C. A. HULTQUIST.

ROCK DRILL.

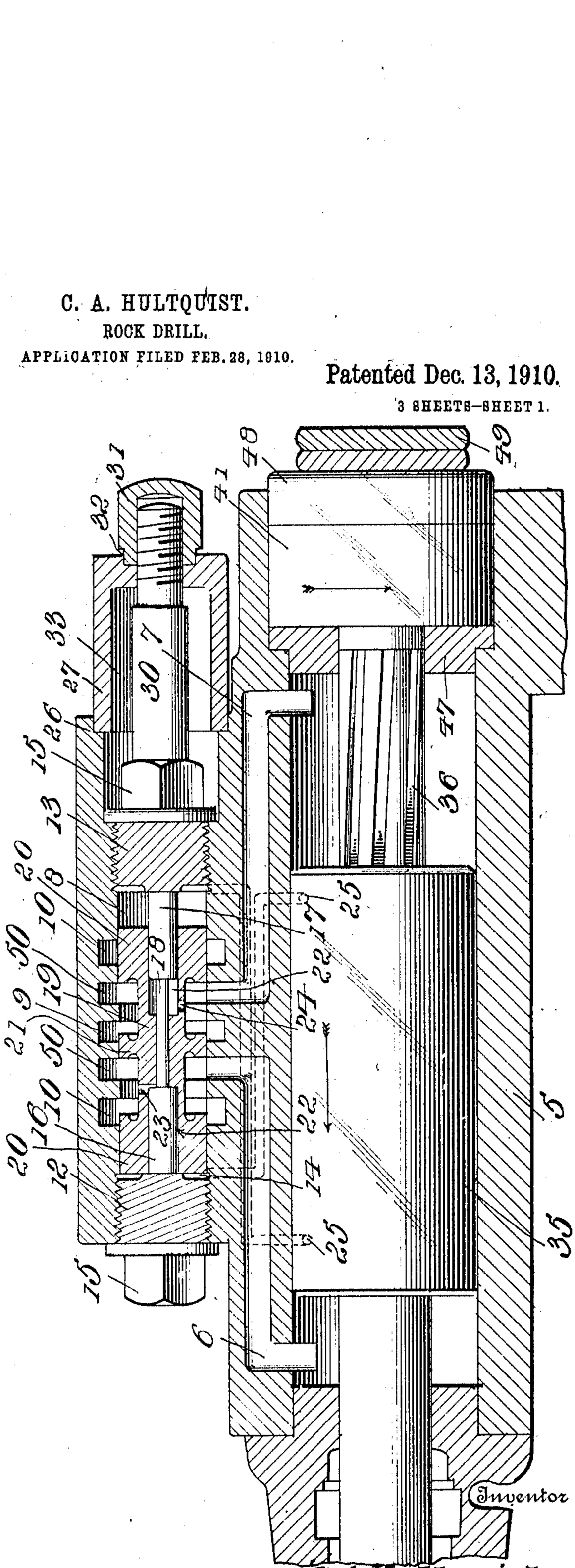
APPLICATION FILED FEB. 28, 1910.

978,586.

Patented Dec. 13, 1910.

3 SHEETS—SHEET 1.

Fig. 1.



Witnesses

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3 SHEETS—SHEET 2.

