would be unusual facilities for reaching either the Victoria or Aylestone Road site, and it was hoped to set down both passengers and stock at the Aylestone Road siding. He had no site in his own mind at Northampton which could give the same railway facilities as were possessed by Leicester.

The PRESIDENT asked whether the allotments next to the Aylestone Road site could be utilised, and, if so, whether the ground could be turfed down this winter.

The Mayor of LEICESTER replied in the affirmative, and gave a definite undertaking on the part of the Corporation accordingly.

Invitation from Northampton.

The deputation from Leicester having withdrawn, Earl SPENCER introduced a deputation from Northampton, consisting of the Mayor of Northampton (Mr. H. E. Randall), the Town Clerk of Northampton (Mr. W. Shoosmith), Mr. S. G. Stopford Sackville (Chairman of the Northamptonshire County Council), Mr. Pickering Phipps (Vice-Chairman of the Northamptonshire Agricultural Society), Mr. Alfred Cockerill, Mr. T. A. Dickson, and Mr. Wm. George. He said they could not claim so large a population as Leicester, but he claimed that they had a large agricultural interest which was second to none in the United Kingdom. They had a growing population in the county, and though the town itself was not so great, a very large number of people would come to the Society's Show from the immediate neighbourhood. They came hoping to be considered favourably, as they had not had a visit from the Royal Agricultural Society since 1847. He dared say that he was the only one there who could remember attending that Show. He was not very old at the time, but he could remember well his youthful enthusiasm when he heard that his father had gained a first prize for pigs. Other towns near them had since had a visit from the Royal Agricultural Society. By the time this Meeting would come round it would be very nearly fifty years since the Society had come to their large agricultural centre. With regard to railway accommodation, they claimed that they were nearly, if not equally, as important as Leicester itself. They were on the main line of the London and North-Western Railway, within an hour of Birmingham, within an hour of Leicester itself, and within an hour and a-half of London. Between London and Northampton, he need hardly say, there was a very important agricultural interest in the various counties. They were within forty minutes of Bedford, and one and three-quarter hours of Oxford. The train service was excellent, as to which they claimed to compare favourably with other towns. With regard to the interest created by the Society's visit, he could speak for himself and for the town, and say that the greatest possible interest was felt in the prospect of securing the Society's presence at Northampton in 1896. They had secured already the funds which the Royal Society very properly demanded. They had a site which they believed was a very convenient one, with facilities for water and gas close at hand. In conclusion, he sincerely trusted that their neighbourhood, which looked forward so much to the prospect of the Society's visit in these days of depressed agriculture, would receive the advantages which their annual Meeting gave. He hoped that the Council would give favourable consideration to their prayer that Northampton should be the place for the Royal Agricultural Society's Meeting in the year 1896.

The MAYOR said he had the greatest pleasure to be there that morning to represent the town of Northampton, and to ask the Society to pay them a visit in 1896. Northampton, although, in fact, a manufacturing town, was situated in one of the largest agricultural districts in the United Kingdom. There was a strong feeling in the town that this visit should take place, and the greatest enthusiasm would be aroused if they were able to say that the Society had come to a favourable decision. The idea of the Society's visit had been received with enthusiasm, and a large, competent, and energetic committee had been engaged for some months in getting together the necessary funds and in making the proper arrangements for the reception of the Society. As had been said by Lord Spencer, they had an excellent site, which possessed a great many natural advantages. He thought a better site could not be found. As to water and gas, they could not be better for the purposes of the Show; and as to the wish of the Northampton people for the Show, he could say that they were extremely anxious for the decision of the Society, which he trusted would be a favourable one.

Mr. S. G. STOPFORD SACKVILLE (Chairman of the Northamptonshire

County Council) said he had the honour to be there that day to urge the claims of the district, which were almost purely agricultural. There was a great deal of the shoemaking industry, and iron-stone quarrying was carried on, but with these two exceptions their district was purely agricultural. Considering the way in which agriculture in their county had suffered since 1879, he thought he could say that they deserved the encouragement of a visit from the Society. He did not wish to detract from the merits of the claims of their neighbours from Leicester, but there were five points in favour of Northampton as against their neighbours at Leicester: First, they compared favourably with the county of Leicester in respect of Governors and Members of the Society. Although he believed their population was not so large as that of Leicestershire, they had 181 Governors and Members, as against 150 in Leicestershire. Secondly, the Society had met at Leicester in 1868—only twenty-eight years before 1896—whereas Northampton had not been favoured since 1847. Thirdly, they were nearer London, with a train service certainly not inferior to any in the world, being on the main line to London by the London and North-Western Railway—a journey of one and a-half hours, as compared with two hours to Leicester. Fourthly, there were remarks that the water supply of Leicester failed, or was not adequate; and he would point out that with the large number of animals that came to their enormous Show they would need a water supply sufficient and constant. Lastly, their introducer that day bore one of the names which was much honoured in their Society. The third Lord Spencer was one of the founders of the Royal Agricultural Society, and if they admitted the celebrity which the Knightley blood represented throughout the world, he felt sure they would admit that Northampton, on that account alone, bore a claim to their consideration.

The deputation then retired.

Selection of Leicester.

Mr. HORNSBY, in moving "That Leicester be selected as the place of the Country Meeting for the year 1896," said he did not wish to say a single word against Northampton. At the same time, being the only Member of the Council for Leicestershire, he felt it a pleasurable duty to ask the Council to hold the Society's Country Meeting at Leicester in the year 1896. But when he asked them to do that he only felt that he was doing his duty as a member of the Council, as he thought that Leicester would be financially a better place for the Society to visit than Northampton. The Leicestershire people, as well as the borough, were most anxious that their Society should come to Leicester, and he had great pleasure in proposing that the Show of 1896 should be held there.

Mr. HENRY SMITH having seconded the motion,

Mr. ALBERT PELL moved an amendment in favour of the selection of Northampton. He would point out to the Council that the arguments, so far as he had caught them, upon which Leicester depended were those of population and gate money. As long as he (Mr. Pell) had had the honour of being on that Council, he had always resisted that view of the case, as one not worthy of the Society. They had done very well in going to purely rural towns, so far as money went, and they had done rather badly when they had approached some of the great towns from which they had expected to derive large revenue. He did not want to make opprobrious remarks with regard to Leicester—he had had a long and honourable connection with that county; but he could not forget some of the defects of that site, from which they had already suffered in connection with the water supply at the Leicester Meeting of 1868. They knew that after a succession of dry seasons Leicester was in difficulties with regard to water. He would like to mention one or two reasons in favour of the Society going to such a town as Northampton. It was most handsomely provided with railway accommodation, and had a station capable of dealing with a population of 200,000 people. Reference had been made to the distance Leicester was from London. He thought it was two and a-half hours. Northampton was one and a-half hours. He (Mr. Pell) did not, however, set much store by London; but what he did set store by were the old traditions, habits, and character of the country which surrounded it. They might say that improvement in agriculture found its birthplace and origin not very far from Northampton, at Woburn, and that it met with the greatest encouragement and support from Althorp. The Duke of Bedford and Lord Spencer were two famous men who took the lead in agriculture, and who were the founders of that Society. The character of the country since those days had altered very much less than the country around Leicester. Northamptonshire was purely and simply agricultural, and did not contain populous towns, though Kettering and Wellingborough were growing very fast. He did not believe, so far as admissions to the Showyard went, that Northampton would fail any more than Cambridge or Chester. He thought their first attention should be given to the improvement of the agriculture of the district, in preference to the mere attraction of numbers of people within the boarded surroundings of the Showyard. For this reason, amongst others, he moved that Northampton should be selected for the visit of the Society in 1896.

Mr. SANDAY seconded the motion.

Mr. STRATTON asked if any large number of allotment holders would be disturbed if the Aylestone site were chosen at Leicester.

The PRESIDENT replied that, as a matter of fact, there were twelve acres of allotments which would be taken sooner or later for building purposes, but it was understood that the allottees could be given more suitable land in exchange. They would have to be disturbed either now or within a very little time.

Sir JACOB WILSON said he was one of those who, as a rule, were largely influenced by the report of the Inspection Committee. They were more likely to know than anyone else, and were better able to act as guides to the Council, but in the present instance it was not so. They had been told that each of the sites was equally eligible, and, therefore, they must look to other sources for information and guidance. He found that the Showyard at Leicester was a mile nearer the town than at Northampton. Northampton was a good showyard; but he would remind them that Northampton was much nearer to Cambridge than Leicester. He fell back upon the inevitable because, in spite of what Mr. Pell might say, it was always desirable in the agricultural interests of the country that they should look to finance; and, in face of the expense which the Society had had recently to undergo, they would see how necessary it was to look at the financial aspect of the matter. Therefore, as far as he was personally concerned, he should vote for Leicester.

The Duke of WESTMINSTER said that 1868 was an extremely dry year. He understood that the soil of the site at Leicester was clay, and they knew what that meant at Kilburn. It was a light soil at Northampton. He thought this a most important point.

Earl SPENCER hoped the Council would bear in mind that the Show at Northampton was held fifty years ago. Since that time Northampton had increased, and was increasing still, together with the other towns in the county, such as Kettering and Wellingborough.

The PRESIDENT then put the question, when there appeared twenty-seven votes in favour of Leicester, and seventeen in favour of Northampton.

It was thereupon formally resolved: "That the Country Meeting of 1896 be held upon the Aylestone Road site at Leicester, subject to the usual agreement being entered into with the Society by the Mayor and Corporation, such agreement to embody the undertaking given verbally by the Mayor on the subject of the Allotment Gardens."

The deputation from Leicester having been recalled and informed of the Council's decision, the MAYOR, in the absence of Lord Granby, who had been obliged to leave, expresed the great pleasure of the deputation at the decision arrived at, and the certainty of their being able to make the Country Meeting of 1896 a very great success.

The Reports of the various Standing Committees were then presented and adopted as below :—

Finance.

Sir NIGEL KINGSCOTE (Chairman) reported that the accounts for the period ended October 31, 1894, as certified by the Society's Accountants, showed total receipts for that period amounting to 6,213*l.* 9*s.* 8*d.*, and expenditure to 16,408*l.* 17*s.* 8*d.* The balance at the bankers' on October 31, allowing for cheques outstanding, was 1,029*l.* 8*s.* 7*d.* Accounts amounting in all to 2,046*l.* 18*s.* 7*d.* had been passed, and were recommended for payment. The quarterly statement of subscriptions, arrears, and property to September 30 had been laid upon the table. The Committee recommended that Messrs. J. Backhouse & Co. be appointed local bankers for the Darlington Meeting.

Financial Result of the Cambridge Meeting.

Sir NIGEL KINGSCOTE added that the Council would be glad to hear that the draft balance-sheet of the Cambridge Meeting of this year, which had been laid before the Committee, and ordered to be submitted to the Auditors, showed an excess of receipts over expenditure of about 1,050*l.* (See page clxxxi.)

House.

Sir NIGEL KINGSCOTE (Chairman) reported that the Committee had held six meetings since the last meeting of the Council for the purpose of settling various details as to the Society's new premises. The furnishing and decorating of the house were now complete, with the exception of the members' reading-room, and the Committee proposed that this room should be opened at the beginning of the Smithfield week. A large number of interesting objects having been kindly lent by various societies and gentlemen for exhibition at the conversazione on the 5th inst., the Committee recommended that the cordial thanks of the Society be given to each lender by a letter signed by the President.

