C. M. HAMPSON.

MOTIVE FLUID OPERATED ROCK DRILL.

APPLICATION FILED DEC. 13, 1907.

907,041.

Patented Dec. 15, 1908.

3 SHEETS—SHEET 1.

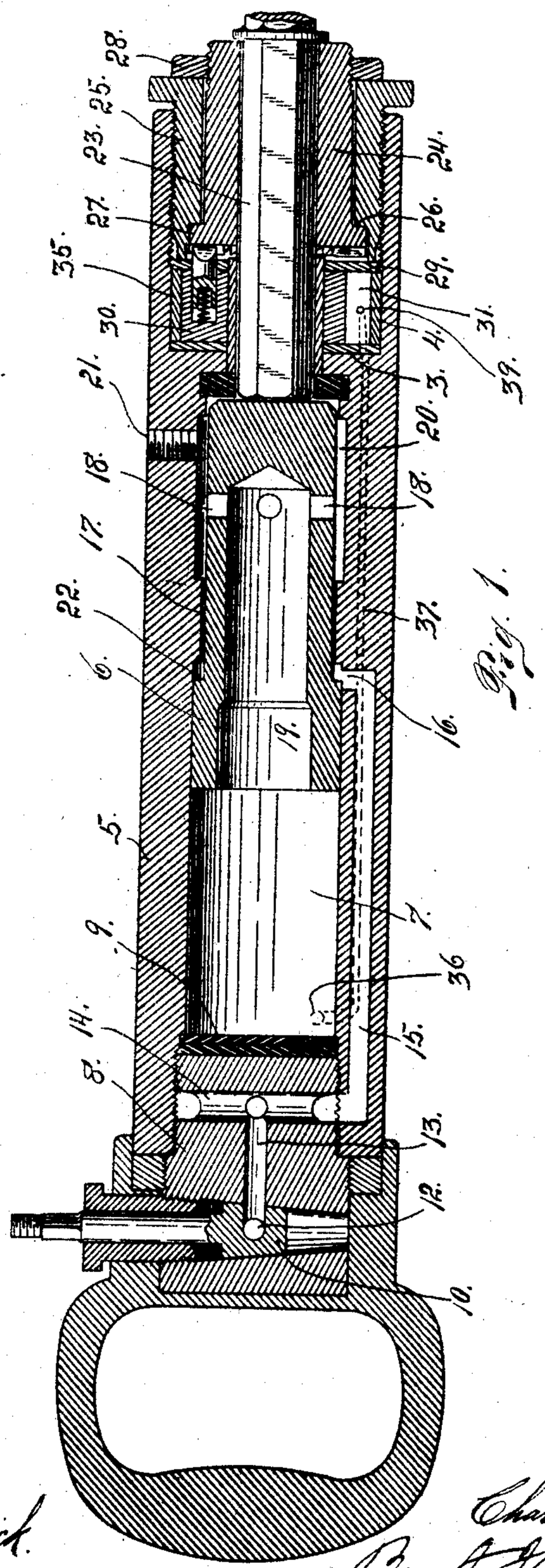

Fig. 1.

