

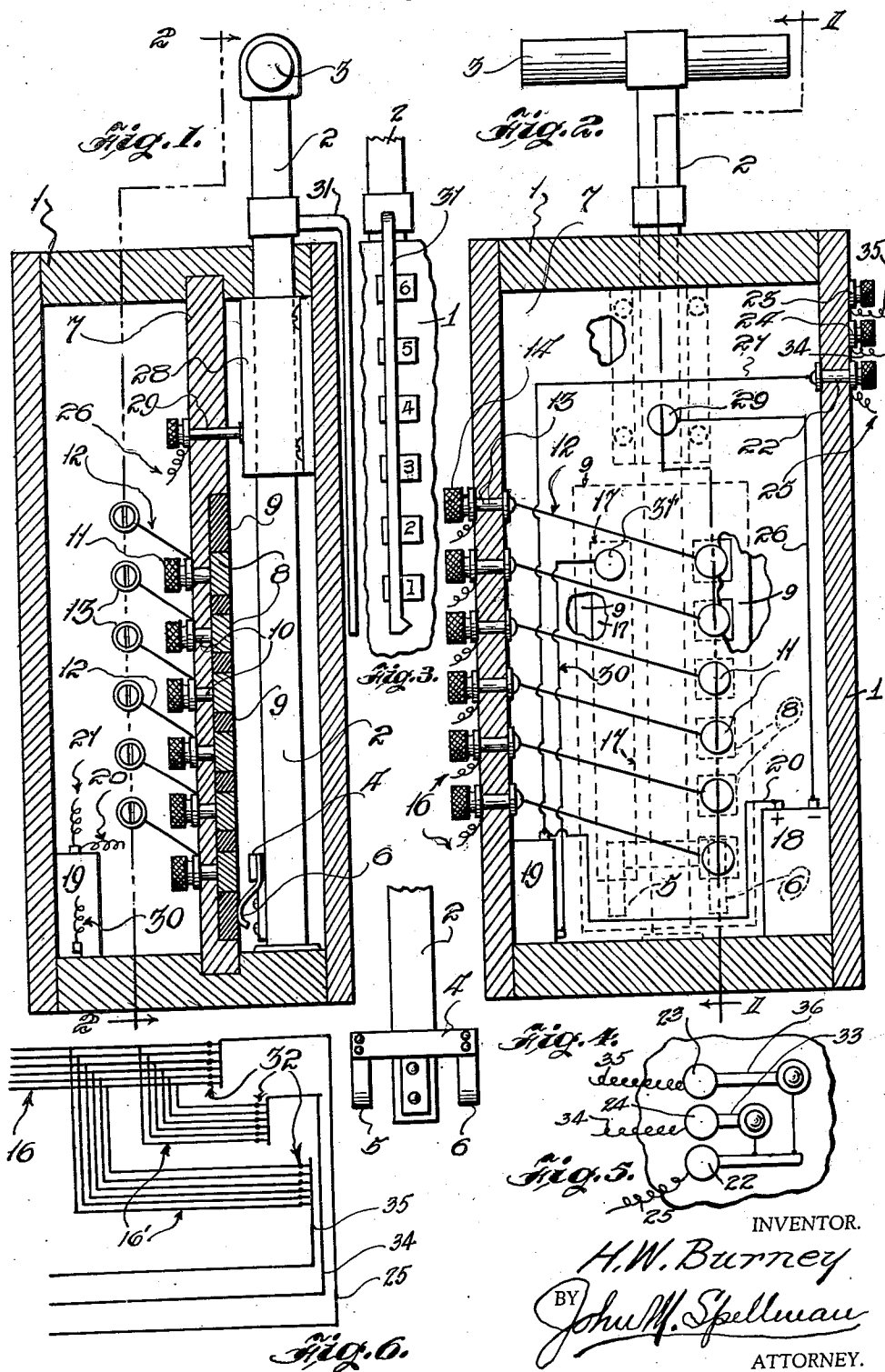
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MULTIPLE FIRING BLASTING APPARATUS

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## MULTIPLE FIRING BLASTING APPARATUS

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4 Claims. (Cl. 175—115)

This invention has for its object to provide an improved multiple firing blasting apparatus, commonly known as a blasting battery.

