distance between the electrodes at the center was 5 inches, and the tube had an opening in the side for putting in the mixture, consisting of 5 parts crystallized silicon and 1 part of pure boron. To assure the passage of current at first, the ends of the carbons were united by fine copper wires. The side opening was closed by a cover, and the whole well luted with refractory clay; the apparatus was then placed in a sheet iron box, surrounded by dry sand. An alternating current of 45 volts was used. This could be regulated at will. The heat lasted from 50 to 60 seconds, with a maximum current of 600 amperes. The electrodes were advanced as they burned off, to avoid forming an arc. The borides of silicon were thus formed in a bath of silicon in fusion, using the latter to conduct the current.

After cooling a melted mass is found, which is then broken into small pieces: these present the appearance of melted silicon. This substance is treated with a mixture of hydrofluoric and nitric acids, which dissolve silicon; the residue is washed with water and dried. From the mass, blackish crystals are separated by sifting, and these are placed in a silver crucible with melted potash, heated at the fusing point for half an hour; this dissolves out all the amorphous substances. After again washing and drying, the crystals are obtained in a pure state. These are blackish and quite homogeneous, with brilliant luster. They contain two different compounds of boron and silicon, as the experimenters have proved after a long analysis. One or the other of these may be dissolved out by the proper reagent; thus by treating the mixture with a great excess of boiling nitric acid, the form $Si B_3$ remains. If the mixture is melted with potash, this time quite free from water and at a high temperature, the former compound is destroyed, leaving the other, $Si B^6$. These two new compounds belong to the series of bodies formerly mentioned, and of which the silicide and boride of carbon have hitherto been the only representatives. Like these, they are very hard, and will scratch the ruby. The boride $Si B_3$ has a density of 2·52. It occurs oftenest in plates of rhombic form, black in color, which, when very thin, are transparent, with a yellow or brown tint. On the contrary, the boride $Si B_6$ is always found in thick crystals, opaque, and with rather irregular faces; its density is 2·47. These two bodies are conductors of electricity; when heated slightly they are attacked by fluorine with brilliant incandescence; chlorine attacks them at a red heat, but less degree, and bromine acts but slowly at a high temperature. Heated in air or oxygen, they oxidize with difficulty; nitrogen has no effect at 1,000° C. They are not attacked by the halogen acids and very slowly by boiling concentrated sulphuric acid. Nitric acid attacks rapidly the form $Si B_6$ and the other form more slowly. Anhydrous potash, when melted, attacks the form $Si B_3$ with great energy, sometimes with incandescence; the other form is decomposed slowly and at a higher temperature.

PARIS EXPOSITION—ELECTRICAL CONGRESS.

BY THE SPECIAL CORRESPONDENT OF THE SCIENTIFIC AMERICAN.

The International Congress of Electricity was formally opened on the 18th of August in the Palais de Congrès of the Exposition. The large hall contained an assembly of prominent electricians and engineers from all countries. The different governments had sent official delegates, as did the various scientific and technical societies, such as the Société Française de Physique, the Société Internationale des Electriciens, the Chamber of Commerce of Paris, the Elektrotechnisches Institut of Carlsruhe and the Berlin Electrotechnical Society, the British Institution of Electrical Engineers, the American Institute, and others. Upon the platform were the delegates and members of the committee. The opening address was delivered by M. Mougeot, Sub-Secretary of State in charge of the Postal and Telegraph Department. M. Mascart, the eminent French electrician, as President of the Organization Committee, delivered the principal address, of which the following is an abstract:

The Committee wishes to express its thanks for the manner in which the members have responded to its invitation; it is to be hoped that this Congress, in bringing together the different members will contribute to strengthen the relations which may have been formed in the past and create new ones. M. Mascart passes in review the work of the early scientists, Volta, Ampère, Faraday, Arago, and dwells on the prosperity which the science and industry has reached at the present time and the work it accomplishes in its various branches; the utilization of the forces of nature for the production of electric energy, the transmission of power to long distances, the revolution in the means of transport, the important work accomplished by the electric furnace in the production of rare metals and alloys, and the outlook for the future in this direction; he speaks of the electric light and the wonderful effects which have been produced at the Exposition, the telegraph and telephone, with the new systems of multiplex transmission, aerial telegraphy, and the applications of electricity in physiology and medicine; the new discoveries relating to radiations from Crookes tubes and from different substances promise to throw new light upon the constitution of matter. It is in this extensive domain that the deliberations of the Congress are to take place. At the first Electrical Congress, held at Paris in 1881, were united the scientists of all countries; among those present, whose loss is now to be regretted, were Helmholtz, Kerchof, Wiedemann, Hopkinson, Hughes, Siemens, Ferraris, and others. M. Mascart brings out the fact that important results accomplished by the first Congress were due to the spirit of good-will and of conciliation which prevailed, and hopes that the present Congress will carry on its work in a similar spirit.

After this address, which was warmly applauded, the list of officers was presented and adopted. M. Mascart was made President of the Congress and the list of Vice-Presidents included Messrs. Moissan, Kohlrausch, Sir William Preece, Prof. Perry, etc., and from the United States Messrs. Carl Hering and Kennelly. The Congress was divided into five sections, with a president for each: 1. Scientific methods and measuring apparatus; M. Violle. 2. A. Mechanical production and utilization of electricity; M. Hilairet. 2. B. Electric lighting; M. Fontaine. 3. Electro-chemistry; M. Moissan. 4. Telegraphy and telephony; M. Wünschendorff. 5. Electro-physiology; M. d'Arsonval. M. Mascart read a telegram from Lord Kelvin, regretting that ill health prevented his attending the Congress. Besides the five sections named, a commission has been formed of the government delegates which will examine questions of international interest. An extensive programme of visits and excursions was arranged. Prince Roland Bonaparte invited the members to a reception at his residence.

After the announcements had been made, Prof. Ayrton, delegate from the British government, expressed the thanks of the foreign delegates for their reception by the French government. This was followed by a similar address from Prof. Dorn, representing the German Empire.

MARCONI'S LATEST DEVELOPMENTS—SYNCHRONIZED MESSAGES.

At the annual gathering of the British Association for the Advancement of Science, in 1899, Prof. Fleming of University College, London, addressed the gathering upon Wireless Telegraphy, and incidentally mentioned that while transmitting messages from Boulogne to Dover they were read at Chelmsford some 118 miles from the point of transmission. This, undoubtedly, was a remarkable performance, but it also emphasized very forcibly one drawback which has long occupied the unremitting attention of Marconi. That is, the possibility of one or more stations reading a message intended for another. Such a circumstance naturally destroys the privacy of the message, and although it is not a very significant matter in the ordinary way, yet it would be a very serious drawback, in case of war, for one belligerent to be able to intercept and to read a message that was being transmitted between the vessels of the other belligerent. Marconi quickly realized the serious nature of this disadvantage, and at his station at Poole, in Dorsetshire, England, he has been endeavoring for a long time past to successfully synchronize his messages—that is, to construct a transmitter, the message sent from which can be only received by the apparatus which has been tuned to receive it.

He has successfully solved the problem, by means of variable conductors and capacities, by the use of which certain instruments can only receive certain messages. By his latest system, Marconi can dispatch from a certain point any number of messages, and each message will be received only by that receiver that has been synchronized to the transmitter, so that jamming of words and confusion of messages upon the various receivers are obviated.

Marconi has set up his station at Poole, because that place is so remote and he is safe from interruption. Twenty odd miles away across the Solent is another station at the southwestern corner of the Isle of Wight. Between these two points messages are being transmitted throughout the day, almost without cessation, and this is how several important discoveries and improvements have been made by the inventor. While experimenting with his sychronizing system, Marconi had several opportunities of proving the capabilities of his device. At Portsmouth the English Admiralty were carrying out experiments with wireless telegraphy in connection with the fleet, and naturally several of these ether waves crossed Marconi's line of transmission between Poole and the Isle of Wight, the effects of which upon his instruments the inventor regarded with the utmost satisfaction, since they proved that he had finally surmounted the most perplexing disadvantage of his system.