Earl CATHCART said that, as an outsider, he might perhaps be allowed to say how greatly they were indebted to the House Committee for all the trouble they had taken and for all their exertions. These had been crowned with the greatest success, and the Committee would doubtless feel that this was their best reward.

On the motion of Sir NIGEL KINGSCOTE, seconded by Earl CATHCART, the Seal of the Society was authorised to be affixed to a legal form of acknowledgment to the Shire Horse Society, in connection with the recent transfer of premises.

Journal.

Earl CATHCART (Chairman) reported that Part III. of Vol. V. of the Journal had been published on September 29, and copies issued to Members of the Society. Several accounts for literary contributions, printing, &c, were recommended for payment. Various presentations to the library had been reported, and the thanks of the Counci were ordered to be sent to the donors.

Chemical.

Mr. WARREN, in presenting the recommendations of the Committee, reported the resignation during the recess of Mr. A. E. Elliott as Resident Manager of the Society's Experimental Farm at Woburn. The Committee recommended the appointment of Mr. C. H. B. Cane, of Dunchurch, Rugby, as his successor. The Consulting Chemist had been instructed to prepare a revised edition of the "Objects, Plan, and Results of the Woburn Experiments." Reports from the Woburn Sub-Committee had been received and adopted.

Botanical.

Mr. WHITEHEAD (Chairman) reported that the experiments of the Consulting Botanist had been rendered abortive this season by the appearance of a parasitic fungus (*Pythium* *de Baryanum*), which had overpowered the plants and prevented the spores of the finger-and-toe disease from developing. Any further experiments, therefore, must necessarily be postponed until next season. The Committee proposed that Mr. Carruthers should be requested to repeat his experiments next year, when it was hoped that more satisfactory results would be obtained. The Committee recommended that the following prizes be offered at the Darlington Meeting for whole fruit jams and bottled fruits in two classes, instead of three, as at Cambridge :—

	1st £	2nd £	3rd £
(A) Collection of Whole Fruit Jams . . .	3	2	1
(B) Collection of Bottled Fruits . . .	3	2	1

They had revised the regulations under which these prizes should be offered, and recommended their adoption as follows :—

The exhibits must have been prepared exclusively from fruit grown in the United Kingdom in the year 1894.

Not less than four nor more than six kinds of fruit must be shown in each exhibit. Each receptacle must contain not less than 1lb.

The exhibits must be contained in glass jars, bottles, or other transparent receptacles, which must be labelled with the name of the fruit which they contain. No trade mark or trade label will be permitted on the receptacle.

No exhibitor shall make more than one entry in the same class.

The exhibitor is to certify that the jams or bottled fruits exhibited are a fair sample of his own make of the season of 1894.

A letter had been read from the Royal Meteorological Society, recalling the fact that twenty years ago Mr. Whitehead and Mr. Carruthers were appointed by the Council, as representatives of the Royal Agricultural Society, upon a Committee for the organisation of observations of natural phenomena. The results of these observations had appeared from time to time in the Journal of the Meteorological Society, and it was now suggested that the whole subject should be reviewed by a fresh conference, and that a decision should be come to as to the continuance or cessation of the work, and as to the part which other societies could and should take in it. The Committee recommended that the Secretary be instructed to reply that in the view of the Council it was desirable that the information which had been collected on this subject during the last twenty years should be systematised and made available for general information, and that they would be willing to co-operate in any new conference that might be convened with this purpose. The Committee recommended that their Chairman, Mr. Whitehead, and the Society's Zoologist, Mr. Warburton, be nominated as the Society's representatives upon such conference. The Consulting Botanist had referred to the practice of farmers in buying grass seeds by bulk or weight, and showed to the Committee samples of different seeds, demonstrating the relative quantity of such seeds necessary to produce a certain number of plants, and their relative cost. The Committee suggested that a short article with appropriate illustrations on the value of seeds in relation to the plants produced, as opposed to their weight and bulk, would make a very useful note in the Society's Journal (see page 797).

The Hon. CECIL T. PARKER moved, and Mr. SANDAY seconded, an amendment to omit the recommendation as to the Prizes for Jams and Bottled Fruits, which gave rise to a discussion, in which Mr. WHITEHEAD, Earl CATHCART, Mr. WHEELER, Mr. BOWEN-JONES, Lord MORETON, Mr. DENT, and Sir JACOB WILSON took part. Eventually the amendment was withdrawn, and the report of the Committee was adopted, on the understanding that the question of the continuance of these prizes should be reconsidered in connection with the Meeting of 1896.

Veterinary.

Mr. ASHWORTH (Chairman) reported that the leaflet on Anthrax which had been prepared and issued immediately after the last meeting of the Council, in accordance with the directions then given, had been extensively circulated amongst owners of stock, veterinary surgeons, and others interested in the subject. The Committee drew the attention of the Council to the special scientific investigations into the causes of abortion in cattle which were now in progress at the Royal Veterinary College, under the auspices of the Society; and they would feel greatly obliged to any members whose herds might be suffering from this disorder, if they would kindly communicate with the College authorities, with a view to their sending an aborted animal to the College for the purposes of experiment and observation. A letter had been read from the Royal Lancashire Agricultural Society on the subject of the prevalence of tuberculosis in cattle, and asking the Society's co-operation with a view to combined action on the part of the principal agricultural societies in urging the Board of Agriculture to adopt measures for dealing with this disease. The Committee did not advise that action should be taken by the Society in the direction indicated until the Royal Commission on Tuberculosis, now sitting, had presented their report.

Professor Brown had presented the following report:—

Pleuro-Pneumonia.—Since the last meeting of the Committee several outbreaks of pleuro-pneumonia have been reported. The suspected were in each case slaughtered, but proved, on post-mortem examination, to have been affected with other diseases.

Foot-and-Mouth Disease.—On the afternoon of the 27th ult. the local veterinary inspector was called in to examine some cattle on a marsh at Rainham in Essex, and found them to be affected with a disease which he considered to be foot-and-mouth disease, and he accordingly instructed the police to prevent all movement of cattle from the marshes. On the following day the inspector again attended, and was satisfied as to the nature of the disease, and at once reported to the Board of Agriculture. One of the veterinary officers of the Board proceeded to Rainham and confirmed the opinion of the inspector. Of the seven cattle which were in one marsh six were badly affected with the disease on mouths and feet. The seven cattle were slaughtered and buried on the spot, and an Order was at once passed to prevent movement of animals from the district, and also to prevent persons from passing through the marshes, and the whole district round has been kept under strict observation. Up to the present time no further cases have been reported, and no clue has yet been obtained as to the origin of the outbreak.

Swine Fever.—The number of cases, which for some time past has reached an average of over 500 per month, has recently fallen to little more than half that number. But it may be observed that a decrease in the number of attacks has always been noticed at this season of the year.

Anthrax.—There have not been any serious outbreaks of anthrax recently, and nearly all the cases reported have been confined to cattle.

Rabies.—This disease has been very prevalent lately, especially in Lancashire and the West Riding of Yorkshire. Only one case has been reported in London.

The Committee gave notice that at their next meeting they would move —(1) For the renewal of their annual grant of £600, of which £500 would be allocated to the Royal Veterinary College and £100 reserved for general purposes; and (2) for the payment to the College, during 1895, of the special grant of £200 for the purpose of further investigations into abortion in cattle.

Stock Prizes.

Mr. Sanday (Chairman) reported that the Committee had further considered the prize-sheet for the Darlington Meeting, and recommended that copies, including the proposals of the Local Committee (which were not yet complete), be printed and forwarded to each Member of Council before the meeting in December, when the prize-sheet would come before the Committee for final approval. The Committee further recommended that the following offers of champion prizes for the Darlington Meeting be accepted, with thanks:—

From the Polled Cattle Society: Two gold medals for the best male and the best female in the Aberdeen-Angus classes.

From the Suffolk Sheep Society: A gold medal for the best two-shear or shearling ram in the Suffolk sheep classes.

From the National Pig Breeders' Association: Four champion prizes, value 5 guineas each, for the best animals in the following breeds:—Large White, Middle White, Small White, and Tamworth.

Letters had been received from the National Sheep Breeders' Association and the Suffolk Sheep Society as to the continuance of classes and prizes for ewe lambs, as at the Cambridge

Meeting, but the Committee were unable to recommend the adoption of the suggestion. A suggestion from the Suffolk Horse Society, that the names of the Society's veterinary inspectors at the Show, and the classes to which they were allotted, should be published at an early date, was considered; and the Committee recommended that the names of the veterinary inspectors should be published, with the names of the judges, in the March number of the Journal. To indicate the particular classes allotted to each veterinary inspector for inspection would, in the opinion of the Committee, be impracticable. The Committee had also considered a further suggestion from the same society, that the veterinary examination should be extended to fillies as well as to stallions and brood mares; but they did not recommend any alteration in the present arrangements.

Mr. BOWEN-JONES said that a good deal of disappointment had been caused among sheep-breeders because the classes for ewe lambs had not been retained amongst the prizes offered by the Society. At the Cambridge Meeting prizes for these classes had been offered by the Local Committee, and they had proved a great success. They were regarded by sheep-breeders generally as having proved very satisfactory, and he believed the entries were greatly admired by the public. He had attended the meeting yesterday, when he had proposed that the ewe lamb classes should be recognised by the Society, and the same prizes offered for them next year at Darlington by the Society as were offered for them this year through the Local Committee. The Stock Prizes Committee had, however, decided not to include these classes at Darlington, and he therefore felt it his duty, as being a member of the National Sheep Breeders' Association, which had passed a resolution in favour of these classes, to ask the Council to give the same prizes for these classes as were given by the Local Committee this year. Accordingly he moved the inclusion of these prizes as an amendment to the report of the Committee.

Mr. A. J. SMITH having seconded the amendment,

Mr. SANDAY explained that the Committee, whilst in agreement with Mr. Bowen-Jones and the National Sheep Breeders' Association as to the value of these classes, felt that at this stage it would be impossible to agree with the suggestion, because it would necessitate the recasting of the whole of the prize-sheet for the present year. It was a subject that might very well be considered for another year, but there was certainly a consensus of opinion upon the Committee that it could not be dealt with at the present moment.

Mr. BOWEN-JONES's motion was then negatived, and the letter from the National Sheep Breeders' Association on the subject was ordered to be referred to the Stock Prizes Committee for consideration next year.

A further amendment by Colonel CURTIS-HAYWARD, to the effect that third prizes should be given by the Society in the class for Jersey yearling bulls, not being seconded, fell to the ground, and the report of the Committee was then adopted.

On the motion of Mr. SANDAY, an offer, received since the meeting of the Committee, of two champion gold medals from the Hackney Horse Society, for the best stallion and the best mare or filly exhibited in the Hackney classes at Darlington, was accepted, with thanks.

Implement.

Mr. FRANKISH (Chairman) reported that the Committee had considered and approved the following regulations drafted by the Society's Consulting Engineer in connection with the exhibition of oil-engines:—

(a) Petroleum oils with high flashing point, to which the Petroleum Acts do not apply, must be stored in the original (40-gallon) casks, the maximum number of casks not to exceed three in number; these to be placed in the space at the back of the stand in such a manner as the Stewards may direct.

(b) In the case of fixed oil-engines in motion, the exhaust must be led up, outside the shed, vertically to the height of the ridge of the roof, and must be kept well clear of the canvas.

