Sept. 18, 1923. 1,468,345

R. Z. FARMER

COMBINED HAMMER AND ROTARY DRILL

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Fig. 1.

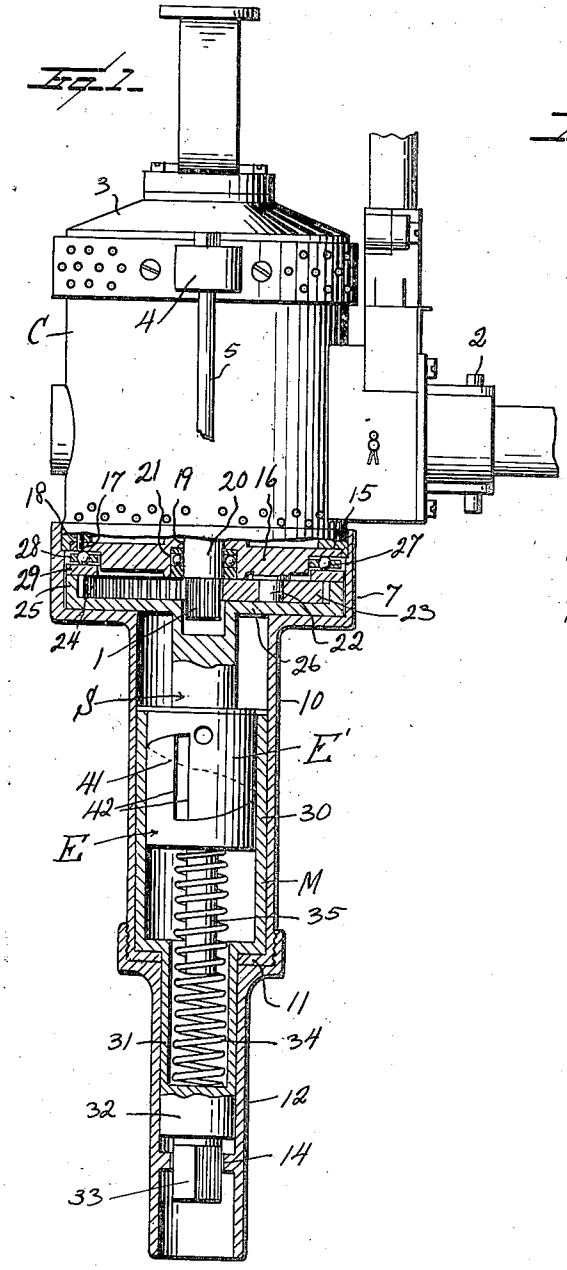
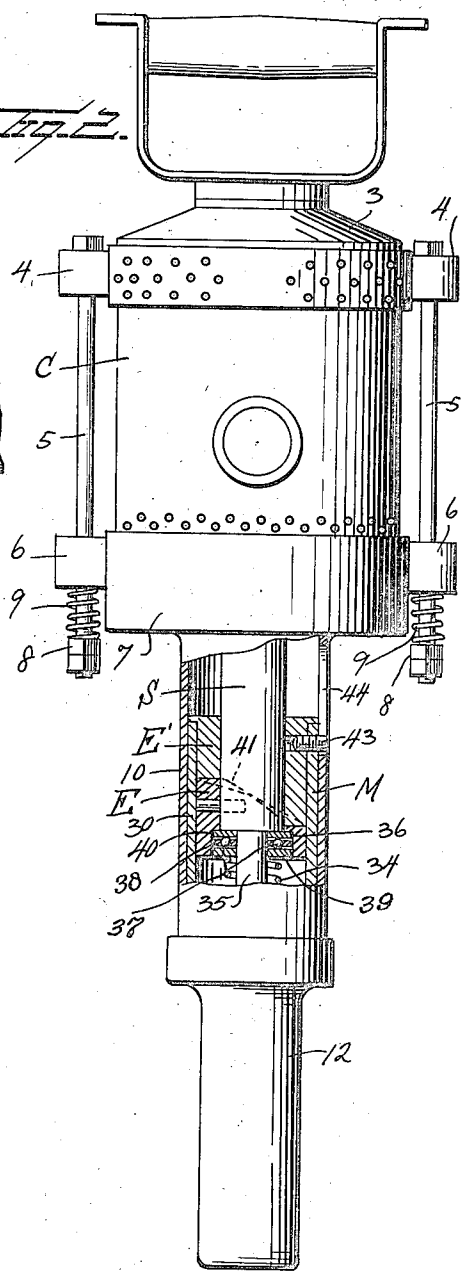