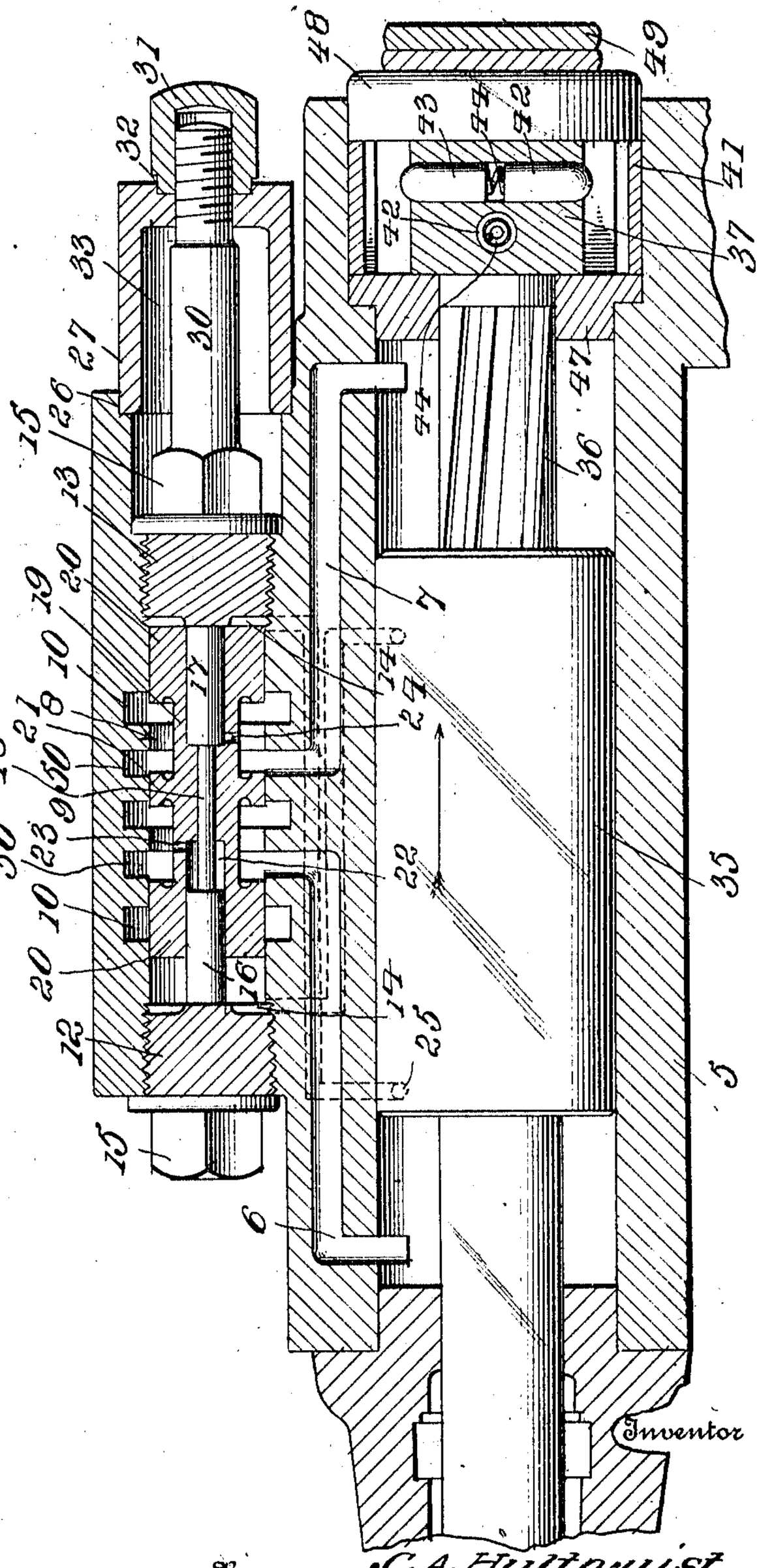

FIG. 2.

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3 SHEETS—SHEET 3.

FIG. 1.