The prize-sheet and regulations for the exhibition of implements at the

Darlington Meeting had been considered, revised, and finally approved, and the Committee recommended that a copy, as amended, be sent to each Member of Council, with a view to their formal adoption at the December meeting. The Committee had considered the recommendation of the Dairy Committee, that in future no exhibitor should be allowed to hold at his stand any demonstration of the churning of butter or the separation of cream, and recommended the insertion of a regulation to this effect in the prize-sheet.

The Committee approved the recommendations of the Judges of miscellaneous implements at the Cambridge Meeting, that two machines, entered as new implements at that Meeting, viz., the potato-picking machine exhibited by Mr. William J. Burgess, of Magdalen, Lynn, and the stone-picking machine exhibited by Messrs. J. Woods and Co., of Stowmarket, should be allowed to go forward as "new implements" at the Darlington Meeting, provided the entries were received in the regular course.

General Darlington.

Mr. DENT[1] reported that the Committee had considered the list of prizes proposed to be offered by the Local Committee, with the suggestions of the Stock Prizes Committee, and had referred back the list for further consideration.

Showyard Works.

Sir JACOB WILSON (Chairman) reported that since the last meeting the Surveyor had cleared away the whole of the Society's plant from Cambridge, and had erected the entrances and stored away the plant at Darlington Mr. Bennison had presented a detailed statement of the cost of the various works in the Showyard at Cambridge, from which it appeared that, after deducting the amount realised by sales of materials and received from exhibitors and purveyors (4,972*l.* 9*s.*), the total cost was 5,761*l.* 5*s.* 8*d.* The Committee recommended the acceptance of the tenders (1) of Messrs. Richard Wade & Sons, of Hull, for the supply of timber at Darlington; (2) of Messrs. Walter Hill & Co for the advertising of the Darlington Meeting. They also recommended that in future there be two reserved stands on either side of the Royal Stand at the horse-ring, one to be for complimentary tickets to be issued by the executive of the Show, and the other to have numbered seats, to be charged for at the rate of 5*s.* each for the first three days of the Show, and 2*s.* 6*d.* for the other two days.

Selection.

The Hon. CECIL T. PARKER reported the Committee's recommendation that Lieut.-Col. Curtis-Hayward be appointed a Steward of Stock, that Mr. Frankish be appointed a Steward of Implements, and that Mr. Rowlandson be appointed to supervise the trials of haymakers and other machinery after the Darlington Meeting.

A formal motion to this effect was moved by the Hon. CECIL T. PARKER, seconded by Sir JACOB WILSON, and adopted.

Education.

On the motion for the further consideration of the recommendations of the Committee with regard to the future granting of Education Life Memberships,

Sir NIGEL KINGSCOTE said that as this was a matter of great importance, on which considerable difference of opinion existed, and as many members of Council, greatly interested in the matter, had been compelled to leave

[1] This was, unhappily, the last appearance of Mr. Dent at the Society's Council Meetings, at which he had been a regular attendant during the long period of over thirty-three years. Elected to the Council in 1861, when he was less than thirty-five, he speedily took a leading and influential share in the Society's deliberations, both in Committee and Council. He was an active Member of the Journal Committee (of which he was Chairman from 1874 until his election to the Presidency in 1881), of the Chemical and Veterinary Committees, and of the Education Committee (of which he was Chairman on two occasions), besides being a member of almost all the special committees appointed from time to time to consider the administration of the Society. He died on December 22, 1894, aged sixty-eight, leaving behind him an imperishable record of conscientious work for the Society's welfare.—E. C.

owing to the protracted nature of their proceedings that day, he thought it would be preferable to reserve a decision as to the recommendation of the Education Committee until the next meeting. He claimed, therefore, under Bye-Law 26, that the sense of the meeting should be taken as to whether the question should be postponed until the December Council.

After a discussion in which Mr. FOSTER, Lord MORETON, Mr. MARTIN, and others took part, it was decided on a division, by 12 votes to 4, to adjourn the debate until December; and it was agreed that the Education Committee's report on the subject should then, as postponed business, take precedence of the reports of other Committees (see page clxxix).

Lord MORETON (Chairman of the Education Committee) said that as the recommendations of the Committee on this subject would be circulated amongst the Council before the December meeting, he would confine himself to dealing with the other parts of the Committee's report. A total of thirty-five candidates from nine schools had been entered for the Society's Junior Examination to take place next week. The ten pupils who won the Junior Scholarships last year having now complied with the Society's regulations, the Committee recommended the payment of the Scholarships and the despatch of the certificates. The Committee recommended that the next Senior Examination be held from May 7 to 11, 1895. A communication had been received from the Charity Commissioners, asking whether the Society would be prepared to appoint a representative Governor on the foundation at Egham known as Henry Strode's Charity, and the Committee recommended that the Secretary be authorised to reply in the affirmative.

The Committee gave notice that at their next meeting they would move for the renewal of their annual grant of 500*l.*

Dairy.

The Hon. CECIL T. PARKER (Chairman) reported that the Committee had agreed upon a preliminary schedule of prizes for dairy cattle, poultry, and dairy produce in connection with the Darlington Meeting of 1895, which it was proposed to include in the draft prize-sheet to be settled next month. The Committee recommended the acceptance of prizes offered by the Local Committee in the butter-making competitions, and for dairy cattle, cheese, and butter, subject to arrangement of details. A resolution from the Eastern Counties Dairy Farmers' Society, as to the sale of separated milk as whole milk, had been read, but the Committee did not recommend any present action in regard to it.

The Committee gave notice that at their next meeting they would move for a renewal of their annual grant of 100*l.*

Miscellaneous.

An invitation to the Society to hold its Country Meeting of 1897 at Cardiff was read, and the thanks of the Society ordered to be sent therefor, the invitation to be further considered when the district for the 1897 Show was formally resolved upon next year.

Various letters and other documents having been laid upon the table, the Council adjourned until Wednesday, December 12, 1894, at noon.

WEDNESDAY, DECEMBER 12, 1894.

SIR JOHN H. THOROLD, BART. (PRESIDENT), IN THE CHAIR.

Present:—

Trustees.—Earl Cathcart, Col. Sir Nigel Kingseote, K.C.B., Rt. Hon. Sir M. W. Ridley, Bart., M.P.

Vice-Presidents.—H.R.H. Prinee Christian, K.G., Mr. H. Chandos-Pole-Gell, Viseount Emlyn, Rt. Hon. Sir Massey Lopes, Bart., Lord Moreton, Mr. Charles Whitehead.

Other Members of Council.—Mr. J. H. Arkwright, Mr. Alfred Ashworth, Mr. Joseph Beaeh, Mr. J. Bowen-Jones, Lord Brougham and Vaux, Mr. Charles Clay, Mr. F. S. W. Cornwallis, M.P., Earl of Coventry, Mr. Perey Crutehley, Lieut.-Col. J. F. Curtis-Hayward, Mr. Alfred Darby, Mr. J. Marshall Dugdale, Mr. W. Frankish, Mr. Anthony Hamond, Mr. James Hornsby, Mr. C. S. Mainwaring, Mr. T. H. Miller, Mr. J. E. Ransome, Mr. S. Rowlandson, Mr. Howard P. Ryland, Mr. G. H. Sanday, Mr. W. T. Searth, Mr. A. J. Smith, Mr. Henry Smith, Sir J. L. E. Spearman, Bart., Mr. E. W. Stanyforth, Mr. Riehard Stratton, Mr. Martin J. Sutton, Mr. R. A. Warren, Mr. C. W. Wilson, Sir Jacob Wilson.

Officers.—Mr. Ernest Clarke, Secretary; Dr. Fream, Editor of the Journal; Dr. J. Augustus Voeleker, Consulting Chemist; Mr. Wilson Bennison, Surveyor; Professor Brown, C.B.

The following members of the Darlington Local Committee were also present:—Captain Gerald Walker, the Borough Surveyor (Mr. Thomas Smith), and Mr. F. Raymond Steavenson (Secretary of the Loeal Committee).

Apologies for non-attendance were received from the Duke of Westminster, K.G., the Earl of Feversham, the Hon. Cecil T. Parker, Sir A. K. Maedonald, Bart., Mr. J. A. Caird, Mr. John Dent Dent, Mr. S. P. Foster, Mr. Charles Howard, Mr. Albert Pell, Mr. J. P. Terry, and Professor Simonds.

The minutes of the last monthly meeting of Couneil, held on November 7, having been taken as read and approved, the eleetion of two Governors and thirty-one Members was proeeeded with as follows:—

Governors.

STUBS, P...Blaisdon Hall, Newnham, Glos.
WRIGHT, W...Wollaton, Nottingham.

Members.

ANGUS, W. G...Bearl, Stocksfield-on-Tyne.
AUSTEN, R. A. G...Nore, Hascomb, Godalming.
BANNER, T...East Cowton, Northallerton.
BENTON, C. H...Chelford Road, Knutsford.
BROWN, T...Littleton Farm, Reigate.
BRUCE, R. Knight..Ledburn Manor House, Leighton Buzzard.
BUCKHAM, J...Alderdene House, Lanchester, Durham.
DAWSON, G...Haughton, Darlington.
ELLERINGTON, R...Ashington Colliery Farm, Morpeth.
ELLIOTT, A. E...Estate Office, Elveden, Thetford.
GREGSON, W., F.G.S., F.S.I...Baldersby, Yorks.
GURNEY, R. H. J...Northrepps Hall, Norwich.
HINDE, H...14 East View, South Shields.
LITTLEDALE, J. B...Sandiway Bank, Hartford, Cheshire.
MARLBOROUGH, DUKE OF..Blenheim Palace, Woodstock.
MAUDSLEY, G...The Arcade, Lancaster.
MITCHELL, G. S...Upper Adburst, Petersfield.
MOIR, J...Brereton Hall, Sandbach.
MULHOLLAND, A. J...Woodrising Hall, Hingham, Norfolk.
PIETERMARITZBURG AGRICULTURAL SOCIETY..Pietermaritzburg, Natal, South Africa.
PRYSE, Capt. E. J. W...Parry, Noyadd-Trefawr, Boneath, Cardigan.
RICHARDS, J. C. A...Blaby Hall, Leicester.
RICHARDSON, W. J...Kirklevington Hall, Yarm, Yorks.
SKIRVEN, J...Grange Farm, Wingate, Ferry Hill.
TRAFFORD, H. R...The Court, Michaelchurch, Hereford.

TRIBLE, A...Halsdon Barton, Cookbury, Brandis Corner, Devon.
TURNBULL, J...15 Hudson Street, Tyne Dock, South Shields.
WESTGARTH, John..Brougham Home Farm, Eamont Bridge, Penrith.
WETHERELL, James..Tempsford, Sandy.
YORKE, J. C...Trecwn, Letterston, Pembroke.
YOUNG, E. Burney..35, Walbrook, E.C.

Education Life Memberships.

Lord MORETON (Chairman of the Education Committee) said that the Council would be aware that at the November meeting the consideration of the proposals of the Education Committee with reference to the granting in future of Life Memberships of the Society, as rewards at the Senior Examination, had been postponed owing to the large amount of other business to be transacted on that occasion. The Education Committee had again carefully considered the question, with a view of meeting as far as possible the opinions which had been expressed by members of the Council, and they had agreed upon a report, which he now laid upon the table (see page 751). Following up the recommendations of that report, he begged formally to move on behalf of the Committee—

1. That in future five Life Memberships be placed annually at the disposal of the Education Committee, to be awarded to those candidates at the Society's Senior Examination who stand highest on the list of winners of first-class certificates, and who obtain not less than two-thirds of the maximum number of marks.

