has arrived, but that the demand for horses will continue, and present conditions point to the probability of their value increasing. Hence, we think that the man who continues to breed good horses of any class will stand to make good money in the not far away future.

The World's Most Famous Agricultural Experiment Station.

By Ernest H. Godfrey, F. S. S.

At the village of Harpenden, in Hertfordshire, England, stands, in front of its picturesque gorse-covered Common the

Rothamsted Experiment Station, oldest and most famous institution of its kind in the world. Towards the close of the present year will be celebrated the centenary of the birth of its founder-Sir John Lawes,-who in scientific partnership with Sir Henry Gilbert, conducted for 57 consecutive years agricultural experiments. which will bear their names in honored remembrance to remote posterity.

FOUNDERS OF THE EXPERI-MENTS.

John Bennet Lawes, born December 28, 1814, succeeded to the ancient manor of Rothamsted at the age of eight. He was educated at Eton and Brasenose College, Oxford; but showing an early preference for science he studied also in the Chemical Laboratory of University College, London. Coming into possession of his property in 1834 at the early age of 20, he at once began experiments upon plants growing in pots, the investigations being subsequently extended to the field. Some years after this, observing the excellent effects upon turnips by dressing with mineral phosphates treated with sulphuric acid, he obtained in 1842 a patent the manufacture of superfor

phosphate, and thus laid the foundation a large personal fortune and immense national industry. The following of an year, with the object of devoting more systematic attention to experiments which had already yielded such fruitful results, he engaged the services of an agricultural chemist, 26 years of age. who had been his fellow student at University College. In this way was begun that wonderful partnership with Sir Henry Gilbert, which was destined to bring to both such enduring fame.

THE FARMER'S ADVOCATE.

Another set of experiments of peculiar interest related to the herbage of permanent pastures. The Rothamsted Experiments have shown the extraordinary influence which different manures have upon grass land, both as regards the botanical constituents and the chemical composition of the herbage. Indeed the experiments have shown that it is possible to modify at will the entire character of the vegetation of a grass field by the judicious application of the appropriate manures. Equally important have been the results of experiments in other directions. It is impossible to enumerate them all; but many of them presented a final and authoritative judgment upon

strengthened in various subsequent enactments; but it is probable that this legislation could never have been successfully inaugurated without the tables of manurial values based upon the data collected at Rothamsted. These have had a most important influence in improving British agriculture, for whereas before the legislation of 1875 unscrupulous tenants would starve their land in the last years of their tenancy to the great detriment of the landlord and the incoming tenant, under present conditions the tenant is encouraged to keep up the full fertility of his farm, since he is sure of just compensation for value that he cannot remove when quitting

POT EXPERIMENTS.

FOUNDED 1866

It has already been stated that the experiments at Rothamsted first began in pots. For many years the experiments on the field scale were deemed of primary importance, but in 1883 Hellriegel and Wilfarth made their important discovery by means of pot experiments of the part played by bacteria in the assimilation of free nitrogen by leguminous plants through the nodules on their roots. Though Lawes and Gilbert had previously done much important work in an investigation of the nitrogen problems, this source of assimilation had not been found out. Hellriegel and Wilfarth's discovery gave an immediate impetus to both pot culture experiments and bacteriological investigations. Their experiments were repeated and confirmed by Lawes and Gilbert, and even carried a stage further

WORK IN THE LABORATORY. The work carried on in the Laboratory at Harpenden for nearly 60 years was also a b s o lutely unique. lutely unique. The precautions taken by Gilbert to ensure a c curacy and the elimination of all disturbing influences is nowhere more apparent thean in his preparation of samples for analysis

whether of soil or plant, and during the long period of his work there has been collected, stored and conveniently classified at Rothamsted a vast collection of samples and analyses which are invaluable for future reference and comparison.

To Gilbert's untiring industry is due a vast amount of the knowledge accumulated with reference to soil chemistry, and the relations of plant growth to manurial applications. He brought He brought out clearly the influence of nitrogen in the production of non-nitrogenous bodies-the carbohydrates-starch and cellulose in the case of cereals, starch in potatoes and sugar in root crops.

Fig. 1-The Original Laboratory at Rothamsted.

agricultural questions that arose during the controversies of the day.

UNEXHAUSTED VALUES OF MANURES.

In connection with Mr. Gladstone's early Irish land legislation, the question arose as to the determination of the compensation payable to outgoing tenants for the unexhausted value of their applications of manures. The same question soon transferred itself to English agriculture, and it was tackled with characteristic vigor by the two investigators at Rothamsted. Their experiDECEMB

the result. able. In sonally vi lecture u nineties b papers, co octavo Vo tional inst

Labors

good could early as 1 ments of t erected by Mr. Lawes tory which 1). On th Committee the amoun the more p a suggesti cipient. 1 was celebra the presen trait paint Gilbert of erection in of a huge tive inscrip then Prince tee, and si The ceremo penden on were also p and scienti ing French tionale d'A tures de F delegations. the Jubilee to Great B all over th of the A Stations of participated created a b Gilbert rece knighthood.