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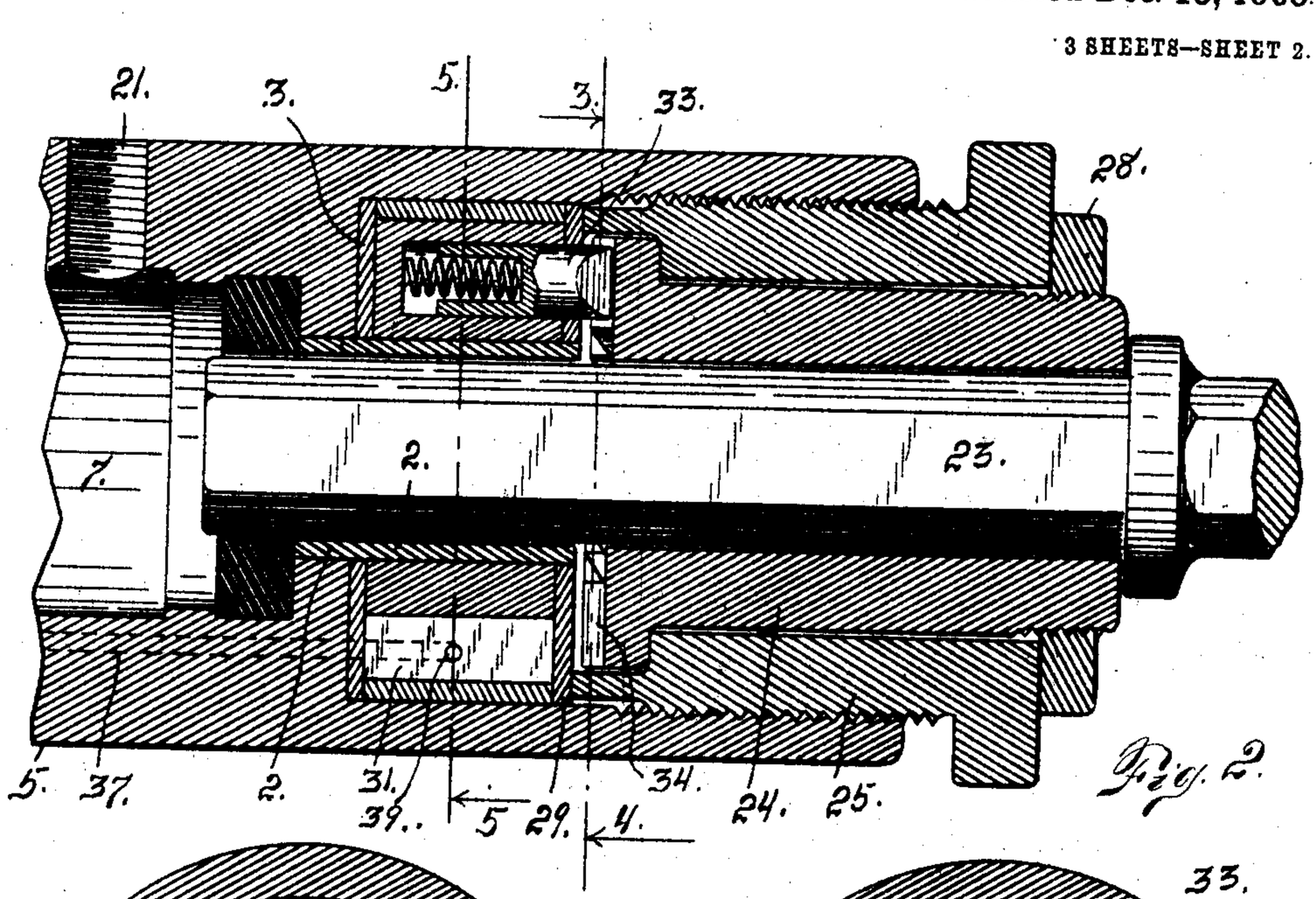

Fig. 2.

