THE ELECTRIC LIGHT IN THE MECHERNICH MINES.

The electric light installation at the Mechernich Mines in its once volcanic Eifel district in Rhenish-Prussia, has now had a fair trial for more than three years and has proved a complete success. The expectation that it would both facilitate the operations and increase their security, has fully been realised, and an extension of the plant is now being carried out. Messrs. Siemens and Halske, of Berlin, undertook the work, which was superintended on their behalf by Mr. Boeddinghaus. An open working 2,000 ft. long, 1,000 ft. wide, and over 300 ft. deep, in which 300 men and 20 horses are continually occupied, was first to be supplied with the electric light. This part of the mine is excavated in steps, the horizontal terraces being provided with rails. Ordinary lamps in globes on poles were out of the question, as blasting operations continue throughout the day and the shots would soon have made havoc of the lamps. After several trials two powerful lamps, of 3,000 candles each, were erected at the upper margin of the pit where they were fairly out of the reach of the projected stones; and reflectors were fixed to throw the light down upon the steps. To find the proper positions for these powerful lamps and to avoid too dark shadows caused some difficulty. But the illumination was finally rendered most efficient, and the open pit with the light playing on the whitish grey rock affords a fine spectacle. As any interruptions, even for short periods, such as those occupied in renewing the lamp carbons, would be dangerous, the whole plant is double; each lamp receiving its current from a D2 dynamo. No hitch of any kind has occurred, and the safety of the miners has decidedly been augmented. It was formerly not always possible for the superintendents to see whether the loose mass resulting from the blasting operations had been properly removed, and frequent minor accidents arose from the débris falling down upon the miners engaged on the step next below. The work can now be controlled much better than before when petroleum lamps and hand lamps were in use. The cost shows a saving of about 4d. per hour in favour of the electric illumination. The satisfactory results obtained in the open working induced the company to introduce the electric light down in the subterranean galleries. The ore forms little concretions of sand and galena scattered all through the rock; the whole mass has therefore to be brought to day to be disintegrated and sifted, and the mining proceeds in parallel and cross galleries which are constantly being widened until they become 90 ft. in width, and 70 ft. in height, by sometimes 300 ft. in length. The operations in themselves would not require much light if there was not always danger threatening from loosened pieces of rock. Pitch torches were formerly employed to examine the bore holes and fissures round them after each explosion. It was a question whether the arc lamp would answer for this purpose in the smoky atmosphere. For the first experiments, arc lamps of 3,000 and 1,000 candles were used, with the positive carbon in the lower holder. The effect was brilliant, yet the light did not penetrate the white smoke cloud which collects at the upper wall immediately after the shot. But as the smoke settles within ten minutes, it was thought advisable to acquiesce in this interruption of a few minutes, and to use smaller lamps of 350 candles, which proved quite efficient. Of these, there are ten in use, with about 10,000 ft. of lead cable, the cable being partially elastic, as the lamps with their wires have to be removed when the blasting is to take place. The lamps were originally supplied with hexagonal lanterns with obscured glass to protect the eyes of the miners. The glasses were of course soon broken, but no complaints are said to have been made about the naked electric lights. The proprietors of the mine have decided upon an extension of the installations.—*Engineering.*

Miscellaneous Notes.

HEATING EFFECTS OF ELECTRIC CURRENTS.—An interesting paper on this subject has been communicated to the Royal Society by Mr. W. H. Preece. With bare platinum wires of small diameter, the general law governing the ratio between the currrent strength and the diameter of the wire, when the latter is raised to a definite temperature, and where radiation is free, appears from Joule's law to be that the current should vary as the diameter $\times \sqrt{\text{diameter}}$ or $c = d\sqrt{d}$. Both the results of Mr. Preece's experiments tend to show that the current varies as the diameter. Platinum wires are however liable to flaws which practically reduce their effective diameter. Mr. Preece has also determined the strength of currents which produce self-luminosity in wires of different kinds and sizes. These currents were measured by finding the difference of potential at the ends of a thick German silver wire, whose resistance was .0157 ohms inserted in the circuits. The results with copper, Swedish wrought iron, German silver and platinum wires, showed that the law $c = d\sqrt{d}$ held very well for all these wires, except with those of platinum, the point of low red heat being taken as the fiducial point. The temperature of a wire which becomes self-luminous has been given by Draper as 977 deg. Fahr., and by Daniell as 980 deg. Fahr. The exception in the case of platinum may account for its exception to the law in the former experiments. Mr. Preece infers from his experiments that electric light wires should be made large enough to avoid the possibility of heating them above normal temperatures, otherwise points of danger are easily reached by increments of currents.

THE WORLD'S TELEGRAPHS.—The telegraph appears to have made more progress in the United States than in any other country. The number of American telegraph offices in 1882 was 12,917, and the number of telegrams forwarded during the year was 40,531,177. The number of telegraph offices in Great Britain and Ireland in 1882 was 5,747, the number of telegrams forwarded being 32,965,029. Germany had 10,803 offices, the number of telegrams forwarded being 18,362,173. France had 6,319 offices, the number of telegrams forwarded being 26,260,124. Russia had 2,819 offices, the number of telegrams forwarded being 9,800,201. Belgium had 835 offices, the number of telegrams forwarded being 4,066,843. Spain had 647 offices, the number of telegrams forwarded being 2,830,186 British India had 1,025 offices, the number of telegrams forwarded being 2,032,603. Switzerland had 1,160 offices, Italy 2,590, and Austria 2,696. The number of telegrams forwarded in these three last-mentioned countries was 3,046,182, 7,026,287, and 6,626,203 respectively.

MAGNETISM OF THIN STEEL PLATES.—A curious and instructive experiment has just been made by M. Duter, who took a number of very thin plates or discs of tempered steel, about a millimetre thick, and from five millimetres to forty centimetres wide, and built them into piles, the adjacent plates being sometimes in contact, and sometimes separated by a sheet of paper or cardboard. These piles were then inserted in a very powerful magnetic field, and withdrawn. It was then found that they had become powerful permanent magnets; but when the individual plates were separated they seemed to have lost their magnetism. On building up the pile again the original magnetism was restored to it. It appears then that the thin plates have not really lost their polarity on being withdrawn from the exciting field. Some of Professor D. E. Hughes's recent experiments have a great similarity to M. Duter's.

A NEW CARBON BATTERY.—A new voltaic battery has been brought out by M. Tommasi and M. Radiguet, in which peroxide of lead surrounds the carbon plate as it lies on the bottom of the cell. The other plate is also of carbon, covered with fragments of retort carbon platinised. The two plates are placed one above the other, but separated by a sheet of parchment paper which divides the containing vessel into two compartments. A saturated solution of chloride of sodium or common salt is filled into both compartments until the upper carbon fragments are partly immersed in it. The electromotive force is 0.6 volt. The negative pole is that carbon plate which is not in contact with the peroxide of lead. If other saline solutions, such as sulphate of ammonia, sulphate of soda, chlorhydrate of ammonia, or even dilute sulphuric acid, be used instead of the solution of salt, the electromotive force does not sensibly vary.

THE RADIATING POWER OF METALS.—M. Walter Meunier has, according to the *Revue Industrielle*, been experimenting on the comparative loss of heat from cast iron, and copper tubes. The experiment were carried out in a room having a uniform temperature, and were made simultaneously with the three materials in question. The tubes were all 2.5 meters long, and 155 mm. in diameter, connected at one end with a steam supply, and at the other end with a worm condenser in water. Observations showed that the weight of water condensed, per square meter of heating surface per hour, was, with naked pipes, 3·484 kilos for the cast iron, 3·906 kilos for the