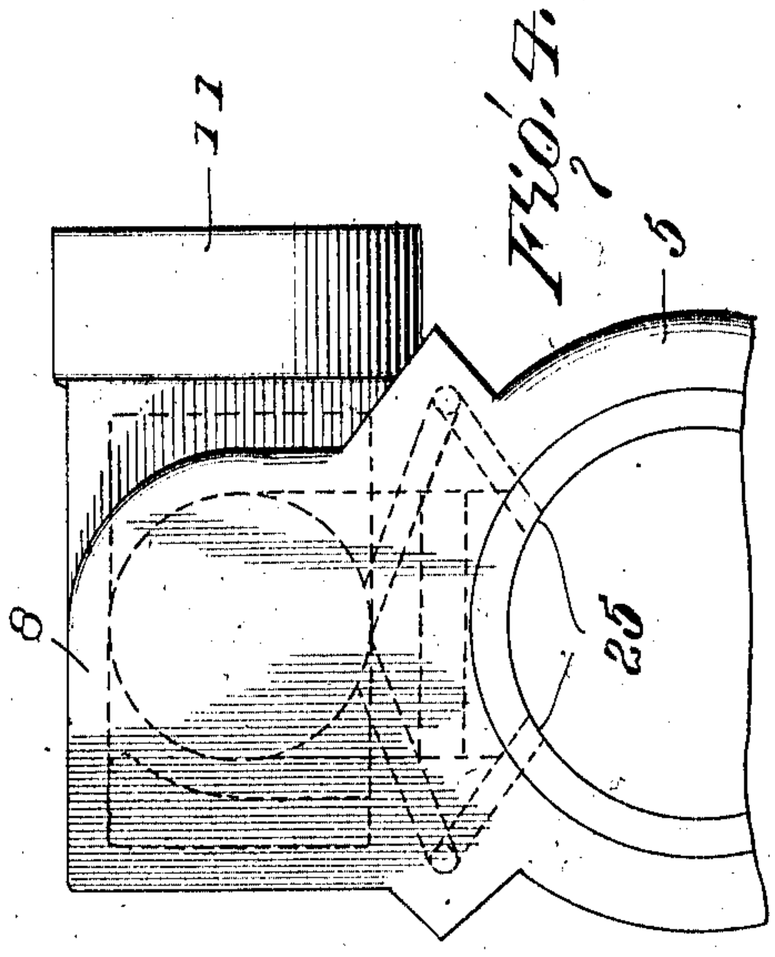


FIG. 3.

