

C. I. DODSON.
 MEANS FOR EXPLODING CHARGES.
 APPLICATION FILED SEPT. 26, 1910.

1,024,622.

Patented Apr. 30, 1912.

3 SHEETS—SHEET 1.

Fig. 1

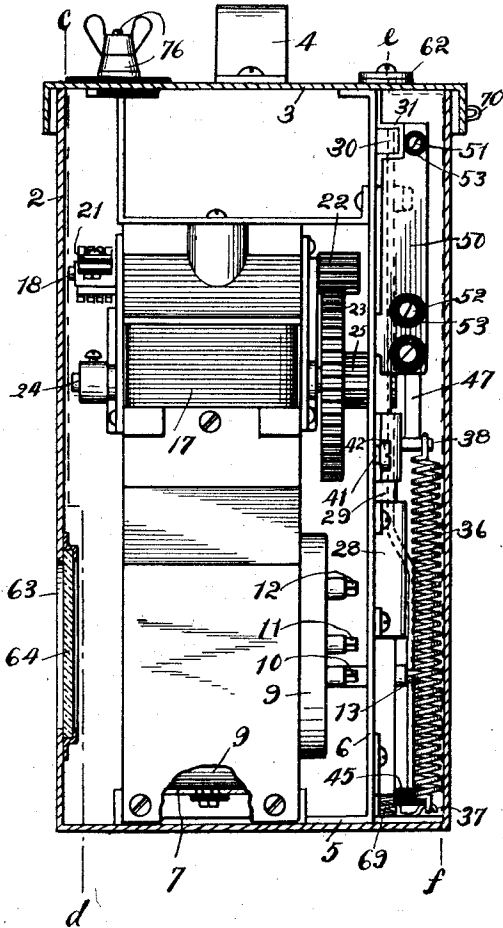
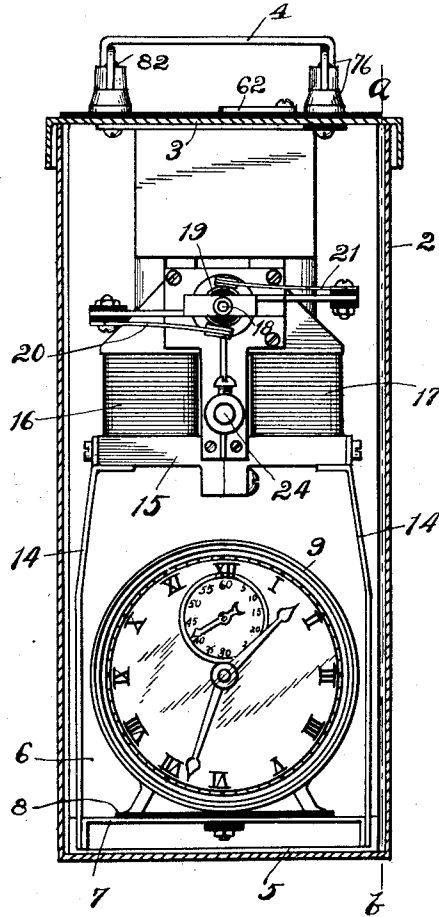


Fig. 2



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3 SHEETS-SHEET 2.