Fig. 2.



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Fig. 4

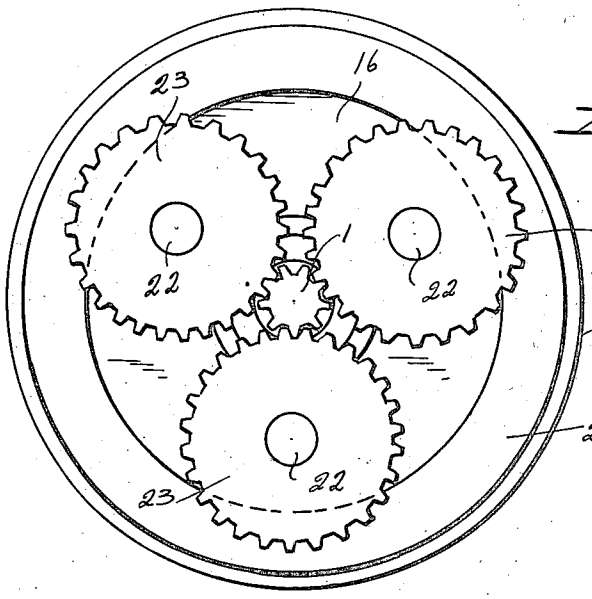


Fig. 5

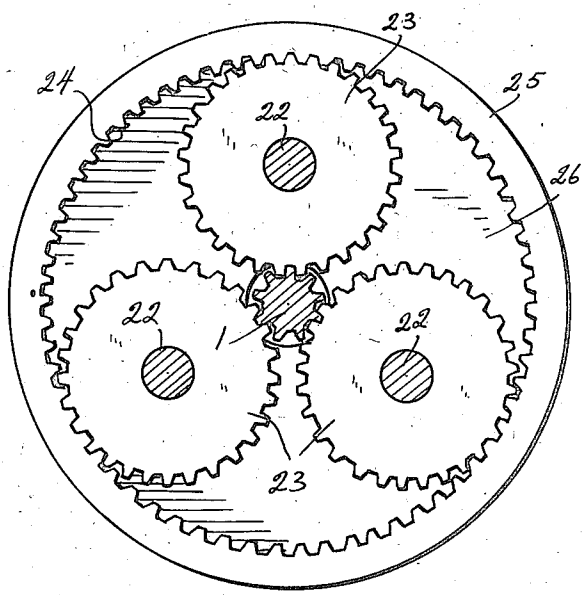
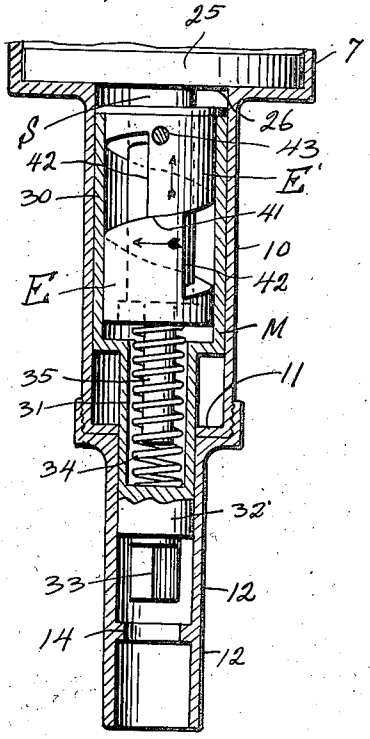


Fig. 6



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UNITED STATES PATENT OFFICE.

