(No Model.) 2 Sheets—Sheet 1.

I. KITSEE.

FIRE DAMP INDICATOR.

No. 262,055. Patented Aug. 1, 1882.

Fig. 1.

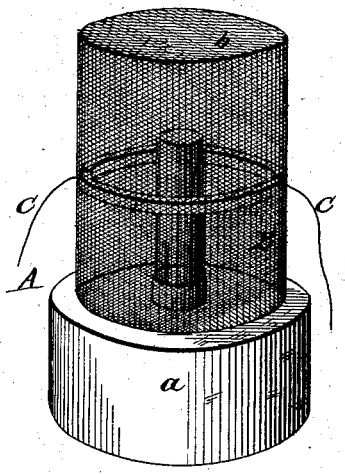


Fig. 6.

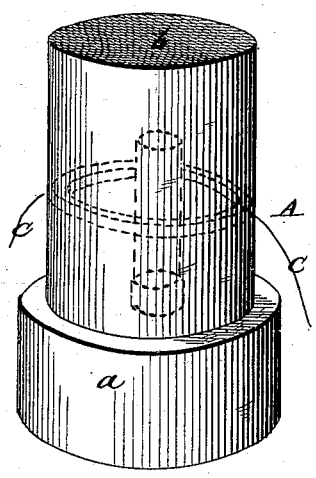


Fig. 4.

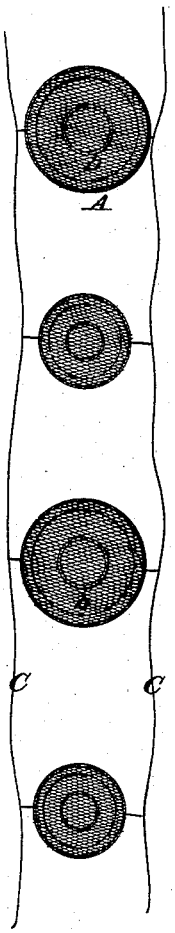


Fig. 2.

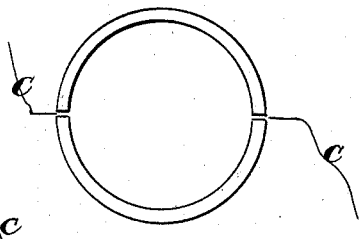


Fig. 5.

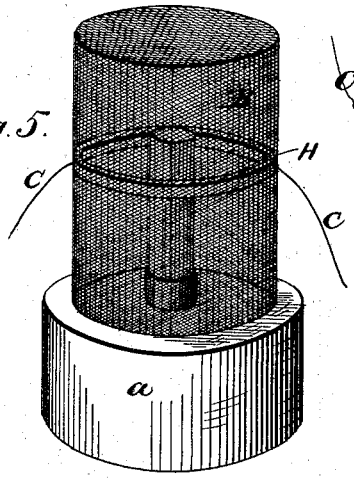


Fig. 3.

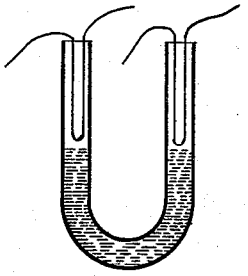
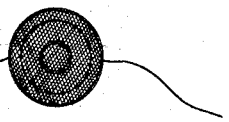


Fig. 7.



WITNESSES

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(No Model.) 2 Sheets—Sheet 2.

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FIRE DAMP INDICATOR.

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Fig. 8

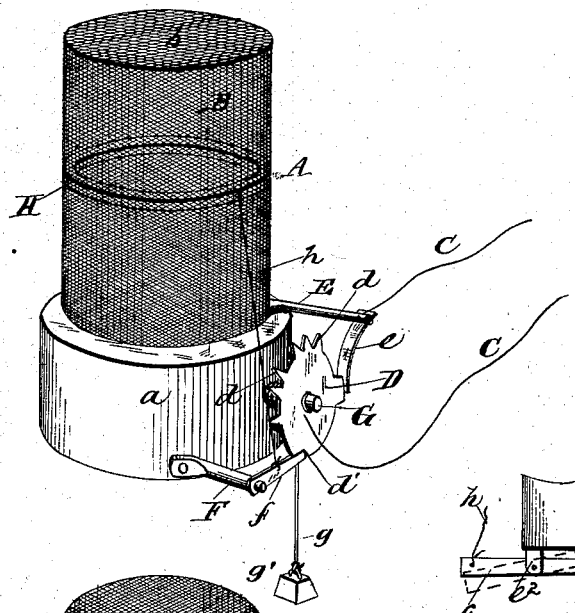


Fig. 10.

