E. PORPHIR.

SHOT FIRING DEVICE.

APPLICATION FILED MAY 4, 1916.

1,232,840.

Patented July 10, 1917.

2 SHEETS—SHEET 1.

FIG. 1.

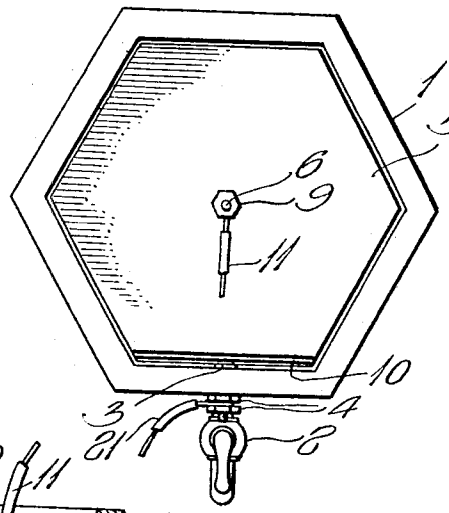


FIG. 2.

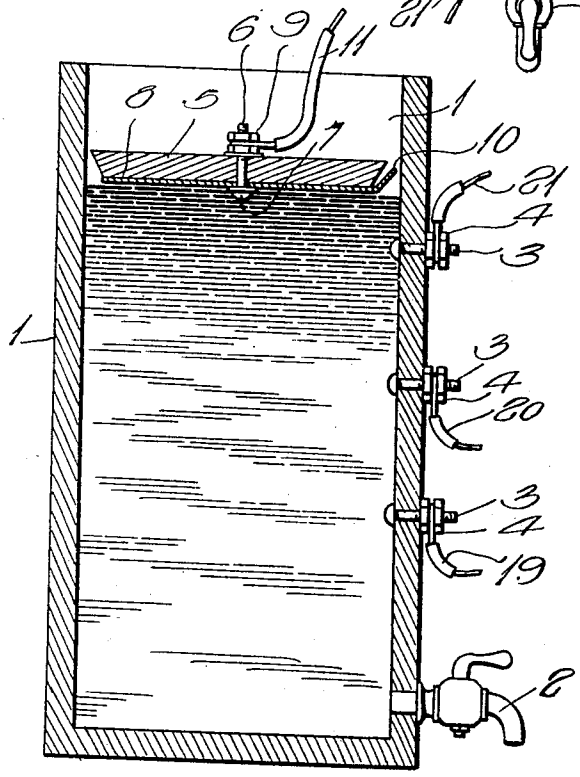
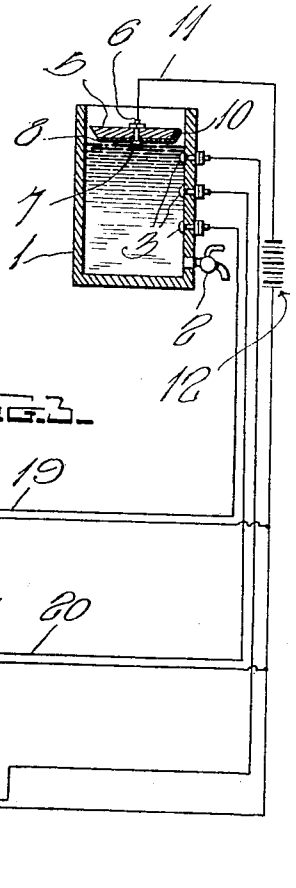


FIG. 3.



Witness
H. Woodard

Inventor
Elmer Porphir
By H. B. Williamson & Co
Attorneys

E. PORPHIR.

SHOT FIRING DEVICE.

APPLICATION FILED MAY 4, 1916.

1,232,840.

Patented July 10, 1917.

2 SHEETS—SHEET 2.

FIG. 5.

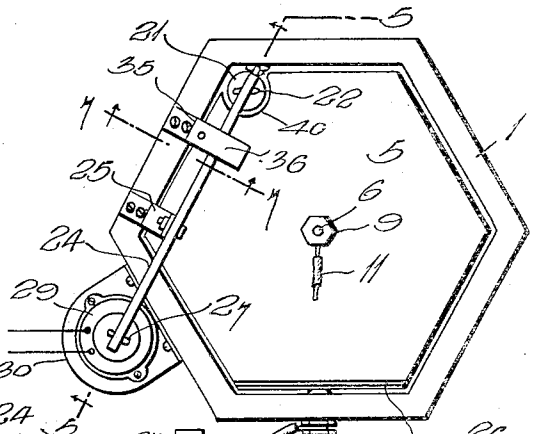


FIG. 6.