Fig. 3

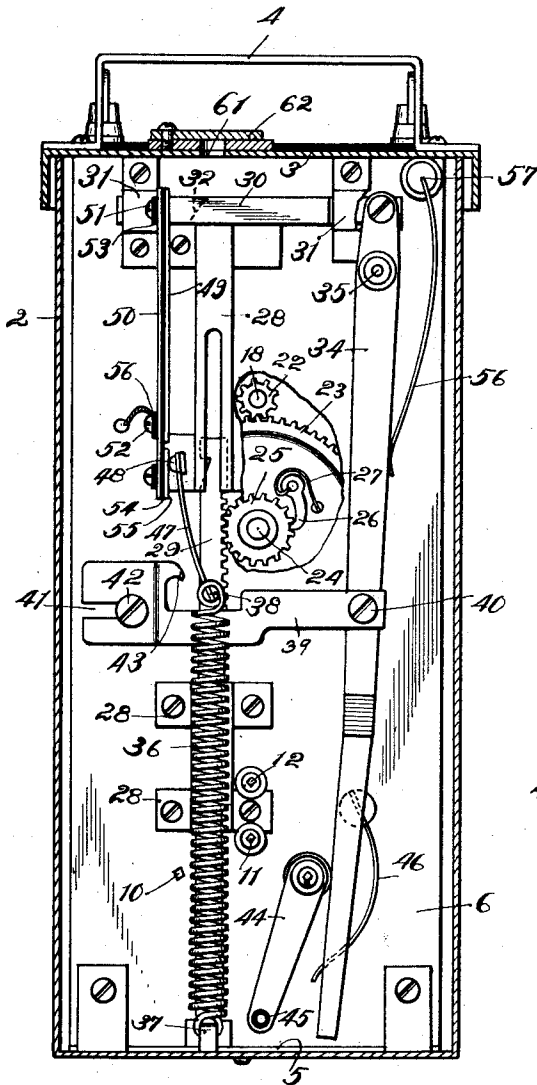


Fig. 5

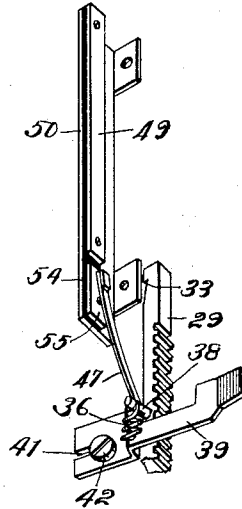
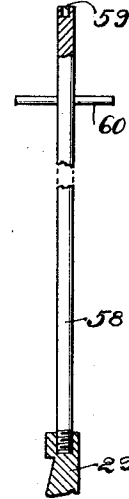


Fig. 4

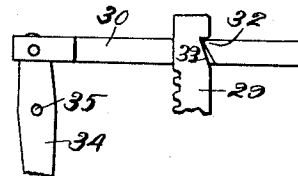


Fig. 6

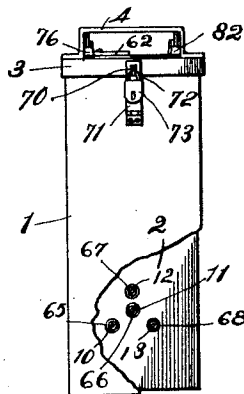
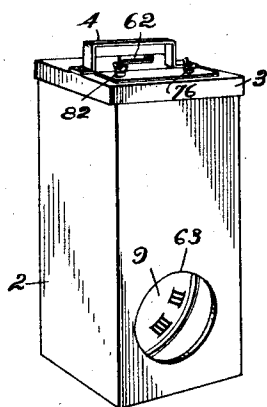
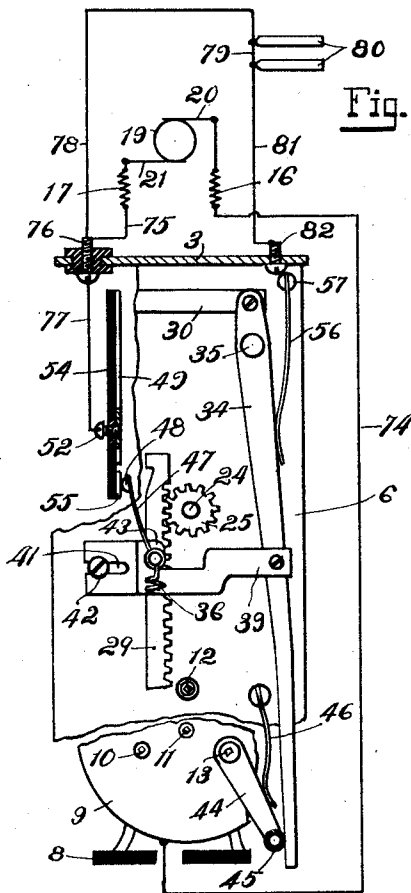
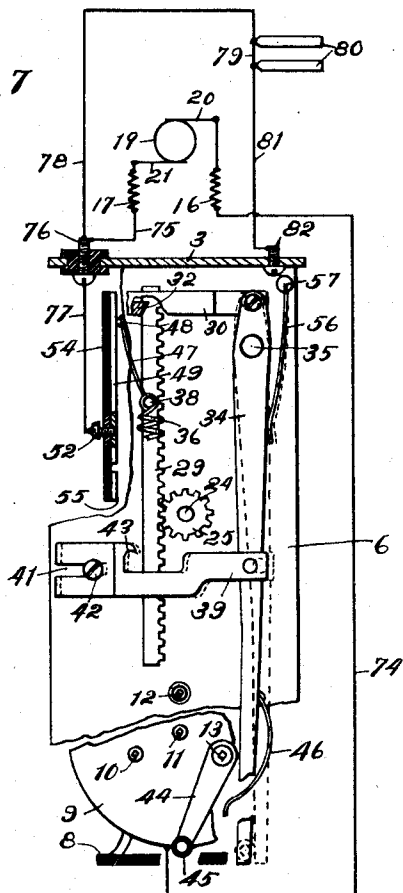
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3 SHEETS—SHEET 3.



