no other education work for the Treasury to do, and there was unfortunately a certain amount of overlapping, because technological work came under the Board of Education, and it was felt that for administration in these matters and, I think, also for the simplification of regulations under which modern universities work, it was of the first importance to avoid waste in administration and overlapping, and the universities themselves agreed. With that object the Government have decided to transfer the distribution of this annual grant to the Board of Education, and now the only Government department modern universities have to deal with is the Board of Education. I am glad to think this meets with the approval of modern universities, and in the many conferences I have had with their representatives they have shown the desire to do their best to work with us for the common end, the extension and efficiency of the work falling under their guidance and control.

"I cannot pretend to say that the Board of Education is at the present time sufficiently equipped to do the whole of the work undertaken by the advisory committee appointed by the Treasury. I have, therefore, set up a small advisory committee to deal with the distribution of these grants. I am glad to say I have secured the service of Sir William McCormick as chairman, who is well known for his services under the Carnegie bequest, and was one of the most active members of the Treasury committee. Associated with him are Sir J. A. Ewing, C.B., F.R.S., Sir William Osler, F.R.S., Miss Emily Penrose, Sir Walter Raleigh, Sir John Rhys, and Sir Arthur Rücker, F.R.S. They are a small and, I may add, a very distinguished committee, and they have already started their meetings, one of their first arrangements being to give Hartley College, Southampton, now struggling to exist as a university college, another year in which to accumulate funds for carrying on university college work."

APPLICATIONS OF SCIENCE TO INDUSTRY.

THE annual meeting of the Society of Chemical Industry was held at the Cutlers' Hall, Sheffield, on Wednesday, July 12, the president, Mr. Walter F. Reid, being in the chair. In his presidential address, Mr. Reid dwelt on the rapid developments of the application of science to industry, and said it was quite impossible for anyone to keep up to date in all branches of applied science. But, though the tendency of the present age was towards specialisation, too minute sub-division had its disadvantages, and there would always be a demand for trained men who had a good general knowledge of science and of the methods of applying it. Manufacturing chemists frequently receive advice from those engaged in other industries to employ more skilled assistants in the factories. Mr. Reid quoted some figures given by Mr. Barker North, in his recent presidential address to the Association of Teachers in Technical Institutions at Southport, showing that the chemical factories stood at the head of all our great industries as regards the proportion of skilled supervision employed. The value of the net annual output per head of those employed in the manufacture of chemicals, coal-tar products, drugs, and perfumery, was also considerably in excess of that in any other of the nine chief trades of the country, the amount being 185*l*. per year, while the next was iron and steel with 118*l*.

It was sometimes alleged that the nature of the training given to students in this country was not of a sufficiently practical character, and that some foreign nations were superior to us in this respect. He did not think it could at present be said that the facilities for acquiring knowledge were less in Great Britain than in any other country —in fact, in some of our institutions they were superior The most important piece of evidence upon which a final judgment could be passed, however, was wanting. They had no information as to the careers of students after they left the colleges or universities. This alone was the final measure of success. Degrees or examinations were but milestones along the road, although they were sometimes quoted as if they were the main end to be attained. Each centre of tuition could, no doubt, give the names of some former students who had been successful in their careers, but what interested him most was the ultimate fate of the rank and file, who supplied the bulk of the assistants in factories. Frequently he had had to engage assistants for various industries, and in one respect they were all deficient. They did not realise that the object of the industrial chemist, like that of the alchemist, was to produce gold, and that every factory operation must yield a profit, failing which it must inevitably cease. In this direction their German colleagues were, perhaps, more advanced, for "Waarenkunde," or knowledge of merchandise, was a recognised subject of tuition, and current price lists were not unknown to students.

In another way, students met with difficulty at the beginning of their career; they were not taught what kind of apparatus and plant was likely to be available for them in practice. Teachers who had not worked in factories could not properly teach students practical work in industrial chemistry. The problem for the student was how to acquire practical knowledge at the commencement of his career. In this he thought employers might materially assist by giving their younger employees more leisure to attend meetings of societies such as the Society of Chemical Industry, and by procuring journals and other literature which the assistant was unable to purchase. A good factory library was of the greatest pecuniary benefit both to employer and employed, but in how many factories did they find one? The rapid march of progress necessitated continuous study. They must all remain students. Sometimes an apparently casual observation might lead to important results if it was followed up, but if the factory chemist was taught to consider himself merely as a kind of teaching machine, and original observation was discouraged, business could not progress.

