

No. 671,970.

Patented Apr. 16, 1901.

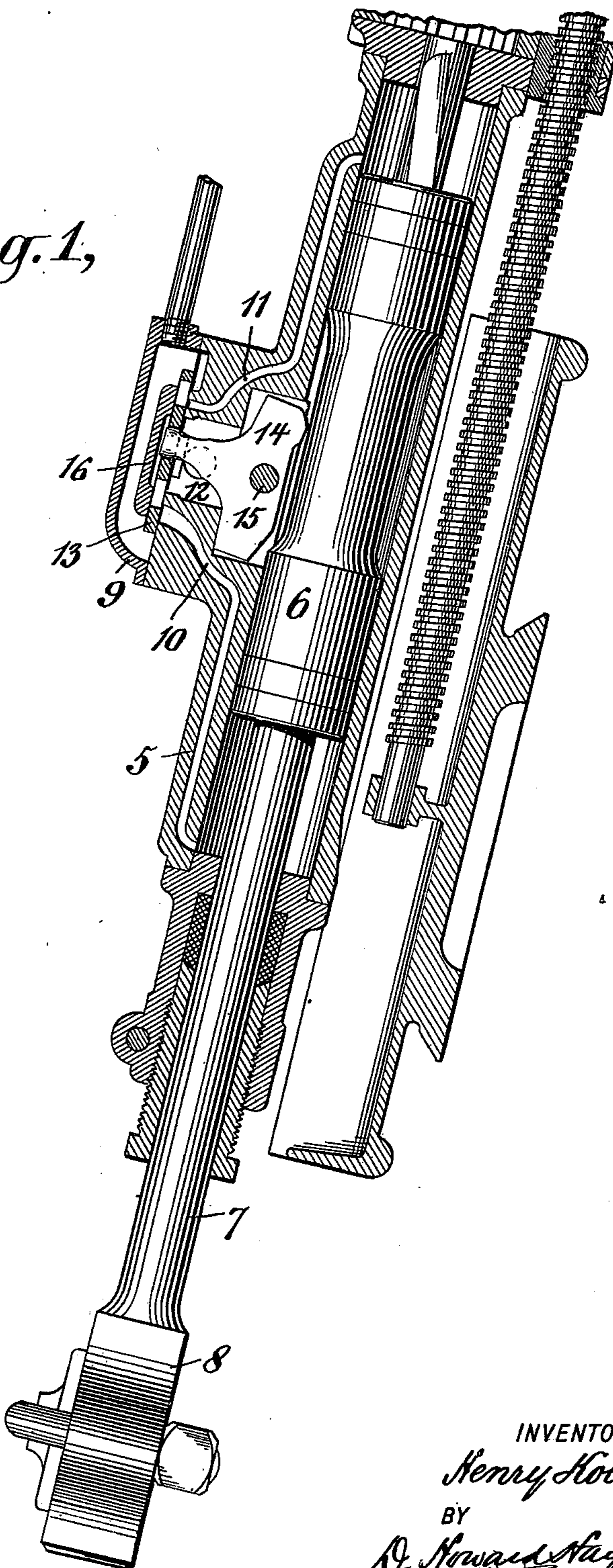
H. KOCH.
ROCK DRILL.

(Application filed Sept. 13, 1900.)

(No Model.)

2 Sheets—Sheet 1.

Fig. 1,



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2 Sheets—Sheet 2.