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UNITED STATES PATENT OFFICE.

CHARLES I. DODSON, OF PITTSBURG, KANSAS, ASSIGNOR TO THE DODSON MANUFACTURING COMPANY, OF PHOENIX, ARIZONA, A JOINT STOCK COMPANY.

MEANS FOR EXPLODING CHARGES.

1,024,622.

Specification of Letters Patent.

Patented Apr. 30, 1912.

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To all whom it may concern:

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

My invention relates to improvements in means for exploding charges.

It is particularly adapted for exploding blast charges in mines.

One object of my invention is to provide an apparatus which may be easily operated and safely handled and which may be relied upon to cause with certainty the explosion of all the charges with which it may be connected and at the predetermined time at which the apparatus has been set for operation.

My invention provides further, an apparatus so constructed that it cannot, by means of rough usage or by accidental means, be caused to prematurely explode the charges.

My invention provides still further, means for protecting the apparatus from being tampered with by unauthorized persons.

Other novel features of my invention are hereinafter fully described and claimed.

In the accompanying drawings which illustrate the preferred form of my invention—Figure 1 is a vertical section on the dotted line *a-b* of Fig. 2, the outer casing being removed. Fig. 2 is a vertical section on the dotted line *c-d* of Fig. 1. Fig. 3 is a vertical section taken on the dotted line *e-f* of Fig. 1, a portion of the supporting frame being broken away. Fig. 4, is a perspective view, enlarged, of the circuit controlling mechanism for short-circuiting the generator and some of the parts connected therewith. Fig. 5 is an enlarged view, partly in elevation and partly in vertical section, of the operating key and the upper end of the rack bar connected with the key. Fig. 6 is an enlarged elevation of the mechanism for holding the rack bar in the elevated position. Fig. 7 is a structural, diagrammatic view of the electric circuits, showing in solid lines the rack bar in the elevated position supported by the holding latch. In this view the lever is shown in solid lines disconnected from the rock arm of the time piece, while in dotted lines the rock arm is shown swung to a position in

which it engages the lever and adjacent contact spring. Fig. 8 is a diagrammatic view of the circuits, showing the rack bar held by the locking latch and the rock arm engaging the lever. Fig. 9 is a perspective view, reduced, of the apparatus, the outer casing being removed. Fig. 10 is a rear elevation, reduced, of the apparatus, a portion of the outer casing being broken away.

Similar characters of reference denote similar parts.

