burn with a flame in an atmosphere of coal-gas the very same phenomena are observed, the hot coal-gas being positive relatively to the air-flame. All these flames showed a potential varying from about $1\frac{1}{2}$ to $1\frac{3}{4}$ times that of a Daniell's cell. The flame of bisulphide of carbon gave a lower result, and so did a magnesium flame. The introduction of any salt of a metal—such as chloride of potassium—into the flame lowered the potential.

Moreover when wires of other metals were employed the differences of potential were not the same as before. Whilst the lower electrode of platinum remained, the upper electrode was replaced by a copper wire when the potential rose to 2 Daniell's cells. With aluminium it was equal to 3, and with magnesium to 3·2 Daniell's. Using a lump of clean sodium as electrode the potential even rose to five times the Daniell cell.

Using as a fluid electrode a drop of water at the end of a capillary tube similar results were obtained, though the differences of potential were smaller.

These experiments corroborate the suggestion that the flame acts like the acids between the poles of a battery-cell, or that the action is an "electrolytic" one.

Messrs. Elster and Geitel succeeded in joining electrically together the flames of twenty-five spirit-lamps, by the device of causing a curved piece of platinum wire to lead from the base of one flame to the tip of the next, and another piece of wire from the base of this to the tip of the succeeding one, and so on. This "flame-battery" of course had a potential twenty-five times as great as that of one flame. But it would not yield much current, owing to the enormous internal resistance of the flames themselves.

Another most important series of researches was then undertaken to investigate whether, without any *flame* or any products of combustion, a difference of potential could be observed between a red-hot platinum wire and a cold platinum wire whose tip was immersed in the currents of heated air that rose from the former. This was accomplished by using as one electrode a thin platinum wire heated to redness by passing through it the current of a battery. And here, *without any flame*, a difference of potential of about one and a half of a Daniell's cell was found, the upper electrode being positive, relatively to the glowing one. From this experiment, which was confirmed in a variety of ways, it appears that *a flame is not in itself a source of electrification at all.* Messrs. Elster and Geitel therefore regard the electrification as a thermo-electric phenomenon; though they use this term in a slightly different sense from that in which it is used in the text-books.

They conclude, therefore, that the production of electrification by flames is (1) independent of the size of the flame; (2) dependent on the nature and state of surface of the electrodes; (3) dependent on the nature of the gases that are burning in the flame; and (4) dependent on the state of ignition of the electrodes.

They therefore regard Pouillet's theory as being wrong, whilst the theories of Matteucci (and Hankel) and of Buff are both, so far as they go, correct. If this so-called thermo-electric origin of the electrification be the true one it is a very important fact indeed; and, as these able experimenters say, will probably explain the back-electromotive force which is observed in the voltaic arc. This is not the least interesting point in this very interesting research. S. P. T.

THE METEOROLOGY OF ICELAND DURING THE WINTER AND SPRING OF 1881-82

THE observations made last winter by Mr. Thorlacius, observer for the Scottish Meteorological Society at Stykkisholm, Iceland, have been received by the Society, and they are of the greatest interest in connection with the unexampled mild weather which prevailed in this country for the five months ending March. The mean pressures, for these five months, at 32° and sea level, were respectively 29·201, 29·140, 29·295, 29·471, and 29·258 inches, the mean of these months being thus only 29·273 inches. In London the mean of the same months was 30·123 inches, or 0·850 inch higher than that of Stykkisholm. The means for these two places for the twenty-four years ending with 1880 are for London 29·948 inches, and Stykkisholm 29·552 inches, the difference being 0·396 inch, or less than half the difference during the winter of 1881-82. The greatest difference occured in January, the mean pressure for which month in London was 30·365 inches, and at Stykkisholm 29·295 inches. Pressure in the north-west of Iceland was thus 1·070 inch less than in London.

On January 14 the pressure at Greenwich was 30.572 inches, and the maximum temperature 42°·4, but at Stykkisholm on the same day temperature rose to 46°·5, with a storm of wind from the south, and pressure was as low as 28·290 inches, being 2·282 inches lower than at Greenwich. At Greenwich pressure rose at 10 a.m. of the 18th to 30·973 inches, the maximum temperature being 34°·2; but at Stykkisholm pressure on the same day was only 29·466 inches, the maximum temperature rose to 46°·5, and a storm of great violence from the south set in at noon and lasted till 6 a.m. of the following day.

During the five months of high temperature in the British Islands the following winds prevailed less than the average of previous years, viz. W. 4, N. 1, N.E. 6, and E. 8 days; but winds from S.E. were 2, S. 7, and S.W. 14 days above the average. Hence during the winter of 1881-82 atmospheric pressure was not only much under the mean in the north-west of Iceland, but the great depression, which is one of the most prominent features of the meteorology of the northern hemisphere in the winter months, was, as indicated by 21 days' greater prevalence of S. and S.W. winds, situated considerably to the north-west of its usual position. Very low mean pressures for the winter months are of frequent occurrence in Iceland, but it is seldom that they continue uninterruptedly low for five months in succession. Thus, since Mr. Thorlacius began his observations in 1845, mean pressure was nearly as low only on three other winters, viz., the winters of 1847-48, 1850-51, and 1862-63, when the mean pressures of these five months were respectively 29·308, 29·330, and 29·310 inches.

The weather underwent a complete change about the middle of March, when S. and S.W. winds nearly ceased and a high mean atmospheric pressure ruled, with repeated cyclonic disturbances passing to the southward of Stykkisholm, and involving Iceland in a succession of violent north-easterly storms of wind, which broke up the Arctic ice to the north, drove it southward, and stranded it on the north and east shores of the island. In these circumstances the weather became unusually inclement and unseasonable, and Mr. Thorlacius reports that no equally severe and disastrous spring has occurred there within the memory of any one living. About Easter all the food for horses, sheep, and cattle had been used up, and these animals died in great numbers. In his parish alone, 62 horses, 1700 sheep and swine, and 7 cows perished, causing a direct loss of 1220*l.*, and the population has been brought face to face with a serious famine.

Though the Government is taking every measure in its power to mitigate the calamity, the prospect is most gloomy. Besides this, all, or nearly all, of the lambs have died, and owing to the great cold and want of rain, grass has scarcely yet begun to grow, the sea-ice still (July 1) surrounds the entire north and east of the island in immense masses, and no ship can get through it to any of the harbours of these coasts. On the north coast the ice drove ashore about fifty large whales, of which the smallest is said to be forty-five feet in length, which proved an unexpected relief to the poor peasantry, and even to the proprietors of the coast districts.