So far as the inventor is aware there are no blasting batteries now in use or heretofore patented wherein a multiplicity of explosions may be brought about without resetting or readjusting the wires for each explosion, and connecting the wires to the firing battery. That is, the operator must set the wires from the battery to the point of explosion or blasting place, make the discharge, and then reset the wires for another explosion or blast.

In keeping with the foregoing it is the object of this invention to provide a multiple firing blasting battery which can be set and arranged for making one or more blasts at a remote and safe point from the battery, without the necessity of the operator moving from the firing controlling point. The apparatus also includes means for firing a series of charges or blasts of explosive material, either one at a time, or all together, and then firing another series of blasts in the same manner, without any resetting of wires or change of location of the operator.

The invention may be readily understood from a perusal of the following detailed description, taken in connection with the accompanying drawing, and wherein:

Figure 1 is a vertical sectional view through the blasting battery, the view being had on the line 1—1 of Figure 2.

Figure 2 is a view similar to Figure 1, taken on the line 2—2 of Figure 1.

Figure 3 is a sectional detail view of an indicating means to reveal the position of the sliding switch.

Figure 4 is a detail sectional view of the lower end of the plunger rod with its switch attached thereto.

Figure 5 is a detail view of an outside switch assembly for completing circuits from terminals.

Figure 6 is a diagrammatic view of the wiring arrangement employed between the battery and blasting point or points when a series of blasts are to be carried out.

Proceeding in accordance with the drawing, the invention embodies the combination of a casing 1 of wood or other suitable material of non-electric conductivity to enclose the parts, which has an opening at the top for the insertion of a reciprocatory metal plunger rod 2, with an operating handle 3. As shown in Figure 4 the lower end of this rod has secured thereto a two-point sliding switch 4 and by the upward movement of

the rod the wiping or sliding movement of the switch points makes connection through a battery and a high tension vibratory coil as the switch points 5 and 6 make contact with the positive and negative sides of the electrical circuit.

The connection of the switch points 5 and 6 with the electric circuit is brought about through the medium of an insulating panel 7 of wood or other suitable material fastened to the top and bottom of the casing as illustrated in Figure 1. Carried in equal spaced relation on the panel 7 are metallic plates 8, separated by insulating members 9, and on each plate is mounted a post 10 with knurled screw cap 11. These posts 10 have connection through their several wires 12 to similar posts 13 with knurled caps 14, the posts 13 being mounted on the outside of the casing and serve to provide terminals for lead wires to the point of blast, such lead wires being indicated at 16. Carried on the opposite marginal edge of the panel 7 and in the path of the switch blade or point 5 is a metallic strip 17, and by means of this strip and the plates 8 opposite, the plunger rod with its switch blades completes the electric circuit.

The electric circuit is established by means of a small battery 18 and a high tension vibratory coil 19, the positive side of the battery being connected directly to one end of the primary winding of the coil through the wire 20, thence from the opposite end of the primary winding of the coil through wire 30 to a post 31 fastened to metal strip 17, and through switch 4 to plunger rod 2, thence to plunger guide 23, through terminal 29 connected thereto—returning to battery on the wire 26.

The circuits from coil 19 through the shots or charges at blasting points 32, indicated diagrammatically in Figure 6, are established through wire 30 to metal strip 17, thence to switch 4 by means of the blades 5 and 6 to the plates 8, through posts 10 and by wires 12 to posts 13, thence by wires 16 through the charges 32 and returning on wire 25, Figure 6, and also shown in Figure 2. The circuit continues through post 22 and wire 21 to the coil 19, and is thus completed for the first series of shots. For the second series of charges, switch 33, Figure 5, is closed, and return is by wire 34, Figure 6, to terminal 24, Figures 2 and 5, thence through switch 33 to post 22 and wire 21 to coil 19. For the third series of shots the return is made on wire 35 to terminal 23 and switch 35, when closed, to post 22 and wire 21 to coil 19. The return terminal connections, however, as well as the lead wire terminals 16,

may be multiplied as far as is practical in the production and utilization of as large an apparatus or battery as is desired.

On the outside of the casing and secured to the plunger rod 2 is an indicator arm 31 which has associated therewith a scale carrying numerals from "1" to "6" or such series of numbers corresponding with the number of contact points or plates 8 on the panel. This indicator is for the purpose of ascertaining when a circuit is completed by the sliding switch blades as the plunger is moved upwardly or downwardly.

