

G. H. ROWE.
ELECTROMECHANICAL DEVICE.
APPLICATION FILED OCT. 8, 1909.

1,062,799.

Patented May 27, 1913.

3 SHEETS-SHEET 1.

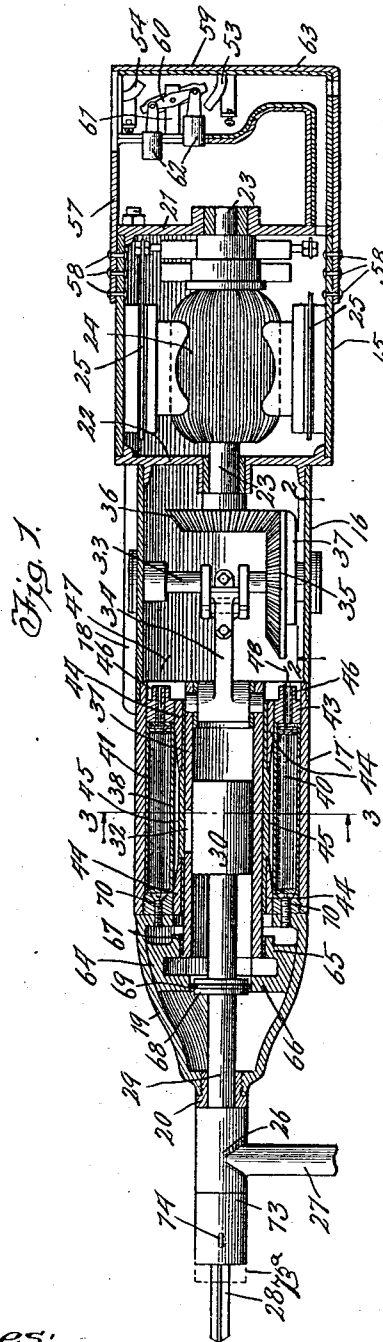


Fig. 2.

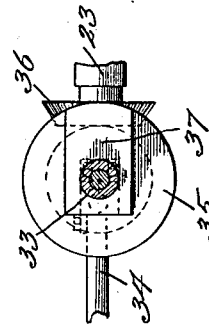
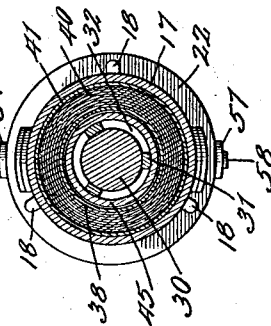


Fig. 3.