Referring to Fig. 10, 1 denotes a rectangular box having an open top, and having slidably inserted therein a similarly shaped inner casing 2, within which the operative parts of the machine are mounted. 3 denotes a cover, preferably arranged to slide over the open ends of the box 1, which will hereafter be called the outer casing, and the inner casing 2. Suitable means are provided for locking the cover 3 to the outer casing 1 to prevent unauthorized persons having access to the operating parts, and also for the purpose of enabling the machine to be lifted and readily transported from place to place when the handle 4, provided on the upper side of the cover 3, is grasped.

Referring now more particularly to Figs. 1 to 8, 5 denotes a horizontal base plate, which is secured to the lower end of a vertical plate 6, the upper end of which is secured to the underside of the cover 3. While in the drawings the cover 3, base plate 5, and plate 6 are shown as separate pieces they may be made in the form of a single casting. Supported on the base plate 5, forward of the plate 6, is a horizontal plate 7, upon which is mounted but electrically insulated therefrom, by the strip of insulating material 8, a time piece 9 which is preferably of the ordinary alarm clock type, having the usual time and alarm movements, the time movement having the usual winding arbor 10 and setting arbor 11, while the alarm movement is provided with the usual setting arbor 12 and the winding arbor 13. Two upwardly extending plates 14, disposed at opposite sides of the time piece 9, have their lower ends secured to the base plate 5 and at their upper ends are secured to and support a current generator of any suitable type. As a current generator I preferably employ a mechanically operated direct current, series wound dynamo, arranged to produce a cur-

rent of comparatively high amperage and low voltage. Such a machine, when in fully active condition, is more efficient for the purpose than a machine of the magneto type but requires more time to build up a current of full efficiency. In order that the full volume of current may be produced before the current is utilized to explode the charges, I have arranged the apparatus, in its preferable form, so that the generator is short circuited during the initial part of its operation. By this means the field magnets and armature become thoroughly magnetized before the current is diverted into the main or working circuit which includes the charges to be exploded.

The generator, denoted by 15, is provided with the usual field coils 16 and 17, armature shaft 18, commutator 19, and brushes 20 and 21.

To rotate the armature shaft 18, any suitable mechanism may be employed but I prefer to employ the following described mechanism.

Secured to and rotatable with the armature shaft 18, is a pinion 22, which meshes with a gear wheel 23, rotatably mounted on a shaft 24 on which is secured a pinion 25. Pivotaly mounted on the rear side of the gear wheel 23 is a pawl 26 which is held engaged with the teeth of the pinion 25 by a spring 27, secured to the gear wheel 23. Vertically slidable in suitable bearings 28, secured to the rear side of the plate 6, is a vertical rack bar 29, the teeth of which engage the teeth of the pinion 25. The arrangement of the pawl 26 is such that when the rack bar 29 is raised to the elevated position shown in Fig. 7, the pinion 25 will rotate in a direction such that the pawl 26 will slip over the pinion teeth and the gear wheel 23 will not be rotated. When the rack bar 29, however moves downward, the pawl 26 will lockingly engage the pinion 25, thereby rotating the armature shaft 18 through the intermediacy of the pinion 22 and gear wheel 23, thereby causing the generator 15 to become active for the purpose of developing a current.

For releasably supporting the rack bar 29 in the elevated position shown in Fig. 7, until such time as has been selected for it to descend for operating the generator, I preferably employ a holding latch comprising a horizontal plate 30, horizontally slidable in suitable bearings 31, secured to the rear side of the plate 6, as shown in Fig. 3. The holding latch 30, as shown in Fig. 6, is provided with a bevel projection 32, which is adapted to enter a notch 33, provided in the adjacent edge of the rack bar 29. For sliding the latch bar 30 to the left so as to release the rack bar 29, as viewed in Figs. 3 and 7, the latch 30 has pivoted to it the upper end of an upwardly and downwardly

extending lever 34, which is pivoted below the latch bar 30, to the rear side of the plate 6 by means of a horizontal pin 35. For downwardly retracting the rack bar 29, I preferably employ a vertical coil spring 36, the lower end of which is secured to a raised projecting portion 37 of the base plate 5. The upper end of the spring 36 is secured to a horizontal stud 38, mounted on the rack bar 29.

