C. I. DODSON.

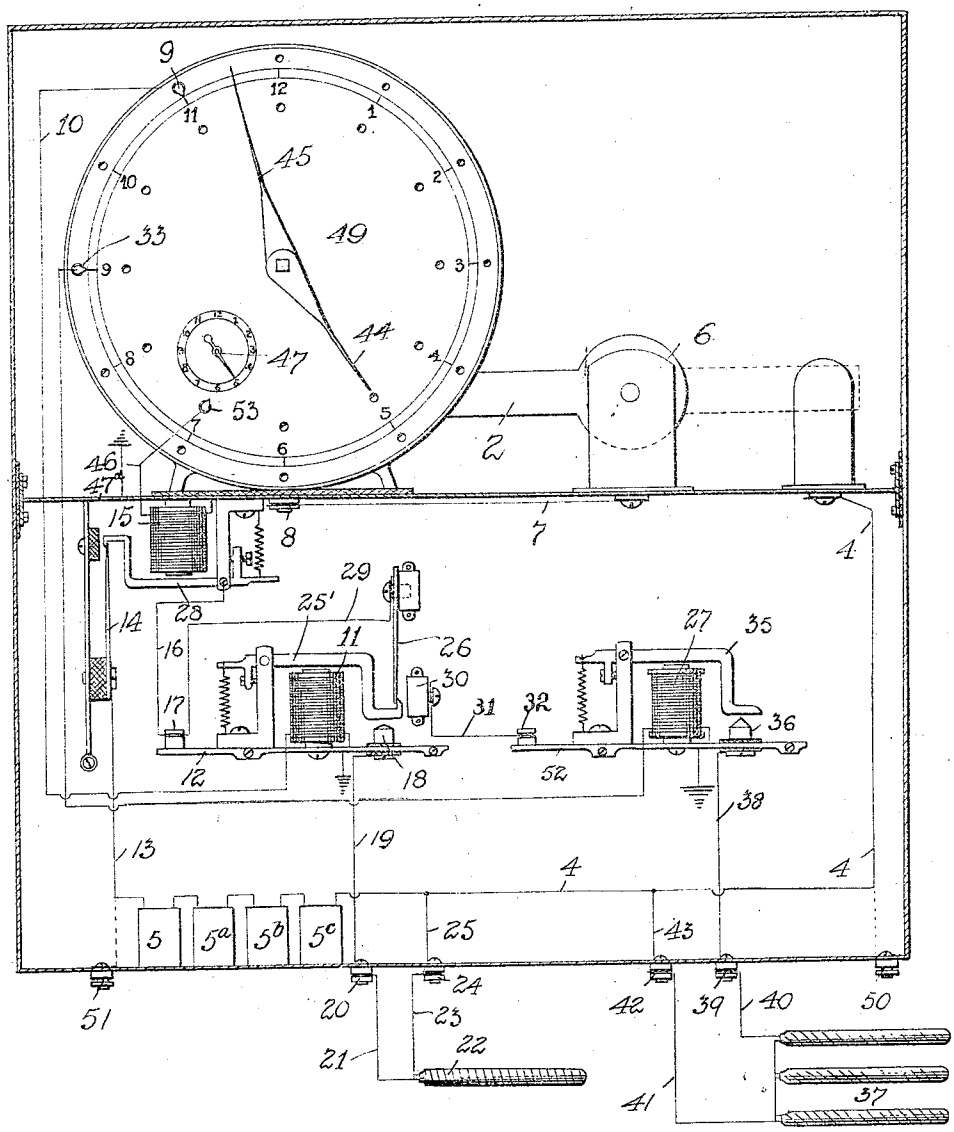
APPARATUS FOR EXPLODING MINE CHARGES.

APPLICATION FILED APR. 6, 1907.

898,847. Patented Sept. 15, 1908.

3 SHEETS—SHEET 1.

Fig. 1



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3 SHEETS—SHEET 2.

Fig. 5.