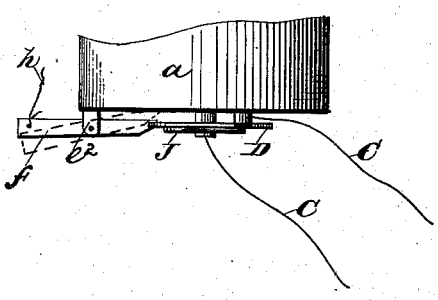
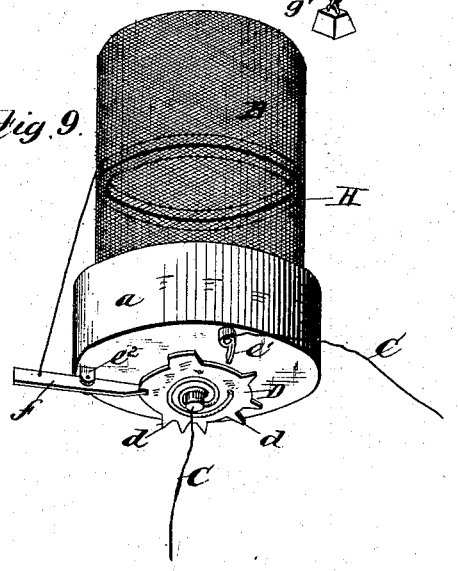


Fig. 9.



WITNESSES

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UNITED STATES PATENT OFFICE.

ISIDOR KITSEE, OF CINCINNATI, OHIO.

FIRE-DAMP INDICATOR.

SPECIFICATION forming part of Letters Patent No. 262,055, dated August 1, 1882.

Application filed April 20, 1882. (No model.)

To all whom it may concern:

Be it known that I, ISIDOR KITSEE, a citizen of the United States, residing at Cincinnati, in the county of Hamilton and State of Ohio, have invented a new and useful Improvement in Fire-Damp Indicators, of which the following is a specification.

My invention relates to devices for automatically indicating the presence of fire-damp in dangerous quantity in mines, and is an improvement on the inventions for which I filed applications for Letters Patent on the 31st day of December, 1881. Said applications relate to automatically giving notice at a terminal station of the existence of fire-damp in dangerous volume by the closing of an electric circuit normally open, the operative mechanism being brought into action by metallic connections readily expansible by heat; also, by breaking an electric current normally closed, in which latter case the operative mechanism is actuated by rupture of fusible substance within the perforated surroundings of a mine safety-lamp. It is not herein necessary to detail the precise means which I employ to give the alarms, as they are specifically set forth in the applications referred to.

My present improvement relates to providing means whereby not only notice shall be given automatically of the existence of fire-damp in dangerous volume, but also indications at given termini of the precise point where such condition exists.

To the accomplishment of this end my invention consists in certain operative devices connected to a fire-damp indicator, that, when brought into action, will make and break an electric circuit, and thereby sound specific codes of alarms, which will at once show the dangerous presence of fire-damp in the mine and its precise location, all as hereinafter described and claimed.

In order to fully explain the line of art to which my present improvement relates, I illustrate in the drawings, Figures 1 to 7, inclusive, substantially the several devices shown in my previous applications. Fig. 1 represents a miner's lamp surrounded with wire-gauze, having therein two halves of a ring of metal readily expansible by heat, and near to which divided metallic ring are two wires led from an electric battery. Fig. 2 is a part thereof in detail. Fig. 3 represents a bent tube containing mercury, in each arm of which are inserted the wires led from an electric circuit. Fig. 4 represents the invention adapted to a system or route of several miners' lamps, wherein lines of positive and negative wires are led in any direction over a large field, said wires being respectively conducted in close proximity to the expansible metal in each lamp in such field or route. Fig. 5 represents an ordinary miner's safety-lamp with wire-gauze surroundings, provided within said wire-gauze with substance readily fusible by heat connected to the current-wires of an electric battery. Fig. 6 represents the same, showing an impermeable flame-surrounding tube having upper and lower perforated coverings. Fig. 7 is a top plan view of one of the lamps. The remaining figures illustrate my present improvements on said devices. Fig. 8 represents in perspective a form of miner's safety-lamp having within its perforated surroundings a substance readily fusible by heat and embodying my improvements. Fig. 9 represents another perspective view of a miner's safety-lamp having the operative mechanism attached thereto below the base. Fig. 10 is a side elevation of the lower part of Fig. 9.

Similar letters of reference indicate like parts on each figure.

A is the safety mine-lamp; *a*, the base thereof; B, the perforated side surroundings; *b*, the perforated top; C C, electric circuit-wires; D, a rotating disk having peripheral teeth or points *d* and detent *d'*; E, an arm or rod provided with metallic spur *e*; F, a bar which carries a pivoted pawl, *f*. G is a shaft carrying the disk D. *g* is a cord round said shaft; *g'*, a weight at the end of said cord. H is a substance within the perforated inclosures, readily fusible by heat. *h* is a cord, at one end anchored or embedded within said fusible substance, the opposite end being fastened to the pawl *f*. J is a tension-spring upon the disk D, Figs. 9 and 10; *e'*, metallic spur on same two figures; e^2, short split post having a hole for pivoting the pawl *f* therein.

