G. H. ROWE.

ROTARY HAMMER.

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1,102,169. **Patented June 30, 1914.**

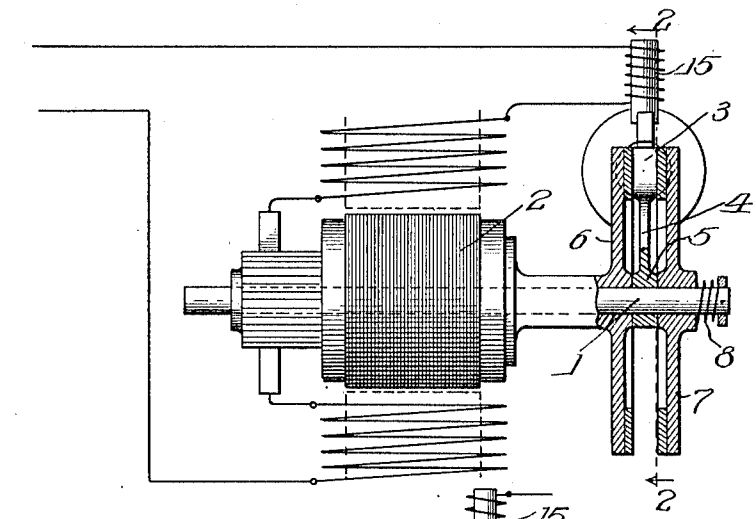

Fig. 1.

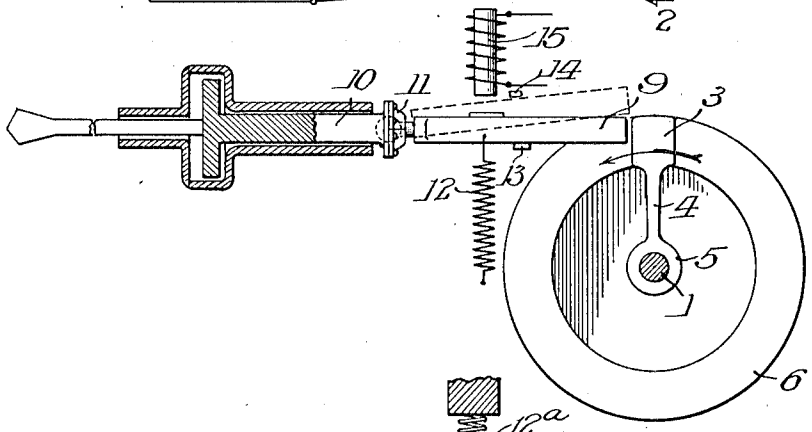

Fig. 2.

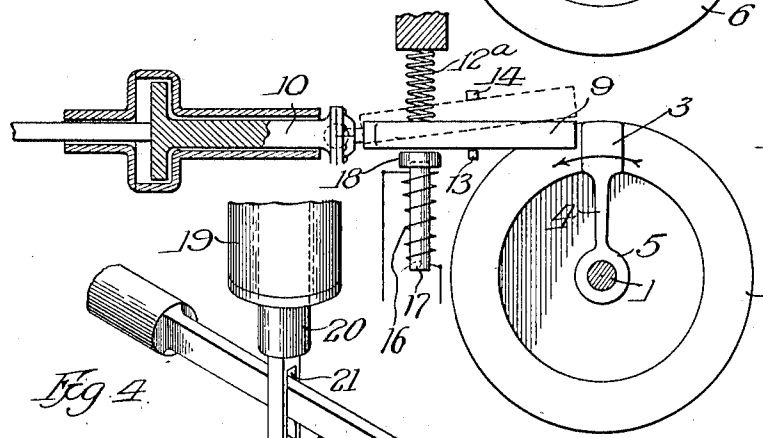

Fig. 3.

Fig. 4.

Witnesses:
Geo. C. Davison
McClelland Young.

Inventor:
George H. Rowe,
By Barton & Folk,
Attys.

COLUMBIA PLANOGRAPH CO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

GEORGE H. ROWE, OF BERWYN, ILLINOIS.