2. That no money prizes be offered for the future at the Senior Examination, but that instead thereof the Society's gold medal be awarded to the candidate who stands highest on the list, and the Society's silver medal to each of the next four candidates on the list, provided that in each case the candidate has obtained the number of marks qualifying for a Life Membership.

3. That the winner of a gold medal be permitted to style himself "Gold Medallist of the Royal Agricultural Society of England"; and the winner of a silver medal, "Silver Medallist of the Royal Agricultural Society of England."

4. That these proposals be embodied in the regulations for the next Examination, to be held in May 1895, now submitted in draft.

5. That the Report of the Education Committee on this subject be received and adopted, and be printed in the Journal for general information.

Mr. CHANDOS-POLE-GELL having seconded the motion,

Mr. SUTTON said that he was very reluctant, after the great trouble which his Lordship and the individual members of the Committee had taken in the matter, to propose any amendment; but he hoped that the Council and Lord Moreton himself would agree to the proposal that the award of the Society's gold medal to the candidate placed first in the Examination should be conditional upon his having obtained three-fourths of the maximum number of marks. It appeared to him to be highly undesirable that the Society's gold medal should be given to anyone who was not *facile princeps*, or who was not really a first-rate man. He took it as being quite clear that they did not wish the gold medal to be given one year to a man who was decidedly inferior to the candidate receiving it another year. He would propose that, where there was no such specially good man who had earned three-fourths of the total marks, no gold medal should be given, but that five silver medals should be given instead of one gold and four silver medals. He considered that this was a question of great moment, and that it would be very unfortunate if it were not now finally settled. He did not wish to throw the matter into the crucible again, but hoped that Lord Moreton would see his way to accepting his (Mr. Sutton's) small amendment.

Mr. SANDAY seconded the motion, and expressed himself as thoroughly in accord with all that Mr. Sutton had said.

Lord MORETON was not altogether sorry that this question had been raised, and no one was better qualified to raise it than Mr. Sutton, who had taken so much interest in the matter. The Committee sat yesterday longer than he ever remembered it to sit before—from 3.30 p.m. to 5.30 p.m., and a considerable portion of that time was devoted to the question as to whether there should be a two-thirds or a three-fourths standard. Although the difference between the two did not appear very considerable at first sight, the statistics which had been compiled as to the percentage of marks gained by the successful candidates showed that three-fourths of the marks were gained by only a small proportion of the candidates. As, however, he understood Mr. Sutton's present proposition, the three-fourths standard was only proposed to be required for the gold medal. He thought it undesirable to complicate their standards too much, and on the whole he preferred the proposal made by the Education Committee after very full discussion yesterday. It was a great thing to have simplicity in rules, and he thought that the matter would be unnecessarily complicated if the gold medal should be for those who passed one standard of three-fourths, and the silver medal for those who passed with two-thirds. If the proposal originally put was adopted, the gold medallist would be the best of the five candidates. What he objected to was the loading of the rules with intricate distinctions.

Earl CATHCART said he could not appreciate that argument. He felt there must be a distinction. He thought it was upon this ground that the Surveyors' Institute had so increased the stringency of their examination, and the Council ought also to be stringent in respect to the examinations of the Society, in order to keep pace with what was going on outside. For this reason he felt obliged to vote for the amendment of Mr. Sutton.

Viscount EMLYN said he thought there was one point which had not as yet been touched upon. The object was to raise the gold medallist distinctly above the silver medallists. There was to be only one gold as against four silver medals; but what would be the result of giving these medals as proposed by Mr. Sutton? They would have gold medallists gaining three-fourths of the marks, and silver medallists coming next with the same proportion; one getting the gold, and the other the silver medal. There might be very little margin, but a candidate with the marks that obtained the gold medal of the year before might only obtain the silver medal in his own year.

Mr. SUTTON'S amendment was then put, and declared carried by 18 votes to 11.

Sir NIGEL KINGSCOTE said that it was a matter of very great regret that their friend Mr. Pell was not there that day owing to ill health, because he would have supported very strongly, both in Committee and before the Council, his (Sir Nigel's) view on the question of these Life Memberships. They were going now to adopt a proposal to give annually five Life Memberships. Certainly the proposal was safeguarded to some extent by the proviso that the recipients must pass with two-thirds of the maximum number of marks; but if they referred to the statistics, they would find that a great many of those who came up for examination passed with two-thirds of the marks. This year there were six, in 1893 there were eight, in 1889 there were seven, so that it would be practically an absolute certainty that the five Life Memberships would have to be given away each year. He felt very strongly —not from the pecuniary point of view—and he believed that he was confirmed by the opinions of many outside, that the great object of candidates in coming up for this examination was to obtain Life Memberships. He thought the Council ought to make them more valuable, and that five per annum were too many. Since they began giving Life Memberships in 1868, they had granted in all 106. He thought it would make the Life Membership much more valuable if the number were limited to four every year, and he therefore moved as an amendment that four Life Memberships be granted, with a corresponding number of medals, instead of five, as proposed by the Committee.

Mr. FRANKISH having seconded the amendment,

Sir JACOB WILSON said that, whilst they all regretted very much the absence of Mr. Pell, he also regretted the absence of Mr. Foster, who represented the other side of the question. Mr. Foster had requested him (Sir Jacob) to express regret that, although he attended on purpose for this matter in November, he was unable to come up again in December. The matter had received, no doubt, a great deal of anxious consideration at the hands of the Education Committee, and he was bound to say that, so far as he could see, they had arrived at a very satisfactory compromise. Seeing the Society had recognised as part of its duty the encouragement of agricultural education, the Council had, in their wisdom, offered certain prizes to be obtained as the result of examinations. These examinations had been eminently successful, and they now desired to take away the rewards because of that success. Surely that must be an inconsistent condition of things. Let them fancy the application of this principle in the case of the breeding of stock, such, for example, as Shropshire sheep, which were well represented in that room. He could remember the day when this breed did not occupy the important position in the prize-sheet that it did now. Breeders were very much encouraged by the prizes given, and the result was that the entries for this breed of sheep were now something enormous. What would the exhibitors of the breed say if, because they had succeeded so well in consequence of the prizes offered, the Council now said that they must take away these prizes or cut them down? His simile as to a Shropshire sheep was not altogether out of place, since they offered 15*l.* for a Shropshire ram and 15*l.* for an agricultural student. (Laughter.) A certain number of their friends wanted now to take away the money altogether. If ever this were a question of importance at all, it was now, when young men were being looked for to fill appointments in connection with the County Councils and otherwise. Yet they were trying to take away from them a great many of the privileges which were formerly offered. There was no doubt that if Life Memberships were given as an alternative to money prizes, candidates would attach much greater weight to the Life Membership. He would remind them, however, that a great many of these men had risen from a humble social position, and that they could not afford to come up to London and risk such large expense unless they had some slight monetary advantage as well. He hoped that the Council would support the Committee in their recommendation, and not be niggardly in offering rewards which cost them so little.

The PRESIDENT then put Sir Nigel Kingscote's amendment, which was lost by 6 votes to 22.

Lord MORETON then moved the adoption of the recommendations of the Education Committee, subject to the alteration proposed by Mr. Sutton, viz., that the gold medallist should be required to obtain three-fourths of the maximum number of marks.

Mr. WHITEHEAD seconded, and the motion was carried *nem. dis.*

The ordinary reports of the various Standing Committees were then received and adopted as below:—

Finance.

Sir NIGEL KINGSCOTE (Chairman) reported that the accounts for the month ended November 30, 1894, as certified by the Society's accountants, showed that the total receipts for that period were 2,713*l.* 1*s.* 6*d*., and the expenditure was 2,047*l.* 9*s.* 10*d.* The balance at the bankers' on November 30, allowing for cheques outstanding, was 1,695*l.* 0*s.* 3*d.* Accounts amounting in all to 4,095*l.* 16*s.* 6*d.* had been passed, and were recommended for payment. The balance-sheet for the Cambridge Meeting, showing a net profit of 1,096*l.* 1*s.* 7*d.*, had been laid upon the table. The Committee had met ten times, and made ten reports during the year.

House.

Sir NIGEL KINGSCOTE (Chairman) reported that the furnishing and fittings of the new premises were now practically complete. A new valuation of the Society's belongings was about to be made, and the revised figure would appear amongst the Society's assets in the balance-sheet for 1894. The Committee had met seventeen times, and made eight reports during the year.

Sir NIGEL KINGSCOTE gave notice of a formal motion for the amendment of Bye-law 19, to bring it into strict conformity with the wording of Section 1 of the Act 6 and 7 Vict., cap. 36.

Journal.

Earl CATHCART (Chairman) reported that in connection with the Committee which had been formed by the Board of Trade to consider the question of Light Railways, on which Committee the Society was represented by himself, the Journal Committee recommended that a circular letter be sent with the parcel containing the next number of the Journal, asking for any suggestions from members as to the agricultural requirements of their districts with regard to light railways (see page clxxxvi.).

A reprint had been authorised of Professor Brown's pamphlet on "Animals of the Farm in Health and Disease." Instructions had been given to the Editor as to the contents of the forthcoming number of the Journal, and as to various suggested articles and notes. The Committee had met eight times, and made eight reports.

Chemical.

Viscount EMLYN (Chairman) reported the settlement of a variety of details connected with the Society's Chemical Department. The annual report for 1894 of the Consulting Chemist had been submitted, and approved for publication in the forthcoming number of the Journal (see page 764). As the Woburn Sub-Committee was now nearly as large as the Chemical Committee itself, it did not appear to the Committee necessary that a special Sub-Committee should, in future, be appointed to deal with matters relating to the Experimental Farm. They accordingly recommended that the Committee be described in future as the "Chemical and Woburn Committee," and that such Committee report direct to the Council on all matters connected with the Experimental Farm. The Committee had met eight times, and made eight reports during the year.

On the motion of Viscount EMLYN, the Quarterly Report of the Chemical Committee was adopted, and ordered to be published in the next number of the Journal (see page 748).

Lord EMLYN said the Chemical Committee had received with much regret an intimation from Sir Thomas Acland that, owing to advancing years, he desired his name to be withdrawn from the Committee. The Committee had felt bound to comply with this request, but, at the same time, they hoped they might have the advantage of Sir Thomas's presence as an *ex-officio* member if he should be able to attend any of their meetings.

Botanical and Zoological.

Mr. WHITEHEAD (Chairman) reported that the Society's Botanist and Zoologist had submitted their annual reports for 1894, which the Committee recommended should be published in the next number of the Journal (see pp. 773 and 774). A letter had been received from the Colonial Office inclosing copies of despatches from the Governor of Malta, reporting that the importation into that colony of potatoes from the United Kingdom had been prohibited in consequence of potato disease, partly on information furnished by the "British Agricultural Society," and (on the presumption that the Royal Agricultural Society was the Society referred to by the Governor) asking to be furnished with any information which might have been sent to Malta by the Society as to the existence of potato disease in Ireland. The Committee recommended that publicity be given to the fact that no information on the subject had been directly furnished by the Royal Agricultural Society of England to authorities or correspondents in Malta.

The Committee had met eight times, and made eight reports.

Veterinary.

