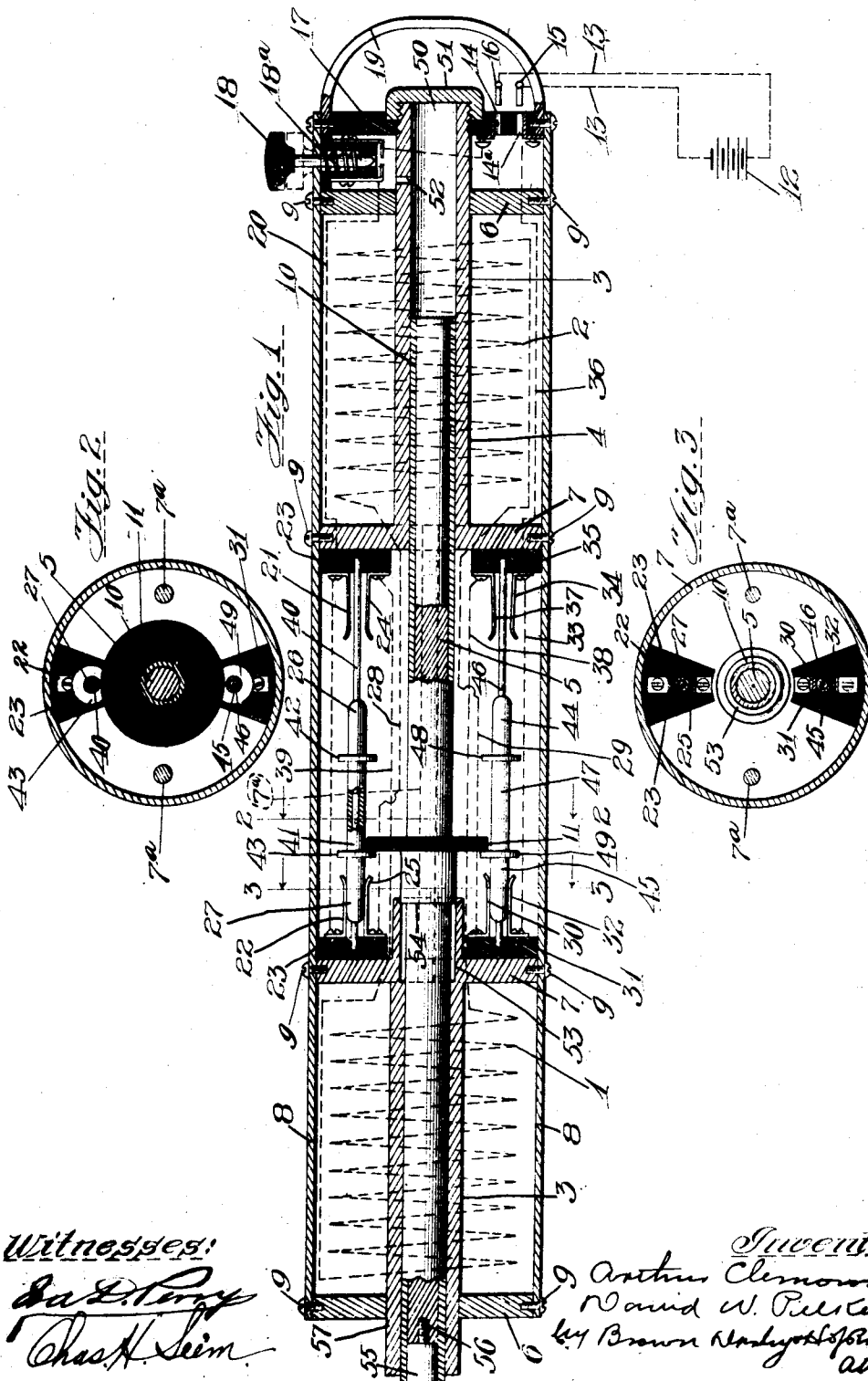


No. 868,967.

PATENTED OCT. 22, 1907.

A. CLEMONS & D. W. PELKEY.
AUTOMATIC TOOL OPERATING DEVICE.

APPLICATION FILED OCT. 9, 1906.



UNITED STATES PATENT OFFICE.

ARTHUR CLEMONS AND DAVID W. PELKEY, OF CHICAGO, ILLINOIS, ASSIGNORS OF ONE-THIRD TO F. W. RIES, OF CHICAGO, ILLINOIS.

AUTOMATIC TOOL-OPERATING DEVICE.

