BLASTING BY ELECTRICITY.

The following illustrated description for conducting blasting operations by electricity is, in substance, taken from the Calcutta *Engineer's Journal*, and will be found very useful and interesting to many of our readers. It is best adapted for large blasts, as it would be rather expensive in comparison with the fuse, for common operations, such as blasting small rocks :—

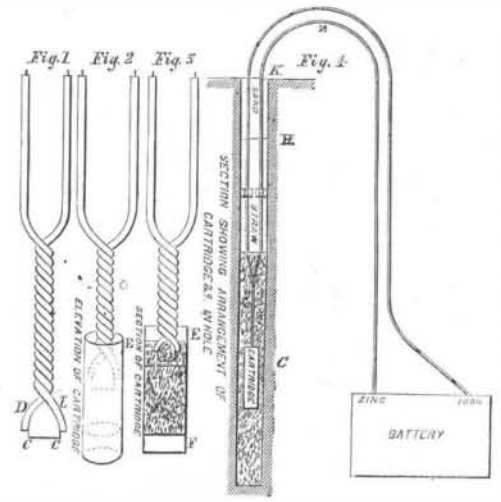
PREPARATION OF CARTRIDGES.

Take two copper wires covered with gutta-percha of the ordinary size employed to make the connections of telegraph instruments commonly called No. 0 gutta-percha wire. They may be of any length most convenient from 6 inches upwards. In the annexed drawing, Fig. 1, they are shown for convenience sake to be only about 6 inches in length, but it would be preferable to have them sufficiently long to project out of the hole a few inches above the surface of the ground, because then no fears need be entertained of any derangement to the connections made with the two battery wires to the two ends, A A, Fig. 1, during the process of filling in the hole, which derangement would injure the insulation and nullify the action of the battery. It should be observed here, that in cases where the shorter wires are used, it will be necessary, after making the connections with the battery wires, to cover the connections over with thin sheet gutta-percha (or paper would do, if the hole is perfectly dry) so as to insulate them perfectly from each other and from the earth. B B, Fig. 4, will illustrate the manner in which this is done.

Let the two wires first mentioned be twisted together for a length of about 3 inches, as shown in Fig. 1, care being taken to leave their lower extremities, C C, free for about an inch, separating them about half an inch from each other. Remove the gutta-percha covering for a length of about a quarter of an inch, as shown at, C C, Fig. 1, and brighten up the ends with sand paper, and then stretch across them a very fine iron, or better, platinum wire (also previously brightened up with sand paper), twisting it round the copper wires, and fixing it in the manner shown in the figure. The upper extremities of the two wires, A A, are also separated, and the gutta-percha stripped off for about an inch, for the purpose of connecting them to the two wires which are to proceed to the poles of the battery. If these connections, owing to the shortness of the wires, are to come within the hole, great care must be taken to insulate them from each other and from the earth in the manner already explained and shown at B B, Fig. 4. Fig. 2 shows the body of the cartridge, which consists of a tin tube 3 inches in length and three quarters of an inch in diameter, the joint being well soldered in order that it may be impermeable to water. On introducing the wires into the tube they should be placed in the center, as shown in Fig. 2, and great care should be taken to prevent the two wires from touching the outside of the tube anywhere. To guard against this most effectually, the two ends should be opened out and then turned inward again, as at D D, Fig. 1, so that the gutta-percha shall press well against the sides of the tube ; thus removing all possibility of the exposed ends of the wire coming into contact with it. The two wires are passed through a cork, and fitted firmly to the upper end of the tin tube, as shown at E E, Figs. 2 and 3, and made perfectly water tight by being covered over with a cement composed of two parts beeswax and one part resin. The tube is then filled with powder at its other extremity F, which is likewise stopped with a cork and cemented in the same manner. Fig. 2 shows the manner in which the cartridge is placed in the hole, after having carefully expelled all dust and moisture, great care being taken that the cartridge is situated in about the center of the charge of powder introduced into the hole, as shown at G, Fig. 4. Above the powder is placed a plug of straw, dry grass, or tow, shown at H, to allow, between the powder and the filling in, a small space filled with air, and above the plug dry sand is poured in until the hole is filled up to the surface, as shown at K. The two ends of the wire then, z I, which projects above the surface of the ground, are connected with the two poles of the battery by means of insulated conductors of sufficient length to allow of perfect protection from any dangers arising from the explosion. The greatest caution should be observed in not connecting the two wires with the battery until the moment the explosion is required to be made, as the effects are instantaneous. If necessary, a number of shots can be fired together, either simultaneously or in such rapid succession as to be all but simultaneous.