Witnesses:
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Albert J. Lueder

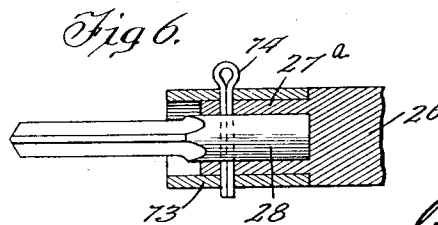
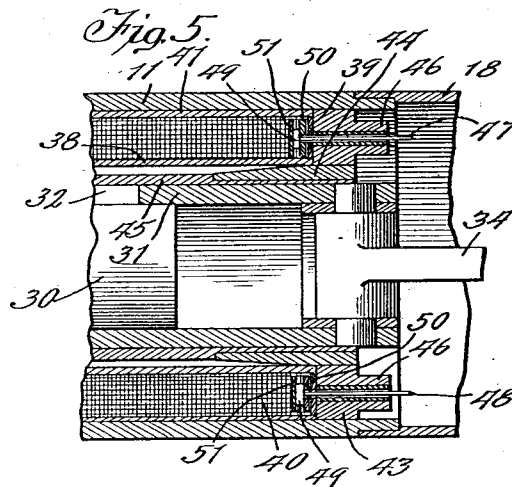
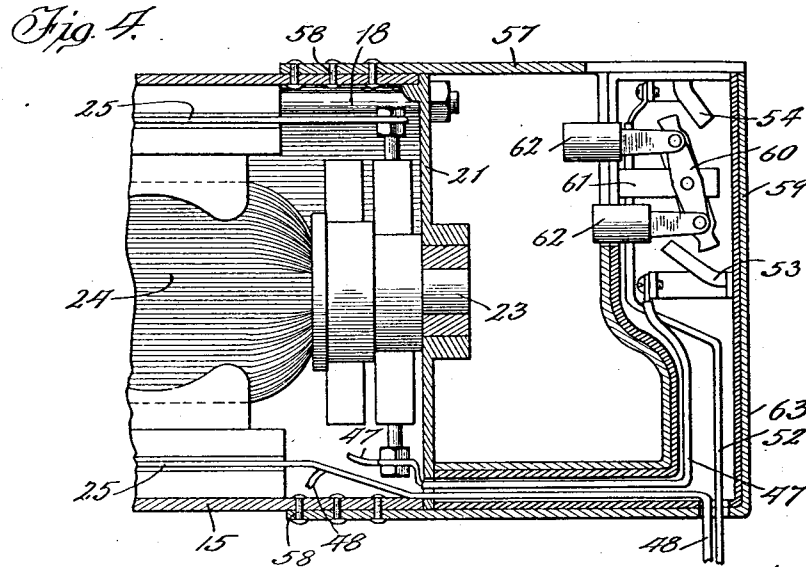
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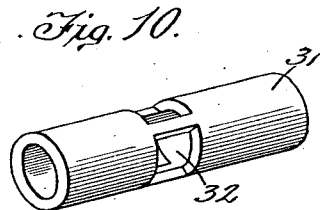
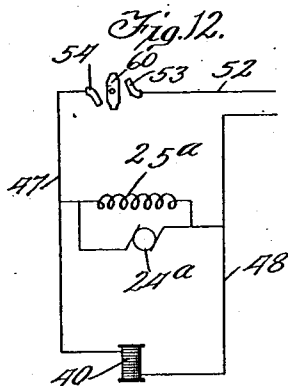
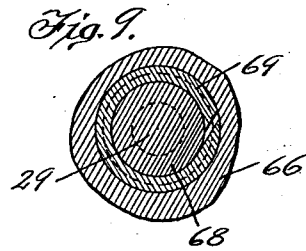
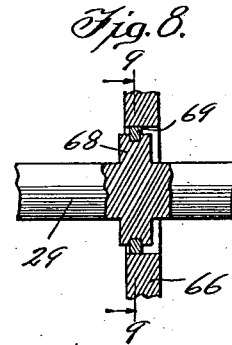
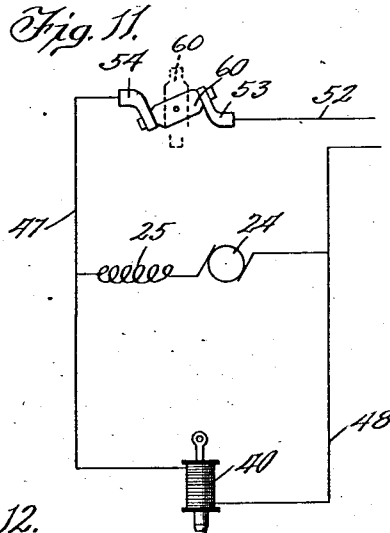
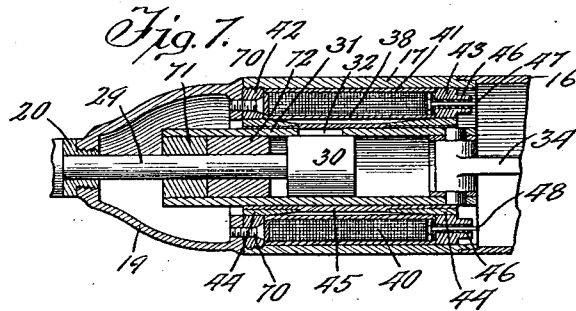
Inventor:
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3 SHEETS—SHEET 3.



Witnesses:
Ed. D. Perry
Alfred J. Lander

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Att'y.

UNITED STATES PATENT OFFICE.

GEORGE H. ROWE, OF CHICAGO, ILLINOIS, ASSIGNOR TO ELECTRO-MAGNETIC TOOL COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

ELECTROMECHANICAL DEVICE.

1,062,799.

Specification of Letters Patent.

Patented May 27, 1913.

Application filed October 8, 1909. Serial No. 521,732.

To all whom it may concern:

Be it known that I, GEORGE H. ROWE, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Electromechanical Devices, of which the following is a specification.

My invention relates to an electro-mechanical device of the general character shown in my pending application, Serial No. 501,549, filed June 11, 1909; and the invention has for its object to provide certain improvements upon and certain advantageous constructions and features which may be used in connection with, the invention as described and claimed in said application, or with other electro-mechanical devices of that character.

One of the principal objects of my invention is to provide means for increasing the momentum of the driven or striking device at the limit of its travel in one direction without increasing the force with which said driven or striking device is moved on the return stroke.