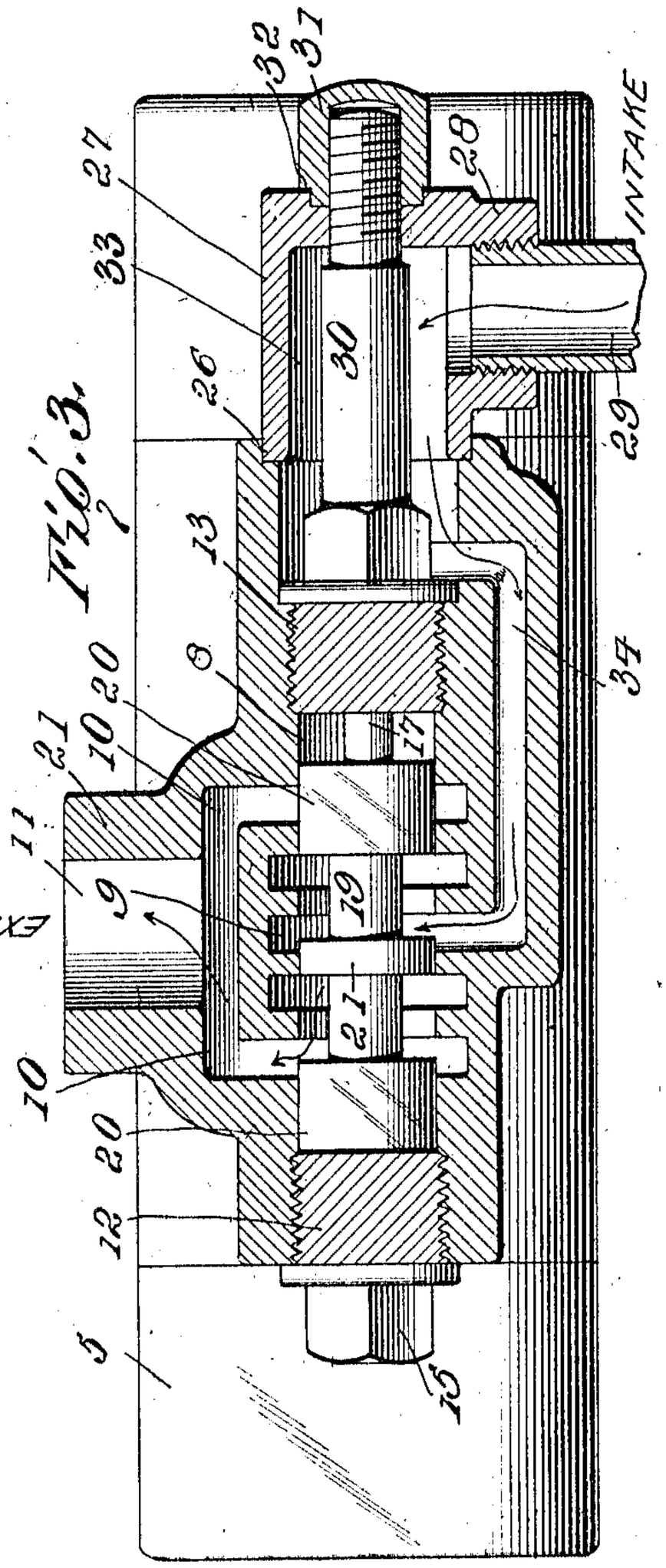
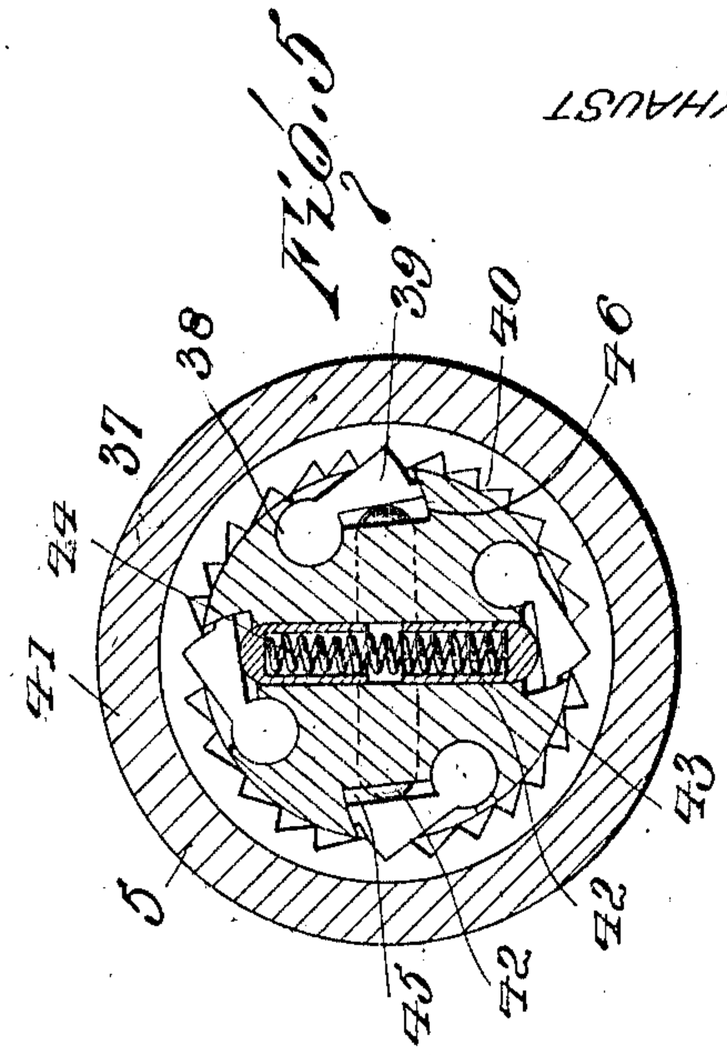


FIG. 2.



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UNITED STATES PATENT OFFICE.

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ROCK-DRILL.

978,586. Specification of Letters Patent. Patented Dec. 13, 1910.

Application filed February 28, 1910. Serial No. 546,466.

To all whom it may concern:

Be it known that I, CHARLES A. HULTQUIST, citizen of the United States, residing at Bisbee, in the county of Cochise and Territory of Arizona, have invented certain new and useful Improvements in Rock-Drills, of which the following is a specification.

This invention relates to rock drills and has for its object the provision of a drill of simple and compact construction in which wear on the several parts incident to the operation thereof is reduced to a minimum.

A further object is to provide a novel form of valve for controlling the admission of air or other fluid to the cylinder.

A further object is to provide means for reciprocating the valve to alternately open and close the inlet ports, and fluid pressure means for preventing rearward movement of said valve at the end of each stroke.