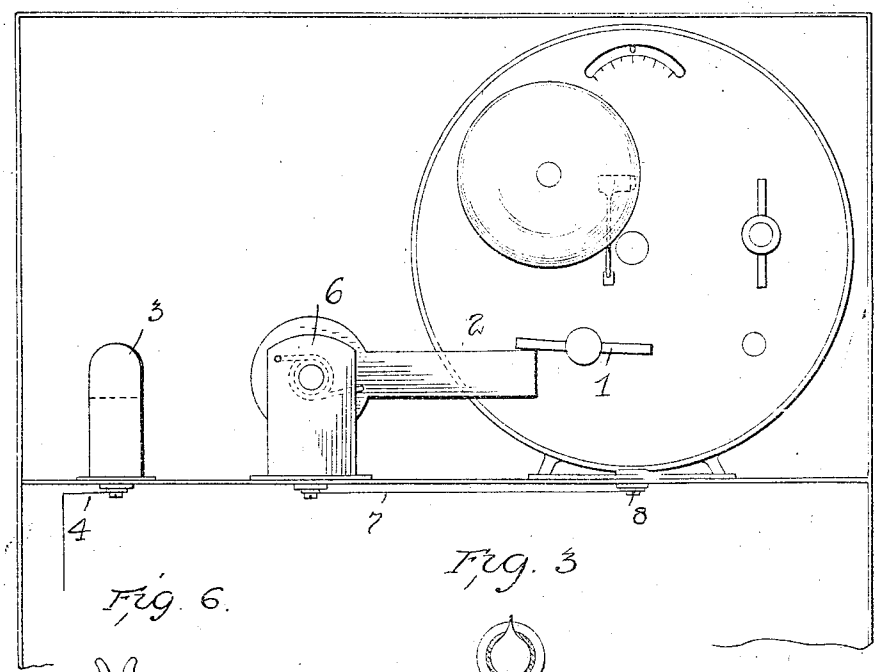


Fig. 6.

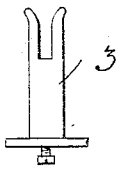


Fig. 3

Fig 4.

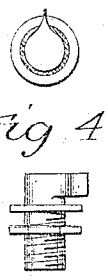
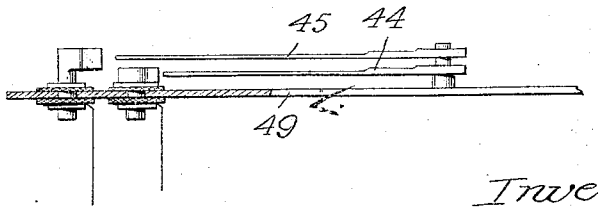