No. 868,967.

Specification of Letters Patent.

Patented Oct. 22, 1907.

Application filed October 9, 1906. Serial No. 338,150.

To all whom it may concern:

Be it known that we, ARTHUR CLEMONS and DAVID W. PELKEY, citizens of the United States, residing at Chicago, county of Cook, and State of Illinois, have invented certain new and useful Improvements in Automatic Tool-Operating Devices, of which the following is a full, clear, and exact specification.

This invention relates to devices for automatically operating tools such as riveting hammers, chisels, reciprocating drills, etc., and it has for its primary object to provide improved and efficient means for thus operating such tools electrically, the invention being especially designed as an improved substitute for the well-known pneumatic hammer.

With a view to the attainment of these ends and the accomplishment of certain other objects which will hereinafter appear, the invention consists in the features of novelty which will now be described with reference to the accompanying drawings, and more particularly pointed out in the claims.

In the said drawings—Figure 1 is a longitudinal sectional view of an automatic tool operating device embodying this invention, the same being shown partially in diagrammatic or conventional form. Fig. 2 is a cross section thereof on the line 2—2, Fig. 1; and Fig. 3 is a similar section on the line 3—3, Fig. 1.

In carrying out the invention, two solenoids or other electro responsive devices are employed, and these are arranged preferably in axial alinement with a movable armature core which is common to both and is alternately attracted thereby, and carries or otherwise operates automatic reversing or switching devices, which serve to alternately energize and deenergize the solenoids or electro responsive devices. In the exemplification of the invention shown the solenoids each comprise a helix, and these are shown conventionally or diagrammatically in the drawing at 1, 2, respectively, these being wound, if desired, upon suitable spools 3, 4, respectively, which may be composed of soft iron or any other suitable material, with their axes in alinement for receiving the aforesaid reciprocating armature or core 5. The flanges 6, 7, of the spools may be inclosed within a suitable casing or cylinder 8, which incloses the coils of the solenoids and the working parts of the mechanism, and may be secured to these flanges in any suitable way, as by means of screws 9. The armature or core 5 is so proportioned with respect to the bores of the spools as to have an easy working-fit therein, this also being composed of soft iron as usual, and in order to avoid the possibility of the same becoming permanently magnetized it is preferably incased in a sheath of brass 10.

The spool flanges 7 at the inner ends of the solenoids are situated a sufficient distance apart to leave room between them for the accommodation of the switching or

reversing mechanism, which is actuated automatically to alternately energize the solenoids by a suitable means carried preferably directly upon the core or armature 5 in the form of a disk or shoulder 11, which is composed of fiber or any other suitable insulation.

The apparatus is supplied with current from any suitable source, such as a battery or generator 12, having its leads 13 running to contacts 14, 14*, to which the leads may be detachably connected by any well known means such as plugs 15, 16. The contacts 14, 14* are mounted within the cylinder 8 upon a suitable insulation 17, and one of them is connected to one side of a thumb switch 18 arranged in a position convenient to the handle 19, so as to be manipulated at will by the thumb of the hand which grasps the handle, for closing the circuit between the contact 14 and a wire or conductor 20, which connects the other side of switch 18 with two contact springs or plates 21, 22, mounted upon the inner flanges 7 of the spools upon suitable insulation 23. Contiguous to the contacts 21, 22, respectively, are companion contacts 24, 25, respectively, which together with the contacts 21, 22, constitute clips for respectively receiving plugs or reciprocating switch members 26, 27. The contact 25 is connected by conductor 28 to one terminal of the helix 2, while the other terminal of this helix is connected by conductor 29 to a contact 30, also mounted upon the flange 7 on a piece of insulation 31 contiguous to a companion contact spring 32, which is connected by a conductor 33 to a contact spring 34, directly opposed to the contact 32 and arranged on the opposite flange 7 upon a suitable block or insulation 35. This contact 34 is connected by conductor 36 to the contact socket 14*. The contact spring 34 has a companion spring 37, which is connected by conductor 38 to one terminal of the helix 1, whose other terminal is connected by conductor 39 to contact spring 24.

The reciprocating switch plugs 26, 27 are preferably formed on the ends of a sleeve or tube 41 for convenience and may be loosely mounted upon a guide-rod 40, having its ends supported by the opposed flanges 7. The plugs are provided with flanges or shoulders 42, 43, respectively arranged to be alternately engaged by the flange or shoulder 11 on the armature 5, so that as the armature reciprocates the circuit will be alternately opened and closed through the solenoids or their helices 1, 2, the parts being so proportioned that the circuit will be broken or opened in one helix before it is closed through the other, and the momentum of the armature, of course, being sufficient to continue its motion during the period when both circuits are opened.