A further object is to provide means for rotating the piston, and means for balancing the rifle bar of said piston, thus to prevent the latter from binding or wedging in the cylinder.

A further object is to provide means whereby the fluid supply pipe may be positioned on either side of the drill without the necessity of detaching said fluid supply pipe.

A still further object of the invention is generally to improve this class of devices so as to increase their utility, durability and efficiency.

Further objects and advantages will appear in the following description, it being understood that various changes in form, proportions and minor details of construction may be resorted to within the scope of the appended claims.

For a full understanding of the invention and the merits thereof and also to acquire a knowledge of the details of construction and the means for effecting the result, reference is to be had to the following description and accompanying drawings, in which:

Figure 1 is a vertical sectional view of a rock drill constructed in accordance with my invention, showing the piston or hammer near the completion of its working stroke; Fig. 2 is a similar view showing the piston or hammer near the end of its return stroke; Fig. 3 is a horizontal sectional view of the valve; Fig. 4 is an end view; Fig. 5 is a vertical sectional view showing the construction of the pawl and ratchet mechanism for revolving the piston.

Corresponding and like parts are referred to in the following description and indicated in all the views of the drawings by the same reference characters.

The rock drill forming the subject matter of the present invention comprises a cylinder 5 having fluid passages or ports 6 and 7 formed in the opposite ends thereof and communicating with a valve chamber 8. The valve chamber 8 is provided with a circumferential inlet port or chamber 9 and oppositely disposed exhaust chambers or ports 10, which latter communicate with a common exhaust nipple or pipe 11 extending laterally from one side of the drill, as shown. The opposite ends of the valve chamber 8 are closed by removable plugs 12 and 13 having their inner ends reduced to form circumferential ports 14 and their outer ends provided with angular portions 15 so that the same may be conveniently grasped with a wrench or other suitable tool to permit the removal of said plugs.

Interposed between the plugs 12 and 13 is a stationary plunger comprising oppositely disposed heads 16 and 17 connected by an intermediate stem or rod 18, said stationary plunger extending through the valve 19. The valve 19 is formed with a plurality of spaced disks 20 and 21 the outer disks 20 being movable alternately over the exhaust ports or chambers 10 and the central disk 21 being movable over the inlet port 9 to control the admission of fluid to the opposite ends of the cylinder.

The valve 19 is provided with a central bore to receive the connecting stem 18 and is also provided with oppositely disposed chambers or pockets 22 for the reception of the heads 16 and 17 of the stationary plunger, there being ports 23 and 24 formed in the walls of the valve and communicating with the chambers 22, as shown.

A duct 25 is disposed on each side of the cylinder and forms a source of communication between the interior of said cylinder and the ports 14 so that the fluid in the cylinder may be utilized for shifting the valve.

One end of the valve chamber 8 is cutaway to form a seat 26 for the reception of a T-coupling or casing 27 to the nipple 28 of which is attached in any suitable manner, a fluid supply pipe 29.

The plug 13 is provided with a stem 30 which projects through an opening in the

end of the T-coupling or casing 27 and is provided with terminal threads for engagement with a clamping nut 31, there being a seat 32 formed in the end of the casing 27 and similar in construction to the seat 26 to prevent the entrance of dirt and other foreign matter to the interior of the casing. The interior walls of the casing 27 are spaced from the stem 30 to form a circumferential chamber 33 which communicates by a passage 34 with the inlet-port or chamber 9 to permit the air from the supply pipe 29 to enter said chamber 9. Thus it will be seen that by releasing the nut 31 and rotating or partially rotating the T-coupling or casing 27, the fluid supply pipe 29 may be positioned on either side of the drill without the necessity of detaching the supply pipe from the casing.

It will here be noted that the seats 26 and 32 form in effect bearings for the casing 27 when the latter is rotated, the casing being locked in adjusted position by tightening the nut 31.

It will also be noted that the plugs 12 and 13 are approximately of the same diameter as the valve 19 so that by unscrewing the plugs, said valve 19 may be readily removed from its seat for the purpose of effecting any necessary repairs thereto. The plugs 12 and 13 not only form abutments for the heads of the stationary plunger, but also permit the valve 19 to reciprocate within the chamber 8 without binding or wedging action between the parts.