ROTARY HAMMER.

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To all whom it may concern:

Be it known that I, GEORGE H. ROWE, citizen of the United States, residing at Berwyn, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Rotary Hammers, of which the following is a full, clear, concise, and exact description.

My invention relates to rotary hammers. Its object is to provide suitable means whereby the member which receives the impact of the hammer is, after the blow has been struck, removed from the path of the hammer in order that the hammer may continue to rotate, the driven member being replaced in position to receive successive blows.

In the operation of hammer drills or other percussion devices by electric motors, a hammer rotating or driven otherwise by the motor is employed for striking successive blows. When the hammer strikes, the speed of the motor is abruptly reduced, this reduction in speed resulting in an increase of the current supplying energy to the motor. In my present invention I take advantage of this current fluctuation by providing means responsive thereto for laterally moving the impact receiving member or rod through the medium of which the blow of the hammer is imparted to the operating tool. Said impact receiving member is thus temporarily moved out of the path of the hammer so that the motor may proceed in its rotation and bring the hammer around again to strike a second blow and thus keep up the hammer blows in rapid succession.

It will be understood that my invention as thus, in a general way, outlined may be made use of in all cases in which electrically driven motors are employed in such manner that the blow of the hammer is followed by a temporary increase in the flow of current in the circuit of the motor. Thus I contemplate the use of my invention in connection with both direct current and alternating current motors.

In its preferred form my invention contemplates a rotary hammer driven by an electric motor, in combination with an electrical device, in series with the motor armature and responsive to fluctuations in the current flow through the armature, for controlling the position of the member which receives the impact of the hammer.

The several features of my invention may be more readily understood by reference to the accompanying drawings, which are more or less diagrammatic, and in which—

Figure 1 is a side elevation partly in vertical section of one embodiment of my invention; Fig. 2 is a section on the line 2—2 of Fig. 1; Fig. 3 is a view similar to Fig. 2 of a modification of the invention; and Fig. 4 is a fragmentary detail view of a still further modification.

Similar letters of reference refer to similar parts throughout the several views.

The rotary hammer is driven in any suitable manner by an electric motor, as for example it may be driven, as shown in Fig. 1, directly from the shaft 1 of the motor armature 2, the hammer 3 being carried upon the end of the arm 4 which extends radially from the collar 5. Said collar loosely surrounds the shaft 1. In order that the hammer 3 may rotate with the shaft 1, and may nevertheless yield to a certain extent after the blow is struck, said hammer is preferably arranged as shown, to be rotated frictionally. For example, there may be secured in fixed relation to the armature 2 and shaft 1, an inner disk 6. Carried upon the end of the shaft 1 is a similar disk 7 so mounted as to have slight movement longitudinally of the shaft. The collar 5 is secured upon the shaft 1 between the disks 6 and 7. The collar 5 and the hammer 3 carried thereby are frictionally clamped between the disks 6 and 7 by the thrust exerted through the spring 8.

In the drawings I have shown my invention as embodied in a drilling machine, in which case the member 9 which receives the impact of the hammer is one section of a drill rod. The two sections 9 and 10 of said rod are secured together in such relation as to permit of a lateral movement of the section 9, and for this purpose I have shown the two sections as connected by an ordinary ball and socket joint 11. The other portions of the drill holder may be of any well known construction, and hence further detailed description thereof is deemed unnecessary.

In Fig. 2 the impact receiving member 9

is shown as normally held by a spring 12 against a stop 13 and is adapted to be moved laterally, as will presently be described, until it comes in contact with the opposing stop 14, in which latter position the member 9 is withdrawn from the path of the hammer 3.

In Fig. 3 the hammer 9 is normally held against the stop 13 by a compression spring 12^a.