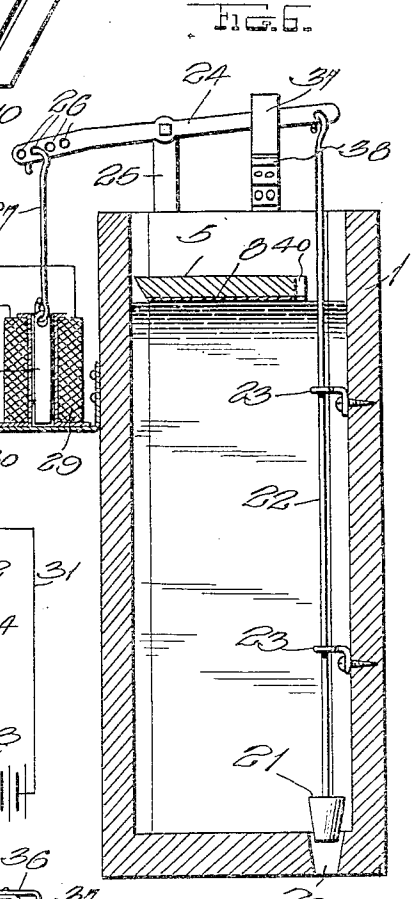
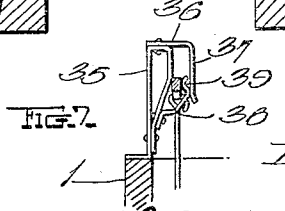


FIG. 7.



Witness

H. Woodard

Inventor

Elmer Porphir

By H. B. Williamson & Co

Attorneys

UNITED STATES PATENT OFFICE.

ELMER PORPHIR, OF PITTSBURG, KANSAS.

SHOT-FIRING DEVICE.

1,232,840. Specification of Letters Patent. Patented July 10, 1917.

Application filed May 4, 1916. Serial No. 95,379.

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.

This invention relates to shot firing devices, and is particularly designed for use in blasting in coal mines, quarries, and the like. Heretofore many lives have been lost and serious bodily injury has been done, owing to the fact that the workmen setting off the blast in mines or quarries, have not had sufficient time to run to a place of safety before the explosion occurred. It is therefore the primary object of the present invention to overcome this danger by the provision of a device which will automatically set off the blasts at a predetermined time after the device itself is thrown into operation.

Another object of the invention is to provide a device of this character which will be of simple, strong, and durable construction, cheap to manufacture, efficient and reliable in operation, and well adapted to the purpose for which it is designed.

With these and other objects in view, the invention consists of certain novel features of construction, and the combination and arrangement of parts as will be hereinafter fully described and claimed.

The accompanying drawings illustrate one manner in which the present invention may be practically applied to use, wherein:—

Figure 1 is a top plan view of a device constructed in accordance with this invention;

Fig. 2 is a central vertical longitudinal sectional view of the same;

Fig. 3 is a diagrammatic view, showing how the device is wired to set off a plurality of blasts;

Fig. 4 is a top plan view of a modified form of the invention showing the valve provided with an electromechanical operating means;

Fig. 5 is a vertical sectional view taken on the plane of the line 5—5 of Fig. 4, showing the valve in its closed position;

Fig. 6 is a similar view showing the valve in its open position; and

Fig. 7 is a detailed sectional view taken on the plane of the line 7—7 of Fig. 4.

Referring more particularly to the drawings, the reference numeral 1 designates a liquid receptacle made of any suitable non-conducting or insulating material, and being preferably as here shown of polygonal configuration in cross section. However, the shape of this receptacle 1 is immaterial, so long as there is some equivalent guiding means for a float 5 to be hereinafter described.

The lower end of the receptacle 1 is provided with a suitable drip valve through which the liquid contents of the receptacle may be allowed to drain off when opened. In the form of the device shown in Figs. 1 to 3 of the drawings this valve is in the form of an ordinary drip cock 2.

Extending through one of the sides of the receptacle 1 is a plurality of vertically alined bolts 3, the heads of which are disposed on the interior side of the same to provide suitable contacts, the purpose of which will be hereinafter described, while arranged at the threaded ends of the bolts 3 on the exterior of the receptacle are clamping nuts 4 between which are secured conductors, the purpose of which will be hereinafter explained.

Moving vertically within the receptacle 1 is a suitable float 5, the latter being shaped to fit the interior of said receptacle and having its edges beveled from its upper to its lower face as shown clearly in Fig. 2 of the drawings. This float 5 carries a suitable metallic contact portion, here shown in the form of a plate 8 of a suitable conducting material preferably a non-corrosive substance, and having a resilient contact tongue 10 extending outwardly from one of its sides, said tongue 10 being struck upwardly, and being adapted to engage the aforesaid alined contacts successively when the float 5 descends in the receptacle. This plate 8 is here shown as being clamped between the lower side of the float 5 and the head 7 of a suitable bolt 6, the latter extending vertically through said float and being provided at its threaded end with clamping nuts 9.