Mounted for reciprocation within the cylinder 5, is a piston 35, the central portion of which is rifled to receive a correspondingly rifled bar 36, the latter being provided with an integral head 37, seated in the rear end of the cylinder 5, as best shown in Figs. 2 and 5 of the drawings. The head 37 is provided with a series of substantially spherical sockets 38 in which are pivotally mounted locking pawls 39 adapted to engage corresponding ratchet teeth 40 formed in the inner face of a retaining ring 41. The head 37 is also provided with intersecting openings 42 in which are mounted sliding plungers 43, the ends of said plungers being adapted to bear against the adjacent edges of the pawls 39 for the purpose of forcing said pawls in contact with the teeth 40. The plungers 43 are each preferably formed in two sections having sockets or chambers formed therein for the reception of coil springs 44 so that the pawls will normally and yieldably bear against the ratchet teeth 40.

Communicating with each socket 38 is a recess 45 adapted to receive the adjacent pawl 39, the end wall of each recess being provided with a curved bearing surface 46 for engagement with the adjacent end of the pawl, thus to assist in preventing accidental displacement of the pawls and also to prevent undue wear on the same.

It will here be noted that two of the pawls are in engagement with the adjacent teeth on the ring 41, while the mating pawls are at the half notch, thus insuring a perfectly balanced rifle bar 36 and effectually preventing binding or wedging action of the piston within the cylinder.

On the rearward stroke of the piston 35, the pawls 39, by engagement with the ratchet teeth 40, will hold the rifle bar 36 rigid, so that as the piston travels over the rifle bar, a slight rotary movement will be imparted thereto for the purpose of turning the drill or other cutting tool. On the working stroke of the piston, the pawls 39 will move the distance of a half tooth and rotate the rifle bar slightly so as to allow the piston 35 to travel in a straight path.

The member 37 is retained within the cylinder 5 by means of a washer 47 and a head 48, the former being provided with a stop-shoulder and the latter being provided with suitable cushioning springs 49 extending across the outer surface of the head, as best shown in Figs. 1 and 2 of the drawings.

Auxiliary ports or chambers 50 are disposed on opposite sides of the inlet port 9 so as to permit the entrance of fluid through the ports 23 and 24 to the chambers 22 of the valve.

Thus it will be seen that on the rearward or return stroke of the piston 35, the air or other fluid in the front end of the cylinder 5 will flow through the adjacent duct 25 to the port 14 at the rear end of the valve 19, so as to shift said valve and permit the air from the inlet port 9 to flow through the port 7 to the rear end of the piston. When the valve 19 is moved to the position shown in Fig. 1 of the drawings, a portion of the air from the main supply pipe will enter the rear chamber 22 through the ports 50 and 24 so as to hold the valve to its seat and prevent rearward movement thereof during the working stroke of the piston. When the valve is in the position above referred to, the air from the port 14 at the rear of the valve will pass through the duct 25 to the front end of the cylinder and the air in the front end of said cylinder will be exhausted through the passage 6 and chambers 50 and 10 to the common exhaust pipe or nipple 11. As soon as the duct leading to the port 14 at the front of the cylinder is uncovered, the fluid at the rear end of said cylinder will flow through said duct and shift the valve 19 in the opposite direction so as to open up communication between the inlet port 9 and the front end of the cylinder and permit the discharge of fluid from the rear end of the cylinder through the ports 7, 50 and 10 to the exhaust 11, a portion of the fluid from the inlet port at the same

time entering the chamber 22 at the front end of the valve through the port 23 and holding said valve against the plug 13.

As the piston 35 reciprocates within the cylinder 5, the rifle bar 36 will impart a slight rotary movement to the piston, as before stated.

Having thus described the invention, what is claimed as new is:

1. A rock drill including a cylinder having inlet and exhaust ports and provided with a valve chamber, a piston operating within the cylinder, removable plugs forming closures for the opposite ends of said chamber, a stationary plunger arranged within the valve chamber and having its opposite ends bearing against the inner faces of the plugs, a valve mounted for reciprocation on the plunger for controlling the admission of fluid to the opposite ends of the cylinder, a duct leading from each end of the valve to the cylinder to permit the passage of fluid for reciprocating said valve, and fluid pressure means for preventing rearward movement of the valve during a part of each stroke.

