

Oct. 6, 1936.

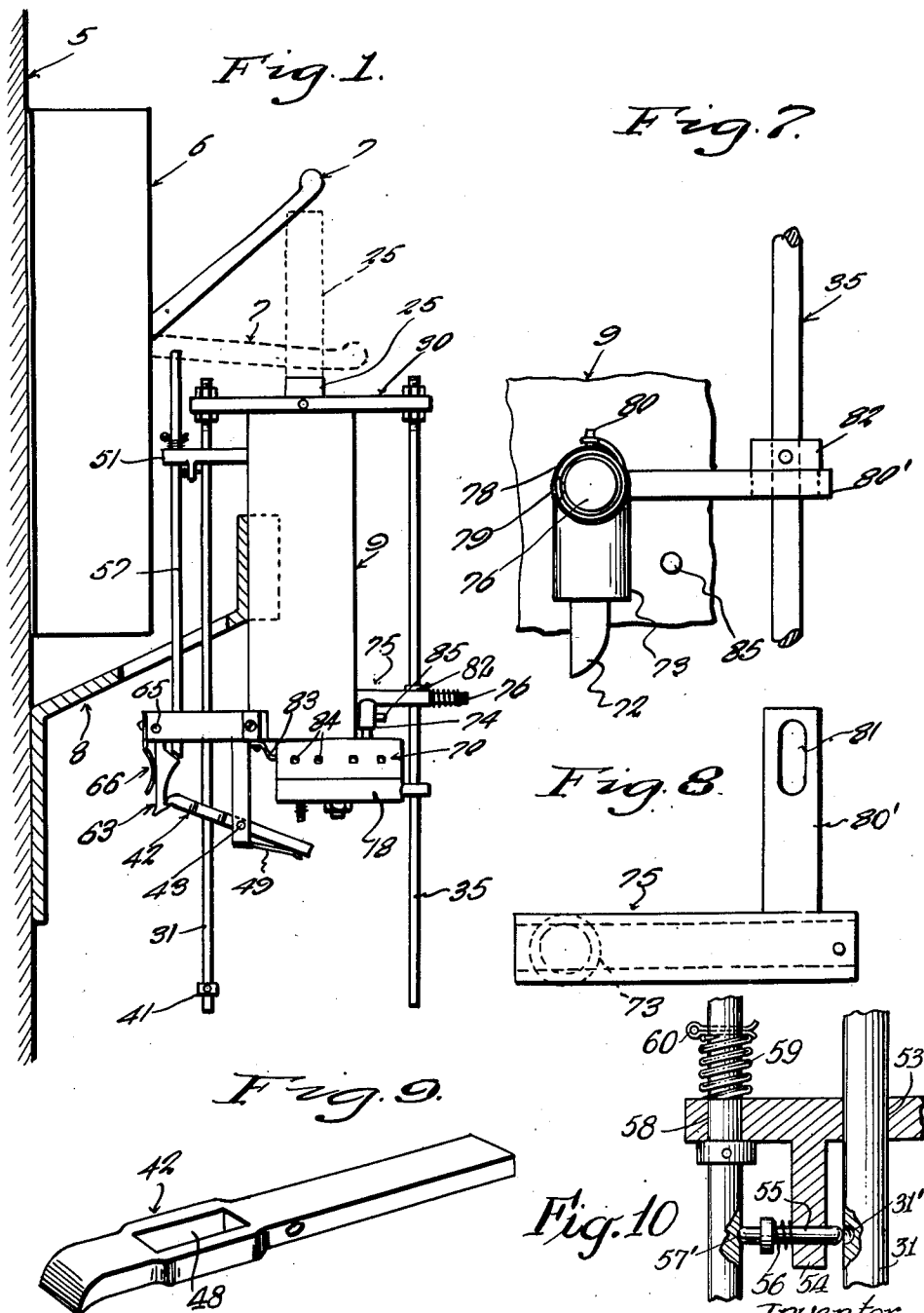
E. W. BROWN

2,056,599

OPERATING MECHANISM HAVING AUTOMATICALLY REPEATED ACTION

Filed June 4, 1934

3 Sheets-Sheet 1



Inventor
E. W. Brown
By *Clarence A. O'Brien*
Attorney

Oct. 6, 1936.