Arranged in a line with two clips constituted respectively by the contacts 30, 32 and 34, 37, are plugs or switches similar to the plugs or switches 26, 27. These are indicated at 44, 45, respectively, and are mounted

upon any suitable guide-rod 46, having its ends supported by the flange 7. These plugs or switches 44, 45 are also formed on the ends of a sleeve or tube 47 sliding upon the rod 46, and they like the plugs 26, 27 are provided with shoulders 48, 49, respectively arranged to be alternately engaged by the flange or shoulder 11 on the armature 5. Consequently the two sets of switches operate in unison. That is to say, the plugs 27, 32 simultaneously engage and disengage their respective switch clips, and the same is true with respect to the plugs 26, 44. It will also be seen by tracing the circuits and that by this double arrangement of switches for each of the solenoids each solenoid is entirely segregated from its circuit at both of its terminals simultaneously. The advantage of this is that it avoids absolutely the possibility of the existence of any residual magnetism at a time when the solenoid should be dead or absolutely de-energized, and it also avoids injurious sparking at contacts which would result and would materially deteriorate the contacts if the circuit were broken at one terminal of the solenoid only.

Assuming the thumb switch 18, which may be automatically opened by a spring 18*, is closed and the plugs 15, 16 are in place, the circuit may be traced as follows: From the lead 13 via the switch 18 into conductor 20 to the contact 22, thence through plug 27 and contact 25 and along conductor 28 to the helix 2, and from the helix 2 along conductor 29 to contact 30, thence through plug 45 and contact 32 along conductors 33 and 36 to the contact socket 14*, and thence back to the source of supply, thereby energizing the helix or solenoid 2, and pulling the armature 5 to the end of its stroke opposite that shown in Fig. 1 of the drawing. As it is about to complete this stroke the shoulder or flange 11 comes into engagement with the distant flanges 42, 48 of the contact plugs 26, 44, and forces these plugs into engagement with their respective switch clips mounted upon the insulations 23, 35, the circuit through the solenoid 2 having previously been broken at both terminals of the solenoid at the time the plugs 27, 45 passed out of contact with their respective clips. The plugs 26, 44 being in engagement with their respective clips, the current will flow through or energize the solenoid 1 through the circuit, which may be traced from the conductor 20 to the contact 21, thence through plug 26 and contact 24 over conductor 39 to one terminal of helix 1 from the other terminal of helix 1 over conductor 38 to contact 34 to the conductor 36 and home again via the socket contact 14*.

In order to avoid objectionable jars or damage to the parts when the armature reaches the limit of its stroke, suitable resisting means may be employed. For this purpose at one end of the spool 4 is formed a dash pot or air cushion 50. This is made simply by closing the end of the spool by means of a cap 51, so that the air forced to the head of the armature will be prevented from escaping too rapidly. In order, however, that it may not retard the speed of the armature prematurely the dash-pot is provided with a vent 52 at a suitable distance from its closed end to allow the air to escape freely or with sufficient freedom until that point is passed, thereby leaving an air cushion at the extremity of the stroke which not only prevents shock, but serves to start the armature on its return movement. The opposite throw of the armature and the shock thereof is, of course, received by the work while the machine is in action, but

to prevent undue shock and possibly damage to the parts in the event the machine should be operated when not contiguous to the work, a similar air cushion may be employed for receiving the shock at this end of the stroke also. Such cushion is constituted by cup or cylinder 53 formed on the end of the spool 3 and arranged to receive an enlargement or shoulder 54 constituting the piston on the armature. It is of course understood that by the time the piston 54 enters the cup or cylinder 53 an effective distance the armature will have performed its allotted function of imparting to the tool the desired impetus or blow.

A machine thus constructed may be utilized as an operating machine for a hammer, a chisel, a reciprocating drill, or other form of tool requiring a rapid reciprocating movement. In this exemplification of the invention the example of tool illustrated is a hammer 55, which is connected to the end of the armature 5 in any suitable way, as by screw 56, so as to be detachable. In the use of the tool as a hammer operating means it is, of course, held close to or against the rivet to be upset or other work to be done, and as is usual with this class of tools it is held in axial contact with the work. For that purpose the end of the spool 3 projects beyond the flange 6 to a point almost at the limit of the stroke of the armature or hammer in that direction, as shown at 57, so that this projection 57 will be pressed against the work or the end of the rivet allowed to project thereinto.