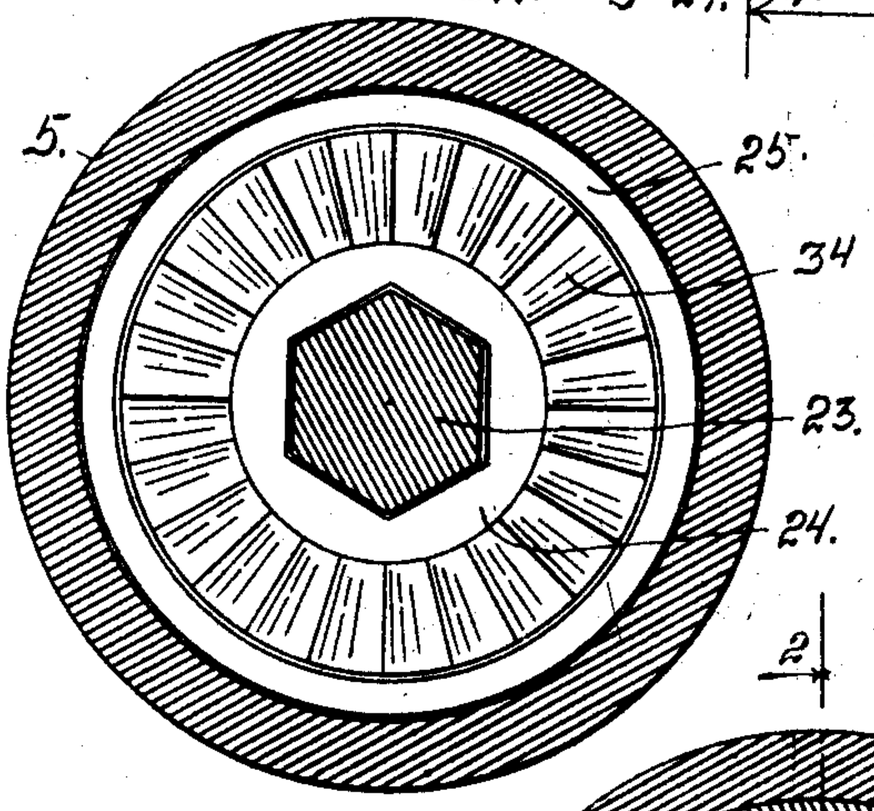

Fig. 3.

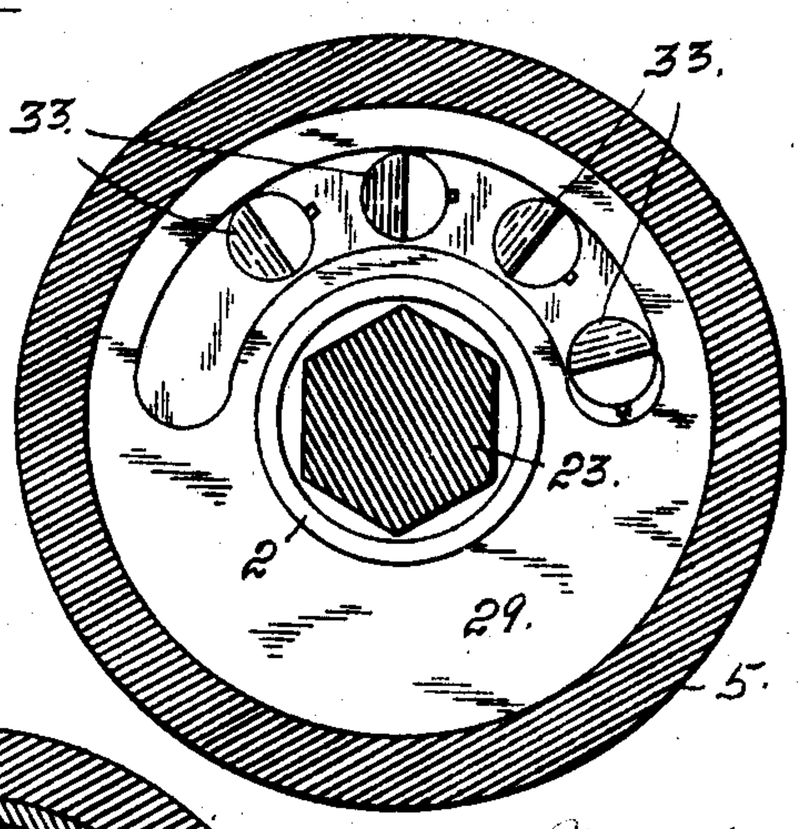

Fig. 4.