E. W. BROWN

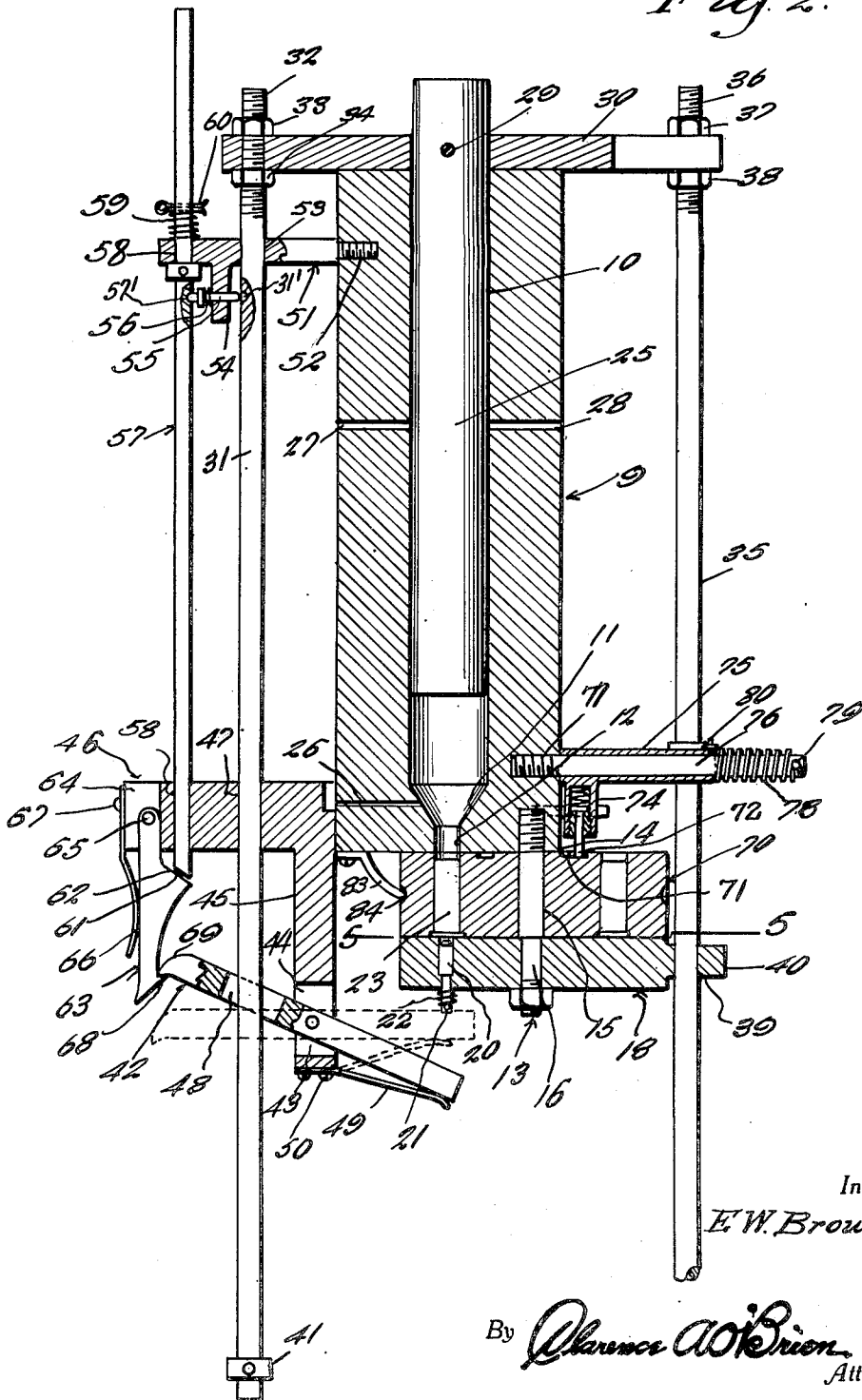
2,056,599

OPERATING MECHANISM HAVING AUTOMATICALLY REPEATED ACTION

Filed June 4, 1934

3 Sheets-Sheet 2

Fig. 2.