To lock the rack bar 29 against any upward movement when the working circuit in which the dynamo is located is closed, I preferably employ a locking latch comprising a horizontal plate 39, one end of which is pivoted by means of a pin or screw 40 to the lever 34, below the pin 35 and the other end of which is provided with a slot 41 through which extends a guiding pin or screw 42, extending horizontally rearward and secured to the plate 6. The locking latch 39 is provided with a projection 43 which, when the rack bar 29 is in the lower position and the lever 34 is in a position shown in Fig. 8, will pass over and obstruct the upward movement of the stud 38.

For the purpose of swinging the lever 34 to the position shown in Fig. 8, and for the purpose of at the same time closing the circuits in which the generator 15 is located, I preferably secure to the winding arbor 13, of the alarm side of the time piece 9, a rock arm 44 which is of electrically conductive material and which is electrically connected with the time piece 9. The rock arm 44 has rotatively mounted on it a roller 45 of insulating material, which is adapted, when the rock arm 44 is swung by the operation of the alarm part of the time piece 9, from the position shown in Figs. 3 and 7 to the position shown in Fig. 8, to engage with and swing the lever 34 to a position in which the holding latch 30 will move to a position in which the rack bar 29 will be released from the projection 32 on said latch bar, providing the rack bar has previously been moved to the upper position shown in Fig. 7. For closing the circuits in which the dynamo is located at the time the lever 34 is moved to the position shown in Fig. 8, there is secured to the rear side of the plate 6 a contact spring 46, which is electrically connected to the plate 6 and is adapted to be struck by the rock arm 44 just prior to the time the roller 45 engages the lever 34. The plate 6, rack bar 29, stud 38, and cover 3 are all electrically connected with each other and form a ground for the working circuit and the branch employed for short circuiting the generator 15.

Secured at one end to the stud 38 is a contact spring 47 which carries a contact 48 adapted to rub against a stationary vertical contact plate 49, during the initial part of the downward movement of the rack bar 29.

29. The contact plate 49, as shown in Figs. 1, 3 and 4, is secured to a vertical plate 50 by screws 51 and 52 which are insulated from plate 50 by insulating washers 53, the plate 49 being insulated from the plate 50 by insulating material 54. Secured to the plate 50 below the plate 49 is a plate 55 which is insulated from the plate 50 by insulating material 54. The plate 55 is provided to support the contact 48 after the said contact has passed from the plate 49 during the downward movement of the rack bar 29.

To normally move the lever 34 to the position shown in Figs. 3 and 7 any desired means may be employed. To accomplish this I have provided a flat spring 56, one end of which is secured to a horizontal stud 57 fastened to the plate 6, the other end of the spring bearing against the lever 34 below the pivot pin 35. To draw the rack bar 29 upwardly into engagement with the latch bar 30 any suitable means may be employed. For this purpose I provide a setting key, shown in Fig. 5, comprising a straight rod 58 having a screw threaded end adapted to be inserted into and fit a vertical threaded hole in the upper end of the rack bar 29. The other end of the key 58 may have a squared recess 59 adapted to receive the square ends of the arbors 10, 11, 12 and 13.

The key 58 may have a transverse finger hold 60 by which the key may be drawn upwardly for drawing up the bar 29, or by which the key may be turned for turning the arbors 10, 11, 12 and 13. The cover 3 preferably is provided with a vertical hole 61 through which the setting key 58 may be inserted for engaging the rack bar 29. A closure 62 may be pivoted to the upper side of the cover 3 for covering the hole 61.

The forward side of the casing 2 has an observation opening 63 covered by a transparent plate 64 and located so that the face of the time piece 9 may be seen there-through. The rear side of the casing 2 has holes 65, 66, 67 and 68 for the insertion of the setting key 58 so that the key may engage the arbors 10, 11, 12 and 13.

