seriously the earliest suggestion that electric signals might be sent under the sea. Yet it is worth while to note that so early as 1811 an effort was made to discover a suitable insulating covering for a submarine wire and that the material used was india-rubber. The decisive factor whereby submarine telegraphy became a practical proposition was, however, contributed by Dr. Werner Siemens in 1847 when he laid a telegraph cable in Berlin with wires insulated by gutta-percha. Faraday, as Sir Charles Bright reminds us, was also at the same time directing attention to the insulating properties of this new material. Gutta-percha has never from that day to this had a serious rival for insulation of deep-sea cables.

Not that the pioneers had waited for it! Previously, in June 1845, the brothers Brett, although only small shopkeepers, in the true spirit of the old merchant venturers applied for government sanction to the provision of telegraphic communication between England and France. When the concession came in 1849, gutta-percha had come into its own and most of the cable laid was of copper wire with a half-inch coating of gutta-percha. The need for a special "shore-end" was recognised even then; but it is puzzling to know why a different insulation should have been adopted. Yet we read that "the shore-ends for about 2 miles from each terminus consisted of a No. 16 BWG. conductor covered with cotton soaked in indiarubber solution, the whole being encased in a very thick lead tube." It is scarcely surprising that it failed, but not before, by transmission of a few signals, it had demonstrated the practicability of ocean telegraphy. A "mad freak," a "gigantic swindle," but, like many another failure, a signpost to success. The next year a new concession was secured and the Submarine Telegraph Company was formed, but it was only floated on the capital of a railway engineer (Thomas R. Crampton) and his friends. The resulting cable, not completed until the end of 1851, marked another development of the engineer's art in cable-making. Küper, a colliery engineer, suggested sheathing the insulated wire with iron wires like a colliery pit rope; and so was reached the essential, and till now the final, form of the successful and trustworthy submarine cable.

Perhaps one day some one will write a work on "Government *versus* Enterprise" in the hope that responsible public servants may be taught by their predecessors' failures. In 1850 the Bretts again found that, "although sensible of their perseverance in bringing the submarine telegraph about," the Government could do nothing to help, and so—"landing rights" not having yet been invented—the Bretts proceeded on their own responsibility to span the Irish Channel. Ultimately success was achieved in 1853, with Charles Tilston Bright (aged 21) in command as engineer to the Magnetic Telegraph Company.

These efforts, however, although they had demonstrated the practicability of submarine telegraphy, had not finished the work of the pioneer—the great unfathomed depths of ocean had yet to be spanned. To put a cable miles deep on the bed of the Atlantic would be impossible, it was said, even if signals could be passed through the enormous length of 2000 miles. Of course pioneers are never very anxious to do anything but the impossible; so J. W. Brett, Cyrus Field (a wealthy American business man who incidentally had discovered, or perhaps invented, "landing rights" for Newfoundland) and Charles Bright (as engineer) projected and with other venturers formed the Atlantic Telegraph Company and secured the required capital in a few days. This was of course only the beginning of the pioneer engineers' work. The British and the United States Governments encouraged and helped the scheme with men-of-war, and at last on August 5, 1858, the shore-end having been duly landed at Newfoundland, the telegraph had bridged the ocean; and the *Times* could say "since the discovery of Columbus nothing has been done in any degree comparable to the vast enlargement which has thus been given to the sphere of human activity." Unfortunately, although the practicability of the scheme had been amply demonstrated and the engineering success was unquestionable, after about two months' work the communication failed—the conductivity of the cable was too low and the power applied to it was too high.

Then followed cables to the east—to Malta, Alexandria and India *via* the Persian Gulf, and it was not until 1865 that any further effort to lay a cable across the Atlantic was projected. In the meantime, Lord Kelvin had perfected his wonderful mirror apparatus, the progenitor of the syphon recorder; closer knowledge of the actual requirements had been secured and improvements in methods of manufacture developed. Also the paying-out and picking-up gear had been largely developed by Henry Clifford, and Brunel's great ship the *Great Eastern* was available to take the large core cable that Bright had succeeded in securing. By the end of 1866 there were two cables working across the Atlantic and the pioneers had about finished their part of the business. The next was routine—and skill combined with knowledge. Other cables followed, east and west; and then in 1872 commenced the great commercial achievements under Sir John Pender, which the Eastern Telegraph Companies are celebrating, after fifty years, with such justifiable pride.

International Chemistry.

THE International Union of Pure and Applied Chemistry held a successful annual meeting in Lyons on June 27-July 2. This was the third annual meeting and a good deal of time was, as on the former occasions, devoted to the details of organisation and the business of getting such an international body well established. Prof. Moureu has been president for three years and has had a difficult task in framing a policy for the score of nations who are now represented in the Union and in guiding them into harmony in these troublous times. He has achieved his desire, and the Union seems likely to continue for many years and to have an increasing importance. It is intended in the future to pay more attention to the purely scientific side of the subject and to attempt some discussions which will be of permanent value.