Oct. 6, 1936.

E. W. BROWN

2,056,599

OPERATING MECHANISM HAVING AUTOMATICALLY REPEATED ACTION

Filed June 4, 1934

3 Sheets-Sheet 3

Fig. 3.

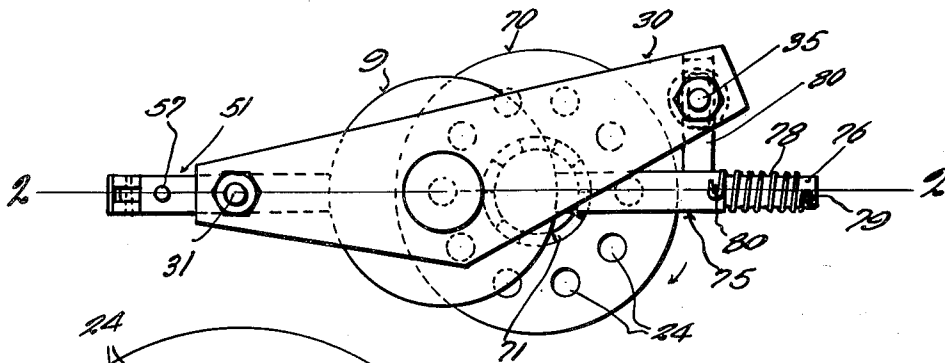


Fig. 4.

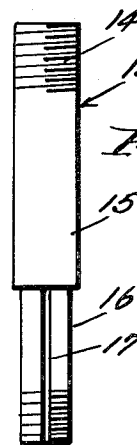
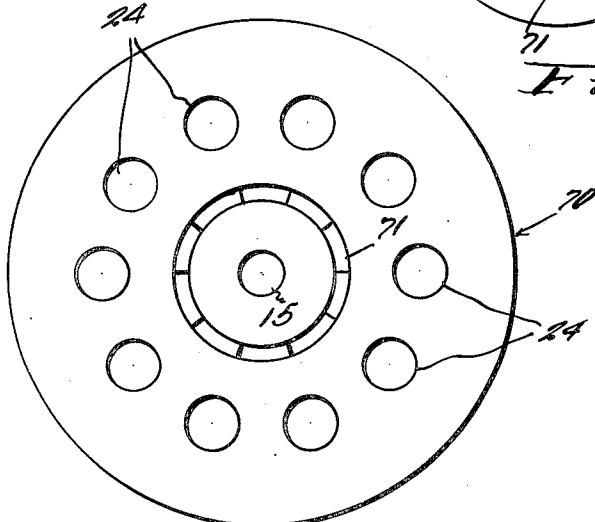
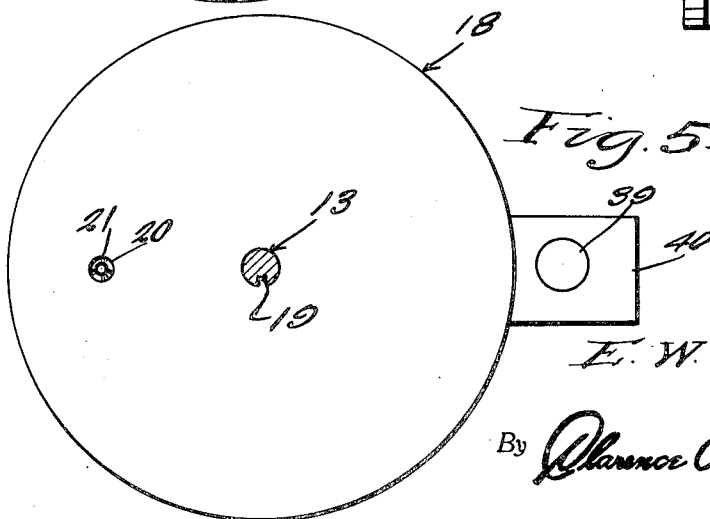


Fig. 6.

Fig. 5.