As illustrative of one embodiment of my invention, I have shown in Fig. 1, a motor of the direct current series wound type. In Figs. 1 and 2, the electroresponsive device which controls the position of the member 9, is the electromagnet 15, which is included in series with the motor armature. The pole of the electromagnet is presented to the member 9, which latter is made of iron or other magnetic material, so that when the electromagnet is sufficiently excited the end of said member 9 will be attracted laterally against the force of the retractile spring 12 to move said member 9 out of the path of the hammer. The electromagnet 15 is so designed that with normal running current supplied to the motor circuit, said electromagnet is not sufficiently energized to attract the member 9 against the force of the spring. It will be understood that just before the hammer strikes the member 9 the hammer and the motor driving the same are at their maximum speed. The counter-electro-motive force of the motor at this instant is at its maximum. Immediately after the hammer has come into contact with the end of the member 9 the speed of the hammer and the motor driving the same is reduced. Thereupon the counter-electro-motive force of the motor is reduced and hence the current passing through the motor and the electromagnet 15 is correspondingly increased. In response to such increased current flow, the electromagnet 15 attracts the member 9 and withdraws the same from the path of the hammer, whereupon the motor again speeds up. The counter-electro-motive force increases continuously with the increase in speed of the motor and therefore the current passing through the motor and through the coil of the electromagnet 15 diminishes in the same ratio as the increase in speed. Therefore, before the hammer is in position to strike a second blow, the counterelectromotive force of the motor has decreased the current in the coil of magnet 15 sufficiently to allow the retractile spring 12 to move the member 9 back to its normal position.

In Fig. 3 I have shown a repulsion magnet 17, the windings 16 being the primary coil and the conducting ring 18 being the secondary coil. Said primary winding 16 is in series with the armature of the motor, irrespective of whether the motor is of the direct or alternating current type. The sudden surge of current through said primary winding, due to a reduction in the speed of the armature, induces current in the secondary 18, which is thereupon repelled and knocks the member 9 out of the path of the hammer. In the case of a direct current motor, current, of course, is induced in the secondary only during the period of the variation of the current flow in the primary. When the motor again speeds up, the current flow in the winding 16 diminishes and there is a like diminution of the current in the secondary 18. Such diminished current flow does not excite the repulsion magnet sufficiently to overcome the force of the spring 12^a, and hence the member 9 is restored to its normal position ready to receive another blow of the hammer.

In Fig. 4 have shown a solenoid 19 having the core 20 thereof extended to engage with the impact receiving member 9^a. Any suitable loose connection between said core and impact receiving member may be employed. In the drawing, the core 20 is shown as provided with a slot 21 for receiving the member 9^a. The slot 21 in the extension of the core 20 is of such length that the solenoid, on being excited, will draw the core in a short distance so as to get up some speed before the lower end of the slot strikes against the member 9, thereby striking a blow which moves said member out of the path of the hammer.

I claim:—

1. The combination with an electric motor, of a rotary hammer driven thereby, an impact receiving member, and electrically actuated means for momentarily withdrawing said impact receiving member from the path of rotation of the hammer after said hammer has struck said member.

2. The combination with an electric motor, of a rotary hammer driven thereby, an impact receiving member, and an electrical device in series with the motor armature for controlling the position of said impact receiving member with respect to the path of rotation of said hammer.

3. The combination with an electric motor, of a rotary hammer driven by said motor, an impact receiving member, and means responsive to abnormal current flow through the armature of said motor for controlling the position of said impact receiving member with respect to the path of movement of said hammer.

4. The combination with an electric motor, of a rotary hammer driven thereby, an impact receiving member, and an electroresponsive device in series with the motor armature to control the position of said impact receiving member with respect to the path of movement of said hammer.

5. The combination with an electric motor, of a rotary hammer driven thereby, a pivotally movable impact receiving rod, means normally holding the end of said rod in position to receive a blow from said hammer, and an electroresponsive device, in series with the motor armature and responsive to an abnormal flow of current, for moving said impact receiving rod out of the path of movement of said hammer.

In witness whereof, I hereunto subscribe my name this 23rd day of May, A. D., 1912.

GEORGE H. ROWE.

Witnesses:
GEORGE E. FOLK,
ALFRED H. MOORE.

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