ROBERT Z. FARMER, OF PORTLAND, OREGON, ASSIGNOR TO AUTOMATIC ELECTRIC BRAKE COMPANY, A CORPORATION OF OREGON.

COMBINED HAMMER AND ROTARY DRILL.

Application filed October 18, 1920. Serial No. 417,645.

To all whom it may concern:

Be it known that I, ROBERT Z. FARMER, a citizen of the United States, residing at Portland, in the county of Multnomah and State of Oregon, have invented certain new and useful Improvements in Combined Hammers and Rotary Drills, of which the following is a specification, reference being had to the accompanying drawings.

This invention relates to a combined hammer and rotary drill, and it is primarily an object of the invention to provide a novel and improved device of this general character wherein each of the desired operations is effected through the instrumentality of an electrically operating motor.

It is also an object of the invention to provide a novel and improved device of this general character embodying a driven shaft with which is associated an operating member and wherein the driven shaft has fixed thereto a cam element coacting with a cam element carried by the operating member, together with means carried by the operating member and cooperating, when in one position, with a containing sleeve or barrel, whereby the cam elements, upon rotation of the driven shaft, impart endwise movement to the operating member.

Furthermore, it is an object of the invention to provide a novel and improved device of this general character embodying an operating member having coacting therewith means for constantly urging said member in one direction, together with motor-operated means for imparting movement to said operating member in the opposite direction.

It is also an object of the invention to provide a novel and improved device of this general character embodying a containing sleeve or barrel in which is arranged an operating member capable of both rotary movement and reciprocatory movement, together with a driven shaft extending within said sleeve or barrel, said working member and sleeve or barrel having keyed thereto coacting cam elements, the locking member for the element associated with the operating member being adjustable into a position to engage the containing sleeve or barrel to hold said cam element against rotation but permitting the same to reciprocate and, when in a second position, locking said cam element to the driven shaft whereby the operating element will be caused to rotate in unison with the driven shaft.

The invention consists in the details of construction and in the combination and arrangement of the several parts of my improved combined hammer and rotary drill whereby certain important advantages are attained and the device rendered simpler, less expensive and otherwise more convenient and advantageous for use, as will be hereinafter more fully set forth.

The novel features of my invention will hereinafter be definitely claimed.

In order that my invention may be the better understood, I will now proceed to describe the same with reference to the accompanying drawings, wherein:

Figure 1 is a view partly in side elevation and partly in section of a combined hammer and rotary drill constructed in accordance with an embodiment of my invention.

Figure 2 is a view partly in top plan and partly in section of the structure as illustrated in Figure 1.

Figure 3 is a fragmentary view partly in longitudinal section and partly in elevation of the operating member and the parts associated therewith as herein embodied.

Figure 4 is an enlarged detail view in plan illustrating the working head of the casing of the motor showing the gears carried thereby and in driven connection with the armature shaft, and

Figure 5 is a view partly in plan and partly in section illustrating the operative connection between the armature shaft and the head carried by the driven shaft S.

As disclosed in the accompanying drawings, C denotes a casing of a conventional type and in which is housed an electric motor of any preferred type and which operates to rotate the pinion 1 carried by the armature shaft of the motor. As the motor within the casing forms no part of my present invention, it is not believed necessary that a detail illustration and description thereof be given other than to refer to the switch 2 whereby the operating circuit for the motor may be opened or closed when required.

Fitting upon the outer or rear end portion of the casing C is a head or cap 3 provided at diametrically opposed points with the outstanding perforate ears or lugs 4. Directed through the ears or lugs 4 are the side

rods 5 which are also directed through the outstanding ears or lugs 6 carried at diametrically opposed points by the cap or head 7 which slidably engages the inner or forward end of the casing C.