Fig 2



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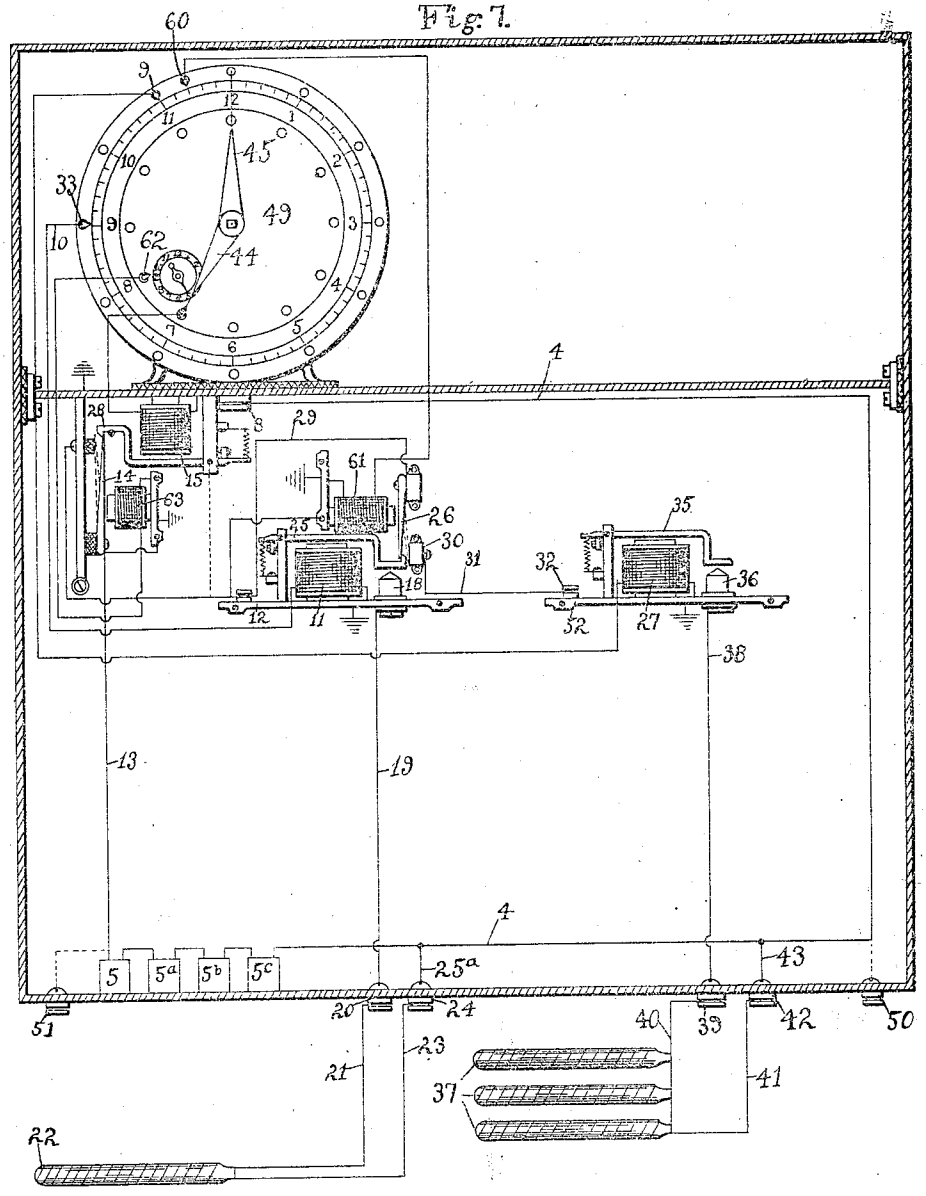
3 SHEETS—SHEET 3.

Fig. 7.



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UNITED STATES PATENT OFFICE.

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APPARATUS FOR EXPLODING MINE CHARGES.

No. 898,847. Specification of Letters Patent. Patented Sept. 15, 1908.

Application filed April 6, 1907. Serial No. 366,729.

To all whom it may concern:

Be it known that I, CHARLES I. DODSON, a citizen of the United States of America, residing at Pittsburg, in the county of Crawford and State of Kansas, have invented a new and useful Improvement in Apparatus for Exploding Mine Charges, of which the following is a specification.

The principal object of this invention is to provide means and system whereby blasting charges may be placed in position throughout a mine or other excavation and each connected to a source of electric energy, including mechanism for successfully closing the circuit through the blasting charges at any desired interval of time.

A further object of the invention is to provide an apparatus of such nature that the closing of a circuit or the creation of a spark within or adjacent to the explosive charges will be insured, so that all the charges will be detonated, and a still further object is to so arrange the firing mechanism that a series of circuit closing devices may be employed by cross wiring from a main line circuit, or may be used independently, with a battery and the mechanism placed near the charge to save wire.

With these and other objects in view as will more fully appear hereafter therein, the invention consists in certain novel features of construction and arrangement of parts hereinafter fully described and illustrated in the accompanying drawings and particularly pointed out in the appended claims, it being understood that various changes in the form, proportions, size and minor details of the structure, may be made without departing from the spirit or sacrificing any of the advantages of the invention.

In the accompanying drawing: Figure 1 is a front elevation of the mechanism for closing the circuit through a series of mine charges, embodying the invention, the wiring connections through electric magnets being shown diagrammatically. Fig. 2 is a detail sectional view, illustrating the clock face with contact points and the hands of the clock. Fig. 3 is an end view of contact point. Fig. 4 is a side view of contact point showing binding nut for fastening to clock face. Fig. 5 is a rear elevation of the clock and shows alarm arbors, wing nut, holding arm showing also at 6 a detailed side elevation of throw arm and of a binding post 3 which the throw arm engages when released from wing nut to complete the circuit from wire 4 to wire 7. Fig. 6 is a side elevation of binding post and shows slot for throw arm (Fig. 6). Fig. 7 is a front elevation showing modifications.