Inventor

E. W. Brown

By *Clarence A. O'Brien*
Attorney

UNITED STATES PATENT OFFICE

2,056,599

OPERATING MECHANISM HAVING AUTOMATICALLY REPEATED ACTION

Edward Webb Brown, Lexington, Ky.

Application June 4, 1934, Serial No. 729,038

7 Claims. (Cl. 123—24)

My invention relates generally to mechanism for operating other mechanical devices, and particularly to mechanism having automatically repeating action, and an important object of the invention is to provide mechanism of the character indicated which is motivated by explosions of explosive material or of rapidly burning fuels, the exploding of the explosives or rapidly burning fuels being caused to occur at regular or at irregular intervals according to the condition of operation of said mechanical devices. Another important object of my invention is to provide mechanism operated by explosion and especially adapted for actuation by such devices as oil circuit breakers for restoring the oil circuit breakers to initial position, after circuit breaking operation thereof.

Other objects and advantages of my invention will be apparent from a reading of the following description in connection with the drawings, wherein for purposes of illustration I have shown a preferred embodiment of my invention.

In the drawings:—

Figure 1 is a sectional elevational view of the device of the invention showing the same applied to an oil circuit breaker.

Figure 2 is a vertical transverse sectional view through the device per se.

Figure 3 is a top plan view of Figure 2.

Figure 4 is a top plan view of the cartridge magazine.

Figure 5 is a top plan view of the firing plate.

Figure 6 is a side elevational view of the spindle carrying the magazine and the firing plate.

Figure 7 is an elevational view taken from the right of Figure 1.

Figure 8 is a top plan view of the magazine feeding arrangement.

Figure 9 is a perspective view of the firing pin operating member.

Figure 10 is a sectional view showing the relation of the stop pin to the slide rod and trip rod.

Referring in detail to the drawings, the numeral 5 generally designates a wall or the like support upon which the oil circuit breaker generally designated 6 is affixed, this device having the resetting arm 7 which is initially and normally in the set position shown in Figure 1 in full lines and falls to the dotted line position shown in this figure with the breaking of the circuit with sufficient force to operate the trigger actuating mechanism to be described below.

A bracket generally designated 8 and secured to the wall 5 supports the operating mechanism

of the invention in operative relation to the resetting arm 7.

The operating mechanism of the invention comprises the heavy metallic cylinder 9 which is provided with the concentric vertical piston bore 10 which is tapered at its lower end as indicated at 11 to a reduced portion 12.

Depending from the lower end of the cylinder 9 and eccentrically located is the spindle generally designated 13 which has the threaded portion 14 screwed into a threaded socket in the lower end of the cylinder 9, and has the smooth portion 15 on which the cartridge magazine rotates, and the reduced portion 16 provided with the longitudinal slot 17 on which the firing plate 18 is mounted, the firing plate 18 having a fixed key 19 in its center opening which engages the slot 17 whereby the firing plate is prevented from rotating relative to the spindle portion 16.

The firing plate 18 has slidably mounted in a vertical opening therein the firing pin 20 which has thereon between a stop pin 21 and the bottom of the firing plate 18 a spring 22 which pushes the firing pin normally downwardly in the unfired position shown in Figure 2. The upper end of the firing pin is arranged to strike the lower end of a cartridge 23 which is arranged in one of a number of circumferentially spaced cartridge chambers 24 opening vertically through the top and bottom of the magazine. The upper ends of the cartridge chambers 24 are arranged to be brought successively into registry with the lower end of the reduced portion 12 of the bore of the cylinder 9 with which the firing pin is aligned so that when the firing pin 20 is raised with sufficient force against the lower firing end of the cartridge 23 in the particular cartridge chamber then in registry, the exploding charge of the cartridge will pass into the bore 10 of the cylinder 9 and drive the piston 25 upwardly in and partly out of the bore 10 to a sufficient height to engage the resetting arm 7 and swing the same upwardly to its reset position and thereby reset the circuit breaker.

It will be observed that a small exhaust passage 26 is radially arranged in communication with the bore 10 in the lower end of the cylinder 9 permitting escape of some of the gases generated by the explosion of the cartridge, and that other radial passages 27 and 28 spaced upwardly from the exhaust passage 26 permit escape of these gases from the bore 10 when the lower end of the piston 25 has passed above them, so that the bore 10 will be adequately exhausted of

the products of combustion of the fired shell or cartridge 23 so that its return by gravity to its initial position after operation will not be hampered by gases in the bore 10.