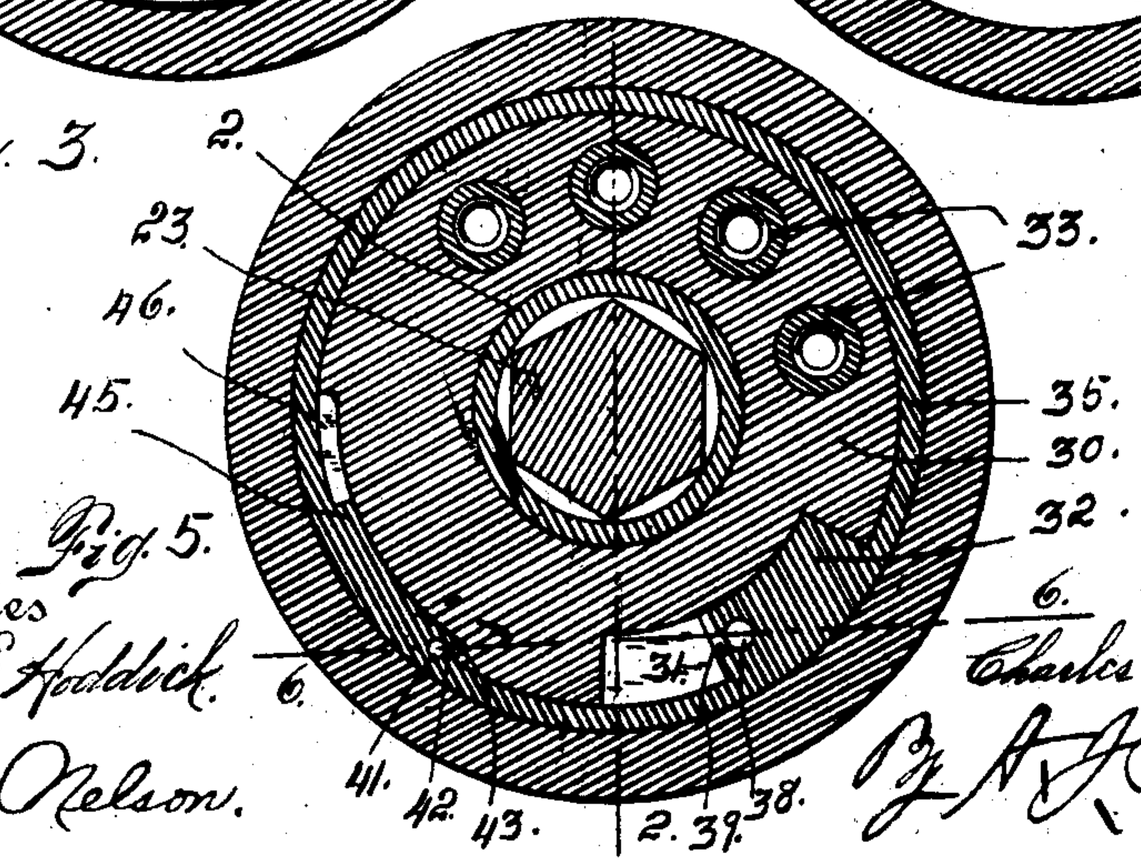

Fig. 5.

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3 SHEETS—SHEET 3.