BATTERIES.

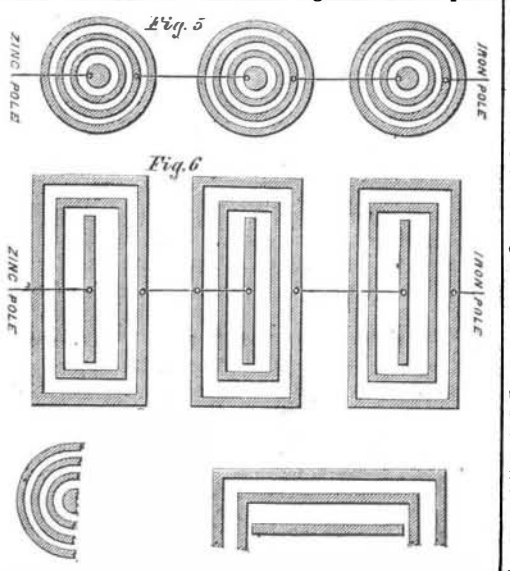
The battery best adpted for igniting the cartridges is Callan's battery, commonly called the "Maynooth Battery." This is the simplest and cheapest form of battery, and can be most readily made up in India. It is very powerful, fifteen cells being sufficient for all purposes of ignition, or for conducting electrical experiments in general. Two forms of this battery are shown in Figs. 5 and 6, the one being circular and the other square. Three cells of each kind are only shown, as they are quite sufficient for illustration.



The number of cells required to make up a battery sufficiently powerful for firing a shot will be from fifteen to fifty, according to circumstances.

CIRCULAR CELL BATTERY.

The battery consists of, first, a circular earthenware cell ; secondly, a circular iron plate ; thirdly, a porous cell ; and, fourthly, an amalgamated zinc ingot. These three last named are placed within the earthenware cell in the order above enumerated, and which will be seen more clearly by referring to cell M, Eig. 5. After placing them together, the space between the porous cell and the earthenware cell is filled up to within half an inch of the top with pure nitric acid, while the porous cell is filled up to within half an inch of the top with sulphuric acid diluted with water in the proportion of 1 of acid to 10 of water. The cells are connected together with a piece



of copper wire, care being taken to connect the iron of one cell to the zinc of the next cell, and so on, connecting the iron and zinc alternately throughout, as shown in Fig. 5.

SQUARE CELL BATTERY.

This battery is simpler in arrangement than the previous one, and can be made up more easily and rapidly in this country. The outer cell is of iron, within which is placed the porous cell, and within the porous cell is placed the amalgamated zinc plate. The arrangement is clearly shown in cell O, Fig. 6. The pure nitric acid is poured within the space between the porous cell and iron cell to within half an inch of the top, and the sulphuric acid, diluted with water, as before, in the proportion of 1 of acid to 10 of water, is poured into the porous cell, filling it up to within half an inch of the top of the cell. The connections are made as before, the iron cell being connected with the zinc plate in the adjoining cell, and so on alternately throughout ; great care should be taken to prevent the iron cells from touching each other, and it is necessary in arranging them to put a piece of brown pasteboard or wood between each. Ten of these cells are sufficient to ignite the cartridge, but the actual number to be used depends upon the circumstances and nature of the operations. Twenty cells of this battery have been found sufficient for producing the electrical light.

Mines may be sprung at a considerable distance away by the electric battery, as thus described. The Russians had the Malakoff and the Redan Towers all mined underneath, and filled with powder, in order to blow them up if the allies should storm them. They had wires connected with an electric battery at some distance off, but the Malakoff was saved from being blown up when the French entered, for a cannon ball had cut the electric cord, and the mine was thus rendered harmless. Part of the Redan was blown up, but no person was injured, as the English soldiers had been withdrawn almost as soon as they entered, as it was rightly suspected the fort had been mined.

FROM THE STEAM PRESS OF JOHN A. GRAY.