Attached to the upper end of the piston 25 by means of a pin 29 is the yoke plate 30 which is adapted to rest on the upper end of the cylinder 9 in the initial position of the piston shown in Figure 2 and which is carried upwardly by the piston 25 when the piston is operated upwardly by the explosion of one of the shells 23.

The shape of the yoke 30 is clearly shown in Figure 3. A depending slide rod 31 has a threaded upper end portion 32 traversing the left hand end of the yoke and carrying nuts 33 and 34, respectively, which engage opposite sides of the plate 30 fixing the slide rod 31 to the left hand end of the plate 30. A similar rod 35 having a threaded upper end portion 36 traversing the right hand end of the plate 30 has nuts thereon fixing the rod 33 to the plate 30 for movement therewith. The lower part of the rod 35 slides through a guide hole 39 in the lateral extension 40 of the firing plate 18.

The lower end portion of the slide rod 31 has a longitudinally adjustable collar 41 which is arranged to operatively engage the under part of one side of the firing lever 42 when the piston rises as the result of the firing of a cartridge so as to elevate the left hand end of the lever sufficiently to reengage the same with the latch 63, thereby cocking the firing lever. The lever 42 is pivoted intermediate its ends on a pivot 43 located in an opening 44 in a vertical portion 45 of a bracket 46 attached to the lower part of the cylinder 9. The slide rod 31 slides through a guide hole 47 in the horizontal part of the bracket 46 and freely through an elongated slot 48 in the firing lever 42. A leaf spring 49 has one end anchored to the lower end of the vertical portion 45 of the bracket 46 as indicated at 50 and its opposite end bearing against the lower part of the firing lever inwardly of the vertical portion 45 so as to normally urge the inner end of this lever toward and beyond the dotted line position shown in Figure 2. In moving through the dotted line position, the firing lever strikes the lower end of the firing pin so as to move the firing pin 20 vertically and against the lower end of the cartridge 23, thereby firing the cartridge and causing the upward movement of the piston 25 accompanied by upward movement of the yoke 30 and the rods 31 and 35.

An upper bracket generally designated 51 is fixed to the cylinder 9 by a shank threaded as indicated at 52 in the side of the cylinder 9 and stands laterally outwardly therefrom in a horizontal position and has an opening 53 slidably receiving the slide rod 31 and a second opening 54 slidably receiving the trip rod 57. A portion 54 of this bracket depends between the slide rod 31 and the trip rod 57 to be described and has slidably mounted in a horizontal position a retaining pin 55 which is urged toward the slide rod 31 by the spring 56. While the slide rod 31 and the trip rod 57 are in their initial depressed positions as shown in Figure 2, the spring 56 forces one end of the pin 55 into the recess 57' in the trip rod. The recess 31' in the slide rod 30 is aligned with the opposite end of the pin 55 so that when the trip rod is displaced from the initial position, the pin 55 is displaced so that it engages in the recess 31' in the slide rod 30 whereby the trip rod 57 is yieldably held in the depressed position. When the slide rod 31

is operated to an elevated position the end of the pin 55 is forced out of the recess 31' in the rod 31 in a left hand direction and into the recess 57' in the rod 57 thereby preventing movement of the trip rod 57 during the operation of the rod 31 or in any position of the slide rod 31 other than its initial fully depressed position corresponding to the initial position of the piston 25. The lower end of the trip rod 57 slides in an opening 58 in the horizontal portion of the bracket 46 while the upper part thereof slides in an opening 58 in the bracket 51. A spring 59 interposed between the upper side of the bracket 51 and the cotter pin 60 in the upper end of the trip rod 57 maintains the trip rod normally in the elevated position in which it is shown in Figure 2.