It will, of course, be understood that while the machine is described in connection with a tool such as a hammer, it is equally applicable for operating any other tool or instrument requiring a rapid reciprocating movement.

For convenience of constructing and assembling the machine, the flanges 7 may be connected together by brace rods 7*.

In order that others skilled in the art might make and use the invention we have thus specifically described an exemplification thereof, but

What we claim as new and desire to secure by Letters Patent, is:

1. In a machine for the purpose described, the combination of a reciprocatory armature or core, two electro responsive devices in whose magnetic fields the ends of said core are respectively arranged, means operatively related to said core for alternately making and breaking the circuit at both terminals of each electro responsive device as the core reciprocates, and means whereby a tool may be connected to said core.

2. In a machine for the purpose described, the combination of a reciprocatory armature or core, two electro responsive devices in whose magnetic fields the ends of said core are respectively situated, and means operatively related to said core for alternately making and breaking the circuit at both terminals of each electro responsive device as the core reciprocates.

3. In a machine for the purpose described, the combination of a movable armature or core, two electro responsive devices having their magnetic fields arranged to act upon said armature or core alternately, and means whereby the circuit at both terminals of each of said electro responsive devices is automatically interrupted simultaneously, and means whereby a tool is given operative relation to said core.

4. In a machine for the purpose described, the combination of two aligned solenoids, an armature having its ends projecting into said solenoids and provided at one end with means for the attachment of a tool, and means for alternately interrupting the circuit at both terminals of each

of said solenoids operatively connected with said armature.

5 5. In a machine for the purpose described, the combination of two aligned solenoids, an armature having its ends projecting into said solenoids, contacts for both the terminals of said solenoids respectively, a reciprocating means for alternately engaging said contacts and thereby alternately energizing said solenoids, and means on said armature for engaging the movement of said reciprocating means as the armature moves, and means whereby a tool may be operatively connected with said armature.

10 6. In a machine for the purpose described, the combination of two aligned solenoids, an armature having its ends projecting thereinto, two sets of terminal contacts for each of the solenoids, means for closing the circuit across both sets of said terminal contacts of one solenoid simultaneously and opening the circuit across the two sets of contacts of the other solenoid, and means whereby a tool may be connected with said armature.

20 7. In a machine for the purpose described, the combination of two axially aligned solenoids, a casing in which said solenoids are situated at a distance apart, forming a chamber between them within said casing, an armature having its ends arranged in said solenoids and extending through said chamber, contacts for both terminals of each of said solenoids situated within said chamber, a reciprocating means located within said chamber for alternately engaging said terminal contacts and thereby alternately energizing said solenoids, and means on the armature within said chamber for engaging and moving said reciprocating means.

30 8. In a machine for the purpose described, the combination of a reciprocating armature, two electro responsive devices in the magnetic fields of which the ends of said armature are situated, means for alternately energizing said electro responsive devices embodying a pair of contacts for each terminal of each of said electro responsive

devices, reciprocating plugs or switches for alternately engaging two pairs of said contacts simultaneously, spaced shoulders carried by both of said switches and an operating shoulder carried by the armature, means whereby a tool may be connected with said armature, and cushioning means for receiving the impact of the armature at the extremity of its stroke. 40

9. In a machine for the purpose described, the combination of two axially aligned solenoids having hollow cores, a reciprocating armature having its ends situated in said hollow cores, one end of one of said cores being closed and having a vent near the extremity thereof, and the end of the armature contiguous thereto forming a piston, the opposite end of said armature having means for the attachment of a tool to be operated, and means for alternately energizing said solenoids. 45

10. In a machine for the purpose described, the combination of two electro responsive devices each embodying a helix having two terminals, a reciprocating armature having its ends arranged in the magnetic fields of said helices, a pair of contacts for each terminal of each of said helices, reciprocating plugs or switches for alternately engaging two pairs of said contacts simultaneously, guides upon which said switches slide, spaced shoulders carried by both of said switches, and an operating shoulder carried by the armature and playing between the spaced shoulders of both switches for alternately moving the switches into and out of engagement with said contacts. 55 60 65

In testimony whereof we have signed our names to this specification, in the presence of two subscribing witnesses, on this 4th day of October A. D. 1906.

ARTHUR CLEMONS.
DAVID W. PELKEY.

Witnesses:

FRANCIS A. HOPKINS,
CHAS. H. SEEM.