DEATHS (CHARACTE

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Joseph Henry Gilbert was the son of a Congregational Minister at Hull, Yorkshire, and his mother, Ann Taylor, with her sister, was known as a writer of children's songs and hymns, one of them beginning with the lines, familiar to child-hood, "Twinkle twinkle little Star." He was educated at the Glasgow University, University College, London, and at the University of Giessen, Germany, where he graduated as Doctor of Philosophy. During his youth he had the misfortune to lose an eye through a gunshot

DESCRIPTION OF THE EXPERIMENTS.

The work at Rothamsted, thus begun, may be divided into three separate but interdependent parts, viz., the field experiments, the pot culture station and the laboratory work. We will glance briefly at each in turn. Nowhere else in the world have field experiments been carried on continuously for so long a period, and it is this fact that gives to the Rothamsted experiments their unique and extraordinary value. On the Broadbalk Field at Rothamsted wheat has been grown for 70 years in succession on plots with no manure whatsoever, on plots with farmyard manure, and on plots with various artificial manures. The results, universally interesting, have proved the possibility of growing wheat successfully for many years continuously upon ordinary arable land, provided that suitable manures be applied and that the land be kept clean. Even with no manure it has proved possible to obtain a constant yield, and the actual average of about 13 bushels per acre over the whole beriod is ap proximately equal to the world's average. the end of the last century it was even superior to the average yield of the United States. has been shown also that mineral manures alone give very little increase, that nitrogenous manures alone give more than mineral manures alone, but that the mixture of the two give considerably more than either separately. It is related that a visitor from the United States, when talking to Sir John Lawes in Broadbalk Field once exclaimed : "Americans have learnt more from the field than from any other agricultural experiment in the world.



Fig. 2 Sir John Lawes, Bt., Founder of Rothamsted Exp. Stn.

ments provided data for the scientific determination of the residual manurial value of rich feeding cakes fed on the land before determination of a tenancy. The Agricultural Holdings Act of 1875 -permissive in its operation-was important as admitting the principle of compensation to outgoing tenants. The original Act has since been usele compulsory, and the provisions have been

SCIENTIFIC CONTRIBUTIONS

Altogether something like 130 contributions were published in the joint names of Lawes and Gilbert on different aspects of their experiments, the medium of publication being chiefly the journals of scientific societies and including the Philosophical Transactions of the Royal Society, the Journals of the Royal Agricultural and Chemical Scoleties and the Proceedings of the Institution of Civil Engineers. The great variety of the agricultural subjects elucidated by the Experiments will be apparent from the following partial selection of papers which appeared in the Journal of the Royal Agricultural Society of England: Agricultural Chemistry in relation to Liebig's mineral theory (1851 and 1863); water given off by plants during growth (1850), comparative fattening qualities of different breeds of sheep (1851), wheat experiments (1855, 1856); the growth of barley continuously on the same land (1857, 1873), manures on permanent meadow land (1858, 1859, 1863); the growth of red clover (1860); the composition of oxen, sheep and pigs. and of their increase whilst fattening (1860), the utilization of town sewage (1863); the growth of wheat continuously on the same land (1864, 1884); the valuation of unexhausted manures (1875, 1885, 1891, 1897); amount and composition of rain and drainage waters (1881, 1882. 1883); the sources of nitrogen of leguminous crops (1891).

THE EXPERIMENTS A PRIVATE ENTER-PRISE.

Be it remembered that these experiments were conducted for nearly 60 years at the sole expense of Sir John Lawes, a private country gentleman and landowner, and that whilst not a penny was contributed by the State or any public body towards the maintenance of the Experiments they lost nothing, by this fact, in the care and sense of responsibility with which they were conducted; possibly they gained through freedom from official interference or control and the absence of "red tape" so frequently associated with it. Of worldwide application, no efforts were spared to make

that his age long survive death to than a year ber 23, 190 They rest parish church inseparable i leaving the simple tombs able as "pr the tombs of men were en the compleme Lawes wa thoroughly a cultural pro perience of pr visionary exp and inclined tions, and ha partner he w plots before Gilbert, on scientist, unit tention to d determination its very end, capable of te Lawes possess the typical E appearance he therefore, apt strangers for really was. near his home man who off basket of wash much to the met them and time he was poultry, the p eyed him with relieved when astonished at 'to name her had admired t PERMANEN

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