

what has been encountered, and one is driven to the conclusion that some portion of the thermal result is due to the internal heat of the earth arising from volcanic agency.

The energy and skill of those in control, amongst whom are Colonel Locher, Herrs Brandau, Pressel, Kager, Sulzer, and many others, are surmounting these difficulties, and it is anticipated that without any very great delay the junction of the headings will be effected.

Certainly no tunnelling operations in any part of the world have been exposed to such vicissitudes and difficulties, and when the arching of the tunnel is fully completed little will be left to show how hardly earned has been the victory over physical obstructions.

It is expected that within three months of the piercement trains will be running, and the railway will prove to be a most important link in the line of communication between Rome, Genoa, and Milan with Lausanne, Berne, and mid-Europe. FRANCIS FOX.

#### WATER-DROPPERS AND RADIUM COLLECTORS.

IT is more than forty years since Lord Kelvin commenced a new era in measurements of atmospheric electric potential by devising the water-dropper. Though marking a great advance, and simple in its construction, the water-dropper has not increased the happiness of those responsible for the conduct of self-recording meteorological instruments. It has weaknesses which it takes some time to discover, and which, when undetected, may lead to serious error. Some of the earlier forms had their water reservoirs so constructed that the pressure under which the jet issued varied considerably with the time since the reservoir was filled. Punctuality in filling the reservoir had in this case the disadvantage of accentuating a subsidiary diurnal variation not due to nature. The misdirected attention of spiders, variations of moisture, and other meteorological conditions, produce changes of insulation in the water tank; choking of the jet occasionally happens through impurities in the water, and in severe winters there may be complete stoppage through freezing of the jet. As this major catastrophe usually occurs at night, it generally entails a considerable loss of trace.

The idea of replacing the water jet by some radioactive substance presented itself pretty soon after the announcement of Becquerel's discoveries. The report of the International Meteorological Committee, which met at Southport in 1903, contains a note by Prof. Paulsen on his early use of a radio-active powder. This was spread on filter paper resting on a disc of copper, a thin covering plate of aluminium serving as a protection against rain. In this form the apparatus was used in Iceland in 1899-1900. M. La Cour modified this form by mixing the powder with caoutchouc into a paste, which was spread on a disc of copper, while a thin copper grating was pressed down on the top of the paste before it was quite dry. This form was used with satisfactory results in Finland in 1900-1. After wetting by rain, however, its efficiency was temporarily lessened. The same report also describes an instrument which M. Moureaux had had in use for some time at Parc St. Maur Observatory, Paris. It employs as collector chloride of radium in a shallow copper vessel, over which is soldered a plate of aluminium 0.1 mm. thick to keep out rain. Chloride possessing 5000 times the activity of uranium was not sensitive enough, but chloride with 30,000 times the activity of uranium gave good results. M. Moureaux so arranged matters that he could at pleasure record

the electric potential, practically at a fixed point, either by the radium collector or a water jet. In this way he obtained an electrogram, successive portions of which were obtained in immediate sequence by the two collectors. Unless the times of the change had been indicated, one could not have told by inspection of the curve—which is reproduced in the report—which collector was being used. When M. Moureaux's note was written the radium had been in use for several months with satisfactory results. A foot-note, however, of later date, mentions that some months later the radium was found to have produced a number of minute holes in the aluminium, and that it was intended to dispense with the aluminium and protect the radium against rain by coatings of varnish. It was further hoped that this would admit of the use of cheaper chloride of less radio-activity.

The employment of radium is thus hardly out of the experimental stage, and any one adopting it at present would be well advised to check the action from time to time by recourse to a water jet. It would also be desirable to make sure before final adoption that the radium does not itself modify the potential which it is desired to record, more especially in calm weather. Whatever the final outcome may be, it is at least satisfactory that M. Moureaux's experiments showed agreement between the water jet and the radium collector when both were upon their good behaviour.

C. CHREE.

#### NOTES.

THE friends of Prof. G. Carey Foster, F.R.S., are taking the occasion of his recent retirement from the principalship of University College, London, as an opportunity of showing their appreciation of him by promoting a fund with the object of having his portrait painted for presentation to the council of the college, and a replica for presentation to Mrs. Foster. The president of the movement is the Right Hon. Lord Reay, G.C.S.I., and the vice-presidents are Sir Norman Lockyer, K.C.B., Sir Oliver Lodge, and Sir Arthur Rücker. Further information with regard to the scheme may be obtained from the secretaries of the fund, University College, Gower Street, W.C.

THE death is announced at Hamburg, on September 27, of Dr. H. Kortum, professor of mathematics at the technical college at Bonn.

THE Naples Academy of Physical and Mathematical Sciences offers prizes of 500 francs to the authors of the best papers in Latin, French, or Italian on the two following subjects: the processes of formation of urea in the animal organism, and the evolution of the ovaric ovum in the Selacii. The essays are to be sent in anonymously, bearing a motto, on or before June 30, 1905. The Padua Society of Encouragement offers, to Italian subjects only, two prizes of 5000 francs for an essay on the present state of the problem of electric traction on railways, and for a new method of diagnosing the disease of pellagra previous to its development. This competition closes on June 30, 1906.

A PETITION has been presented to His Majesty in Council asking for the grant of a charter of incorporation to the South African Philosophical Society under the name of "The Royal Society of South Africa."

MR. WILFRED MARK WEBB has accepted the honorary secretaryship of the Selborne Society.

THE death is announced of Dr. Tillaux, professor of surgery in the University of Paris, president of the Academy of Medicine, and Grand Officer of the Legion of Honour.