Towards the end of the memoir he makes a comparison with ninety-six stars of the same cluster, taken by Rutherford during the years 1870–74 and measured by Miss Young, and he finds that they agree within very small limits, with the exception of one star. Omitting this, and two others which were measured only on one of his two plates, the differences Young minus Messow were as follows:—

$$D_\alpha = 0'.0005. \qquad D = +0'.01$$

A further investigation of the differences between Young and Messow as regards proper motion leads the latter to state that the two star clusters have not altered their position in space. The memoir concludes with a catalogue of the positions of the 649 stars for 1899–1900, together with their estimated and measured magnitudes.

OXFORD UNIVERSITY OBSERVATORY.—From the thirty-eighth annual report of the Savilian professor of astronomy we learn that the Cambridge ledgers containing the corrections to the Cambridge meridian observations from all the separate plates taken at Oxford have now been completely revised and discussed for magnitude equation. It has been found that the observations of faint stars are affected by considerable and rapidly changing errors, such as Prof. Arthur Searle found at Harvard. To enable this work to be accomplished, the work on differential star places had to be temporarily put aside. We are further informed that two zones (+64° and +63°) of the Vatican plates have been completely reduced with the exception of one doubtful plate in zone +63°. This plate has since been repeated at Rome.

THE THIRD INTERNATIONAL ROAD CONGRESS.

THE Permanent International Association of Road Congresses, which held its first meeting in Paris five years ago, completed its third congress in London on Saturday last. The attendance of home and foreign members and visitors was far greater than at either of the two previous meetings, and there is no doubt that both in the quantity and quality of the matters discussed, and the general interest taken in the road inspections and in the road-making apparatus shown at the exhibition, this congress showed a marked advance on the two previous ones.

Too much was attempted. Papers on nine important questions had been invited, and the response was such that more than 120 papers replying to the questions alone had been received, to be translated into the three official languages—English, French, and German—and summarised for discussion by carefully selected reporters. The discussions were on these summarised reports, and as the resolutions voted on after their discussion reach 4500 words in English, 5500 in French, and about the same in the German readings, it will be seen that much has been attempted.

The questions on which papers were invited were the following:—(1) The planning of new streets and roads; (2) the best types of surfacing to be adopted on bridges; (3) the great question of bituminous construction of macadamised roads; (4) wood paving; (5) the best methods of lighting streets and highways; (6) the causes of deterioration of road surfaces noted since 1908; (7) the regulation of fast and slow traffic; (8) the functions of road authorities; (9) finance and the incidence of taxation necessary for the upkeep of the roads.

In addition, communications on many important subjects were invited, but on these, although many of them contained much valuable data, there was no time for discussion.

The resolutions discussed and voted on are really condensed summaries of the average opinions contained in the papers, and therefore have a certain value as indicating the general trend of well-informed opinion on road matters in the year 1912, for on account of the time necessarily occupied in the preparation, printing, translation, and summarising most of the conclusions arrived at last week were based on papers written nearly a year ago.

It was, of course, inevitable that a great mass of the contributions came from countries where road construction and road problems are not in a very advanced state, so that the real interest to the more scientific members present lay in the opportunities that these meetings give for personal discussion of the problems which are now presenting themselves in this most interesting branch of engineering.

All who are studying the modern road development which is called for by the steady demand for door to door transport of passengers, as well as goods, know that the question of the time is how to produce road surfaces which are efficient from the point of view of reducing so far as possible the running cost of the vehicles which use them, at the lowest cost for road construction and annual maintenance.

It is almost unnecessary to repeat what has been so often urged, that road engineering demands as intimate a study of the action of the wheel rolling on the road surface as has been devoted to the same question on railways, with such marked economy in the cost of railway transportation. On account of the widely varying type of the vehicles running on the roads and of the great variety of their means of propulsion, and of the fact that for many years to come horse-drawn as well as mechanically-propelled vehicles will use the same road surface, the problems of construction and maintenance are certainly more complicated than those of the railway.

At the informal meetings of the more scientific of the engineers who visited London last week many interesting views were interchanged which cannot fail to further the science of road engineering, as has been found to be the case at the international meetings of the Iron and Steel Institute, where such informal discussions have always been the real feature of the meetings.