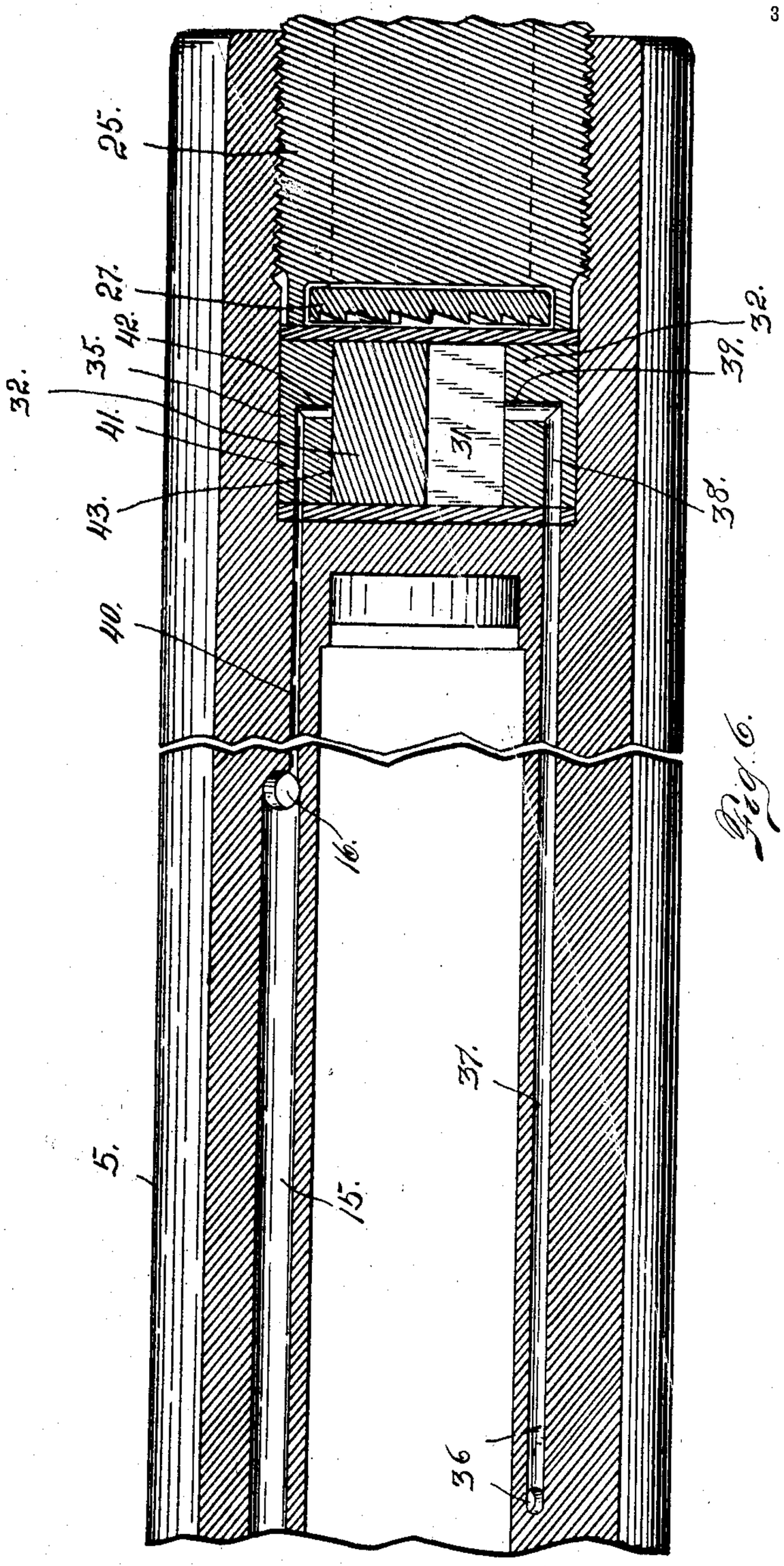

Fig. 6.

Witnesses

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UNITED STATES PATENT OFFICE.

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MOTIVE-FLUID-OPERATED ROCK-DRILL.

No. 907,041. Specification of Letters Patent. Patented Dec. 15, 1908.

Application filed December 13, 1907. Serial No. 406,312.

To all whom it may concern:

Be it known that I, CHARLES M. HAMPSON, a citizen of the United States, residing at the city and county of Denver and State of Colorado, have invented certain new and useful Improvements in Motive-Fluid-Operated Rock-Drills; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters and figures of reference marked thereon, which form a part of this specification.

My invention relates to improvements in motive fluid-actuated rock drills.

More specifically the invention relates to a construction for rotating the drill steel by the motive fluid agent which operates the hammer which acts on the drill steel.

