E. PORPHIR.

SHOT FIRING DEVICE.

APPLICATION FILED SEPT. 13, 1917.

1,251,820.

Patented Jan. 1, 1918.

2 SHEETS—SHEET 1.

FIG. 1.

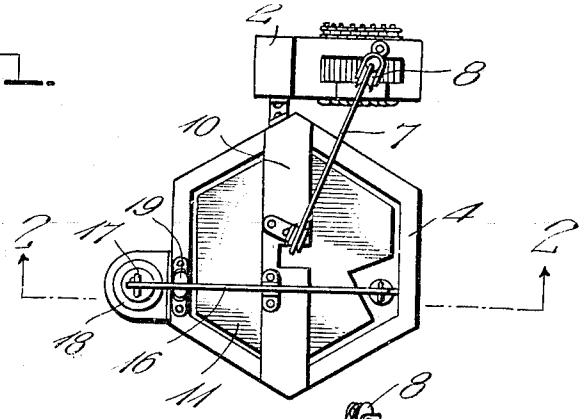
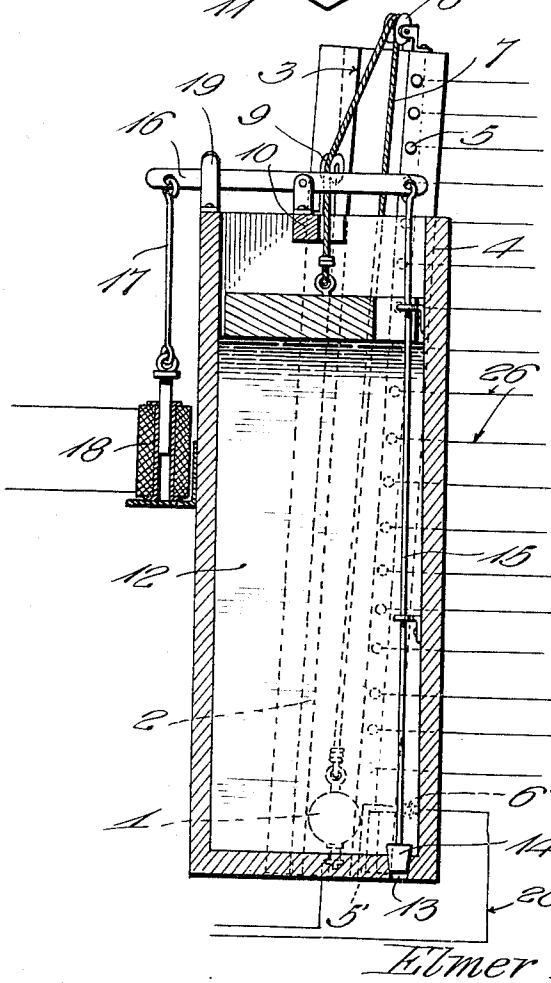


FIG. 2.



Witness

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2 SHEETS—SHEET 2.

FIG. 3.

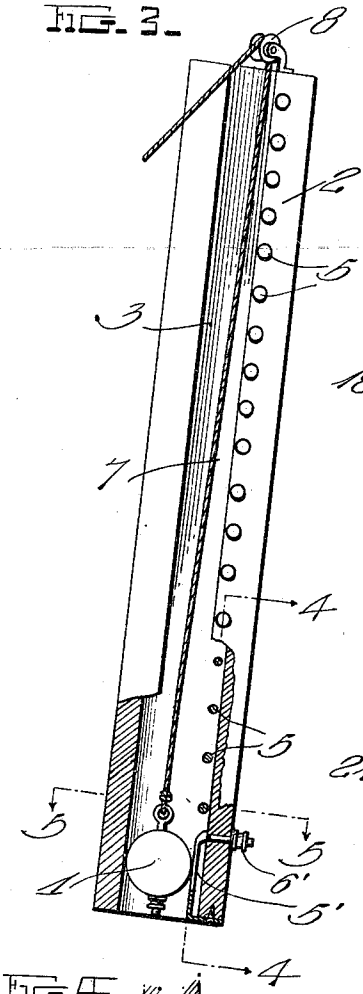


FIG. 6.