Mr. ASHWORTH (Chairman) reported the Committee's recommendation that a horse-shoeing competition be held in connection with the Darlington Meeting, and that prizes be offered in two classes: (1) for the shoeing of cart horses, and (2) for the shoeing of hunters. They recommended that a total amount of 16*l.* be offered in each class, and that its distribution be left to the discretion of the Judges, provided that no prize of a less amount than 1*l.* be given, and that not more than six prizes be given in each class. This change was proposed in view of the difficulty experienced by the judges when they had before them a number of candidates whose merits were practically equal. A letter had been received from the Worshipful Company of Farriers, stating that the Company would present the freedom of their Guild to the winners of the first prizes, free of cost, provided the judges considered sufficient ability had been displayed, and that the Registration Committee of the Company would admit the first-prize winners to the official register free of charge, and (on payment of the usual fees) all other competitors who shall duly satisfy the judges of their efficiency. The Committee recommended that the offer of the Farriers' Company be accepted with thanks. The Committee moved for the renewal of their grant of 600*l.* for the year 1895, and that of this sum 500*l.* be allocated to the Royal Veterinary College. They also recommended the payment to the College during 1895 of the special grant of 200*l.* which had been made by the Council for the purpose of further investigations into abortion in cattle. The Committee had met eight times, and had made eight reports during the year.

The following report had been presented by Professor Brown :—

PLEURO-PNEUMONIA.—No case of this disease has been found among home-bred cattle in Great Britain since the last meeting of the Committee in November, but three cases of the disease have been discovered in cattle brought from the United States.

FOOT-AND-MOUTH DISEASE.—In addition to the outbreak which occurred at Rainham, in Essex, at the end of October, two more have occurred since, one at Linton, in Cambridgeshire, and the other at Rodmersham, near Sittingbourne, in Kent. In both these cases sheep were affected. Restrictions on sales and movement of animals were at once imposed over a large district, including the counties of Cambridge, Essex, Herts, Kent, London, Middlesex, and part of Suffolk. In the Kent outbreak the diseased sheep and those in contact were slaughtered. In the Cambridgeshire outbreak, where the disease appeared among a flock of some 200 in-lamb ewes, it was decided to adopt a system of strict isolation instead of slaughter. There was no extension of the disease in either case. The foot-and-mouth-disease restrictions have now been withdrawn, except as regards two small areas round the infected places.

SWINE FEVER.—During the five weeks ended December 1, according to the *Gazette* returns, 462 pigs died from swine fever in Great Britain, 3,072 were slaughtered as diseased or having been exposed to infection, and 109 were slaughtered as suspected, but were found free from swine fever on post-mortem examination. This is a slight increase on the number of deaths and pigs slaughtered as diseased or in contact as compared with the figures for the preceding five weeks, but there is a small decrease in the number of pigs slaughtered as suspected. A point worthy of notice with regard to these swine fever *Gazette* returns is that, in the last published one, there is no Scotch county mentioned; a circumstance which has not occurred since the week ended April 7.

ANTHRAX.—This disease still maintains a high rate of prevalence. During the five weeks ended December 1 there were 40 fresh outbreaks, 69 animals attacked, 6 diseased animals were killed, 48 died, and 13 recovered. The returns for 48 weeks show 456 outbreaks and 945 animals attacked, as compared with 515 outbreaks and 1,207 animals attacked in the corresponding period of 1893, and 256 outbreaks and 550 animals attacked in 1892.

RABIES.—This disease still continues on the increase. During the past five weeks there have been 43 cases, or nearly 9 per week, whereas in the first quarter of the year the cases did not average 3 per week. There have been 206 cases of rabies in 48 weeks this year, as compared with 89 in the corresponding period of last year, and 34 in 1892. The disease has occurred in the counties of Chester, Derby, Lancaster, and York (West Riding).

ABORTION EXPERIMENTS.—Two pregnant cows from healthy stock were obtained early in November, and since that time two recently aborted cows were purchased from a stock in which twenty-six cases of abortion have occurred during the present year.

Stock Prizes.

Mr. SANDAY (Chairman) reported that the second-prize animal in Class 81 at the Cambridge Meeting (Mr. W. S. Forster's cow, "Blackeyes") had become disqualified for the prize, and they recommended that the second and third prizes in this class be awarded as follows:—

No. 864, SECOND PRIZE of 10*l.* to Mr. LOUIS HUTH, for "Virgin 20th" (Third Prize).

No. 859, THIRD PRIZE of 5*l.* to Major BEST, for "Dahlia 3rd" (Reserve Number).

The offer from the Hackney Horse Society of two champion gold medals for the best Hackney Stallion and the best Hackney Mare or Filly exhibited at the Darlington Meeting had been accepted with thanks.

Letters had been received from the Secretaries of the Durham County and Northumberland Agricultural Societies on the subject of the shearing of Cheviot and Blackfaced Mountain sheep, and suggesting an alteration of the Society's regulation with regard to shearing, so as to include these two breeds amongst those sheep which must be shorn before being exhibited; and the Committee recommended that the regulation respecting the shearing of sheep be amended to meet these views.

The Committee had finally revised the prizes and regulations for the Darlington Meeting, including the prizes proposed to be offered by the Darlington Local Committee, and they recommended that the Prize Sheet be issued forthwith (see p. cxci.). They also recommended that the Chairman be empowered to accept any champion prizes from breed societies which might be offered before the Prize Sheet was printed, and which complied with the regulations. The Committee had met eight times during the year, and made eight reports.

On the motion of Mr. SANDAY, the following further offers of champion prizes were accepted with thanks:—(1) From the Shire Horse Society: two champion gold medals for the best Shire stallion and the best Shire mare or filly; (2) from the Kerry and Dexter Cattle Society: two champion prizes of 10 guineas each for the best Kerry and the best Dexter Kerry animals exhibited at the Darlington Meeting.

Implement.

Mr. FRANKISH (Chairman) reported that the Committee had considered and approved the arrangements which had been made by Mr. Rowlandson, as Steward of Forage, for securing land and crops for the trials of haymaking machines in connection with the Darlington Meeting. As in all probability the trials of haymaking machines would take place in the first week in July, the Committee recommended that the Society should take charge of the competing machines exhibited in the Showyard during the interval between the closing of the Show and the time of the trials. The Committee had met eight times, and made eight reports during the year.

General Darlington.

Sir MATTHEW RIDLEY reported that the list of prizes for stock proposed to be offered by the Local Committee, as amended by the Stock Prizes Committee, had been considered and approved, and an additional class for Stilton cheese made in 1894, offered by the Local Committee, had been accepted. The Local Committee had nominated the following agents:—For lodgings: Mr. H. G. Steavenson, Houndgate, Darlington; for dairy produce: Mr. R. Wilkin Drury, Blackwellgate, Darlington; for season tickets: Messrs. Bailey and Co., Horse Market, Darlington.

Showyard Works.

Sir JACOB WILSON (Chairman) reported that instructions had been given to the Surveyor for a revaluation of the Society's permanent plant. The Committee recommended the acceptance of the following offers:—(1) Messrs. Shand, Mason, and Co., for the supply of fire appliances at Darlington; (2) Messrs. J. A. Haward and Son, of Darlington, for the furnishing and decoration of the Royal Pavilion; (3) Messrs. Thomas Walker and Sons, of York, for the sale of timber, &c., after the Darlington Meeting.

Committee of Selection.

Earl CATHCART (Chairman) reported that the Committee recommended Professor Wilhelm Fleischmann, Director of the Agricultural Institute of the Royal University of Königsberg, for election as an Honorary Member of the Society, in recognition of his distinguished services to European agriculture, and especially to the industry of dairying. The Committee were of opinion that, as the first Wednesday in June, 1895, fell in Whit-week, it would be more generally convenient to hold the last Council meeting before the Darlington Show on the previous Wednesday, May 29. The ordinary May meeting of the Council would be held on May 1, and the Council meeting in the show week on June 26. The appointment, therefore, of May 29 as the date of the intervening Council meeting would have the additional advantage that it would be four weeks after the previous Council meeting of May 1, and four weeks before the next Council meeting in the Showyard on June 26.[1] The Committee had met seven times, and made seven reports during the year.

Earl CATHCART formally moved the election as an Honorary Member of the Society of Professor Fleischmann, whose great reputation made it very desirable that he should be associated with the Society in this manner.

Mr. WHITEHEAD seconded the motion, which was unanimously adopted.

Education.

Mr. MAINWARING reported that, of the thirty-five candidates from the nine schools who had entered for the Society's Junior Examination on the 13th and 14th ultimo, thirty-two from eight schools had actually competed. Of these, twenty had obtained the number of marks necessary to qualify them for scholarships and certificates in the event of their complying in the forthcoming year with the conditions of the examination. Of the twenty successful candidates, the first ten would receive scholarships upon complying with the Society's regulations, and the remainder would receive certificates (see p. 759).

The Committee moved for the renewal of their annual grant of 500*l.* for the ensuing year. They had met five times, and made five reports during the year 1894.

Dairy.

Mr. DARBY reported that the Committee had finally approved of the Schedule of Prizes for Dairy Cattle, Poultry, and Dairy Produce, which they had referred to the Stock Prizes Committee for incorporation in the Prize Sheet of the Darlington Meeting. They had also arranged the details for the Competition of Butter-makers at this meeting. They moved for the renewal of their annual grant of 100*l.* for the year 1895. The Committee had met seven times, and made seven reports during the year 1894.

[1] The dates of the Council meetings in 1895 will, therefore, be as follows: February 6, March 6, April 3, May 1, May 29, June 26 (at Darlington), July 31, November 6, December 11.

On the motion of Mr. STRATTON, seconded by Sir JACOB WILSON, and with the approval of Mr. Rowlandson as representing the Local Committee, an alteration was made in the prizes proposed to be offered by the Local Committee for dairy cows to be judged by their physical appearances at the time of judging. These will now read as follows:—For dairy cows over 1,000 lb. live weight, 15*l.*, 10*l.*, 5*l.*; for dairy cows not exceeding 1,000 lb. live weight, 15*l.*, 10*l.*, and 5*l.*

Standing Committees for 1895.

The following Standing Committees were appointed for 1895:—Finance, House, Journal, Chemical and Woburn, Botanical and Zoological, Veterinary, Stock Prizes, Implement, General Darlington, Showyard Works, Selection, Education, Dairy.

The present members of the various Standing Committees were (with some exceptions) reappointed to those Committees. Mr. Ryland was added to the Stock Prizes and Implement Committees, Mr. Martin to the Showyard Works Committee, and Mr. Crutchley to the Dairy Committee. To replace the Earl of Coventry, Sir Walter Gilbey, and Mr. Rowlandson, who retired by rotation from the Committee of Selection, Mr. Arkwright, Mr. Beach, and Mr. Wheeler were elected.

Committee for Selection of Judges.

On the motion of Sir JACOB WILSON, seconded by Mr. WHITEHEAD, a Committee was appointed to recommend Judges of stock, poultry, and produce at the Darlington Meeting; such Committee to consist of the members of the Stock Prizes Committee and the Stewards of the several departments, and to sit for the first time in February next.

New Standing Order.

On the motion of Earl CATHCART, seconded by Mr. SANDAY, it was resolved as a Standing Order—"That, as soon after appointment as may be, it is desirable that the Chairmen of the Standing Committees should confer in private, with a view to avoid all possible friction or overlapping in the conduct of the general business confided to the several Committees."

Conference on Light Railways.

The SECRETARY read a letter from the Board of Trade, received since the last Council meeting, inviting the Society to send three representatives to the Conference on Light Railways which had been convened for December 6.

The PRESIDENT said that as it appeared desirable that the Society should be represented at this Conference, and as it was necessary for action to be taken without waiting for the meeting of the Council, he had nominated as the Society's delegates to the Conference Earl Cathcart, Mr. Frankish, and the Secretary, and he trusted that these nominations had the Council's approval.

