vestigations on various subjects have been carried on, the results of which have been in part published in the French scientific journals. Of the work published in Portuguese, that of Dr. Lacerda, on the nature and physiological effects of snake and other poisons, and the successful application of permanganate of potash as an antidote to snake-poisons, is the most striking and important. The laboratory being open to investigators outside of the establishment, several have availed themselves of the opportunities thus afforded; and Messrs. Guimerães and Raposo have investigated the physiological effects of coffee, Paraguayan tea, and other alimentary substances; and Dr. Araujo Goes is now engaged in studying the microscopic organisms of pulmonary diseases.

The school of mines also has its annals, of which one volume has been published, containing important papers from the pen of the director, Professor Gorceix, on the mode of occurrence of the topaz, diamond, and other precious stones, and on the geology of the regions where they occur, as well as papers from the students of the school, which prove that it is training an able corps of investigators, from which much may be expected in the future. The second volume, now in preparation, will contain translations of the little-known papers of Lund on the bone-caverns of Lagoa Santa.

The past year has witnessed an almost complete reorganization of the medical school of Rio de Janeiro, with the establishment, on a liberal scale, of many new laboratories for instruction and research, from which much good work is naturally to be expected. Up to the present time the studies of Dr. Domingos Freire in organic chemistry, and on the microscopic organisms of yellow-fever, and the nature, cause, and treatment of that disease, are the most important that have appeared from that institution.

In the polytechnic school the era of investigation has been too recently introduced, and on too small a scale, to have yet produced any material results. Dr. Saldanha da Gama, in the botanical department, is studying the flora of the vicinity of Rio, and training his students in the methods of research; and important geological and mineralogical investigations are being carried on by Dr. Ennes da Souza, who has had the advantage of a thorough scientific training at Freiberg. The chemical department has just received as guests Professor Michler of the university of Zurich, now on a scientific visit to Brazil, and Dr. Sampaõ, a Brazilian graduate of the same university, who are conducting elaborate investigations on the chemistry of Brazilian vegetable products.

Brazil not having as yet reached that stage of scientific and material development in which scientific men can hope to gain a livelihood, and find means and time for investigation outside of the government schools and other establishments, little can be expected among private workers. Notwithstanding this fact, the development of what may be called the official science has been too slight to place it in advance of the non-official. Fritz Müller, a farmer in a German colony of southern Brazil, finds time for the zoölogical investigations that have given him a world-wide reputation; Glaziou, director of the public gardens of Rio, has contributed largely to the Flora braziliensis, and is probably unsurpassed in his knowledge of Brazilian botany; Rodrigues Peixoto, a practising physician, has been associated with Lacerda in important studies on Brazilian craniology; and Barbosa Rodrigues has worked extensively on the palms and orchids in botany, and in the fertile field of Amazonian ethnology.

Though the showing for Brazilian science is so small, and some of the work above mentioned may, on close scrutiny, prove to be somewhat crude and non-scientific in its methods and deductions, enough has been done to mark the dawning of a new era full of promise for the future, and characterized by the study of nature rather than the study of books. The small nucleus of investigators cannot fail to train disciples, to draw others around them, and to educate the government and people to the point of distinguishing true research from mere empty show and glitter. When once truly scientific methods come to be fairly naturalized in the country, the Brazilians will not be found lacking in the mental qualities that make able and original investigators. If scientific progress be slow, it will not be, as hitherto, from indifference, or ignorance of the true nature of science, but because the material development of the empire does not permit the facilities of research enjoyed in older and richer countries.

HISTORY OF THE APPLICATION OF THE ELECTRIC LIGHT TO LIGHTING THE COASTS OF FRANCE.[1]

IV.