Mr. Reid recalled how many great industries had arisen from very small beginnings. The fixation of atmospheric nitrogen as an industry was still in its infancy. In 1781 Cavendish found that, on passing an electric spark through a mixture of carbon dioxide and hydrogen, nitrous acid was produced. He communicated his observation to Priestley and Lavoisier, neither of whom could obtain the same result. Cavendish's observation was more accurate than his method, for he made his experiments in vessels containing only a partial vacuum, and the nitrogen and the residual air yielded nitrous acid. In 1784 R. Kirwan repeated the experiment with atmospheric air, and again found acid. Here we had the English origin of what was destined to become one of the great industries of the world, but which was being developed chiefly in foreign countries. When Tyndall made his classic researches on glaciers, he little imagined that factories would arise in the Alps with a glacier at one end of the system and nitric acid of 98 per cent. running into carboys at the other.

The history of the development of modern smokeless powder had never been told. Soon after graduating at Berlin, Mr. Reid was commissioned by the Argentine Government to report on the mineral resources of that country. In carrying out the work, he had to penetrate into a wild region where his gun was the chief source of the daily food. There were few opportunities for cleaning the gun when work was finished, and as a result the gun was ruined by rust. When he returned to England, he endeavoured to find some means whereby rust might be prevented. He heard of the work done by Von Lenk with gun-cotton, and he also heard from the officials of the Patent Safety Gun-cotton Co., Stowmarket, that the manufacture of powder for firearms had been abandoned because of the great irregularity of the explosions and the number of accidents that had happened. He made a long series of experiments, and finally found that by gelatinising nitrocellulose, either completely or partially, the explosion could be rendered quite uniform. Some of the first experiments were made with a paste forced through a perforated plate similar to those used in the gutta-percha industry. The threads thus produced were cut into short lengths, and gave good results. But in those days, when cartridge cases and gun or rifle chambers were adapted to black powder, which was twice the bulk of the new product, there was a great disinclination to make the necessary alterations. A partially-gelatinised, bulky powder had, therefore, to be made for the market. It was called "E.C." powder—the initials of the Explosives Co., Ltd., who were then owners of the Stowmarket Works. It was only recently that sporting guns and cartridge cases had been specially made to suit the fully gelatinised powder, which had now almost supplanted black powder for sporting purposes. The utility of the new powder for military purposes was evident to civilians from the beginning, but our military authorities, after testing it, said that it could not be adopted, because the trajectory was so much flatter than any powder then in use, and that the sights of all army rifles would require alteration. The British rifles being so short-sighted, he had no option but to turn to our neighbours of France. In November, 1881, he showed the powder and method of manufacture to the military attaché at the French Embassy, but it was some time afterwards before the French produced their powder "B," and this forced the hand of our military authorities at home. To-day, even the sights of our military rifles had been altered; in fact, he believed there was no part of either rifle or cartridge that had not been altered, and the art of war had been changed throughout the world.

Fifteen years after the process had been worked out, he learned that a German botanist, Hartig, had made experiments in the same direction in 1847. The pamphlet in which he described his experiments was extremely scarce. He knew of only one copy of it in Great Britain, and he had been unable to obtain it in Germany, so that his ignorance on the subject in 1881 might perhaps be excused.

The president next gave illustrations of the discovery of the method of silvering glass, a paper on which was written as long ago as 1867 by Justus von Liebig; of the discovery of Portland cement by Aspdin, the Leeds mason; and how both these discoveries led to important industrial results. He showed how fogged photographic plates led to the discovery of the Röntgen rays. Bolsover, in repairing the handle of a knife composed partly of silver and partly of copper noticed that these metals adhered to one another when fused. This laid the foundation for Sheffield plate. Dr. John Wright's invention of the use of cyanide of potassium in electro-plating was the outcome of research, and about the same time another inventor was busy on the same subject. One of the brothers Siemens found a method of electro-plating which he considered new, and brought it to England, where he offered it to Elkington. The latter was able to show him an almost identical process already at work. Mr. Reid next referred to the discovery of the vulcanising of india rubber by Hancock, which showed the necessity, not only of patient work, but also of perseverance and careful observation. Hancock had made a number of mixtures of india rubber with various substances, none of which appeared to have any particular advantage. The samples were put on one side for some months, when the whole of them were treated with oil. It was noticed that a portion of one sample was not acted upon by the oil, and on looking up his records of the samples Hancock found that this particular one had been heated to about 300° F., and that it contained sulphur. Incidents of this kind could be multiplied. He hoped he had shown the younger members of the society the advantages, first, of original work in connection with their industries; secondly, of careful observation and diligent inquiry into anything that might appear new to them; and thirdly, of perseverance until they had obtained some definite result.