Earl CATHCART said he might perhaps mention that he had been elected a member of the Committee appointed at the Conference to go into the matter, and to bring up a report for consideration at a further meeting of the Conference to be held before the reassembling of Parliament. The functions of the Committee were to consider:—(1) How far the usual requirements of the Board of Trade as to constructing and working New Railways may fairly be relaxed, especially in the case of lines built through sparsely populated and agricultural districts. (2) Whether additional legal facilities for obtaining powers to construct Tramroads and Light Railways are neeessary or desirable. It was understood that the Government did not, as at present advised, propose to afford any pecuniary aid by way of loan or otherwise. The assistance of the State would only be in the direction of cheapening initial procedure and in lessening departmental requirements and restrictions. It ought to be borne in mind that any Light Railway intended to benefit agriculture should probably—without burdening Local Rates—be made ultimately to pay its own way. A "Light Railway" had been defined as any Railway of any gauge of inferior construction to existing requirements, and worked in an unwonted manner with the view to promote the utmost economy.

It being desirable that the agricultural aspects of the question should be fully considered, the Journal Committee thought it would be well to invite suggestions from Members of the Society as to the agricultural Light-Railway requirements of any particular district in which they might be interested. It would facilitate a general statement if such suggestions were given in the form of answers to the following schedule of questions: (*a*). District to be agriculturally developed, naming terminal towns, places, or stations; (*b*) Description of Light Railway considered most suitable; (*c*) The main line of Railway, if any, with which a suggested Light Railway should have connexions; (*d*) How funds for construction and equipment might possibly be provided —by local subscription, by rates, or advances on the security of rates, or by a combination of these sources, or otherwise; (*e*) Any other observations likely to prove useful for the purposes of the inquiry. To be of use, it was essential that any replies to the circular which the Journal Committee suggested should be enclosed with the new Journal should be forwarded to the Secretary as early as possible in the month of January.

Date of next Meeting.

Authority having been given for the Society's seal to be affixed to a new certificate to transferees of the Harewood House Debenture Stock, and the Report to the General Meeting of members having been prepared, the Council adjourned over the Christmas recess until Wednesday, February 6, 1895.

Proceedings at Half-yearly General Meeting of Governors and Members,

HELD AT THE SOCIETY'S HOUSE, 13 HANOVER SQUARE.

THURSDAY, DECEMBER 13, 1894,

SIR JOHN H. THOROLD, BART. (PRESIDENT), IN THE CHAIR.

Present:—

Members of the Council. — Earl Cathcart, Viscount Emlyn, Lord Brougham and Vaux, the Right Hon. Sir Matthew White Ridley, Bart, M.P., Sir Jacob Wilson, Messrs. J. Hungerford Arkwright, Alfred Ashworth, H. Chandos-Pole-Gell, Charles Clay, Lieut.-Col. J. F. Curtis-Hayward, Messrs. J. Marshall Dugdale, Wm. Frankish, Anthony Hamond, C. S. Mainwaring, P. Albert Muntz, M.P., G. H. Sanday, Martin J. Sutton, and Charles Whitehead.

Governors.—Lord Tredegar, Mr. W. F. Holt Beever, Lieut.-Col. G. Herbert Morrell, and Mr. W. Barrow Simonds.

Members.—The Hon. H. W. Fitzwilliam, Sir Richard H. Paget, Bart., M.P., Sir Henry Simpson, Messrs. R. C. Assheton, Thomas Carrick, Horace Cox, H. Denis de Vitré, T. A. Dickson, William Fortune, George Gibbons, Douglas A. Gilchrist, Charles Hamilton, Wm. H. Harrison, M. Hulton-Harrop, Surg.-Lieut.-Col. Ince, M.D., Messrs. C. D. Kemp-Welsh, Frederick King, William Langford, W. G. McLaughlin, Robert Milnes, jun., F. E. Muntz, Ralph Palmer, Edmond Riley, H. Le Roy-Lewis, S. Sandbach, Dr. Wm. Somerville, Messrs. J. P. Sowerby, Thomas Stirton, John Thornton, Jonas M. Webb, G. D. Yeoman, &c.

Officers.—Mr. Ernest Clarke, Secretary; Dr. J. Augustus Voelcker, Consulting Chemist; Mr. Wilson Bennison, Surveyor; Professor Brown, C.B.

The PRESIDENT, in opening the proceedings, said that he had great pleasure in congratulating them upon their first general meeting held in that beautiful house. He was sure that those members of the Society who had not before seen it would agree with the Council that they could not have a more suitable place in which to hold their meetings in the future, and he knew they would agree with him in cordially thanking those who had enabled them to obtain Harewood House. They all knew that it was the efforts of the Duke of Westminster and Sir Walter Gilbey which were mainly instrumental in enabling them to acquire the house. He only hoped that those present would use their best endeavours to increase the number of members of the Society, because they could not conceal from themselves that their expenses in the future would be very much increased.

Report of the Council.

The Report of the Council for the past half-year was taken as read, the Secretary giving a brief synopsis of its contents (see page 739).

Lord TREDEGAR, in moving the adoption of the report, said that the possession of those excellent rooms should greatly facilitate the various discussions carried on by the Council, and would therefore assist the great cause of agriculture in which they were all so anxiously interested. He referred with satisfaction to the comprehensive list of prizes, including those offered by the Local Committee provided for the Darlington Meeting. He looked upon the butter-making competitions as of great importance. On this subject he could speak from his own experience, as they had proved most satisfactory in his part of the country, and the butter and cheese schools in South Wales had done an immense amount of good. He thought they must congratulate the Board of Agriculture on their successes in stamping out pleuro-pneumonia and foot-and-mouth disease. He doubted, however, the advantage of attempting to stamp out swine fever in the same way, as in his district the most stringent regulations had failed to produce beneficial results.

Mr. GEORGE GIBBONS, in seconding the motion, referred to the importance of increasing the number of members. Their membership might be increased to 20,000 if each existing member were to introduce a new member during the coming year. With regard to contagious diseases, he considered that tuberculosis deserved more attention than it at present received. No disease was more fatal to cattle, and medical experience testified that no disease was more fatal to the human being.

The motion for the adoption of the Report was then put, and was unanimously adopted.

Vote of Thanks to Auditors.

Mr. T. A. DICKSON said he had great pleasure in proposing a vote of thanks to the Auditors (Messrs. A. H. Johnson, C. Gay Roberts, and S. B. L. Druce) for their services during the past year, and he moved that they be re-elected for the ensuing year. They had done their work well in the past, and that was the best guarantee that they would do it well in the future. He desired to take that opportunity of thanking the Council for reconsidering the question of the Education Life Memberships, and he hoped that the decision arrived at on the day before would never be regretted by the Council. He hoped that those who were elected Life Members of the Society by examination would do all they could to further the interests of that great body, and that they would always be a credit to it.

Mr. G. D. YEOMAN had great pleasure in seconding the vote of thanks to the Auditors. He would like to see the members increase year by year, and agreed that one should do all one could to get others to join, seeing that the Society was the backbone of English farming.

Suggestions by Members.

In response to the usual enquiry from the Chair, as to whether any member had remarks to make or suggestions to offer for the consideration of the Council,

Sir HENRY SIMPSON drew attention to the action of the Registration Committee of the Farriers' Company in granting registration to "Doormen," who were only able to take off and put on a horse's shoe, and who were not capable of making the shoe. He instanced the benefit which had been derived from the Society's shoeing competitions, and from the registration of all-round farriers, which had resulted in their being able to obtain in country districts the services of men who not only knew how to shoe a horse well, but who also knew something about the structure of the horse's foot. He hoped that the consent of the Council would not be given to any alteration in the scheme of registration which involved the granting of any other certificate than that which certified that the shoeing-smith could fulfil all the duties of his trade, and that he knew something of the structure of the foot of the horse.

Mr. HENRY DE VITRÉ referred to the inadequate accommodation provided by the Great Western Railway for cattle, which they were now obliged to send in horse-boxes. He understood they were to have properly fitted cattle-trucks to travel on passenger trains, and, in fact, the London and North-Western Railway gave every possible facility in this way, but the Great Western Railway had done nothing in this direction.

Sir R. H. PAGET suggested whether experiments with reference to the improvement of grass land might not be undertaken by the Society. It was quite clear, now that arable cultivation was so rapidly decreasing, that pastures were readily capable of being improved under suitable conditions. There were lands and soils which, by treatment with special manures adapted for them, could effect a perfect revolution in the nature of their herbage. Even by a simple dressing of ordinary manure they could get rid of weeds, and produce results that were perfectly startling. He considered that, in this time of serious agricultural depression, their Society might do real service if it could see its way, either at Woburn or on a larger scale elsewhere, to undertake a series of careful experiments for the improvement of grass lands under different conditions of soil and climate.

Surg.-Lieut.-Col. INCE and Mr. H. LE ROY-LEWIS threw out suggestions that the Society might let its rooms for the meetings of other societies of a scientific or agricultural character.

Mr. G. D. YEOMAN referred to the importance of poultry farming, which he was sure might, with proper energy and skill, be made financially successful.

Mr. JOHN THORNTON supported Mr. de Vitré's remarks as to the inadequacy of the cattle-truck accommodation on the southern lines, and referred to the excessive charges made for the carriage of animals exported to foreign countries.

Mr. WILLIAM LANGFORD suggested that the Council should take steps to prevent the excessive feeding of show animals. He thought that the excessively fat animals that were exhibited at their Shows throughout the country would in a large proportion of cases cease to be fertile, and an injury was, therefore, being done to the stock production of the country. He suggested that when once a bull or other animal had obtained the highest prize it should not be allowed to compete again.

Mr. WILLIAM FORTUNE referred to the enormous extent of the adulterations in the food of the people, notably in regard to milk and butter, and suggested that the Society should lend its powerful aid in a crusade against these practices.

Mr. FREDERICK KING considered that the representation of the Society upon the Council required alteration —if necessary, by an amendment of the Charter, or by a new Charter. Both science and practice were under-represented, and there was too much of the tinsel of title.

No other member desiring to offer observations, the PRESIDENT promised that each of the suggestions made should receive the careful attention of the Council.

Vote of Thanks to the Chairman.

Sir HENRY SIMPSON, in moving a vote of thanks to the Chairman, said that it was unnecessary for him to say many, or indeed any, words to commend that motion to the meeting. He could not, however, help expressing his personal gratification in seeing Sir John Thorold occupy that dignified position, and felt perfectly certain that the honour and prestige of the Society were safe in his hands.

Mr. RALPH PALMER seconded the vote of thanks, and referring to what had been said as to the composition of the Council, observed that as a member of one of the old City companies, his experience taught him that the interests of private members were best preserved by concentrating all their power in the Council. He felt that every individual member of the Society owed a deep debt of gratitude to the President for his labours on behalf of the Society, and to the Council for the way in which the Society's interests were safeguarded by them. Perhaps he might be permitted to refer to a matter touched upon by Lord Tredegar as to the connection of science with agriculture. A report had been issued this year by the Gresham University Commission, in which for the first time applied science had been recognised. The Commissioners had asked for the views of the Royal Agricultural Society as the greatest votary of applied science in England; and they were so struck with the evidence given by the Society's representatives that in their report they recommended that the Society should have a representative on the Senate of the new University. They hoped that if that University should ever be established, the Society would consent to guide the branches of applied science relating to agriculture as mentioned in the report, and he trusted that the Society would give its aid in assisting to carry the recommendations of the Commission into practical effect.