2. A rock drill including a cylinder having inlet and exhaust ports and provided with a valve chamber, a piston operating within the cylinder, removable plugs forming closures for the opposite ends of the valve chamber, one of which is provided with a stem, a casing spaced from the stem to form a chamber communicating with the inlet port and provided with means for attachment to a source of fluid supply, a plunger interposed between and bearing against the plugs, a valve mounted for reciprocation on the plunger for controlling the admission of fluid to the opposite ends of the cylinder, and a duct leading from each end of the valve to the cylinder to permit the passage of fluid for reciprocating said valve.

3. A rock drill including a cylinder having inlet and exhaust ports and provided with a valve chamber, a piston operating within the cylinder, solid plugs forming closures for the opposite ends of the valve chamber, one of said plugs being provided with a threaded rod, a rotary casing surrounding the rod and spaced from the latter to form a chamber communicating with the inlet port and a source of fluid supply, a plunger interposed between and bearing against the plugs, a valve mounted for reciprocation on the plunger for controlling the admission of fluid to the opposite ends of the cylinder, and a nut engaging the threaded end of the rod and bearing against the casing for securing the latter in adjusted position.

4. A rock drill including a cylinder having inlet and exhaust ports and provided with a valve chamber, a piston operating within the cylinder, removable plugs forming closures for the opposite ends of the valve chamber, one of said plugs being provided with a stem, a casing spaced from and surrounding the stem to form a chamber communicating with the inlet port and a source of fluid supply, means carried by the stem and engaging the casing for holding the latter in adjusted position, a plunger interposed between and bearing against the plugs, a valve mounted for reciprocation on the plunger for controlling the admission of fluid to the opposite ends of the cylinder, a duct extending from each end of the valve to the cylinder to permit the passage of fluid for reciprocating the valve, and pockets formed in the valve around the plunger and communicating with the fluid supply, for preventing rearward movement of the valve during a part of each stroke.

5. A rock drill including a cylinder having inlet and exhaust ports and provided with a valve chamber, a piston operating within the cylinder, removable plugs forming closures for the opposite ends of the valve chamber, a stationary rod arranged within the valve chamber and having its opposite ends provided with enlarged heads bearing against the inner faces of the plugs, a valve mounted for reciprocation on the plunger for controlling the admission of fluid to the opposite ends of the cylinder, said valve being provided with a central bore for the reception of the rod and oppositely disposed chambers adapted to receive the heads of said rod, there being ports formed in the walls of said chambers and adapted to communicate alternately with the fluid supply, and a duct extending from each end of the valve to the interior of the cylinder.

6. A rock drill including a cylinder having inlet and exhaust ports and provided with a valve chamber, a piston operating within the cylinder, removable plugs forming closures for the opposite ends of the valve chamber and provided with inner flat bearing faces, a stationary plunger arranged within the valve chamber and having its opposite ends bearing against the flat faces of the plugs, a valve mounted for reciprocation on the stationary plunger for controlling the admission of fluid to the opposite ends of the cylinder, a duct extending from each end of the valve to the interior of the cylinder for reciprocating the valve, and fluid pressure means for preventing rearward movement of the valve during a part of each stroke.

7. A rock drill including a cylinder having inlet and exhaust ports and provided with a valve chamber, a piston operating within the cylinder, removable plugs forming closures for the opposite ends of the valve chamber and provided with circum-

ferential ports and flat bearing faces, a plunger interposed between the plugs and provided with a reduced stem and oppositely disposed heads bearing against the flat faces of the plugs, a valve mounted for reciprocation on the plunger for controlling the admission of fluid to the opposite ends of the cylinder, and a duct extending from each end of the valve to the interior of said cylinder to permit the passage of fluid for reciprocating the valve, there being pockets formed in the valve to receive the heads of the plunger and provided with ports to permit the admission of fluid to said chambers for the purpose of preventing rearward movement of the valve during a part of each stroke.

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

CHARLES A. HULTQUIST. [L. S.]

Witnesses:
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