The rods 5 extend beyond the lugs or ears 6 and are provided with the adjustable stops 8 herein disclosed as nuts threaded thereon. Surrounding each of the side rods 5 and interposed between a lug or ear 6 and a stop 8 is an expansible member 9 herein disclosed as a coil spring encircling said side rod 5.

The springs 9 operate to maintain the caps or heads 3 and 7 in applied position upon the casing C yet at the same time serve as a cushion to substantially entirely absorb the shocks and jars incident to the use of the device and particularly when the device is being used as a hammer and not in firm contact with the work.

The cap or head 7 is carried by the inner end portion of an elongated sleeve or barrel 10 of requisite dimensions and the opposite end portion of said sleeve or barrel 10 is provided with an inwardly directed annular flange 11.

Threaded upon or otherwise engaged with the outer end portion of the sleeve or barrel 10 is an elongated socket member or chuck head 12, the bore of which is of a diameter substantially equal to the diameter of the opening defined by the inwardly directed flange 11. The member or head 12 at a predetermined point inwardly of its outer end is provided with an inwardly directed annular flange 14 which serves as a stop for a purpose to be hereinafter referred to.

The forward edge of the wall of the casing C is provided with an internal rabbet 15 to receive the marginal portions of a plate or head 16. Said plate or head 16 is provided with an opening 17 to receive an outstanding pin 18 carried by the wall of the casing C whereby the applied plate or head 16 is held against rotation. The central portion of the plate or head 16 is provided with an opening 19 through which the armature shaft 20 is disposed and the outer portion of the opening 19 is enlarged to receive the antifriction members 21 so that the shaft 20 may rotate with a minimum of frictional resistance.

Extending outwardly from the plate or head 16 at points equidistantly spaced circumferentially thereof are the stub shafts 22 herein disclosed as three in number and each of which serves as a mounting for a gear wheel 23, said gear wheel being slidable thereupon so that the same may be readily and conveniently applied or removed. The gears 23 are of equal ratio and mesh with the pinion 1 of the armature shaft 20. The gears 23 also mesh with the internal or orbit gear 24 carried by the side flange 25 defining the head 26 of the operating member M.

The marginal portion of the plate or head 16 is reduced in thickness and coacting with said marginal portion are the bearings 27 carried by the retaining ring 28 and which bearings also engage the washer 29 contacting with the free edges of the flange 25. The head 26 closely fits within the cap or head 7 and the shaft S extends axially of the sleeve or barrel 10 and also axially of the operating member M.

The member M comprises a tubular cylindrical body 30 snugly fitting within the sleeve or barrel 10, said body 30 being of a length less than the sleeve or barrel 10 so that the body may have reciprocating movement therein. The outer end of the body 30 is continued by a tubular extension body 31 which snugly engages within the inner portion of the bore of the socket member or chuck head 12. The outer end of the extension body 31 is closed. This closed outer end 32 is of material thickness in order to offset the stress and strain imposed thereon incident to the use of the device as a hammer. The closed outer end 32 of the extension body 31 is provided at its axial center with the outstanding hammer 33 angular in cross section. The hammer 33 is also adapted to fit within a correspondingly formed socket in the end portion of a drill inserted within the socket member or chuck head 12 when it is desired to use the device for rotating such drill.

Interposed between the outer end of the shaft S and the outer closed end 32 of the extension body 31 is an expansible spring 34 of requisite tension. The portion of the spring 34 adjacent the shaft S encircles a stem 35 extending axially from the outer end of the shaft S and whereby the spring 34 is effectively held against buckling or similar derangement and particularly in view of the fact that said stem 35 is of a length to extend at all times within the bore of the extension body 31.