To reduce the force of impact of the rack bar 29 when it moves downwardly I provide a vertical coil spring 69 on the top of the base plate 5, as shown in Fig. 1. This spring has its upper end located so as to receive thereupon the lower end of the rack bar 29. To lock the cover 3 to the outer casing 1, the cover may have secured to it a staple 70 adapted to extend through a hasp 71 which is pivoted to the casing 1. The staple 70 is adapted to receive the shackle 72 of a lock 73, as shown in Fig. 10.

The following is the preferred arrangement of circuits:—Connected to the field coil 16 is a conductor 74 electrically connected to the time piece 9. The field coil

17 has connected to it a conductor 75 connected to a binding post 76 mounted on but insulated from the cover 3. The binding post 76 is connected by a conductor 77 with the screw 52 which is in electrical connection with the contact plate 49. The binding post 76 is connected by a conductor 78 with a fuse wire 79 connected to explosive charges 80 which are provided with the usual electric fuse exploders or with spaced terminals. Said fuse wire 79 is connected by a conductor 81 with a binding post 82 secured to and electrically connected with the cover 3.

In operating my invention, after the charges 80 have been properly placed and are ready to be exploded, the conductors 78 and 81 are connected respectively to the binding posts 76 and 82 and also to the terminals of the fuse wire 79. The lock 73 is then removed from the staple 70 from which the hasp 71 is then removed. The cover 3 and inner casing 2 may then be withdrawn from the outer casing 1 and set in the positions which they are to occupy when the charges are exploded. The parts will now be in the positions shown in Fig. 8. In this position the branch circuit which passes through the plate 49 will be broken, the contact 48 resting at this time upon the plate 55. The setting key 58 is then applied to the arbors 10, 11, and 12 for winding the time spring and for setting the time and alarm hands in the usual manner. The setting key 58 is then engaged with the upper end of the rack bar 29 which is drawn upwardly by the key until the rack bar engages the projection 32 of the latch bar 30, the rock arm 44 having been previously turned from the position shown in Fig. 8 to the position shown in solid lines in Fig. 7. In this position of the parts the circuit between the rock arm 44 and the spring 46 is broken, so that if by jarring or other rough usage the lever 34 is swung so as to release the latch 30 from the rack bar 29 no current can be generated in either the branch or working circuits, as both of these circuits are closed through the contact spring 46 and rock arm 44. When the parts are as shown in Fig. 7 the branch circuit will be completed through the traveling contact 48 and the plate 49, as soon as the rock arm 44 contacts with the spring 46. At the time that the alarm side of the time piece operates, the arbor 13 will turn in the usual manner, thereby swinging the rock arm 44 against the spring 46 and immediately afterward the insulating roller 45 will strike the lever 34 and force said lever to the position shown in dotted lines in Fig. 7, which is assumed to be the position occupied by the lever when the latch bar 30 releases the rack bar 29. At this time the rack bar 29 will be forced suddenly downward by the

spring 36, thereby rotating the armature shaft 18 in the manner hereinbefore described, thus causing the generator 15 to develop a current which will flow through the branch circuit by the following path:— Starting from the field coil 17 the current will flow through conductor 75 to binding post 76, thence through conductor 77, screw 52, contact plate 49, contact 48, spring 47, stud 38, rack bar 29, plate 6, contact spring 46, rock arm 44, timepiece 9, conductor 74, field coil 16, brush 20, commutator 19 and brush 21 back to the field coil 17. This branch circuit having the least resistance will receive the bulk of the current generated by the generator 15. By the time the contact 48 has reached the lower end of the contact plate 49 the generator will have developed a maximum of efficiency. The contact 48 is so arranged that it will pass off from the contact plate 49 before the rack bar 29 has reached the limit of its downward movement. As soon as the contact 48 pass from the plate 49 the current being fully built up will pass with a surge of maximum volume and intensity through the working circuit about to be described, and will cause with certainty the explosion of all the charges 80 in said circuit. The working circuit will receive the current as soon as the contact 48 passes from the plate 49. When this occurs the current will pass from the field coil 17 through conductor 75, binding post 76, conductor 78, fuse wire 79, to and through charges 80, thence through conductor 81 to binding post 82, thence through cover 3, plate 6, spring 46, rock arm 44, timepiece 9, thence by the path already described back to field coil 17. At this time the parts will be in the position shown in Fig. 8. As the rack bar 29 moves downward the stud 38 will strike the upper downwardly inclined edge of the projection 43 on the latch 39, thus moving the said latch and lever 34 to the left, as viewed in Fig. 8, a distance sufficient for the passage of the stud 38 past the projection 43, the spring forced arm 44 yielding sufficiently to permit such movement of the said latch and lever.

