the last which bring the solution near to saturation. Prof. Mendeléeff points out that researches pursued in the direction just mentioned could throw some light on the internal forces which are active in solutions and other chemical compounds.

It appears from the annual report of the Russian Chemical and Physical Society that the chemical section has now 162 members; its income, including several grants, reached 5734 roubles (about 570*l.*), and its capital 13,932 roubles, of which 7894 roubles were devoted to premiums. The physical section has 103 members; its income reached 1851 roubles, and its capital 16,000 roubles.

At the annual general meeting of the Hackney Microscopical and Natural History Society held on March 19 at the Morley Hall, Hackney, a valuable microscope was presented to the honorary secretary by the members. The president, Dr. M. C. Cooke, in presenting the testimonial, made some highly eulogistic remarks upon the energy and unremitting attention given by the honorary secretary during the seven years of the existence of the Society, to which he ascribed its present flourishing condition. A silver plate bearing the following inscription was attached to the instrument:—"Presented to Collis Willmott, Esq., by members of the Hackney Microscopical and Natural History Society in appreciation of his services as Hon. Secretary, 19th March, 1884."

We have received from the Direction of Schools at Tiflis its annual report, and we are glad to recognise that education in the Caucasus—which is perhaps more independent of the Ministry of Public Instruction than other parts of Russia—is spreading more rapidly than might have been supposed. On January 1, 1883, there were no less than 1168 schools under the supervision of the Ministry, with an aggregate of 80,838 scholars, of whom 15,036 are girls. If the 60 Jewish and 1920 Mussulman schools at synagogues and mosques be added—however low the degree of education given to their 18,647 scholars—as also 31 schools of various descriptions, military, theological, and lower medical, the aggregate number of scholars would reach 102,728. There is thus (excepting the Jewish and Mussulman schools) one school for each 4880 inhabitants, surely still a very low figure; but it is a little higher in the more densely peopled Northern Caucasus (1 to 3060 in Kubau). Of the 1168 schools above mentioned there were 1055 primary schools, with 52,251 scholars, one-fifth of whom are girls; 33 higher primary schools, with 5213 scholars; 5 schools for teachers, with 500 scholars; 8 technical schools, or *Realschulen*, with 2312, and 10 lyceums, or half-lyceums, with 3555 scholars. We see with pleasure that there were also 6 lyceums and 6 half-lyceums for girls, with the high figure of 3127 scholars. The distribution of education among different nationalities is very interesting. Of the above-mentioned 80,838 scholars, 46 per cent. per cent. were Russians, 25 per cent. Armenians, 17 Georgians, and 5·2 Tartars and Circassians. With regard to the population, the proportion of Armenians receiving instruction is 1 to 41, while it is only 1 to 44 with the Russians, 1 to 75 with the Georgians, 1 to 350 with the Circassians, 1 to 851 with the Tartars, 1 to 33 with Jews, and 1 to 7 with the Western Europeans settled in the Caucasus. Even in lyceums the Armenians (1 to 858) come first after the Jews (1 to 210) and before the Russians (1 to 866), while only 1 to 11,237 Circassians, 1 to 9352 Tartars, and 1 to 1246 Georgians, enter the lyceums. The Russians like the technical schools better, and the daughters of the functionaries take the lead in the lyceums for girls. Altogether the tendency towards education is well felt in Northern Caucasus, and it is agreeable to see that in secondary schools—male and female—11 to 12 per cent of the scholars are children of peasants and Cossacks. The number of these schools is even too small, and in 1882 no less than 441 boys were refused admission to lyceums on account of want of room. One may be sure that this tendency would be still greater were it not for the want of sympathy displayed throughout Russia with the so-called classical lyceums, where a mechanical study of Latin takes the place of sound instruction in natural sciences. We must notice also a beautiful educational map of the Caucasus which accompanies the Report for 1880. Owing to a system of coloured signs of different shapes, one sees at a glance the number of schools of different description, male and female, spread throughout the Caucasus, as well as who pays for them—the State, the municipalities, the village communes, or private persons; while a number of coloured plates on the borders of the map show the tendency towards instruction in different provinces, the nationalities of the scholars, and so on.

We are informed that Mr. Robert Hunt's (the Keeper of Mining Records) large and comprehensive work on the history, discovery, practical development, and future prospects of metalliferous mines in the United Kingdom, under the title of "British Mining," will be published early next month by Messrs. Crosby Lockwood and Co.

AN IMPROVED THERMO-ELECTRIC PILE FOR MEASURING SMALL ELECTROMOTIVE FORCES[1]

THIS paper contains a description, illustrated by sketches, of a new and convenient form of thermo-electric apparatus for measuring small electromotive forces by the method of opposition, and of the method of constructing and using the apparatus.

The apparatus consists essentially of a series of about 300 pairs of horizontal, slender, parallel wires of iron and German silver, the former alone being covered with cotton. The wires are about 8 inches long, fixed side by side in close mutual contact, though insulated from each other, as a continuous flat layer about 16 inches long, in a wooden frame, and soldered end to end in single continuous series. About 1½ inch in length of the opposite ends of the wires are bent downwards to a vertical position, so as to enable them to dip into two liquids of different temperatures contained in two long, narrow troughs. The liquids employed are non-conductors; this was found to be necessary. The one for the hot junctions is melted paraffin kept at a temperature of 120° C., and the one for the cold ones is non-volatile petroleum, known by the name of "thin machinery oil." The ends of the wires are immersed about one-fourth of an inch in the liquids.

The maximum power of the instrument is of course limited by the amount of difference of temperature of the two liquids, and of the two series of ends of wires immersed in them. Any lower degree of electromotive force is obtained by attaching a copper wire to one end of the series, and sliding the free end of the other terminal wire across the middle part of the upper surface of the wires, from that end of the series towards the other; the German silver wires being bare permit metallic contact.

An apparatus as above described, consisting of 295 pairs of wires, had a resistance of 95·6 ohms at 16° C., and by a difference of 100° C. of temperature of the two baths, gave a current having an electromotive force of ·7729 volt, or with a difference of 130° C., 1·005 volt. Each element therefore equalled ·0000262 volt for each C. degree difference of temperature.

After having been verified with a standard voltaic cell, such an apparatus (or any fraction of it) may itself be employed as a standard. It is capable of producing and measuring as small a degree of electromotive force as a 34861st part of a volt. When the potential of the currents to be measured exceeded one volt, either an additional pile or a standard voltaic cell was employed with it.

Several apparatus of this kind have been constructed, and a large number of determinations of electromotive force have been made with them. Fifteen determinations per hour have frequently been made; the rate of working, however, depends upon the steadiness of the current to be measured.

[1] Abstract of a paper read before the Birmingham Philosophical Society February 14, by Dr. G. Gore, F.R.S.