In my improved construction a disk is mounted adjacent the drill-steel-holding chuck and carries spring-actuated pawls adapted to act on a ratchet face with which the adjacent extremity of the chuck is provided. This pawl-holding disk is adapted to have an alternating or back and forth movement within a ring which is stationary within the drill casing. This disk is provided with two shoulders of different area. The construction is such that the motive fluid which operates the hammer acts constantly upon the shoulder of smaller area and intermittently upon the shoulder of larger area. The intermittent action of the fluid upon the shoulder or surface of larger area is controlled by the action of the hammer, and the motive fluid is only allowed to act on the larger area when the hammer is at or approximately at its rearward limit of movement. The constant pressure on the smaller area has a tendency to maintain the pawl holder in one position, but as soon as the motive fluid is admitted to the surface of larger area, the pawl holder is moved in the opposite direction. In this way an alternating or rotary reciprocating movement is produced. When the pawl holder moves in one direction, the pawls act upon the ratchet face to impart to the chuck and the drill steel carried thereby, a partial rotary movement in one direction. When, however, the pawl holder moves in the opposite direction, the spring-held pawls slip over the face of the ratchet without imparting any movement. In this way an intermittent rotation of the drill steel is brought about by the motive fluid agent the same being controlled by the action of the hammer which operates as a valve both to control its own action, as well as the reciprocating action of the pawl holder.

Having briefly outlined my improved construction, I will proceed to describe the same in detail reference being made to the accompanying drawing in which is illustrated an embodiment thereof.

In this drawing, Figure 1 is a longitudinal section taken through a hammer drill equipped with my improvements. Fig. 2 is a fragmentary view of the same shown on a larger scale. This may be considered a section taken on the line 2—2 Fig. 5. Fig. 3 is a cross section taken on the line 3—4 Fig. 2 looking in the direction of arrow 3. Fig. 4 is a section taken on the line 3—4 Fig. 2 looking in the direction of arrow 4. Fig. 5 is a section taken on the line 5—5 Fig. 2. Fig. 6 is a longitudinal section taken on the line 6—6 of Fig. 5.

The same reference characters indicate the same parts in all the views.

Let the numeral 5 designate the casing of the drill in which is located a hammer 6 mounted to reciprocate in a chamber 7. The rear part of the casing is closed by a plug 8 provided with a yielding buffer 9 with which the hammer comes in contact when at its rearward limit of movement. In the rear part of the plug 8 is inserted a valve 10 for controlling the introduction of motive fluid to the drill. This valve is provided with an opening 12 adapted to register with a passage 13 in the plug. This passage leads to a circumferential groove 14 communicating with a longitudinal passage 15 extending forwardly to a port 16 communicating with the chamber 7. Forward of the port 16, the chamber 7 is somewhat reduced in size as shown at 17 to fit the reduced portion of the hammer 6. When the hammer is at its rearward limit of movement, the motive fluid passing through the port 16, enters the ports 18 formed in the hammer and communicating with a chamber 19 of the hammer, the latter being hollow. As soon as the motive fluid enters the chamber 19, it also passes to the chamber 7 and acts to drive the hammer forwardly.

As soon as the hammer reaches its forward limit of movement the motive fluid exhaust through the ports 18 into a space 20 formed in the drill casing and communicating with an exhaust port 21. The motive fluid then acts on a shoulder 22 of comparatively small surface area, to give the hammer the return movement. The pressure of the live fluid is constant upon the shoulder 22 but as its area is exceedingly small as compared with the surface upon which the live fluid acts as soon as it enters the chamber 19 of the hammer, the latter is driven forwardly with great force, the resistance offered by the action of the live fluid upon the shoulder 22 being insignificant.

Nothing is claimed on the mechanism just described in detail, as it has been chosen as a simple form of construction to which my improvements may be applied.

The hammer 6 when at its forward limit of movement, strikes the rear extremity of the drill steel 23 which is located in a chuck 24 held in place by a screw sleeve 25 threaded into the casing and having a shoulder 26 which engages a collar 27 formed upon the rear extremity of the chuck thereby holding the latter securely in place. The forward extremity of the chuck is threaded and a nut 28 is screwed thereon to engagement with the sleeve 25. The rear extremity of the screw sleeve 25, engages a disk 29 which closes the forward extremity of a circumferential chamber 4 formed in the forward part of the drill casing and in which is located a pawl holder 30 adapted to have a limited rotary movement in reverse directions. A disk 3 is located in the rear extremity of this chamber. The ring 35 is located between the disks 3 and 29 and the screw sleeve 25 locks these parts securely in place. The ring 35 serves as a spacer to prevent the pawl holder from being clamped between the disks. The two disks 3 and 29, surround a sleeve 2 through which the drill steel passes. The rear extremity of the sleeve 2 engages a rubber buffer A which surrounds the rear extremity of the drill steel. The pawl holder is cut away on one side forming a chamber 31 in which is located a lug 32 of less size than the chamber, thus allowing the pawl holder a limited movement. This action is sufficient for imparting a step by step rotary action to the chuck by virtue of the engagement of pawls 33 with ratchet teeth 34 formed on the rear extremity of the chuck. The lug 32 is formed on a ring 35 fast in the drill casing and surrounding the pawl holder.