On account of the abundant supply of bituminous binding material provided by the tars and pitches from our gasworks, England has made an exceedingly good start in the science of binding road surfaces with tarry matter. On the other hand, America made her first road developments by using the bitumens which are either obtained from natural deposits or as the residuals from the distillation of some of the earth oils. Quite recently the demand for the various forms of petroleum for power and heating purposes has increased the production of the bituminous residuals, and it is likely that the low cost of freight will enable America to supply these residuals to English road engineers as a formidable rival to the tars and pitches which have been in use up to the present.

One of the most interesting features to the scientific members of the congress has been the inspection of the trial lengths of roadways laid down by our Road Board to enable various road materials, such as the roadstones, the tars, and bituminous binders, to be tested under fixed and regular conditions of heavy traffic at Sidcup, Wandsworth, Fulham, and on other roads and streets in and near London. In addition, the latest scientific development of road apparatus was shown to the members of the congress at the National Physical Laboratory at Bushy, where

the "road machine" was shown in action; this machine having been designed to reduce the time necessary to test road materials from many months down to a corresponding number of hours. The machine was only completed a few weeks ago, but the few tests already made on improved road surfaces have already directed attention to several interesting phenomena which had long been suspected by road engineers, but were incapable or difficult of proof on the ordinary roadway on account of the great variations in weather, traffic, and other matters which render accurate comparative tests difficult, if not impossible.

OPENING OF THE NEW WING AT ROTHAMSTED.

ON Friday, June 27, the new wing of the Rothamsted laboratories was opened by the Right Hon. Walter Runciman, President of the Board of Agriculture, in presence of a large and distinguished company, which included Earl Grey, Earl Denbigh, Earl Rosse, Lord Lucas, Prof. H. E. Armstrong, Mr. G. W. Lamplugh, Dr. W. N. Shaw, Sir William Tilden, Sir David Prain, Dr. G. J. Fowler, Dr. J. A. Voelcker, and others.

The new wing (on the right) adjoining the old one-storey building of the Rothamsted Experiment Station.

In his opening remarks the chairman (Sir John Thorold) stated that the wing now ready for opening was the third great advance during the last few years at Rothamsted. The first was made in 1906, when Mr. J. F. Mason gave the James Mason Bacteriological Laboratory, and provided funds for its maintenance; the second was made in 1907, when the Goldsmiths' Company gave a grant of 10,000*l.* towards soil investigations; and the third became possible when the Government instituted the Development Fund, out of which part of the cost of new buildings could be met.

In declaring the buildings open, Mr. Runciman sketched out the history of the Rothamsted Experiment Station from its beginning in 1843 to the present time. The experiments grew out of some pot trials made by Lawes as a young man in the late 'thirties. The first result was the discovery of superphosphate, which alone had proved of almost incalculable benefit to the world, markedly increasing the yields of some of the British and Continental crops, and rendering possible the economic growth of wheat in Australia. Feeding experiments on animals came later, and proved of fundamental importance both to farmers and physiologists. During the fifty-seven years of their partnership, Lawes and Gilbert had investigated most of the important problems connected with British agriculture, and laid the whole community under a great debt of obligation to them. The work thus begun had expanded considerably under Mr. Hall's directorship (1902–12), and the growth was such that the new wing was already full, and the director, Dr. Russell, was preparing plans for new buildings to be erected in commemoration of the centenary of the birth of Sir John Lawes (1814) and Sir Henry Gilbert (1817). Mr. Runciman expressed the hope that the centenary fund would be well and widely supported.

Mr. J. F. Mason, M.P., who followed, recognised that farmers had evolved an admirable system of agriculture, but pointed out that every industry benefited by scientific aid. He instanced the steel industry as one in which science had done great things. Already science had done much for agriculture, and there is every reason to suppose that it will do more.

Earl Denbigh and Sir Hildred Carlile both paid high tributes to the work that is being done at Rothamsted in relation to British agriculture, while Earl Grey emphasised the enormous part that has been played by science in the development of Canadian agriculture.

The buildings were then inspected. They include a large soil laboratory and directors' room on the ground floor, a botanical laboratory, library, and chemical laboratory on the first floor, and a glasshouse for water cultures on the roof. Special rooms are provided in the basement for polarimeter work and for soil incubations. The laboratory is served throughout with electric current, which is generated in an adjoining dynamo and battery house. The total cost of the building and fittings is about 3400*l.*, and the expenditure on the new farm (which has been taken over to supplement and extend the old experimental fields) is about 3200*l.* Towards this the Board