In the English lighthouses, for which the de Meritens machine has also been adopted, another style of commutator is used, as shown

[1] Continued from No. 7.

in Fig. 13. In this arrangement, the terminals to which the conductors from the lamp and those from the two machines are connected have

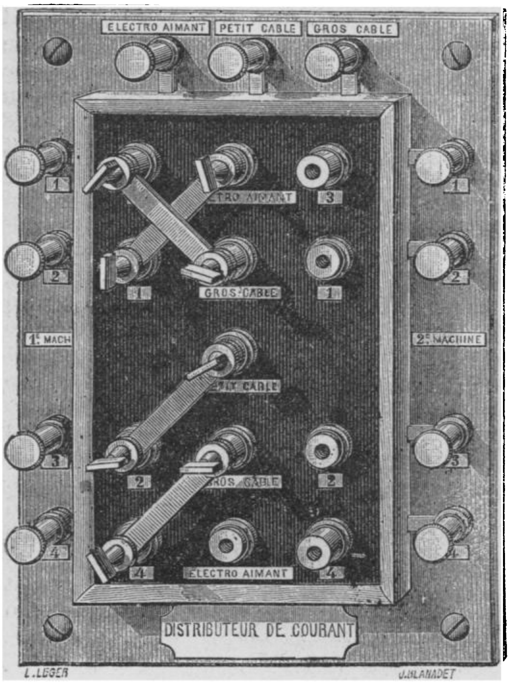

FIG. 13.

practically the same relative positions as in the previous case. From these terminals pass stout copper strips, which can be clamped by binding-screws bearing the same numbers as the terminals. The locking-pieces in connection with the terminals of the machine can be connected by thick copper strips by the binding-screws corresponding to the lamp-cables; and to facilitate this coupling, the locking-pieces are more or less raised, so that the strips may cross each other without touching. In this way perfect contacts are obtained; but a longer time is required to change the combinations. Fig. 13 shows the connections when machine No. 2 is coupled for quantity. Fig. 14 allows the difference in height of the locking-pieces to be seen, and shows how machine No. 1 is coupled for quantity.

The metallic rails upon which the regulator rests have already been described. These rails are in direct communication with the large cable; and it is by them that the current arrives at the frame of the regulator, and thence to the carbons. The cable of the electro-magnet and the small cable are attached to two terminals (H and H′, Fig. 15) with insulated springs. These springs, pressing on two contacts under the lamp, make the appropriate connections.

The regulator itself is a combination of the Serrin and Berjot lamps. It comprises the two electro-magnets of the latter lamp, the armatures of which form an internal core, — one magnet having coarse wire, and placed direct in the circuit; the other having fine wire, and mounted in a derived current. The former acts on the articulated frame carrying the lower carbon; the latter acts on the disk brake controlling the clock-work.

Fig. 15 shows at S the electro-magnet with coarse wire acting by the arm Q on the frame. R and R′ are the springs which tend to raise this frame. L is the lever which serves to regulate the tension of the spring R: it is controlled by a screw, V, which can be turned by insert-

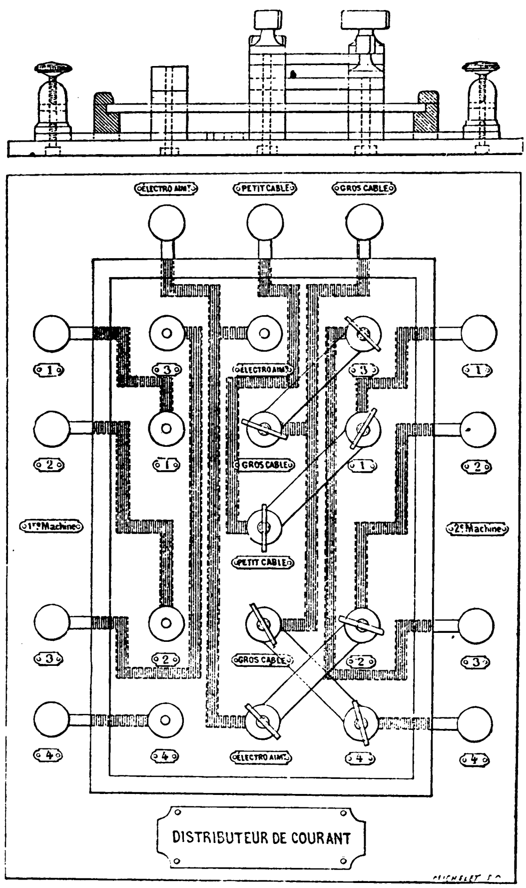

FIG. 14.

ing a key at the hole O. The magnet with fine wire is placed symmetrically with the other on the opposite side of the clock-work.