TRIALS OF ROAD MATERIALS AND CONSTRUCTION.

THE use of motor vehicles has so completely altered the conditions of the wear and tear of the roads, that it has become necessary to find some new method of maintaining the surface and preventing the nuisance of the dust arising from the wear of the surface by the wheels of the motors. During the last few years various processes have been tried, chiefly directed to finding some more durable means of binding the surface material with which the roads are covered. The most successful so far have been by the use of tar asphalt or oil for binding the broken granite or other road material used for repair.

The new Road Board, with the view of securing a service test under uniform conditions, has made arrangements with the Kent County Council for carrying out a series of experiments on trial lengths of a main road, to be carried out under the direction of its advisory engineering committee. The site selected for these experimental trials is on the main road from London to Folkestone between Eltham and Sidcup. This road is thoroughly representative of the average condition of heavy road traffic. The average number of vehicles using this road in one day includes 322 motors of all kinds, and 454 horse-drawn vehicles, the traffic density amounting to 500 tons per yard of width.

The experiments are to be carried out under the direction and superintendence of Mr. Maybury, the county surveyor of Kent, who has paid special attention to this subject, and has so far succeeded in maintaining the surface of the main roads in Kent in excellent order. The special subjects to be taken into consideration are:—The first cost of the coating, and the future cost of maintenance and efficiency. Twenty-three different processes are to be given a trial, each extending over a length of a hundred yards. They include ordinary water-laid and rolled macadam; the same with a tared surface; tar macadam; and several patent processes.

Arrangements have been made for an inspection of the work while it is going on by those interested, and a pamphlet has been issued by the Road Board, giving full particulars and copies of the conditions and specifications under which the trials are to be carried out. This pamphlet is to be obtained at Messrs. Waterlow and Sons, London Wall, E.C.; price eighteenpence.

METEOROLOGICAL REPORTS.

PHILIPPINE WEATHER BUREAU (1908).—The part of the annual report now received includes (1) the administrative report for the fiscal year ending June 30, 1908, and (2) hourly meteorological observations made at the Manila Central Observatory during the calendar year 1908. The activity and popularity of the department dealing with storm warnings may be gauged from the fact that during a typhoon 160 telephonic inquiries were received in a single day. Telegraphic observations were received twice daily from twenty-nine foreign stations, and include reports from Japan, China coast, Formosa, and Indo-China. Special attention is directed to the "immense service" to shipping and other interests which the Eastern Extension and Great Northern Telegraph Companies have for years rendered in allowing free transmission of meteorological messages. The mean temperature of the year 1908 was 79·2° (rather below the normal); the maximum, 97·2°, occurred in May, and the minimum, 61·7°, in February. The rainfall was 97·7 inches (about 21⅓ inches above the normal); none fell in April (the average being 1·2 inches). Among the large number of seismic disturbances reported from different localities in the fiscal year only one violent shock occurred, viz. on November 24, 1907, in south-east Luzon.

Davos Meteorological Station (1910).—The annual summary, printed as a supplement to the monthly weather charts published by the Curverein, gives the mean maximum temperature in January and July, respectively, as 29·7° and 59·5° F.; mean minimum, 12·9° and 39·6°; absolute maximum, 77·5°, in July; minimum, −9·6°, in February. Rain (and melted snow) amounted to 45·6 inches (9·3 inches above the normal). Snow fell in every month except June and August. Sunshine was recorded during 1605·6 hours, which was much below the average (1790·7 hours for 1885–1905).

Bombay and Alibag Observatories (1910).—The mean temperature of the year was 79·1°, being 0·3° below the normal; the maximum hourly temperature was 92·7°, in June, and the minimum 61·5°, in January. The rainfall was 67·86 inches, being 7·3 inches below the normal (1873–96); June received a fall of 23·92 inches, being 3¾ inches above the average. Milne's seismograph registered fifty-seven earthquakes; those of November 9 and December 13 and 16 were great disturbances. The mean magnetic declination was 0° 57′ 43″ E.; inclination, 23° 35·7′; horizontal force, 0·36845 C.G.S. units. During the year there were 102 calm days, 236 days of small, 25 days of moderate, and 2 days of great disturbance. Part of the observatory is still infested by white ants, although the floor has been cemented; it is now proposed to use Minton tiles.

Falmouth Observatory (1910).—The report of this important station, maintained by the Royal Cornwall Polytechnic Society, and one of the normal meteorological