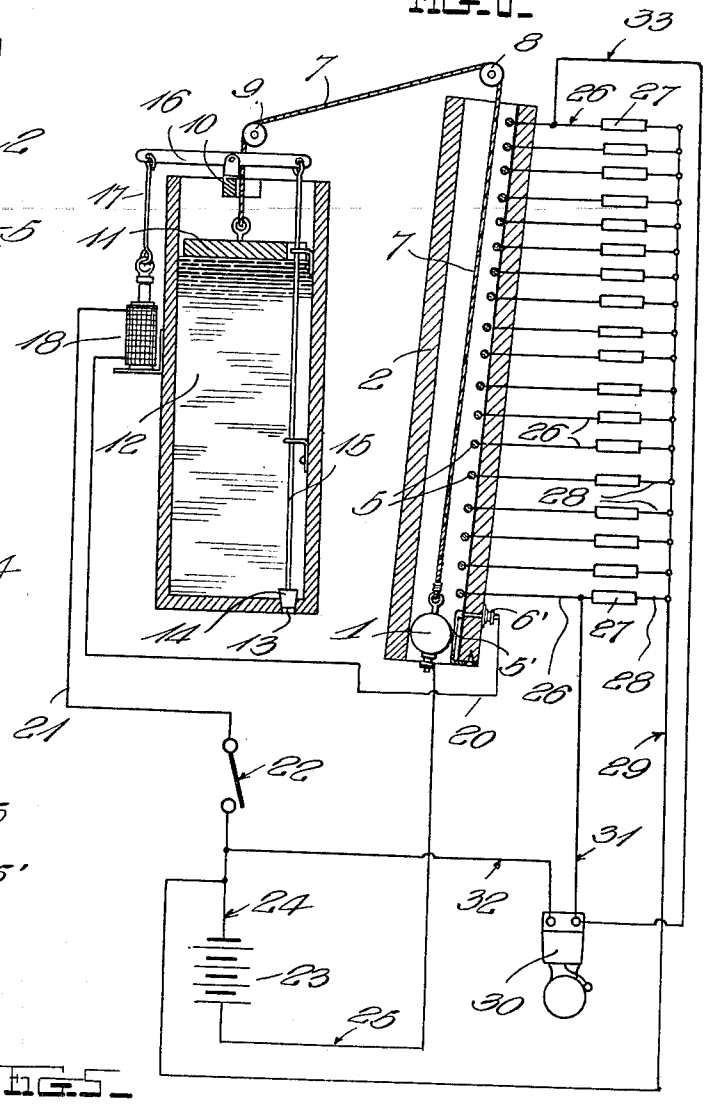


FIG. 4.

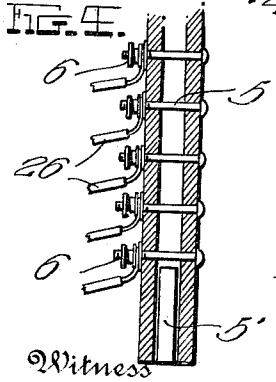
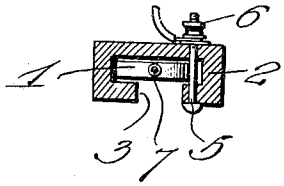


FIG. 5.



Witness

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UNITED STATES PATENT OFFICE.

ELMER PORPHIR, OF PITTSBURG, KANSAS.

SHOT-FIRING DEVICE.

1,251,820. Specification of Letters Patent. Patented Jan. 1, 1918.

Application filed September 13, 1917. Serial No. 191,219.

To all whom it may concern:

Be it known that I, ELMER PORPHIR, a citizen of the United States, residing at Pittsburg, in the county of Crawford and State of Kansas, have invented certain new and useful Improvements in Shot-Firing Devices; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to improvements in devices intended primarily for successively firing a number of charges of blasting powder or the like in mines, one object of the invention being to provide a device of this class which may be easily and inexpensively manufactured and marketed, yet one which will be highly efficient and durable.

A further object is to provide a device which will sound a signal such as a bell before or simultaneously with firing of the first charge, and either simultaneously with or immediately after firing of the last charge, thus signifying to the operator at the mouth of the mine when the blasting period starts and is completed.

A further object is to provide means for normally holding the circuit closing means of the charges against movement, and electric means for releasing the holding means of said circuit closing means, the circuit of said electric means being normally completed by said circuit closing means with the exception of a switch, whereby closing of this switch will start the entire device.

With the foregoing general objects in view, the invention resides in the novel features of construction, and unique combinations of parts to be hereinafter fully described and claimed, the descriptive matter being supplemented by the accompanying drawings which form a part of this specification and in which:—

Figure 1 is a top plan view of the improved device;

Fig. 2 is a vertical section of the liquid containing chamber, the float therein and associated parts;

Fig. 3 is an enlarged side elevation, partly in section, showing more particularly the circuit closing weight, the inclined guideway for said weight, and the contacts along the lower side of said guideway;

Fig. 4 is a vertical section of Fig. 3 on the plane of the line 4—4 thereof;

Fig. 5 is a detail horizontal section of Fig. 3 on the plane indicated by the line 5—5; and,

Fig. 6 is a diagram showing the wiring and the general operation of the entire device.

In the drawings above briefly described, the numeral 1 designates a weight formed of metal and of any suitable size and shape, although it will by preference be in the form of a disk as illustrated clearly in Figs. 3 and 5. A vertical guideway 2 formed of wood or any other preferred insulating material, is provided for the weight 1, said guideway preferably having an open side 3. The guideway 2 is adapted to be inclined as shown in the drawings and said guideway may be supported in any preferred manner, but for illustrative purposes it is shown secured to one side of a liquid container 4. A series of vertically spaced contacts are provided along the lower side of the guideway 2, said series including a plurality of bolts 5 passing across said guideway, and a vertically elongated contact plate 5′, all of these parts being adapted for successive engagement by the weight 1. The nuts 6 on the bolts 5, constitute means for attaching a plurality of current conducting wires to said bolts, whereas the contact plate 5′ is provided with a binding post 6′ as shown most clearly in Fig. 3.