Similar numerals of reference are employed to indicate corresponding parts throughout the several figures of the drawings.

In carrying out the present invention the charges are all placed in position by the miners, and each charge is connected in multiple or in series and set off simultaneously and automatically by setting the mechanism of the apparatus at any time desired, whereby the operator is safe from premature explosions, as more than one connection is made before explosions occur, as when electric energy in form of batteries is contained in apparatus and if desired contact points may be changed to suit time and conditions for charges to be exploded.

If desired each miner may have an apparatus at his own room or working place, for firing his charges independently and he may use one or more dry cells or battery of any desired make and place them in the apparatus, then make his connection from charges to apparatus to make connections which complete circuit through charges and explode them after he has left the mine. Or the apparatus may be cross wired from a main line circuit by connecting to binding posts 50 and 51 and cutting out batteries 5, 5^a, 5^b and 5^c and connecting wire 13 to binding post 51 and wire 4 to binding post 50.

Each mechanism is controlled by its clock and each charge may be detonated throughout a mine or other working simultaneously or at different intervals, by setting time clock to make the connections. Two or more parts of the mine may be set to fire the charges at the same time, if the conditions are favorable.

In these drawings is shown a clock of any suitable kind having a face 49 and fixed to a partition of the suitable containing case or frame. The hour hand 44 and the minute hand 45 of this clock move as usual over the face having the ordinary divisions and numerals. This clock is provided with an alarm having a hand 47, for moving over the usual divisions of time. On the alarm arbor is fixed a wing nut 1 which when in position

shown in Fig. 1 holds down an arm 2 pivoted in a slotted post 6 and held normally by the tension of a light spring against the wing of the nut 1 so that, when under the action of the alarm spring the wing nut is moved in the direction indicated by the adjacent arrow and the wing being removed, the arm 2 is released and by its light spring is thrown over and automatically engages the slotted end of a fork 3. This causes the alarm bell to ring and warns the miners and at the same time establishes electrical connection between the wire 4 and the wire 7, through the post 3, bar 2 now engaging therewith, and through post 6. The wire is connected with a source of electric energy such as dry batteries 5, 5^a, 5^b, 5^c. The wire 7 is in connection with the clock frame through the binding screw 8. On the frame of the clock is also set an insulated contact point 9, arranged to be touched by the minute hand of the clock. It is set, for example, at the point of five fifty-five of the clock. It is connected with a wire 10 which leads to the coil of an electro-magnet 11 and thence either to the ground or to the binding post 17 on frame 12. To this post is connected the terminal wire 13 from the other pole of the battery through spring 14, armature 28 and wire 16. This completes the circuit, and when the minute hand 45, of the clock touches the contact point 9 it causes the armature of the magnet 11 to drop down in the contact point 18. This completes the circuit through wire 19 and binding post 20 on the casing, and through the wire 21 to the fuse wire in the mine charge 22. In this is any known electric fuse exploder, primer or spaced terminals, whereby a spark may be created by the passage of the current from the connections heretofore described and from the fuse wire of the charge 22 through wire 23 to binding post 24 on the casing, through wire 25, to wire 4. Through this circuit the mine charge 22 is exploded. This occurs in the arrangement shown, where the minute hand of the clock reaches the point 9, or if the alarm is set at 5 o'clock as indicated substantially in the figure, the alarm will be sounded at five o'clock and the charge 22 will be exploded 55 minutes later. These times and the arrangement of the contact points are merely illustrative. By means of another circuit provision is made for the further automatic explosion, in a time limit, of another charge.