The Lyons meeting was well attended, about a hundred and twenty delegates taking part, among whom may be mentioned Messrs. Swarts and Timmermans (Belgium), Billmann (Denmark), Mourelo (Spain), Parsons, Bartow, and Washburn (United States), Grignard, Kestner, Marie, Moureu, and Perrin (France), Pope, Lowry, Hewitt, and Mond (Great Britain), Nasini and Paterno (Italy), Bodtker (Norway), Cohen, Kruyt, and Verkade (Holland), and Votoček (Czecho-Slovakia). Lyons is well provided with suitable buildings for the various meetings and social functions and there are many objects of interest in the vicinity. The commissions on nomenclature, publications, standards, food analysis, industrial hygiene, and international patents continued their work and presented interim reports. To carry out the recommendations of these commissions

requires more money than the International Union can provide, and a finance committee was appointed to allocate such funds as are available to those commissions the needs of which seem to justify the expenditure the most. It will be a case of the survival of the fittest, and the members of the finance committee, Messrs. Fraser (U.S.A.), Bertrand (France), Pomilio (Italy), and Miall (England) are not likely to be very popular with the members of the various commissions.

M. Kestner presided over the commission on international patents, a difficult problem which admits of no speedy solution. He has a plan for dealing with some of the defects of the existing system but proposes no universal panacea for all the inventors' troubles. Those who are interested in this thorny question might well communicate with him or the Société de Chimie Industrielle in Paris.

Interesting papers on purely scientific subjects were read by Profs. Perrin and Vignon.

Owing to the inability of some of the members to visit Lyons at this time the important Committee on the Elements which replaces the old International Committee on Atomic Weights did not meet. It is now meeting or has just met in Paris, and an authoritative list of atomic weights, isotopes, and other such data should be issued at a suitable interval after that meeting.

The Union elected as president for the ensuing three years Sir William Pope, and as vice-presidents for the same period Profs. Bancroft, Paterno, Billmann, and Votoček. It is probable that two additional vice-presidents will in due course be elected also, a proposal which is necessitated by the growing number of the countries concerned in the Union.

The next meeting will be held in Cambridge in the latter part of next June, and a considerable effort will be made to render this meeting one of real chemical importance. The French, who have been very prominent in the early stages of the Union, have done such good work in very difficult circumstances that it is felt that the English must, to maintain the tradition now that things are becoming a little easier, play their part in a manner which will be worthy of the ancient University which offers its hospitality and of the new president who will direct the proceedings of the meeting.

It is quite likely that the Society of Chemical Industry will hold its annual meeting next year in Cambridge immediately after the meeting of the International Union and a considerable migration of British and foreign chemists may be expected.

Radio Broadcasting in Great Britain.

DISAPPOINTMENT has been expressed at the delay in introducing radio broadcasting, arrangements for the establishment of which have been under discussion for some time past by the Postmaster-General and manufacturers of radio apparatus. The necessity, however, for the most careful and thorough examination of all aspects of the question is best illustrated by considering the present position of broadcasting in the United States. Radio broadcasting was commenced by the Westinghouse Electric and Manufacturing Co., for the information and entertainment of the public. Their success, however, produced a host of imitators, and broadcasting stations were established indiscriminately, some privately and some publicly owned. Only during the last few weeks has the United States Government taken action to co-ordinate and control indiscriminate transmission from radio-telephonic stations. When two broadcasting stations send out messages at approximately the same wave-length the electrical waves interfere with each other and the listener hears the conversation of two people speaking at the same time. It is not surprising to learn that the absence of a co-ordinating authority in the United States has resulted in a service which is unsatisfactory to the public owing to the lack of general agreement as to hours of operation, wave-lengths employed, and the character of broadcasted matter.

The British Government has wisely and properly decided that broadcasting licences will not be issued until those interested in carrying out this work are agreed on a scheme which will ensure, in the first place, efficiency and continuity of broadcasting, and, in the second place, agreement respecting hours of working, wave-lengths, number and location of stations, etc. Only in this way can confusion be prevented. Furthermore, the Government desires to prevent the broadcasting of advertising matter, in addition to having to safeguard the interests of newspapers and news agencies, Army, Navy, and Air Force work, commercial radio-telegraphy, etc.

We understand that about twenty manufacturers applied to the Postmaster-General for leave to broadcast, and during the preliminary discussions it became evident that the erection, equipment, maintenance, and operation of a proper broadcasting station costs approximately 20,000*l.* per annum. A number of manufacturers therefore intimated their desire to abandon the idea of broadcasting, while about six of the strongest electrical concerns in the country interested in radio developments are prepared to continue. The manufacturers appointed a sub-committee to draft a scheme, and this committee reached agreement on all the main features of a broadcasting system for Great Britain. They were, however, unable to put forward an agreed scheme for one company to undertake broadcasting. It is now understood that the manufacturers have divided themselves into two groups, each of which is proceeding to form a broadcasting company, with one or other of which all manufacturers of radio apparatus would be associated. At the same time the Postmaster-General has intimated his willingness to give a licence to each of these companies to operate stations. The two groups between them undertake to establish a sufficient number of stations to serve the whole country. There will probably be one station belonging to each group in London and seven other stations distributed throughout Great Britain, divided between the two groups by mutual arrangement or, if agreement is not reached, by allocation of the Postmaster-General.

There is little doubt that details of working arrangements between these two groups will shortly be settled, and that broadcasting will be established on a basis which will give efficient and continuous service to the public without the hopeless confusion and lack of adequate control evident in the United States.

If each of the above nine stations is to have an annual cost of about 20,000*l.* per annum, the two broadcasting groups have to contemplate an outlay of 180,000*l.* per annum. In order to assist the groups in securing an adequate return for this enormous outlay, it has been suggested to the Postmaster-General that a portion of the licence fees paid by users of receiving sets should be returned to the broadcasting groups. The groups represent between them the whole of the manufacturers of radio apparatus in this country, and their constitution is such that a genuine manufacturer must be admitted if he so