A cable or the like 7 is secured to the weight 1 and is trained over a pulley 8 at the upper end of the guideway 2, said cable also extending over an additional pulley 9 on a cross bar 10 of the receptacle 4, and then being secured to a float 11 which is positioned in said receptacle, the weight of said float being greater than that of the weight 1. A body of water or any other preferred liquid 12 is normally confined in the receptacle 4, so that the float 11 is maintained at the upper end of said receptacle, the weight 1 being then in contact with the plate 5′ as shown clearly in Figs. 2, 3 and 6. The receptacle is provided, however, with an outlet opening 13 through which the liquid may drain from said receptacle when required, thus permitting the float to lower so that it pulls upon the cable 7 and thus raises the weight 1 into successive contact with the bolts 5.

Any suitable means such as a plug 14 may be employed for normally closing the outlet 13, said plug being carried on the lower end

of a vertical rod 15 which rises within the receptacle 4 and is connected at its upper end to a lever 16 which is fulcrumed on the bar 10. A link or the like 17 connects the lever 16 with a solenoid 18 or other preferred type of electrical operating means for said lever, whereby energizing of this means will so operate the lever as to remove the plug 14 from the opening 13, so that the liquid may drain from the receptacle 4. Any suitable catch such as that indicated at 19 in the drawings, may be provided for holding the lever 16 in operative position, that is, in the position in which it is retaining the plug 14 raised above the opening 13.

A wire 20 leads from the binding post 6′ of the contact plate 5′ to the coil of the solenoid 18, whereas another wire 21 extends from this coil to a single throw switch 22, one pole of said switch being connected with a battery or the like 23, by a wire 24. An additional wire 25 leads from the battery 23 to the weight 1 and is electrically connected with the latter. It will thus be clear that with the weight in question normally contacting with the plate 5′, the circuit of the solenoid 18 will be completed with the exception of the switch 22 which normally remains open, but, the moment this switch is closed, the solenoid will act to open the plug 14 so that the liquid may start draining from the receptacle 4. This having been done, the float 11 will descend so that the weight 1 rises within the guideway 2 for successive contact with the bolts 5.

Wires 26 lead from the bolts 5 to a plurality of blasting squibs 27, whereas other wires 28 extend from said squibs to a wire 29, the latter being electrically connected with the wire 24. By this arrangement, as the weight 1 rises within the guideway 2, it will successively complete the circuit of the several squibs 27, so that they will be fired one at a time. These squibs will of course be located in a mine or the like, whereas the remainder of the apparatus will be disposed at a remote point, and in order to indicate to the operator exactly when the explosions start and stop, the following arrangement is provided.

A bell or other suitable signal 30 is connected by a wire 31 with the lowermost of the wires 26 and an additional wire 32 leads from said bell to the wire 24. By this arrangement, the engagement of the weight 1 with the lowermost contact bolt 5, will simultaneously complete the circuit of the first squib 27 and the bell 30, so that as the first charge is fired, the bell will ring. Another wire 33 leads from the uppermost wire 26 to the bell 30. It will thus be clear that when the weight 1 comes in contact with the uppermost bolt 5, it will not only fire the last of the series of squibs 27, but will again complete the circuit of the bell 30, to sound the latter, thus indicating to the operator that the series of explosions are over and that it is then safe to proceed further with work in the mine.

From the foregoing, taken in connection with the accompanying drawings, it will be obvious that although my invention is of extremely simple and inexpensive construction, it will be highly efficient and durable, particular emphasis being laid upon the fact that the weights 1 and plate 5′ normally complete the circuit of the solenoid 18 with the exception of the switch 22, it being therefore only necessary to close this switch to set the entire device in operation. I also attach great importance to the provision of the signal 30 and the means for sounding it at the beginning and ending of the series of explosions, and to the general construction of the guideway 2 and associated parts.

Since probably the best results are obtained from the specific details of construction shown and described, such details constitute the preferred form of the device, but I wish it understood that within the scope of the invention as claimed, numerous minor changes may well be made.

I claim:

1. The combination of a fixed contact, a traveling contact normally resting against said fixed contact, means for moving said traveling contact from engagement with said fixed contact, means for normally holding said moving means against operation, electric means for releasing said holding means, and a circuit for said releasing means including said contacts.

2. A device of the class described comprising a metal weight, an inclined guideway for said weight, a plurality of fixed contacts spaced along the lower side of said guideway, and means for moving said weight within said guideway for successive engagement with said contacts.

3. A device of the class described comprising a metal weight, an inclined guideway for said weight, a plurality of contacts extending across the lower side of said guideway for engagement successively by said weight, said contacts having means for the attachment of current conducting wires, and means for moving said weight within said guideway.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

ELMER PORPHIR.

Witnesses:

ARTHUR FULLER,
EDITH WIESNER.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."