In arranging the device for use, a ground wire or conductor 11 is clamped between the nuts 9 above referred to. This ground

wire includes a suitable source of electric energy here shown in the form of a battery 12. The reference characters 13, 14 and 15 represent blasting squibs each having their wires 16, 17 and 18 connected to the ground wire 11. The other wires 19, 20 and 21 of these squibs are clamped between the locking nuts 4 on the aforementioned bolts 3, so that when the resilient tongue 10 comes into engagement with the heads of these bolts, the circuit will be successively completed through the squibs, thereby setting off the blast as will be readily understood.

To set the device for operation, the float and contacts are connected with the squibs in the manner just described, and water, oil or other comparatively non-conducting fluid is placed in the receptacle 1, the valve or cock 2 being closed. After the usual danger signal is given the valve is opened the desired amount, thereby allowing the fluid to slowly drain from the receptacle, and allowing the float to descend in the same into successive engagement with the contacts.

In Figs. 4, 5, 6 and 7, a modified form of the invention is shown. In this form the receptacle 1 is shown as being provided with a conical-shaped opening 20 in the bottom thereof, and at one corner thereof. This opening 20 is adapted to receive a conical-shaped plug 21 fixed to the lower end of a vertical rod 22, the latter being slidable in suitable guides 23 secured to the side of the receptacle. The upper end of the rod 22 is loosely or pivotally connected to a horizontal bar or beam 24. This bar 24 is pivoted intermediate its ends to a post 25 which extends upwardly from one of the sides of the receptacle, and is provided at its upper end with a plurality of apertures 26.

Extending loosely through one of the apertures 26 is the hooked end of an upright link 27, the lower end of which is connected to a soft iron core 28, which is adapted to slide vertically within the central opening through an electric magnet 29, the latter being supported upon a suitable bracket 30 arranged on the exterior of the receptacle and being secured to one of the sides thereof. This magnet 29 has its terminals connected by conductors 31 and 32 to an electric battery 33, whereby it is energized when the circuit through the same is closed by means of a suitable switch or push button 34.

Fixed to the upper edge of one of the sides of the receptacle 1 is a bracket 35, to the upper end of which is secured a horizontal strap 36 having its inner free end bent laterally downwardly as at 37, and secured in a similar manner to the inner side of the bracket 35 is a strip 38, the free end of which is bent outwardly and then flared inwardly as at 39 for the purpose now to be described. The bar 24 is arranged between the inner side of the bracket 35 and the downwardly bent end of the strap 36, and has its inner side frictionally engaged by the free end of the strip 38. When the bar 24 is moved downwardly, or to the position shown in Fig. 6 of the drawings, the portion thereof in engagement with the strip 38 is moved above or disengaged from said strip, whereby the latter springs outwardly and under the bar to lock it in this position. This allows the valve 21 to be retained in its open position so as to allow the contents of the receptacle to drain out.

When it is desired to regulate the amount of opening of the valve 21, the link 27 is detached from the bar 24 and then attached to another one of the apertures 26 therein, as will be readily understood.

The float 5 is provided at one of its corners with a notch 40 so as to cause no interference with the rod 22, and is connected with the ground wire 11 in the same manner as the float arranged in the other form of the device.

In using this modified form, it is only necessary to fill the receptacle with the non-conducting fluid, whereupon the valve or plug 21 is held firmly in the opening 20, until the switch 34 is closed. The magnet 29 is thereupon energized, thus drawing down on the core 28, which in turn operates the bar 24 so as to lift the valve from its seat. The fluid contents may then slowly drain out of the receptacle, thereby allowing the float 5 to descend and engage the contacts in the manner heretofore described.

From the foregoing description, taken in connection with the accompanying drawings, the construction and operation of the invention will be readily understood without a more extended explanation.

As various changes in form, proportion and the minor details of construction may be resorted to without departing from the spirit of this invention, I do not wish to be limited to the construction herein shown and described other than that set forth in the appended claims.

I claim:—

1. A multiple charge firing device comprising a polysided liquid receptacle, a series of vertically spaced contacts passing through one side of said receptacle for connecting current conducting wires, the inner ends of said contacts being in the form of rounded heads, a float movable vertically in said receptacle, a contact plate having its outer end directed upwardly to form a contact for engagement with said series of contacts, and having means for attaching a current conducting wire thereto, said float being of a shape corresponding to the polysided shape of the receptacle to prevent rotation of said float and to thus maintain the contact plate and the series of contacts in alinement, and a valve at the lower end of

said receptacle for preventing the escape of liquid and supporting the float above said series of contacts until the charges are to be fired and for then permitting the escape of such liquid.

2. A charge firing device comprising a vertically disposed receptacle polysided in horizontal section and having in its lower end an outlet, a contact carried by the vertical wall of said receptacle and located on the interior of the latter, a float movable vertically in said receptacle, and a contact carried by said float for engagement with said first named contact, said float being of a polysided shape corresponding to that of the receptacle to prevent rotation of said float in said receptacle, whereby the contacts are maintained in vertical alinement and need not extend entirely around the float or the receptacle.

In testimony whereof I have hereunto set my hand in 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."