The resetting member 7 of the oil circuit breaker falls into the dotted line position shown in Figure 1 when the circuit is broken and in so doing strikes the upper end of the trip rod 57 with sufficient force to push the trip rod 57 downwardly so that its beveled lower end 61 strikes the beveled surface 62 of the swingable dog 63 which is pivoted on the pivot 65 located in an opening 64 in the bracket 46 to the left of the trip rod 57 as shown in Figure 2. A leaf spring 66 having its upper end fastened as indicated at 67 to the left hand extremity of the horizontal portion of the bracket 46 engages its lower end with the side of the dog 63 so as to push the dog toward the position in which it is shown in Figure 2 in which the hook portion 68 of the dog is engaged with the hook portion 69 of the firing lever 42 so that the firing lever is held in the unoperated "cocked" position.

It will be obvious that when the resetting member 7 of the oil circuit breaker falls and strikes the upper end of the trip rod 57 the trip rod 57 will be actuated downwardly and will as a result throw the dog 63 toward the left against the tension of the spring 66 and thereby release the hooked end 69 of the firing lever 42. As a result of this the spring 49 of the firing lever will swing the right hand end of the firing lever against the lower end of the firing pin so as to throw the firing pin 20 against the cartridge and explode the cartridge, so that the piston 25 and the plate 30 will be caused to rise toward the dotted line position shown in Figure 1 and in so doing engage and restore the resetting member 7 to its initial set position.

The firing plate 18 is of circular form as shown in Figure 5, while the magazine generally designated 70 is of flat cylindrical form having the circumferentially spaced chambers 24 for receiving and holding the cartridges 23. Circumferentially spaced ratchet teeth 71 are concentrically spaced around the center of the magazine represented by the spindle hole 15 and are engaged by the ratchet dog 72 which is vertically slidable in the socket 73 containing the resisting spring 74 interposed between the top end of the socket and the upper end of the dog 72. The socket 73 is formed on a tubular part 75 which is rotatably mounted on the shaft 76. The shaft 76 has the threaded end 77 threaded into the lower part of the cylinder 9. A helical spring 78 circumposed on the shaft 76 outwardly of the outer end of the tubular part 75 has one end anchored to the shaft 76 as indicated at 79 and the opposite end anchored to the tubular part as indicated at 80 whereby any rotation of the part 75 on said shaft will be accompanied by tensioning of the spring 78 tending to restore 75

the dog 72 to engagement with the ratchet notches 71 on the magazine.

Extending laterally from the outer end portion of the tubular part 75 is the lateral arm 80' which has the elongated slot 81 in which the rod 35 works. The rod 35 is provided with a collar 82 arranged to engage the upper side of the arm 80' as shown in Figure 7 and hold this arm in a depressed position in which the dog 72 is engaged with one of the ratchet teeth.

As any one of the cartridges 23 is fired and the piston 25 moves upwardly and in so doing carries with it the yoke 30 and the rods 31 and 35, the collar 82 on the rod 35 will be upwardly withdrawn from the top of the arm 80' and the spring 78 will rotate the tubular part 75 accompanied by the socket 73 and the dog 72 toward the rear in Figure 2 so that the lower end of the dog 72 will assume a position over the next succeeding one of the ratchet teeth 71. After the explosion has taken place and the weight of the piston 25 and the plate 30 and the rods 31 and 35 has caused these parts to return toward their depressed positions, the collar 82 on the rod 35 will strike the upper side of the arm 80 and cause the tubular part 75 and the socket 73 and the dog 72 to move toward the positions from which they were moved originally, thereby causing the dog 72 to operatively engage with the said succeeding one of the ratchet teeth 71 and thereby shift the magazine 70 on the spindle 15 so as to place the next succeeding unfired cartridge 23 under the reduced portion 12 of the bore of the cylinder ready for firing in the same manner as described. It will be obvious that any number of cartridge chambers 24, loaded with cartridges may be provided or an automatic feed means (not shown), for replenishing the cartridges in the magazine may be provided, so that the device of the invention may be practically continuously operable automatically.

The magazine 70 is loaded by removing the nut on the lower end of the spindle 13, depressing the firing plate 18 and shoving the cartridges 23 up into place with their rims engaging shoulders extending radially outwardly from the lower ends of the chambers 24. The firing plate 18 is then replaced so as to abut the lower ends of the cartridge in the position shown in Figure 2.