The vote of thanks having been put to the meeting by the SECRETARY, was adopted unanimously.

The PRESIDENT said he had to thank Sir Henry Simpson and Mr. Ralph Palmer for the kind way in which they had proposed the vote of thanks, and the meeting for the manner in which they had received it. With regard to what had fallen from Sir Henry Simpson, he might say that it was really a matter for the Registration Committee of the Farriers' Company to settle. The Council of the Royal Agricultural Society felt that, in view of the very strong feeling there was on the Registration Committee that the "doormen," who had a certain position in the trade of shoeing-smiths in the great towns, should be registered, they ought not to offer any decided opposition to the proposal. As regards the Society itself, its prizes would be given as before to men in all ways competent to do everything connected with the shoeing of a horse.

With regard to what fell from Mr. de Vitré and Mr. Thornton, they were fortunate in having a member upon their Council who, he had no doubt, would take cognisance of what had been said.

Referring to Sir Richard Paget's suggestion, he might say that at Woburn they had had for some years plots sown down with different descriptions of mixtures, and the results were very striking. Any members of the Society who visited the Woburn Experimental Farm would derive useful information on the subject. For the last few years they had been trying experiments on that farm with different manures. With regard to the larger question of trying experiments in different districts, the Society had had experience of this kind, and, if desired, he had no doubt that the Council would arrange with other bodies and carry out experiments with grass land in various parts of England.

As to their financial position, the Society was fortunate in being so well supported, and the Council had already made a beginning towards paying off some of the debenture stock with the proceeds of which that house had been bought. He was sure that members would do their best to increase the number of subscribers, and if they continued to have such fine weather as at Cambridge this year, they would be able to make a little profit on their Shows, so that the Society might eventually become the absolute owners of the property.

With regard to the overfeeding of show animals, they had found it to be impracticable to place any very effective check upon this practice. He had only seen one animal shown in store condition, and its owner had acknowledged that he had given it everything possible to eat, and that he could not get it fat. (Laughter.) The gentleman who had mentioned the adulteration of milk and butter had their entire sympathy. It was, of course, very difficult to deal with it. He would point out that there were armies of inspectors paid by the ratepayers, whose duty it was to protect the ratepayers from this adulteration.

Mr. King had found fault with the representation of the Society, and also with the fact that they had not a sufficient number of practical men on the Council. He admitted that they had not as many as they should like, but it was extremely difficult for practical men to leave their farms. Most of them had, unfortunately, to be more or less practical farmers, inasmuch as they had to undertake the cultivation of their own land. The interests of the members of Council were entirely the interests of the agricultural world, and they devoted what time they had to the service of the Society, believing that in so doing they were helping themselves. So long as he had the pleasure and honour of being on that Council, he should consider it his greatest privilege to help in every possible way the development of agriculture in this country. (Hear, hear.)

The proceedings then terminated.

PRIZE LIST

FOR

DARLINGTON MEETING, JUNE 24 to 28, 1895.

Total value of Prizes offered (exclusive of Champion Prizes, Medals, and Cups offered by Breed Societies), £6,035, of which amount £948 is contributed by the Darlington Local Committee.

Last Day for Receipt of Entries of Live Stock, Poultry, and Produce, Wednesday, MAY 1, 1895. (Post Entries at Extra Rates may be tendered up to Saturday, MAY 11, 1895.)

CHAMPION PRIZES.

HORSES.

HACKNEY	Best STALLION	Gold Medal by the Hackney Horse Society.
	Best MARE or FILLY	Gold Medal by the Hackney Horse Society.
SHIRE	Best STALLION	Gold Medal by the Shire Horse Society.
	Best MARE or FILLY	Gold Medal by the Shire Horse Society.

CATTLE.

SHORTHORN	Best BULL	Prize of £20 by the Shorthorn Society.
	Best COW or HEIFER	Prize of £20 by the Shorthorn Society.
ABERDEEN ANGUS	Best BULL	Gold Medal by the Polled Cattle Society.
	Best COW or HEIFER	Gold Medal by the Polled Cattle Society.
KERRY	Best BULL, COW, or HEIFER	Prize of 10 Guineas by the Kerry and Dexter Cattle Society.
DEXTER KERRY	Best BULL, COW, or HEIFER	Prize of 10 Guineas by the Kerry and Dexter Cattle Society.

SHEEP.

SUFFOLK	Best RAM	Gold Medal by the Suffolk Sheep Society.

PIGS.

LARGE WHITE	Best BOAR or SOW	Prize value 5 Guineas by the National Pig Breeders' Association.
MIDDLE WHITE	Best BOAR or SOW	Prize value 5 Guineas by the National Pig Breeders' Association.
SMALL WHITE	Best BOAR or SOW	Prize value 5 Guineas by the National Pig Breeders' Association.
TAMWORTH	Best BOAR or SOW	Prize value 5 Guineas by the National Pig Breeders' Association.

CHEESE.

Prize of £20 by the Local Committee for the three best Cheeses of 1894 make, exhibited in the Classes for STILTON, COTHERSTONE, WENSLEYDALE, and SWALEDALE (Stilton shape), WENSLEYDALE and SWALEDALE (Flat shape), and CLEVELAND Cheeses.

HORSES (£2,012).

HUNTERS.

Class		1st £	2nd £	3rd £
1	Mare (with foal at foot), up to 15 st. and upwards	20	10	5
2	Mare (with foal at foot), up to between 12 and 15 st.	20	10	5
3	Mare or Gelding, up to 15 st., foaled in '89 or '90 [1]	30	15	10
4	Mare or Gelding, up to 12 st., foaled in '89 or '90 [1]	30	15	10
5	Gelding, foaled in 1891 [1]	30	15	10
6	Mare, foaled in 1891 [1]	25	10	5
7	Gelding, foaled in 1892 [1]	15	10	5
8	Gelding, foaled in 1893 [1]	15	10	5
9	Colt, foaled in 1894 [1]	15	10	5
10	Filly, foaled in 1892	15	10	5
11	Filly, foaled in 1893	15	10	5
12	Filly, foaled in 1894	15	10	5

CLEVELAND BAYS.

Class		1st £	2nd £	3rd £
13	Stallion, foaled in 1892	15	10	5
14	Stallion, foaled in 1893	15	10	5
15	Mare (with foal at foot)	15	10	5
16	Filly, foaled in 1892	15	10	5
17	Gelding, foaled in 1892 [1]	10	5	3
18	Gelding or Filly, foaled in 1893 [1]	10	5	3
19	Colt or Filly, foaled in 1894 [1]	10	5	3

COACH HORSES.

20—26 Same as for Cleveland Bays.

HACKNEYS.

Class		1st £	2nd £	3rd £
27	Stallion, foaled in 1892, above 15 hands	15	10	5
28	Stallion, foaled in 1892, above 14 hands and not over 1 hands	15	10	5
29	Stallion, foaled in 1893	15	10	5
30	Stallion, foaled in 1894	15	10	5
31	Mare (with foal at foot), above 15 hands	15	10	5
32	Mare (with foal at foot), above 14 and not over 15 hands	15	10	5
33	Filly, foaled in 1893	15	10	5
34	Filly, foaled in 1894	15	10	5
35	Mare or Gelding, above 14 hands, up to 15 stones, foaled in 1889, '90, or '91 [1]	15	10	5
36	Mare or Gelding, 13 hands and not over 14 hands, up to 12 stones, foaled in 1889, '90, or '91 [1]	15	10	5
37	Mare or Gelding, foaled in 1892 [1]	15	10	5
38	Gelding, foaled in 1893 [1]	15	10	5

PONIES.

Class		1st £	2nd £	3rd £
39	Stallion, not over 14 hds.	15	10	5
40	Mare (with foal at foot), not exceeding 14 hands	15	10	5
41	Mare or Gelding, under 13 hands, foaled in 1889, 1890, or 1891 [1]	10	5	–

SHETLAND PONIES.

Class		1st £	2nd £	3rd £
42	Stallion, not over 10½ hands, foaled previously to or in 1891 [1]	10	5	–
43	Mare, not over 10½ hands, foaled before or in 1891 [1]	10	5	–

PIT PONIES.

Class		1st £	2nd £	3rd £
44	Pony, not over 10 hands [1]	10	5	–
45	Pony, above 10 hands and not over 11 hands [1]	10	5	–

HARNESS HORSES AND PONIES.

Class		1st £	2nd £	3rd £
46	Mare or Gelding, of any age, above 14 hands [1]	15	10	5
47	Mare or Gelding, of any age, not over 14 hands [1]	15	10	5

SHIRE.

Class		1st £	2nd £	3rd £
48	Stallion, foaled in 1892	20	10	5
49	Stallion, foaled in 1893	20	10	5
50	Stallion, foaled in 1894	15	10	5
51	Mare (with foal at foot)	20	10	5
52	Filly, foaled in 1892	15	10	5
53	Filly, foaled in 1893	15	10	5
54	Filly, foaled in 1894	15	10	5

CLYDESDALE.

55—61 Same as for Shires.

SUFFOLK.

Class		1st £	2nd £	3rd £
62	Stallion, foaled in 1892	15	10	5
63	Stallion, foaled in 1893	15	10	5
64	Mare (with foal at foot)	15	10	5
65	Filly, foaled in 1892	15	10	5
66	Filly, foaled in 1893	15	10	5

AGRICULTURAL.

Class		1st £	2nd £	3rd £
67	Gelding, foaled in 1891 [1]	10	5	3
68	Gelding, foaled in 1892 [1]	10	5	3

RULLEY HORSES.

Class		1st £	2nd £	3rd £
69	Gelding, foaled previously to or in 1890 [1]	10	5	3

[1] Offered by the Darlington Local Committee.

CATTLE (£1,740).

SHORTHORN.

Class		1st £	2nd £	3rd £
70	BULL, calved 1890, 1891, or 1892	15	10	5
71	BULL, calved in 1893	15	10	5
72	BULL, calved in 1894	15	10	5
73	Cow, in-milk or in-calf, calved previously to 1892	15	10	5
74	HEIFER, in-milk or in-calf, calved in 1892	15	10	5
75	HEIFER, calved in 1893	15	10	5
76	HEIFER, calved in 1894	15	10	5

HEREFORD.

Class		1st £	2nd £	3rd £
77	BULL, calved 1890, 1891, or 1892	15	10	5
78	BULL, calved in 1893	15	10	5
79	BULL, calved in 1894	15	10	5
80	Cow or HEIFER, in-milk or in-calf, calved previously to or in 1892	15	10	5
81	HEIFER, calved in 1893	15	10	5
82	HEIFER, calved in 1894	15	10	5

DEVON.

Class		1st £	2nd £	3rd £
83	BULL, calved 1890, 1891, or 1892	15	10	5
84	BULL, calved in 1893 or 1894	10	5	–
85	Cow or HEIFER, in-milk or in-calf, calved previously to or in 1892	15	10	5
86	HEIFER, calved in 1893 or 1894	15	10	5

SUSSEX.

87–90 Same as for Devons.

WELSH.

Class		1st £	2nd £	3rd £
91	BULL, calved in 1892, 1893, or 1894	10	5	–
92	Cow or HEIFER, in-milk or in-calf	10	5	–

RED POLLED.

93–96 Same as for Devons.

ABERDEEN ANGUS.