When the fire-damp within the perforated inclosure increases to that degree of intensity that it becomes inflammable the heat caused thereby will melt the fusible substance H and release the cord *g*, causing the pawl *f* to drop out

of the detent *d'*, thus rotating the shaft G and the disk D that it carries. As the disk revolves its peripheral teeth will in succession strike against the metallic spur, thus breaking and making the electric circuit and transmitting distinctive signals to the electric apparatus at the terminal end of the wires C C.

The cord *g* can be of any required length, so that as it unwinds from the shaft or drum G it will cause the disk D to make any number of revolutions and repeat the alarm several times. In the drawings I show a disk, D, provided with peripheral teeth or points arranged in groups, thus 1 2 3. It is intended to provide each disk with diverse groups of peripheral teeth arranged in arbitrary series, so that each will sound a distinctive alarm different from any other one in the route.

It is manifest that instead of operating the disk by means of the descending weight, which unwinds the cord from the shaft, said shaft may be normally held retracted by any suitable mechanical means—as, for instance, a spring, J, the tension of which will be withdrawn by the release of the pawl from the detent in the disk, as illustrated in Figs. 9 and 10.

It will be observed that the metallic revolving disk and the metallic spur are each connected to one of the wires of an electric circuit, which is closed by metallic contact and broken by the withdrawal of said contact.

I have, for the purpose of fully explaining my invention, confined my description so far to the construction and operation of a single safety mine-lamp; but it is manifest that in practice it will be requisite to establish a perfect system of annunciators, so that notification of increase of fire-damp in dangerous volume shall be given wherever it occurs. In such a system each of the circuit-wires must be continuous and unbroken its whole length. In other words, a positive and negative wire will have to be led over a large field, and must be so arranged with respect to each lamp as to enable each lamp in the route or field to act independently. In order to effect this result, the lines of wire will be led along the whole route, and short branches led therefrom—one to each metallic spur and one to each metallic disk—so that these elements are both connected to the circuit-wires within the field of operation. Thus, whichever one of the lamps has its cord *h* released, the special disk actuated will transmit its distinctive signal.

Having now fully described my invention, what I desire to secure by Letters Patent is—

1. In a fire-damp indicator, a mine safety-lamp provided with substance readily fusible by heat within the perforated inclosure, and further provided with a rotating disk having peripheral teeth arranged in groups, and with a metallic spur near the said peripheral teeth, said disk and said spur being respectively connected to the circuit-wires of an electric battery so arranged that when said disk is rotated an electric circuit will be opened and closed, substantially as described.

2. In a fire-damp indicator, an electric apparatus having attached sounding alarm mechanism, one wire of the circuit of which is connected to a metallic rotatable disk having peripheral teeth arranged in groups, and the other circuit-wire of which is connected to a metallic spur coincident with said peripheral teeth, said disk being held in tension by a cord anchored or sealed within substance readily fusible by heat, inclosed within the perforated surroundings of a safely mine lamp, substantially as described.

3. In a fire-damp indicator, the combination of a mine safety-lamp having within the space inclosed by perforated surroundings a piece or pieces of substance readily fusible by heat, said fusible substance connected to a pawl holding a rotatable disk having peripheral teeth arranged in groups, and, further, in combination with a metallic spur near said peripheral teeth, all so arranged that when the fusible substance is ruptured an electric current is broken and closed and an alarm-annunciator will be actuated, as and for the purposes set forth, substantially as described.

4. In a fire-damp indicator, the combination of the safety-lamp A, supplied with interior substance, H, readily fusible by heat, the rotatable disk D, having peripheral teeth *d*, arranged in groups, provided with detent *d'*, the weight *g'* and its cord *g*, the pawl *f*, and its retaining-cord *h*, with the circuit-wires C C of an electric battery, said battery having attached annunciator, all arranged as described, adapted, when the fusible substance H is melted, to actuate the operative mechanism and open and close an electric circuit, thereby transmitting distinctive signals at a terminal point, as and for the purpose intended, substantially as described.

5. An automatic fire-damp-indicator system consisting of a series of safety mine-lamps, each of said series of lamps within perforated surroundings being provided with substance readily fusible by heat, and having sealed within said fusible substance a cord which holds a pawl within the detent-notch of a rotatable metallic disk having peripheral teeth arranged in groups, in combination with the wires of an electric battery, each of said disks adapted, when rotated, to open and close the electric circuit and actuate one of a code of specific alarms on a terminal annunciator, whereby notice will be automatically given of the existence and exact location of fire-damp in dangerous volume, substantially as described.

ISIDOR KITSEE.

Witnesses:
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W. C. FIEDELDEY.