When the armature 25 touches the binding post 18, this occurring when the minute hand contacts with the point 9, it releases the conducting spring 26, thereby permitting it to move into contact with the binding post 30. This completes circuit on to and through electro-magnet 27 to ground 52 and circuit may be traced from battery 5 to 5^c, wire 13, spring 14, armature 28, wire 16, binding post 17, wire 29, spring 26 which is now bearing on block 30, by being released from armature point through armature 25', (when pulled down) wires 31 to binding post 32 on ground frame 52. It was five minutes to 6 o'clock when mine charge was exploded. Now, at 15 minutes to 7 o'clock, or when the minute hand in its circuit reaches contact point 33, it completes the circuit through clock case to and through electro-magnet 27 to ground frame 52, and causes armature 35 on electro magnet 27, to come down on contact post 36, which completes circuit on to wire 38 and binding post 39, which is secured to casing and through wire 40 to fuse wire of mine charge 37, and back from fuse wire 41, binding post 42, also, which is fastened to casing (Fig. 1) and wire 43, to main wire 4, which completes circuit and explodes mine charge 37. The circuit may be traced from battery 5, wire 13, spring 14, armature 28, wire 16, binding post 17, wire 29 and spring 26, which is now bearing against contact block 30 by release when mine charge was exploded at 5:55 o'clock. Wire 31, binding post 32, which is fastened to ground frame 52, armature 35, contact post 36, wire 38, binding post 39, wire 40, through mine charge 37, wire 41, binding post 42, wire 43, to main line wire which completes the circuit and explodes mine charge 37 at 6:45 o'clock. Then to prevent batteries 5 to 5^c from running down by circuit being closed at 9 and 10 o'clock, each hour as the minute hand 45 would complete its circle at 9 and 11 o'clock each hour, and to prevent danger the next day when the miner making his connections and wiring his charges, attempting to connect wire from the apparatus, (to make both safe) when the hour hand 44 comes in contact with contact 53 (similar to those heretofore described and illustrated in Fig. 2) at 7 o'clock and 15 minutes after mine charge 37 has exploded, it causes the circuit to be complete through electro-magnet 15, which causes the circuit to be complete through electro-magnet 15, which causes armature 28 to come down on magnet and releases spring 14, which breaks circuit between wires 13 and wire 16 and circuit may be traced from point of hour hand 44 to contact point 53, wire 46 to and through electro-magnet 15 to ground frame 47^a, which is grounded until spring 14 is released. It is not set again until arm 2 is released from binding post 3 and set under wing nut 1 on alarm arbor which holds it there until 5 o'clock A. M. or P. M. In a device constructed in accordance with this invention any number of charges may be exploded simultaneously or in successive order and the intervals between explosions may be properly timed by adjusting the positions of the contact points 9, 33 and 53, with respect to the minute and hour hands. The apparatus may be placed in any position and after

the clock is wound it will automatically fire the mine charges as the clock hand comes in contact with the several contact points.

Any form or kind of a time clock may be employed and Figs. 6 and 7 may be dispensed with by using electro magnets to cut it in circuit as illustrated in Fig. 9. In this form with the hands as shown, the alarm rings at 5 o'clock. At 7 the hour hand makes connections from spring point 14 to block at point of spring by being released from armature of electro-magnet 15 and completes the circuit to electro-magnet 11 and spring 26. At 7:45 minute hand completes circuit through to electro-magnet 27 and explodes mine charge 22. At 7:55 minute hand completes circuit through to electro-magnet 27 and explodes mine cliarges 37. A fourth contact placed at 7:57 whereby minute hand and electro-magnet 6 replaces spring 26 to original position at which it occupied at 7:57. At 8 o'clock hour hand replaces spring 14 to original position by closing circuit from contact 62 through electro-magnet 63.

My invention thus herein described, I claim as follows:

1. In an apparatus for exploding mine charges, a main circuit including a source of electric energy, a normally open switch included in said circuit, a clock having means for automatically operating said switch to close the primary circuit at a predetermined time, a normally open auxiliary circuit, forming part of the main circuit and including said source of electrical energy and the mine charge, said auxiliary circuit being incapable of being closed to fire the charge prior to the closing of the main circuit and means carried by the clock for automatically closing said auxiliary circuit at a time subsequent to the closing of the switch in the main circuit.