Although I have shown and described herein a preferred embodiment of my invention, it is to be definitely understood that I do not desire to limit the application of the invention thereto, and any change or changes may be made in material, and in structure and arrangement of parts, within the spirit of the invention and the scope of the subjoined claims.

What is claimed is:—

1. A device of the character described comprising a cylinder having a piston operating therein, said cylinder having an axial opening, cartridge magazine means having opening means successively registrable with said axial opening, said magazine being adapted to be moved to register one after another of said opening means with the opening of said cylinder, firing pin means supported adjacent said magazine, firing pin operating means supported adjacent said firing pin, and trip means adapted to be operated by the member to be operated and operatively engageable with the firing pin means for operating the firing pin and exploding the cartridge present in said cartridge containing means to

operate said piston to reset the member to be operated.

2. A device of the character described comprising a cylinder having a piston operating therein, said cylinder having an axial opening, a magazine having cartridge containing means successively registrable with said axial opening, said magazine being adapted to be moved to register one after another of said means with the opening of said cylinder, firing pin means supported adjacent said magazine, firing pin operating means supported adjacent said firing pin, and trip means adapted to be operated by the member to be operated by the piston, said trip means being operatively engageable with said firing pin means for operating the firing pin operating means and exploding a cartridge to operate said piston to reset said member to be operated, and means operated by said piston for registering different ones of the cartridge holding openings of the magazine with the opening in said cylinder.

3. In a device of the character described, an explosion cylinder having a piston operating therein, said cylinder being provided with an axial opening, a cartridge magazine arranged to successively register different individual cartridges with said axial opening, firing pin means supported in relation to said magazine means and arranged to fire a cartridge registered with said opening when operated, firing pin operating means operatively engageable with said firing pin means upon operation of said operating means by an outside agency, means assisting the return of said piston to initial position after operation, and magazine operating means arranged to be actuated by the return movement of said piston.

4. In a device of the character described, an explosion chamber having an explosion operated piston working therein, said chamber being provided with an exploding charge receiving opening, a cartridge magazine arranged to successively register different ones of a plurality of cartridges with said opening, second means operable to fire a registered cartridge, third means operable for conditioning operation of said second means, and fourth means operatively connecting said piston and the cartridge magazine for operating the same, and fifth means assisting return of said piston to initial position after operation.

5. A device for resetting a member into initial position after movement thereof to another position, said device comprising an explosion cylinder having a piston working therein, said piston being arranged to operate so as to engage and reset said member, an explosive cartridge magazine carrying a plurality of explosive cartridges arranged to be registered with an explosive charge receiving opening formed in said cylinder, cartridge exploding means arranged to be operated by the said movement of said member for firing a cartridge registered with said opening in the cylinder for operating said piston and resetting said member into its initial position.

6. A device for resetting a member into initial position after movement thereof to another position, said device comprising an explosion cylinder having a piston working therein, said piston being arranged to operate so as to engage and reset said member, an explosive cartridge magazine carrying a plurality of explosive cartridges arranged to be registered with an explosive charge receiving opening formed in said

cylinder, cartridge exploding means arranged to be operated by the said movement of said member for firing a cartridge registered with said opening in the cylinder for operating said piston and resetting said member into its initial position, said cartridge exploding means including a spring actuated firing lever, a latch for holding said firing lever in cocked position, and trip means arranged to hold the latch means engaged with the firing lever, said trip means being operatively engageable by said member in moving toward said other position.

7. A device for resetting a member into initial position after movement thereof to another position, said device comprising an explosion cylinder having a piston working therein, said piston being arranged to operate so as to engage and reset said member, an explosive cartridge

magazine carrying a plurality of explosive cartridges arranged to be registered with an explosive charge receiving opening formed in said cylinder, cartridge exploding means arranged to be operated by the said movement of said member for firing a cartridge registered with said opening in the cylinder for operating said piston for resetting said member into its initial position, said cartridge magazine being movable to register different ones of said cartridges with said opening in the cylinder, and magazine operating means connected to said piston for moving said cartridge magazine upon each stroke of the piston so as to remove an exploded cartridge from registry and for registering a new cartridge with said opening in the cylinder.

EDWARD WEBB BROWN.