As the mechanism is inclosed in the inner casing 2 through which access can be had to the working parts only by use of the special setting key 58, a person not possessing such a key cannot cause a current to pass from the generator over the working circuit to cause thereby a premature explosion.

With the parts disposed as shown in Fig. 8, the rack bar 29 cannot be lifted by reason of its engagement with the locking latch 39. In the position of the parts as shown in Fig. 7, the working circuit cannot be closed until the operation of the

alarm has taken place at the time set. Even if the mechanism is jarred so as to release the rack bar 29 from the latch 39, the generator will be operated but will produce no current, for the reason that the rock arm 44, in the position shown in solid lines in Fig. 7, is out of contact with the spring 46, so that both the branch and working circuits are broken.

After the mechanism has been set so as to effect an explosion at a predetermined time, it is placed with the inner casing 2 within the outer casing 1, which is then locked to the cover 3 by the mechanism already described. The apparatus may then be set in any suitable position and may be safely left until it has operated to cause the explosion of the charges with which it is connected.

It will be noted that the circuit controlling contacts all have rubbing contacts, so that perfect electrical connection is always obtained and the full effect of the current is utilized.

The employment of the outer casing 1 not only insures against unauthorized manipulation of the apparatus, but it protects the working mechanism from injury by the access thereto of moisture or dirt.

I do not limit my invention to the structure shown and described, as various modifications, within the scope of the appended claims, may be made without departing from the spirit of my invention.

Having thus described my invention, what I claim and desire to secure by Letters Patent, is:—

1. In means for exploding charges, an electric circuit, a generator of electricity located in said circuit, means for operating the generator, means for holding the operating means inactive when it has been moved into operative position, means for closing the circuit and releasing the holding means, and means for locking the operating means against movement to the operative position when the circuit is closed and the holding means is in the released position.

2. In means for exploding charges, an electric circuit, a current generator, in said circuit, circuit controlling means in circuit with said generator, means for operating said circuit controlling means, means for holding said operating means inactive when it has been moved into operative position, means for locking the operating means against movement into the operative position, and means for releasing the operating means from the holding means and for operating the locking means to lock the operating means after the circuit controlling means has been operated.

3. In means for exploding charges, an electric circuit, a current generator in said circuit, circuit controlling means in circuit with the generator, means for operating the

circuit controlling means, means for holding the operating means inactive when it has been moved into operative position, means for locking the operating means against movement to the operative position, and a lever for actuating the holding and locking means.

4. In means for exploding charges, an electric circuit, a current generator in said circuit, circuit controlling means in circuit with the generator, means for operating the circuit controlling means, a latch for holding the operating means inactive when the operating means has been moved into operative position, a latch for locking the operating means from movement to the operative position, and means for moving the locking latch into the locking position and the holding latch to the release position.

5. In means for exploding charges, an electric circuit, a current generator in said circuit, circuit controlling means in circuit with the generator, means for operating the circuit controlling means, a latch for holding the operating means inactive after the operating means has been moved into the operative position, a latch for locking the operating means from movement to the operative position, and a lever for actuating said latches.

In testimony whereof I have signed my name to this specification in presence of two subscribing witnesses.

CHARLES I. DODSON.

Witnesses:

E. B. HOUSE,
FLORENCE M. VENDIG.

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