The connection of the two carbons to the prime mover of the clock is made by means of a steel ribbon, F, attached to the lower ends of the two rods *g* and *l*. This ribbon is led over several pulleys, and is wound on a wheel on the axis of the prime mover for a great part of its circumference. The turning of this

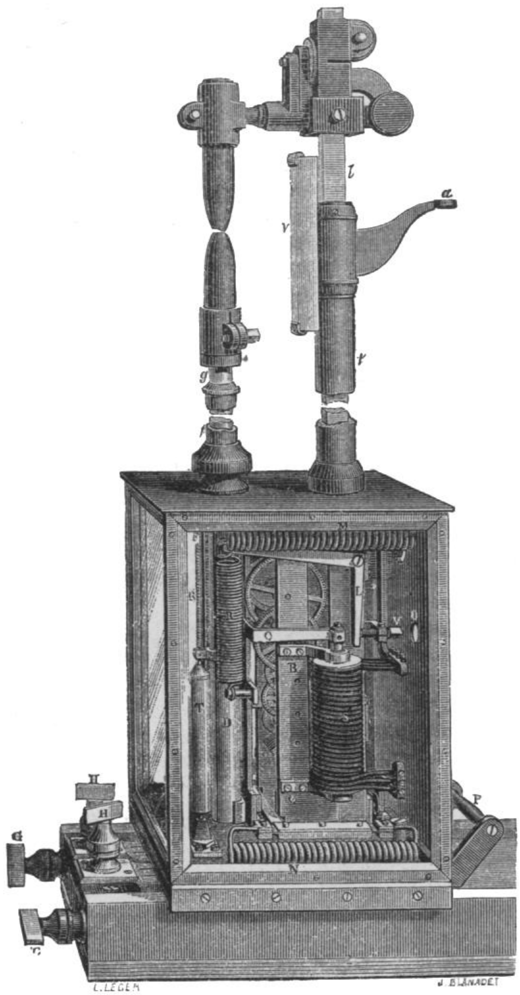

Fig. 15.

wheel is thus produced in a very certain manner. The rod *g* slides in the tube D fastened to the movable frame, and this tube is slit vertically to allow the attachment of the ribbon to pass. This manner of connecting the two carbons, which replaces the chain used by Serrin, and does away with the use of ratchet-wheels, allows the carbons to be placed at any desired height by a slight sliding of the ribbon.

Another peculiarity of this lamp is the mode of connecting the different interior parts of the apparatus. The current of the large cable arrives at the upper carbons by the rails and uninsulated portions of the regulator. From the lower carbon, it returns to the two insulated terminals H and H′, passing to one by the movable frame, and to the other through the electro-magnet S. The connections between the contacts are made with four thick spirals of nickel-plated copper. Two are shown at M and N.

The tube D, which carries the rod *g*, is not insulated from the frame; but the latter is insulated from the upright which supports it. This is on account of ease of construction, it being less difficult to insulate a straight piece than a round tube like D. An air-pump, T, serves to check the motions of the frame, and to prevent too rapid oscillations. The porous plate V is placed opposite the ends of the carbons, to protect the rods *t* and *l* from the excessive heat of the *foyer*. It is composed of the same material as the porous vases used in batteries. When the upper carbon rod arrives at the end of its course, it acts on a bevelled piece, which frees a contact spring, and suppresses the communication with the fine wire magnet, so that it may not be injured by the passage of too strong a current.

THE WEATHER IN JANUARY, 1883.

The monthly weather-review of the U. S. signal service contains copious statistics of the meteorological conditions, as observed at 171 regular stations in the United States and Canada, 224 stations occupied by voluntary observers, and 56 army-posts, besides various other sources of information. The following are given as the special features for the month: —

The very low mean temperatures. The departures from the normal are most marked for the upper lake-region, the upper Mississippi and Missouri valleys. The average temperature for all the districts east of the Rocky Mountain range was 3.3° below the normal.

The excessive rainfall over the south Atlantic and east Gulf states, with a marked deficiency in California.

The heavy snow-storms in the west, blockading or impeding all railroad traffic.

The chart on the opposite page has been reproduced by permission of the chief signal-officer from the regular chart No. III. of the signal-service series. It contains lines of equal air-pressure reduced to sea-level, lines of equal temperature unreduced, and mean