My invention has for a further object to provide certain other new and useful improvements in electro-mechanical devices which will be described in the following specification.

The invention in a preferred embodiment is illustrated in the accompanying drawings, wherein—

Figure 1 is a longitudinal sectional view of a rock drill constructed in accordance with my invention. Fig. 2 a fragmentary sectional view taken on line 2—2 of Fig. 1, looking in the direction of the arrows. Fig. 3 is a section on line 3—3 of Fig. 1, looking in the direction of the arrows. Fig. 4 is a detail sectional view, on an enlarged scale, of the handle and associated parts. Fig. 5 is a similar view illustrating particularly the construction of the exciting coil. Fig. 6 is a fragmentary sectional view of the lower end of the tool carrier. Fig. 7 is a fragmentary longitudinal sectional view illustrating a modification. Fig. 8 is a detail view, partly in elevation and partly in section, of the tool carrier shank. Fig. 9 a section taken on line 9—9 of Fig. 8. Fig. 10 a view in perspective of the reciprocating sleeve, and Figs. 11 and 12, diagrams

showing two preferred arrangements of the electric circuits.

Like characters of reference indicate like parts in the several figures of the drawings.

In the preferred construction of my drill shown in the drawings 15, 16 and 17 designate cylindrical members which are held together by tie rods 18, and 19 a generally conical end piece into which is tapped the bushing 20. The casing thus formed is closed at the end by a cap piece 21 and is divided by a partition 22. The shaft 23 of the armature 24 of the preferably series wound motor is mounted in bearings in the cap piece 21 and partition 22. The field coils of the motor are shown at 25, 25.

The tool carrier 26, preferably provided with the handle 27 by means of which it may be turned, is constructed with a socket 27^a for the end of the drill tool 28 and with a shank 29 which extends through the bushing 20.

30 is a plunger arranged within a sleeve 31 of iron or steel, preferably constructed as shown in Fig. 10 with the central openings 32.

Journalled in the casing section 16 is a crank shaft 33 having a connecting rod 34 which extends to sleeve 31. The crank shaft 33 carries a bevel gear 35 which meshes with a bevel gear 36 on the end of the armature shaft 23.

In order to give a smooth action to the reciprocation of sleeve 31, I preferably construct the bevel gear 35 with the counterweight 37, diametrically arranged with respect to the crank on shaft 33.

In the operation of machines of this character, considerable trouble has been experienced because of the penetration of oil into the winding of the exciting coil with destructive effect to the insulation. I, therefore, preferably construct the exciting coil and its associated parts in the following manner: 38 is a brass spool having the integral brass heads 39. 40 represents the winding and after this has been placed on the spool it is covered by the cylindrical brass sheathing 41 which is soldered to the heads of the spool. 42 and 43 are iron pole pieces secured to the spool 38. 44, 44 are annular extension pieces for said pole pieces. A brass sleeve 45 separates the iron sleeve 31 from the iron pole piece extensions. The

pole piece 43 is formed with the bosses 46, 46, which are perforated for the leads 47 and 48 to and from the winding 40. These wires extend to buttons 49, to which the ends of the winding are connected, these buttons being arranged between the fiber rings 50 and 51. The winding is, therefore, hermetically sealed except at the openings through bosses 46 and these openings are above the point where they can be reached by the oil used to lubricate the sleeve 31.

Preferred arrangements of the electric circuits are diagrammatically shown in Figs. 11 and 12. One of the supply wires 52 leads to one contact 53 of the controlling switch, and from the other contact 54 the wire 47 leads to the winding 40 of the exciting coil. The wire 48 leads from the exciting coil back to the source of supply (not shown). The motor shown in Fig. 11 is a series wound motor arranged in parallel with the exciting coil, 24 representing the armature, and 25 the field. In Fig. 12 the arrangement is the same except that the motor is a shunt wound motor, 24^a representing the armature and 25^a the field.

The handle of the machine preferably consists of a single casting 57, riveted to the casing section 15 by the rivets 58. The handle has the hollow portion 59 in which is located the single controlling switch of the machine, which may be of any desired construction, this switch being shown as consisting of the contacts 53 and 54, the switch arm 60 being on standard 61, and the push buttons 62. The diameter of the hollow part 59 is diminished at one side of the switch so as to form the hand grip 63.