When my improved device is used as a hammer, the shaft S rotates while the spring 34 is non-rotatable and for which reason it is of especial importance to provide means whereby the operative engagement between the spring 34 and the shaft S will not effect a rotary movement to said spring. As herein disclosed, the outer end of the shaft S has in contact therewith a washer 36 with which engages the ball bearings 37 carried by the retaining ring 38. Also engaging the bearings 37 is a washer 39, and with which the spring 34 directly engages, whereby the shaft S is permitted to rotate without imparting rotary movement to the spring 34.

As particularly illustrated in Figure 2 of the accompanying drawings, the washers 36 and 39, together with the retaining ring 38, freely surrounds the stem 35 and are also

substantially housed within a pocket or depression 40 provided in the outer face of a cam element E. The cam element E is fixed to the outer end portion of the shaft S and coacts with a second cam element E′ at all times keyed or locked to the operating member M. The members E and E′ at their opposed ends are provided with the cam edges 41 arranged on desired pitch and the high and low points of the cam edge being connected by a straight edge 42 extending substantially longitudinally of the shaft S.

As is particularly illustrated in Figure 2, the cam element E is keyed to the operating member M by the threaded shank or screw 43 and the adjustment of the shank or screw 43 controls the movement of the member M.

When it is desired to use the device as a percussive or impact hammer, the shank or screw 43 is moved outwardly to extend within a slot 44 disposed longitudinally of the sleeve or barrel 10. When the shank or screw 43 is in this position, the element E′ is loose upon the shaft S and as said shaft S rotates, the coacting cam element E will move the element E′ inwardly of the shaft S and at the same time place the spring 34 under compression. Upon each revolution of the shaft S, the straight edges 42 of the elements E and E′ will assume such relative positions to permit the compressed spring 34 to throw the member M outwardly and under such force to permit the hammer 33 to impose the requisite impact or blow upon the work. It is to be understood that a rivet set, a mining drill, or the shank of any other desired tool is inserted within the outer end of the socket member or chuck head 12 and after such tool has been applied and is in contact with its work, the operator imposes sufficient pressure against the device to initially place the spring 34 under slight compression in order to assure the requisite impact or blow by the hammer 33 upon the tool or shank inserted within the socket member or chuck head 12.

When it is desired to use my improved device with a rotary drill or kindred rotary tool, the shank or screw 43 is adjusted inwardly a distance whereby the same is entirely free of the barrel or sleeve 10 and in gripping contact with the shaft S. With the shank or screw 43 in this second position, it will at once be obvious that both of the elements E and E′ are keyed to the shaft S and whereupon the member M will rotate in unison with the shaft S and at the same axial speed.

I claim:

1. A device of the class described comprising a driven shaft, an operating member loosely mounted upon the shaft, means for urging said operating member in one direction under force, coacting means carried by the shaft and the operating member for intermittently imparting movement to the operating member in the opposite direction, means for holding the operating member substantially against rotation when reciprocating, said last named means including a barrel substantially housing the shaft and the operating member and provided with a slot in its wall extending in a direction longitudinally of the shaft, a pair of coacting cam elements mounted upon the shaft, one of said elements being fixed to the shaft, and a shank threaded through the operating member and into the second cam element and thereby connecting the second cam element and the operating member, said shank being movable to extend within the slot of the sleeve to cause the cam elements to cooperate to effect a reciprocation of the operating member, said shank being also movable into locking engagement with the shaft and free of the sleeve to cause the shaft and operating member to rotate in unison.

2. A device of the class described comprising a drive shaft, a plate through which said shaft extends, means for holding the plate against rotation, gears rotatably supported by the plate and operatively engaged with the drive shaft, a driven shaft provided with a head, said head having an internal gear with which the first named gears are engaged, an operating member loosely mounted upon the driven shaft, means for urging said operating member in one direction under force, coacting means carried by the driven shaft of the operating member for intermittently imparting movement to the operating member in the opposite direction, and means for holding the operating member substantially against rotation when reciprocated, said driven shaft and operating member rotating in unison when said last named means is inoperative.

In testimony whereof I hereunto affix my signature.

ROBERT Z. FARMER.