Class		1st £	2nd £	3rd £
97	BULL, calved 1890, 1891, or 1892	15	10	5
98	BULL, calved in 1893	15	10	5
99	BULL, calved in 1894	10	5	-
100	Cow, in-milk or in-calf, calved previously to 1892	15	10	5
101	HEIFER, in-milk or in-calf, calved in 1892 [1]	15	10	5
102	HEIFER, calved in 1893	15	10	5
103	HEIFER, calved in 1894	15	10	5

GALLOWAY.

104–110 Same as for Aberdeen Angus.

HIGHLAND.

Class		1st £	2nd £	3rd £
111	BULL, of any age	10	5	–
112	Cow, of any age	10	5	–

AYRSHIRE.

113–116 Same as for Devons.

JERSEY.

Class		1st £	2nd £	3rd £
117	BULL, calved in 1891, 1892, or 1893	15	10	5
118	BULL, calved in 1894	10	5	–
119	Cow, in-milk, calved previously to or in 1892	15	10	5
120	HEIFER, in-milk or in-calf, calved in 1893	15	10	5
121	HEIFER, calved in 1894	15	10	5

GUERNSEY.

Class		1st £	2nd £	3rd £
122	BULL, calved in 1891, 1892, or 1893	15	10	5
123	BULL, calved in 1894	10	5	–
124	Cow or HEIFER, in-milk or in-calf, calved previously to or in 1892	15	10	5
125	HEIFER, calved in 1893 or 1894	15	10	5

KERRY.

Class		1st £	2nd £	3rd £
126	BULL, calved in 1892, 1893, or 1894	10	5	–
127	Cow, in-milk or in-calf, calved previously to or in 1892	10	5	–

DEXTER KERRY.

128, 129 Same as for Kerry.

DAIRY COWS.

Class		1st £	2nd £	3rd £
130	Cow, in-milk, giving the *largest quantity of milk*, on the average of two milkings, up to standard adopted by Society of Public Analysts	15	10	5
131	Cow, in-milk, giving *greatest weight of butter-fat*, provided yield of milk obtained in two milkings be not less than 25 lb.	15	10	5
132	Cow, in-milk, over 1,000 lb. live weight [1]	15	10	5
133	Cow, in-milk, not exceeding 1,000 lb. live weight [1]	15	10	5

[1] Offered by the Darlington Local Committee.

SHEEP (£1,170).

LEICESTER.

Class		1st £	2nd £	3rd £
134	Two-Shear Ram	10	5	–
135	Shearling Ram	15	10	5
136	Pen of Three Ram Lambs, dropped in 1895	10	5	–
137	Pen of Three Shearling Ewes of the same flock	15	10	5

COTSWOLD.

138–141 Same as for Leicester.

LINCOLN.

142–145 Same as for Leicester.

OXFORD DOWN.

146–149 Same as for Leicester.

SHROPSHIRE.

150–153 Same as for Leicester.

SOUTHDOWN.

154–157 Same as for Leicester.

HAMPSHIRE DOWN.

158–161 Same as for Leicester.

SUFFOLK.

162–165 Same as for Leicester.

WENSLEYDALE.

Class		1st £	2nd £	3rd £
166	Two-Shear Ram	10	5	–
167	Shearling Ram	15	10	5
168	Pen of Three Ram Lambs, dropped in 1895	10	5	–
169	Pen of Three Shearling Ewes of same flock	15	10	5
170	Pen of Three Ewes, and their lambs dropped in 1895 [1]	10	5	–

BORDER LEICESTER.

171–175 Same as for Wensleydale.

SOMERSET AND DORSET HORN.

Class		1st £	2nd £	3rd £
176	Shearling Ram, dropped after November 1, 1893	10	5	–
177	Pen of Three Shearling Ewes of the same flock, dropped after November 1, 1893	10	5	–

KENTISH OR ROMNEY MARSH.

Class		1st £	2nd £	3rd £
178	Shearling Ram	10	5	–
179	Pen of Three Shearling Ewes of the same flock	10	5	–

CHEVIOT.

Class		1st £	2nd £	3rd £
180	Two-Shear Ram	10	5	–
181	Shearling Ram	10	5	–
182	Pen of Three Shearling Ewes of the same flock	10	5	–

BLACK-FACED MOUNTAIN.

183 & 185 Same as for Cheviot.

LONK.

186 & 187 Same as for Kentish or Romney Marsh.

HERDWICK.

188 & 189 Same as for Kentish or Romney Marsh.

WELSH MOUNTAIN.

190 & 191 Same as for Kentish or Romney Marsh.

PIGS (£432).

Classes		
192—195	Large White	For Prizes see below
196—199	Middle White	
200—203	Small White	
204—207	Berkshire	
208—211	Any Other Black Breed	
212—215	Tamworth	

In each of the above breeds the following prizes will be given:—

	1st £	2nd £	3rd £
Boar, farrowed in 1893 or 1894	10	5	3
Pen of Three Boar Pigs, farrowed in 1895	10	5	3
Breeding Sow, farrowed previously to or in 1894	10	5	3
Pen of Three Sow Pigs, farrowed in 1895	10	5	3

[1] Offered by the Darlington Local Committee.

POULTRY (£234).

Prizes are offered for the best Cock, Hen, Cockerel, and Pullet of the following Breeds:—

Classes		s.	s.	s.
216—219	Dorking, Coloured	30	15	10
220—223	Dorking, Silver Grey	30	15	10
224 & 225	Dorking, White	30	15	10
226—229	Game, Old English	30	15	10
230—233	Game, Indian	30	15	10
234—237	French	30	15	10
238—241	Brahma	30	15	10
242—245	Cochin	30	15	10
246—249	Langshan	30	15	10
250—253	Wyandotte	30	15	10
254—257	Plymouth Rock	30	15	10
258—261	Minorca	30	15	10
262—265	Leghorn, White	30	15	10
266—269	Leghorn, any other colour	30	15	10
270 & 271	Andalusian	30	15	10
272 & 273	Hamburgh	30	15	10
274—277	Any other variety except Bantams	30	15	10
278	Aylesbury Drake	30	15	10
279	Aylesbury Duck	30	15	10
280	Aylesbury Young Drake	30	15	10
281	Aylesbury Duckling	30	15	10
282	Rouen Drake	30	15	10
283	Rouen Duck	30	15	10
284	Pekin Drake	30	15	10
285	Pekin Duck	30	15	10
286	Cayuga Drake	30	15	10
287	Cayuga Duck	30	15	10
288	Any Breed (except Aylesbury) Young Drake	30	15	10
289	Any Breed (except Aylesbury) Duckling	30	15	10
		£	£	s.
290	Gander	2	1	10
291	Goose	2	1	10
292	Turkey Cock	2	1	10
293	Turkey Hen	2	1	10

Table Poultry.

		s.	s.	s.
294	Pair of Cockerels of 1895, of any pure breed	30	15	10
295	Pair of Pullets, ditto	30	15	10
296	Pair of Cockerels of 1895, 1st cross from pure breeds	30	15	10
297	Pair of Pullets, ditto	30	15	10

Table Ducklings.

		s.	s.	s.
298	Pair of Ducklings of 1895, of any pure breed	30	15	10
299	Pair of Ducklings of 1895, 1st cross from pure breeds	30	15	10

PRODUCE (£286).

BUTTER.

Class		Prizes
300	2lb. Fresh Butter, slightly salted, made up in pounds	Four of 5*l.* each; Four of 3*l.* each; Four of 1*l.* each
301	2 lb. Fresh Butter, slightly salted, made up in pounds, from milk drawn from cows other than Channel Islands or cows crossed with Channel Islands breeds.	Four of 5*l.* each; Four of 3*l.* each; Four of 1*l.* each

CHEESE.

		Prizes 1st £	2nd £	3rd £
302	Three Cheddar, of not less than 50 lb. each, made in 1895	10	5	3
303	Three Cheshire, of not less than 40 lb. each, made in 1895	10	5	3
304	Three Stilton, made in 1895	5	3	2
305	Three Stilton, made in 1894 [1]	5	3	2
306	Three Cotherstone made in 1894 [1]	5	3	2
307	Three Wensleydale and Swaledale (Stilton Shape), made in 1894 [1]	5	3	2
308	Three Wensleydale and Swaledale (Flat Shape), made in 1894 [1]	5	3	2
309	Three Cleveland, made in 1894 [1]	5	3	2
310	Three Cheeses, of any other British make, made in 1895	5	3	2
311	Three Cream Cheeses, made with use of Rennet	2	1	–
312	Three Cream Cheeses, made without the use of Rennet	2	1	–

CIDER AND PERRY.

313	Cask of Cider, made 1894	5	3	2
314	One Doz. Cider, made 1894	5	3	2
315	One Doz. Cider, made before 1894	5	3	2
316	One Doz. Perry	5	3	2

JAMS AND BOTTLED FRUITS.

317	Whole-Fruit Jams	3	2	1
318	Bottled Fruits	3	2	1

[1] Offered by the Darlington Local Committee.

PRODUCE—*continued.*

HIVES, HONEY, AND BEE APPLIANCES.

Offered by British Bee-keepers' Association.

Class		Prizes 1st s.	2nd s.	3rd s.
319	Collection of Hives, &c.	100	50	–
320	Observatory Hive	30	20	–
321	Frame Hive	20	15	10
322	Do. for Cottagers' use	20	15	10
323	Honey Extractor	15	10	–
324	12 Sections of Comb Honey ('95), about 12 lb.	15	10	5
325	6 Sections of Comb Honey ('95), about 6 lb.	15	10	5
326	Run or Extracted Honey ('95), about 12lb.	15	10	5
327	12 Sections of Comb Honey, '94 or before	15	10	5
328	3 Shallow Frames of Comb Honey, 1895	15	10	5
329	Run or Extracted Honey, '94 or before	15	10	5
330	Granulated Honey	15	10	5
331	Display of Honey	40	20	10
332	Useful Inventions	Special Prizes according to merit.		
333	Other Exhibits			

IMPLEMENTS (£60).

(Entries close April 1, 1895.)

	1st £	2nd £
I. Hay-making Machines	20	10
II. Clover-making Machines	20	10

BUTTER-MAKING COMPETITIONS (£69).

Class 1 (*Tuesday, June* 25). Open to the United Kingdom.

Class 2 (*Wednesday, June* 26). Female Members of a Farmer's family not in service or working for wages.

Class 3 (*Thursday, June* 27). Dairymaids and others resident in the Society's District B.—The Counties of Cumberland, Durham, Northumberland and Westmoreland. (Open only to those who have not been prize-winners at previous Country Meetings of the Society.)

Class 4 (*Thursday, June* 27). Dairymaids or Members of a Farmer's family, resident in the County of Durham or North Riding of Yorkshire. (Open only to those who have not been prize-winners at previous Country Meetings of the Society.) (*Offered by the Darlington Local Committee.*)

Champion Class (*Friday, June* 28). (Open only to prize-winners in above Classes.)

Prizes: 1st 6*l.*, 2nd 4*l.*, 3rd 3*l.*, 4th 2*l.*, 5th 1*l.*, in Classes 1, 2, 3, and 4, and in the Champion Class 5*l.* and the Society's Silver Medal.

HORSE-SHOEING COMPETITIONS (£32).

(Limited to Shoeing-Smiths in the Society's District B.)

Class 1. Cart Horses (*Tuesday, June* 25, and, if required, *Wednesday, June* 26).

Class 2. Hunters (*Thursday, June* 27, and, if required, *Friday, June* 28).

Prizes amounting to 16*l.* will be awarded in each class.

Copies of the detailed Prize Sheet and Regulations (both for Stock and Implements) may be obtained on application to the Secretary of the Society at 13 *Hanover Square, London, W.*