

On an Electric-light Fire-damp Indicator

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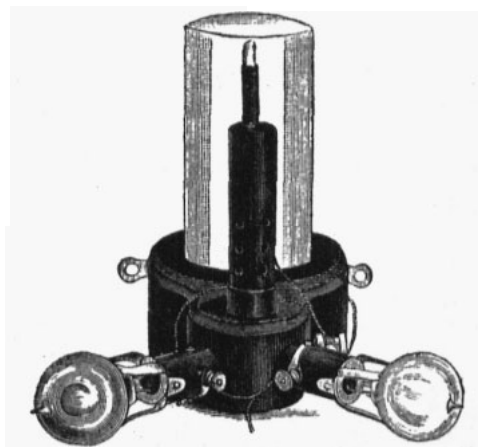
being arranged so as to compensate one another, so that when much wire was rolled up on one, less would be rolled up on the others. This principle has hardly been sufficiently used up to now, and is worthy of attention. In many other instruments depending on the length of strings, the direction of the forces altering, there is unequal strain ; but in this instrument (as was pointed out by Mr. Boys) there will be no such tendency, as the string is always kept stretched by a constant weight.

XII. *On an Electric-light Fire-damp Indicator.*

By WALTER EMMOTT *and* WILLIAM ACKROYD *.

THE Royal Commission on Accidents in Mines point out, in their recently issued Report, a serious objection to the use of the electric light in mines, notwithstanding its many other great advantages, in that the light of an incandescent lamp being produced within a vacuum cannot admit of any device for the indication of fire-damp such as is employed in the Davy for example. This difficulty was

Fig. 1.



experienced by one of us in the course of an installation of the electric light in the Lofthouse pit, Wyke, Yorks, in the summer of 1885 ; and we have since made a series of experi-

* Read June 12, 1886.

ments with the object of devising a method of making the electric light an indicator of fire-damp. The apparatus placed before the Physical Society is the outcome of our work. It consists of two incandescent lamps, one with white glass and the other with red, and other necessary adjuncts, such that in an ordinary atmosphere the white incandescent lamp alone shines, but in fire-damp the white lamp goes out and the red one begins to emit its light. This is effected as follows :—A porous pot of unglazed hard-baked porcelain is joined by air-tight connections to a tube a portion of which is represented by TT^1 , fig. 2. This tube is of such an internal diameter that it will readily admit of being sealed with a small quantity of mercury, Hg . A platinum wire runs the whole length of the tube and is connected with one of the poles of the battery B or other source of electricity. Two other platinum wires in the tube run parallel with this for part of the way, as in fig. 2, and each is connected with a lamp. The lamps W and R are joined, and a branch wire connects them to the other pole of the battery. In fig. 2 the current is represented as flowing through W ; when from diffusion in an atmosphere of fire-damp, the conducting plug Hg is driven up to T^1 , the current will flow through R , and the red light may then be taken to indicate the presence of fire-damp.

Fig. 2.

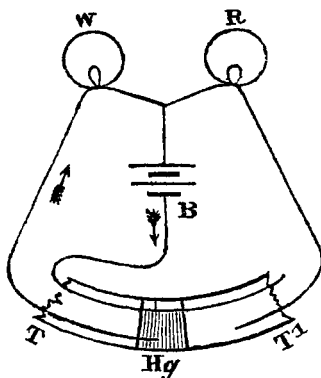
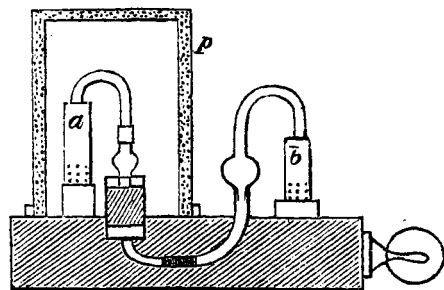


Fig. 3.



p . Porous pot.
 a and b , desiccating tubes.

The wires being within the tube, one or other of the lamps must always be shining so long as there is a current, whether the apparatus be in an atmosphere of fire-damp, choke-damp, or air; and to prevent the mercury being driven out of the

tube by too much pressure, bulbs are arranged on either side as in fig. 3, which presents a diagrammatic view of the apparatus. We have found an internal diameter of tubing of about 3 millim. best adapted for ensuring easy mobility of the mercury. The presence of the wires within the tube has interfered with the perfection of the seal; this we have overcome by the introduction of a little concentrated sulphuric acid, which also serves the purpose of preventing sparking and of lubricating the interior. The use of sulphuric acid necessitates the addition of desiccators *a* and *b*, fig. 3, to each end of the tube; but in cases where it has been found advisable not to use sulphuric acid, both the acid and the desiccators have been dispensed with by slightly modifying the arrangement of the wires at the lower part of the tube. With this form of apparatus we are readily able to detect the presence of 5 per cent. of coal-gas in a mixture of this gas with air; and with a mercury seal of less weight and closer proximity of the wires at T and T¹ (fig. 2), it appears possible to get any required degree of sensitiveness. It is proposed to have the apparatus fixed in the main roads and hauling roads in pit installations.

DR. H. SPRENGEL exhibited at the meeting on May 22 the following objects connected with the Hell-Gate Explosion near New York; viz.:—

(1) Three photographs taken of the Flood Rock from three different points at the moment after the explosion, October 10, 1885, when the mine was charged with 22 tons of dynamite and 107 tons of one of Dr. Sprengel's Safety-Explosives (Journ. Chem. Soc. 1873, p. 806).

(2) A sample of this Safety-Explosive (79 per cent. potassium chlorate and 21 per cent. nitrobenzene), possessing the power 109 according to General Abbot, U.S. Army (dynamite with 75 per cent. nitroglycerin being 100).

(3) Effects on lead, produced by the explosion of equal weights of another series of Safety-Explosives—the Nitric-Peroxide mixtures—demonstrating their greatly superior power over that of nitroglycerin.