Marconi has also made some other important discoveries. He now utilizes cylindrical tin cans, about five feet in height, in lieu of the vertical wires, since they furnish more convenient capacities and radiators. He is lengthening the distance over which messages may be transmitted, and although his experiments at Poole can be conducted only on a limited scale, yet he is confident that when he works upon a larger station, they will be equally successful, and there is no doubt but that many important developments in ether telegraphy will be divulged in the near future.

At the present moment Marconi has a sufficiency of work on hand. The North German Lloyd Steamship Company are having one of his systems installed at Berkum (Germany), to be used in connection with their fleet of vessels. Apropos of this, Marconi has been carrying out many experiments with a view to applying the system practically to shipping, so that greater safety may be assured to vessels at sea. Then the International Company of France are having the coast of that country, metaphorically speaking, lined with his installations, so that communication may be maintained between the vessels of the French Navy and any point of the mainland, which would play an important part in case of a war between England and France, since by this means the latter nation could manipulate their troops according to the information received from their battleships, and thus be able to work the land and sea forces hand in hand. Then six stations are being set up in the Hawaiian Islands and will soon be in working order. Many vessels in the English Navy are also having the system installed.

EXPLOSION OF A NAPHTHA LAUNCH.

The recent explosion on a naphtha launch at New Rochelle, N. Y., in which two persons lost their lives and a third was severely if not fatally injured, again emphasizes the need of greater care both on the part of the boat-builder and the boat-owner. The launch in question was built on the usual lines of small, vapor-motor boats. In the stern the engine was placed, to which naphtha was fed by pipes leading from a storage-tank in the bow. For some time this tank had been in a leaky condition; and the oil that escaped was a source of constant danger to the occupants of the boat. A time at last came when the vapor from the leaking oil happened to mingle with the air in the lockers or recesses in just the right proportions to explode, if the proper degree of heat, say, from a lighted cigar or a match was presented. Whether the explosion at New Rochelle was thus caused, it is at present impossible to ascertain; but that the catastrophe would have been averted if the storage-tank had been repaired in due season, seems reasonably certain. Although launches, as a rule, are constructed with great care, a due regard for the safety of negligent purchasers should induce boat-builders still further to reduce the danger of explosions. In launches in which the vaporized naphtha is led back and condensed at the source of supply, the storage-tank is inclosed in a water and air-tight compartment. Although there may be apparently no reason for similar precautions in launches of the non-condensing type, and although the leakage of a properly-made storage-tank is of rare occurrence, the water-tight compartment should, nevertheless, be employed, for reasons which the New Rochelle explosion have brought home forcibly enough.

ACCUMULATORS WORKING UNDER WATER.

The municipal electric plant of Munich furnishes the remarkable case of a battery of accumulators which continued to work when submerged under water. The station is situated on an island formed by the Isar, and during the inundations of last year was partially submerged. The batteries of accumulators, which were on the ground floor, were first reached, and were soon entirely covered. One of the batteries was used on the city lighting circuit, and the other was connected in parallel with the dynamos for the traction system. As the tramway service had to be discontinued, the second battery was removed from the circuit, and it was thought that the batteries for the lighting circuit would also have to be cut out, as the fly-wheels of the engines were half under water, except two. Nevertheless, as it was almost indispensable to light at least the principal streets of the city, it was decided to try to operate the submerged battery. The attempt was successful, and the battery, which had been constructed to give 6,000 ampere hours with a 600-ampere discharge, was able to furnish 4,000 ampere hours during the night; the remainder was lost in discharges in the water. Encouraged by this success, the engineers charged the battery on the following day, and the discharge was repeated under the same circumstances. Two days after the water had lowered sufficiently to give access to the battery rooms; it was found that the density of the acid had fallen, but not to a very great extent; from 22° B. it had fallen to 20° B. only. It is thus seen that there was scarcely any diffusion. Outside of a layer of mud a quarter of an inch thick upon the top of the plates and the connecting rods, the inundation had left scarcely an appreciable trace. It was supposed at the beginning that it would be necessary to replace the acid of the batteries, which represented a considerable expense, as they contained more than 30,000 gallons; but as the acid held its strength, as shown above, a slight strengthening was all that it required.