In order to obtain greater force at the striking movement of the plunger 30 than upon the return stroke, I may provide either the arrangements shown in Fig. 1 or the modification illustration in Fig. 7. Referring, first, to the construction shown in Fig. 1, 64 is an iron ring having an internal groove dividing it into two annular members 65 and 66, the outer end of sleeve 31 being intended to be projected into the opening in the annular part 65 when it reaches the limit of its travel forward. A thin brass ring 67 may, if desired, be employed to prevent the end of sleeve 31 coming into actual contact with the part 65. This is desirable because if the sleeve 31 came into contact with the member 65, the adhesion of the parts due to the magnetism would impede the operation of the machine. The shank 29 of the tool carrier is made of iron or steel, and is formed with the preferably integral ring 68, in a groove in the perimeter of which is a split brass non-magnetic ring 69 (see particularly Figs. 8 and 9) which bears against the annular member 66. The shank 29 extends into the sleeve far enough so that the plunger 30 is driven against the end of the same.

The parts are shown as they will be at the end of the striking movement. When the sleeve 31 is moved in the opposite direction it will clear the annular member 65. Therefore, the ring 64 is cut into the magnetic circuit at the end of the forward stroke and is cut out of the magnetic circuit on the return stroke. The split ring 69 holds the ring 68 out of contact with member 66 so as to prevent adhesion of these parts when magnetized. The part 19 of the casing is shown as connected to the outer pole-piece 42 by screws 70, the pole-piece being threaded into the casing section 17.

The alternative arrangement for increasing the momentum of the working stroke shown in Fig. 7 consists of the following parts, the parts not referred to being the same as above described: The shank 29 of the tool carrier is provided with an iron ring 71 and inwardly of this, with a brass ring 72. At the forward stroke of sleeve 31 the outer end of the latter is projected into contact with or proximity to ring 71. The ring 71 and shank 29 are thereupon cut into the magnetic circuit and the inner end of the shank exerts a direct pull on the plunger 30.

In a drill used in boring bodies of rock, cement or the like, it is sometimes desirable to have some way of gaging the depth of the holes bored. I have provided my drill with simple but effective means which provides for the securing of the drilling tool to the tool holder and also provides a gage. The socket 27^a of the tool-holder has an external diameter less than that of the part just inwardly of the socket, and I provide with the drill, a number of sleeves of different lengths. In the drawings, 73 indicates a sleeve of a certain length, the dotted line 73^a (Fig. 1) showing the position of a longer sleeve. The drilling tool 28, the socket 27^a and the sleeve 73 have corresponding perforations for a cotter pin 74 which serves to hold the drilling tool and the gage-sleeve in position on the end of the tool-holder. To remove a given sleeve and put on one which is longer or shorter, it is only necessary to remove the cotter pin 74, pull off the sleeve, put on another and replace the pin.

The operation of the device, as above described, is as follows: By manipulation of the single controlling switch located in the handle of the machine, current is supplied to the motor and to the exciting coil. The motor reciprocates the sleeve 31 and the plunger 30 is given a corresponding reciprocation because of the magnetic attraction produced between the sleeve and the plunger by the exciting coil. It will be seen that the magnetic circuit through the pole-pieces 42 and 43, casing section 17, pole-piece extensions 44, sleeve 31 and armature 30—and through the ring 64 and shank 29 of the tool

carrier, when these parts are included in the magnetic circuit—is a substantially closed circuit, being entirely closed except for small gaps which are necessary to prevent the adhesion of the parts and which are at all times substantially uniform. When the sleeve 31 enters the opening in the annular member 65, the shank 29 is cut into the magnetic circuit and as the end of this shank stands directly in the path of plunger 30, it exerts a direct pull which increases, in accordance with well known laws, as the plunger approaches the shank. This, of course, increases the blow imparted to the tool. The proportion of the various parts of the machine should be such that the shank 29 is cut out of the magnetic circuit and so demagnetized before the inward movement of sleeve 31 has advanced sufficiently to cause any appreciable pull on the plunger 30. The operation of the modification shown in Fig. 7 is substantially the same.

By arranging the exciting coil in parallel with the motor circuit or circuits, I provide for the control of the machine by a single switch; but what is more important, I provide a closed circuit through which the electrical energy stored in the exciting coil during the operation of the machine may freely discharge when the main circuit is broken at the switch; thus preventing, or, at least, minimizing arcing, likely to be injurious to the switch contacts.

I do not limit myself to the exact devices, constructions and arrangements shown and described, as modifications may be devised which will come within my invention as defined by the claims.