In Figure 6 is shown diagrammatically an electrical circuit illustrating the operation of utilizing the apparatus or battery in firing a multiplicity of charges or shots. In this circuit the lead wires 16 are from terminals 13 on the casing 1 and are of sufficient length so that the operator can be located at a safe distance from the place of exploding charges. Other wires 16' are spliced or otherwise connected to these lead wires 16, and when the sliding switch 4 on the plunger rod 2 makes contact with the plates 8 and the metallic strip 17, an explosion occurs at the respective blasting points 32.

From the foregoing it will also be apparent that the switch blades on the plunger rod complete the electric battery circuit through the coil 19 and also complete the connections of lead wires and return wires with this coil, as the switch completes the circuits with the plates 8 and the strip 17. The operation of the plunger rod, through its switch, connects each lead wire to one end of the primary winding of the coil (in succession as the switch completes the circuits with the plates) and the return wire to the other end of the primary winding of this coil.

It is believed that with the foregoing description and explanation further details will not be necessary for the understanding of the apparatus. Likewise, and as before pointed out, the invention may be modified by increasing the number of terminals, switch contacts, leads, and similar parts necessary to increase the capacity of the firing battery, and similarly other alterations are capable, all of which may be within the scope and meaning of the appended claims.

What is claimed as new is:

1. A multiple firing blasting device, comprising a casing, a longitudinal series of separate terminal contact elements supported within the casing and insulated from each other, a corresponding series of separate circuit-wire-attaching elements mounted on the exterior wall portion of the casing and insulated from each other, each of said exteriorly mounted attaching elements being respectively connected electrically to a corresponding one of said series of interiorly mounted terminal contact elements, a reciprocatory plunger element slidably supported within the casing in longitudinal and parallel relation cooperatively with said series of terminal contact elements, a complementary, elongated contact element mounted in longitudinal and parallel relation cooperatively with said series of terminal contact elements, a pair of switch contact elements mounted on said reciprocatory plunger element and being respectively in electrical circuit connection with said plunger element, a second series of separate circuit-wire-attaching elements mounted on the exterior wall portion of said casing, electrical switch means for connecting to-

gether and disconnecting said last mentioned series of wire-attaching elements, at will, an electrical battery and a high tension electrical element within said casing, one pole of the battery being in electrical circuit connection with one end of the primary winding of said high tension element, said winding end being also in electrical circuit connection with one of said exteriorly mounted second mentioned series of wire-attaching elements, the opposite end of said primary winding being in electrical circuit connection with said interiorly mounted elongated contact element, and the opposite pole of the battery being in electrical circuit connection with said reciprocatory plunger.

2. The device as set forth in claim 1, and further including an indicator comprising correlated indicating points located and marked on the exterior wall portion of the casing and a cooperative pointer element mounted and operably connected to reciprocate in unison with said plunger element.

3. A self-contained, unitary, multiple firing blasting device, comprising a portable casing, a cooperative electrical battery and a high tension electrical coil element within said casing, a sequential series of separate contact elements mounted within said casing, in spaced relation to and insulated from each other, an elongated contact element in parallel cooperative relation to said series of separate contact elements, spaced and insulated therefrom, a longitudinally disposed, reciprocatory element having an operating handle exteriorly of the casing, said element extending and working in parallel relation to said series of separate contact elements and said elongated cooperative contact element, switch contact elements on said reciprocatory element, in electrical circuit connection therewith and arranged and adapted to travel in continuous contact with said elongated contact element and intermittently and sequentially with said series of separate contact elements, a series of circuit-wire-attaching elements mounted exteriorly on said casing, each of said attaching elements being respectively in electrical connection with a corresponding one of said series of separate contact elements, a second series of circuit-wire-attaching elements mounted exteriorly on the casing, switch means for connecting together the attaching elements of said second mentioned series and disconnecting them, at will, one pole of the contained electrical battery being in circuit connection with one end of the primary winding of the cooperative high tension coil element, and said end of the winding being also in circuit connection with one of the wire-attaching elements of said second mentioned exterior series of said elements, the opposite end of the primary winding being in circuit connection with said elongated interior contact element, and the opposite pole of the battery being in circuit connection with said reciprocatory element carrying the switch contact elements.

4. The device as set forth in claim 3, and further comprising means on the exterior wall portion of the casing for indicating the relative working position of said reciprocatory element with respect to said series of separate interiorly located contact elements.

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