The rear portion of the casing 5 is provided with a port 36 communicating with a forwardly extending passage 37 which registers with a passage 38 formed in the lug 32. This lug is also provided with a port 39 for the escape of motive fluid into the chamber 31, whereby the pawl holder is actuated in one direction. The entrance of air or motive fluid to the chamber 31 is intermittent since it only has access to said chamber when the live motive fluid is in the chamber 7 of the casing and acting on the hammer. As soon as the ports 18 of the hammer pass forward of the port 16, the live motive fluid is cut off from the chamber 7. When this occurs, provision must be made for imparting to the pawl holder the reverse movement. From the passage 15, a small passage 40 leads forwardly and registers with a passage 41 formed in the ring 35. This ring is also provided with a port 42 leading from said passage, whereby the motive fluid acts on a shoulder 43 of the pawl holder, the said shoulder being of relatively small surface area. The action of the motive fluid on the shoulder or face 43 is constant. Hence as soon as the motive fluid is cut off from the chamber 31, the constant pressure on the relatively small surface of the shoulder 43, imparts to the pawl holder the reverse movement. The shoulder 43 of the pawl holder when in the position shown in Fig. 5, acts upon a relatively small projection 45 which enters a recess 46 formed in the pawl holder. This recess is of the same length as the chamber 31 and makes room for the projection 45 during the back and forth movement of the pawl holder in the performance of its function. The pawls 33 are inserted in recesses formed in the pawl holder and are acted on by coil springs 44 which hold them in engagement with the ratchet teeth 34. When the pawl holder makes the reverse movement, the forward extremities of the pawls slip over the ratchet teeth 34 without moving the chuck.

From the foregoing description the use and operation of my improvement will be readily understood. Assuming that the hammer is at its forward limit of movement as shown in Fig. 1, the live motive fluid acting on the shoulder 22 of the hammer imparts to the latter its reverse or rearward movement. Before the hammer reaches the rear extremity of the chamber 7, its ports 18 are brought into communication with the port 16 of the casing, allowing the motive fluid to enter the chamber 7 and act upon the hammer to impart a forward movement whereby it is caused to strike the drill steel. As soon as the motive fluid enters the chamber 7, a relatively small part of it escapes through the port 36, and the passages 37, 38 and the port 39, to the chamber 31, imparting to the pawl holder 30 a partial rotary movement in such a direction that the pawls 33 act on the ratchet teeth 34 of the chuck to impart to the latter together with the drill steel a corresponding movement. Again as soon as the hammer passes to the forward position whereby the motive fluid in the

chamber 7 exhausts through the port 21, the constant pressure of the live fluid upon the shoulder 43 of the rotary pawl holder, imparts to the latter the reverse movement whereby the pawls slip over the teeth 34 without actuating the chuck.

Having thus described my invention, what I claim is:

The combination with a casing and a drill, of a motive fluid-controlled hammer piston for striking the latter, a drill chuck provided with a ratchet formed on the face of its inner extremity, a pawl-holder mounted to have an alternating rotary movement for rotating the chuck, pawls carried by the said holder, occupying positions parallel with its axis, and mounted to reciprocate in recesses with which the holder is provided, the said pawl-holder having differential surface areas, the casing being provided with means for constantly admitting the motive fluid to the smaller surface area of the said holder, and also with means for intermittently admitting the said fluid to the larger surface area, the intermittent admission of motive fluid being controlled by the reciprocation of the hammer, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

CHARLES M. HAMPSON.

Witnesses:
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ALFRED P. SCHMUCKER.