I have shown the various improvements which are made the subject matter of this application as employed in connection with the rock drill; but it is obvious that most of them, at least, are equally applicable to other forms of percussion apparatus.

I claim:

1. In an electro-mechanical apparatus, the combination with a driving device, of a reciprocating driven device, means for producing a cushioning magnetic connection between said devices, and auxiliary means for increasing the force of the working stroke in relation to that of the return stroke.

2. In an electro-mechanical apparatus, the combination with a driving device, of a reciprocating driven device, means for producing a cushioning magnetic connection between said devices, and electro-magnetic means for increasing the force of the working stroke in relation to that of the return stroke.

3. In an electro-mechanical apparatus, the combination with a driving device, of a driven device, means for producing a cushioning magnetic connection between said devices, a magnetizable body arranged

in the path of the driven device for increasing the force of the working stroke of the driven device in relation to that of its return stroke which is alternately magnetized and demagnetized.

4. In an electro-mechanical apparatus, the combination with a driving device, of a reciprocating driven device, means for producing a cushioning magnetic connection between the devices, said driving and driven devices providing a substantially closed magnetic circuit; and a magnetizable body which is cut into said magnetic circuit so as to increase the force of the working stroke of said apparatus.

5. In an electro-mechanical apparatus, the combination with a driving device, of a reciprocating driven device, means for producing a cushioning magnetic connection between the devices, said driving and driven devices providing a substantially closed magnetic circuit; and a magnetizable body which is cut into said magnetic circuit, and which stands in the path of said driven device so as to exert a direct attraction upon the same at the end of the working stroke thereof.

6. In an electro-mechanical apparatus, the combination with a driving device, of a reciprocating driven device, means for producing a cushioning magnetic connection between the devices, said driving and driven devices providing a substantially closed magnetic circuit; a magnetizable body which is cut into said magnetic circuit, and which stands in the path of said driven device so as to exert a direct attraction upon the same at the end of the working stroke thereof, said magnetizable body being adapted to be cut out of said magnetic circuit on the return stroke of the driven device.

7. In an electro-mechanical apparatus, the combination with a reciprocating sleeve, of a plunger in said sleeve, a coil to produce a cushioning magnetic connection between said sleeve and plunger, and a magnetizable body arranged so that it is magnetized by the sleeve at the limit of travel of the latter in one direction, and so as to exert an attraction upon said plunger.

8. In an electro-mechanical apparatus, the combination with a reciprocating sleeve, of a plunger in said sleeve, a coil to produce a cushioning magnetic connection between said sleeve and plunger, and a magnetizable body arranged so that it is magnetized by the sleeve at the limit of travel of the latter in one direction, and so that the plunger is brought into contact therewith.

9. In an electro-mechanical apparatus, the combination with a driving device, of a reciprocating driven device, means for producing a cushioning magnetic connection between said devices, a tool carrier against which the driven device is driven, and means

for magnetizing said tool carrier at the end of the working stroke of said driven device and thereafter demagnetizing the same.

10. In an electro-mechanical apparatus, the combination with a driving device, of a reciprocating driven device, means for producing a cushioning magnetizable connection between said devices, a tool carrier against which the driven device is driven, said driving and driven devices providing a substantially closed magnetic circuit; and means whereby said tool carrier is cut into said magnetic circuit at the end of the working stroke of the driven device and is cut out of said magnetic circuit on the return stroke.

11. In an electro-mechanical apparatus, the combination with a reciprocating sleeve, of a plunger in said sleeve, a coil to produce a magnetic connection between said plunger and sleeve, a magnetizable tool carrier against which said plunger is driven, and a magnetizable body in magnetic relation with said tool carrier into proximity with which the sleeve is carried at the end of the working stroke of said apparatus.

12. In an electro-mechanical apparatus,

the combination with a reciprocating sleeve, of a plunger within said sleeve, means for driving said sleeve and an exciting coil to produce a magnetic connection between the sleeve and the plunger comprising a spool, a winding on said spool, a cylindrical sheathing which with the spool incloses the winding; and iron pole-pieces on the heads of the spool provided with bores for the leads to and from the winding.

13. In an electro-mechanical apparatus, the combination with a reciprocating sleeve, of a plunger within said sleeve, means for driving said sleeve and an exciting coil to produce a magnetic connection between the sleeve and the plunger comprising a spool, a winding on said spool, a cylindrical sheathing which with the spool incloses the winding; and an iron pole piece on the upper end of the spool provided with upstanding bosses which are bored for the leads to and from the winding.

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Witnesses:

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