2. In an apparatus for exploding mine charges, a main circuit including a source of electric energy, a normally open switch in said circuit, a clock having means for sounding an alarm and closing said switch, a plurality of normally open auxiliary circuits, each forming part of the primary circuit and including said source of electric energy and each arranged to explode an independent mine charge, and means carried by the clock for independently and successively closing said auxiliary circuits at times subsequent to the closing of the switch in the main circuit, said auxiliary circuits being incapable of being closed to fire the charge prior to the closing of the main circuit.

3. In an apparatus for exploding mine charges, a main circuit including a source of electric energy and having two breaks therein, a clock having means for automatically closing the first break at a predetermined time, means carried by the clock for closing the second break at a time subsequent to the closing of the first break, a normally open auxiliary circuit forming part of the main circuit and including said source of electric energy, a mine charge adapted to be fired by the passage of current through said auxiliary circuit, and means controlled by the passage of current through the main circuit for closing said auxiliary circuit, said auxiliary circuit being incapable of being closed prior to the closing of the main circuit.

4. In an apparatus for exploding mine charges, a main circuit including a source of electric energy and having two breaks, a spring switch lever included in said circuit for closing one break, an alarm clock having an alarm arbor engaging said switch lever to hold it in open position until the sounding of an alarm at a predetermined time, means whereby the arrival of one of the hands at a determined position closes the other break, a normally open auxiliary circuit forming part of the main circuit and including said source of electric energy, means whereby the passage of current through the main circuit closes said auxiliary circuit, and a mine charge adapted to be fired by the passage of current through said auxiliary circuit said auxiliary circuit being incapable of being closed prior to the closing of the main circuit.

5. In an apparatus for exploding mine charges, a main circuit including a source of electric energy and having two breaks, a switch lever included in said circuit for closing one break, a spring tending normally to close said switch, an alarm clock having means for holding said switch lever in open position until a predetermined time, means carried by the clock for closing the other break at a time subsequent to the closing of the first break to establish a complete circuit, an auxiliary circuit forming part of the main circuit, and including the source of electric current and mine charge, a normally open switch controlling said auxiliary circuit, and an electro-magnet in the main circuit for operating said switch.

6. In an apparatus for exploding mine charges, a main circuit including a source of electric energy and having two breaks, a switch lever for closing one break, a spring tending normally to close said switch, an alarm clock having means for holding said switch lever in open position until a predetermined time, means carried by the clock for subsequently closing the other break to establish a complete circuit, an electromagnet included in said main circuit, an auxiliary circuit forming part of said main circuit and including said source of electric energy and a mine charge, a switch included in said auxiliary circuit adapted to be closed by the energizing of said magnet, a branch circuit adapted to be connected with the main circuit by the operation of said magnet, a second normally open auxiliary circuit including said

source of electric energy and a second mine charge, and means whereby a second closing of the main circuit by the block will close said second auxiliary circuit and fire the second charge.

7. In an apparatus for exploding mine charges, a main circuit including a source of electric energy and having two breaks, a normally open switch lever included in said circuit for closing one break, an alarm clock having means for closing said switch at a predetermined time, means operated by the minute hand of the clock for closing the other break, an electromagnet included in said circuit, an auxiliary circuit forming part of said main circuit and including said source of electric energy and a mine charge, a switch lever included in said auxiliary circuit and designed to be operated by the energizing of the magnet to fire the charge, a normally closed switch in the main circuit, and means controlled by the movement of the hour hand for opening said normally closed switch.

8. In an apparatus for exploding mine charges, a main circuit including a source of electrical energy and having two breaks, means for closing one of said breaks at a predetermined time, means for subsequently closing the other break to establish a current in the main circuit, a normally open auxiliary circuit, forming part of said main circuit and means operated by the passage of current through the main circuit for closing the auxiliary circuit, and a mine charge adapted to be fired by the passage of current through the auxiliary circuit.

In testimony whereof, I affix my signature in presence of two witnesses.

CHARLES I. DODSON.

Witnesses:

LUE BIVIN,

W. F. GRACEY.