Fig. 2,

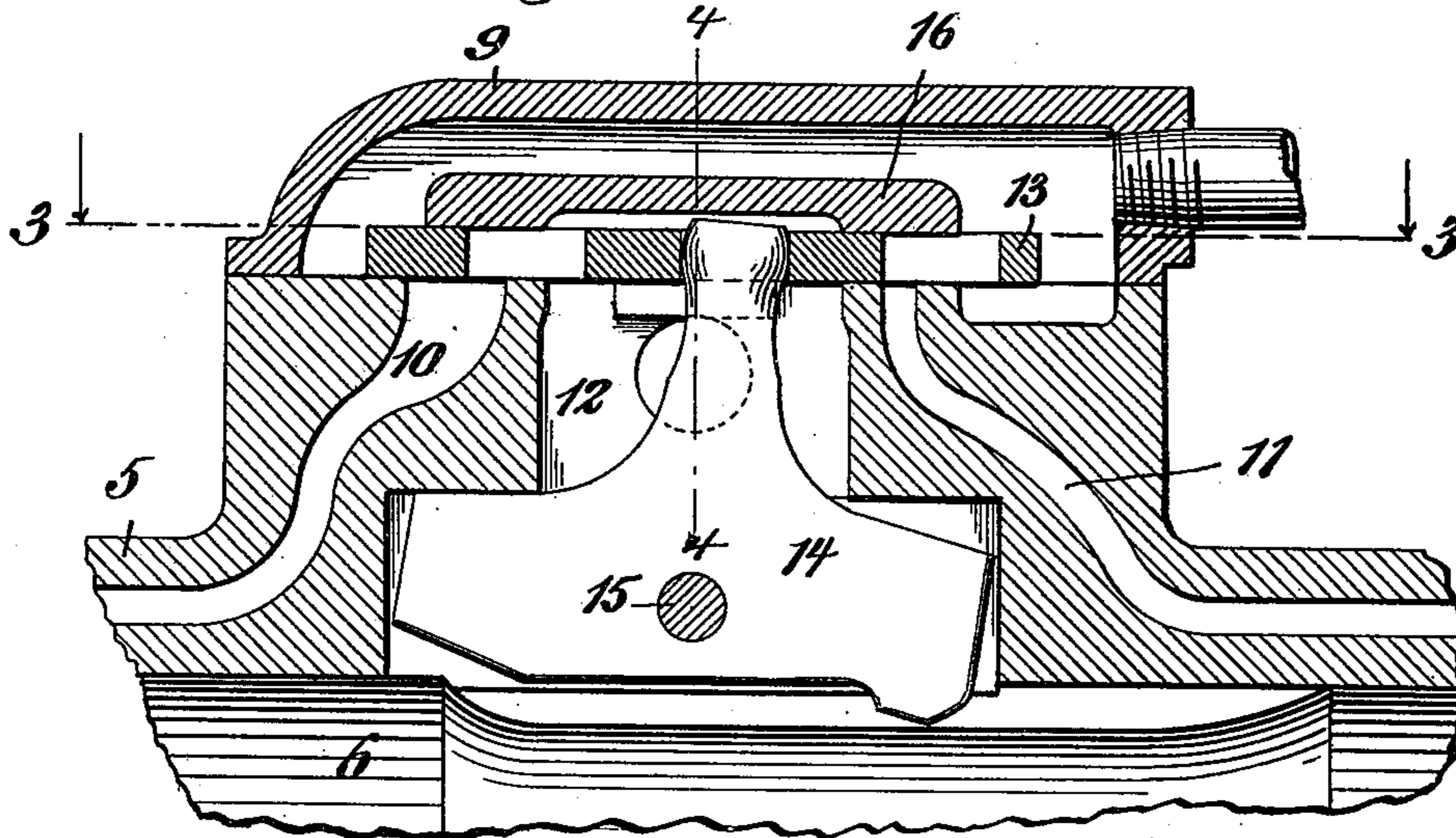


Fig. 3,

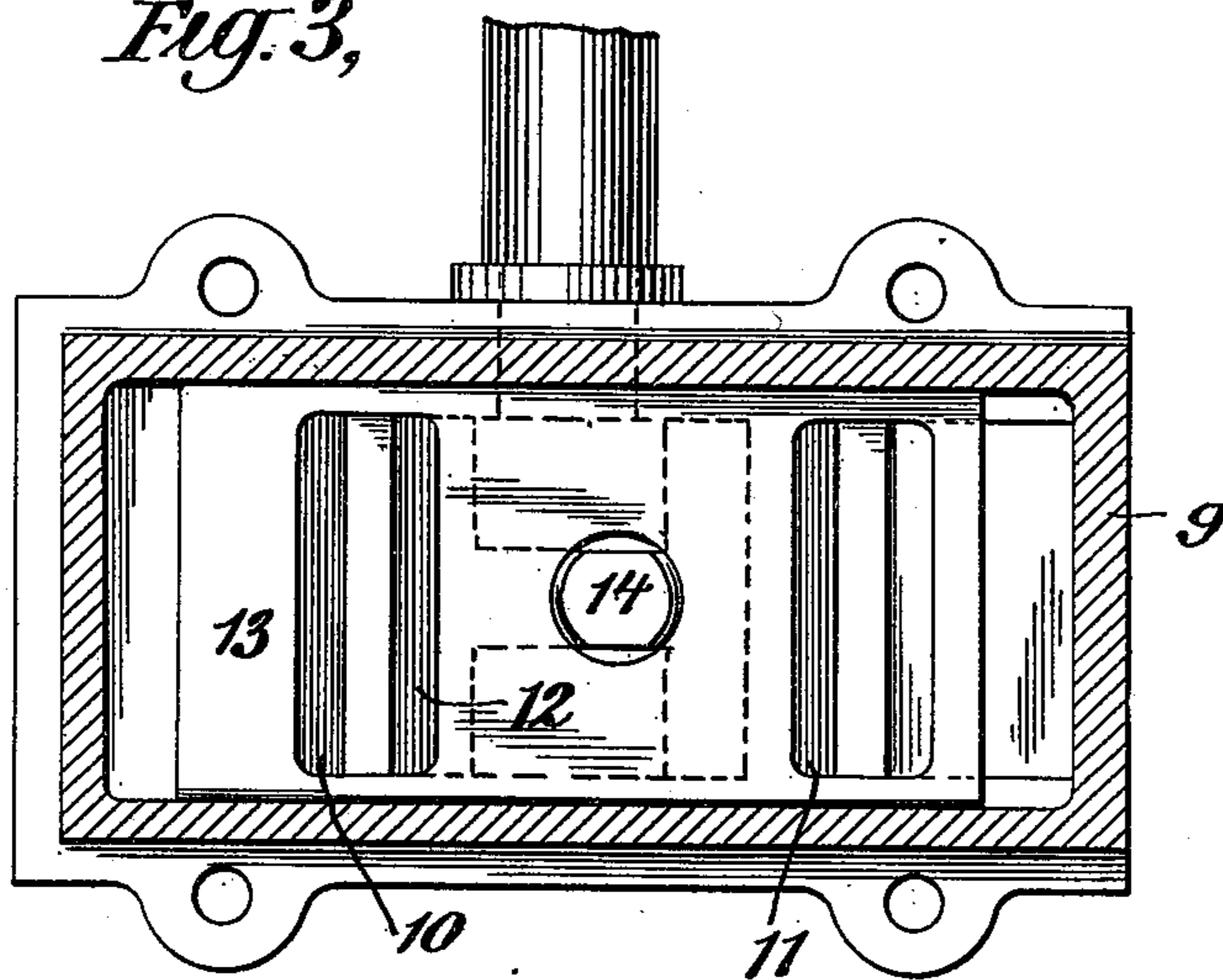
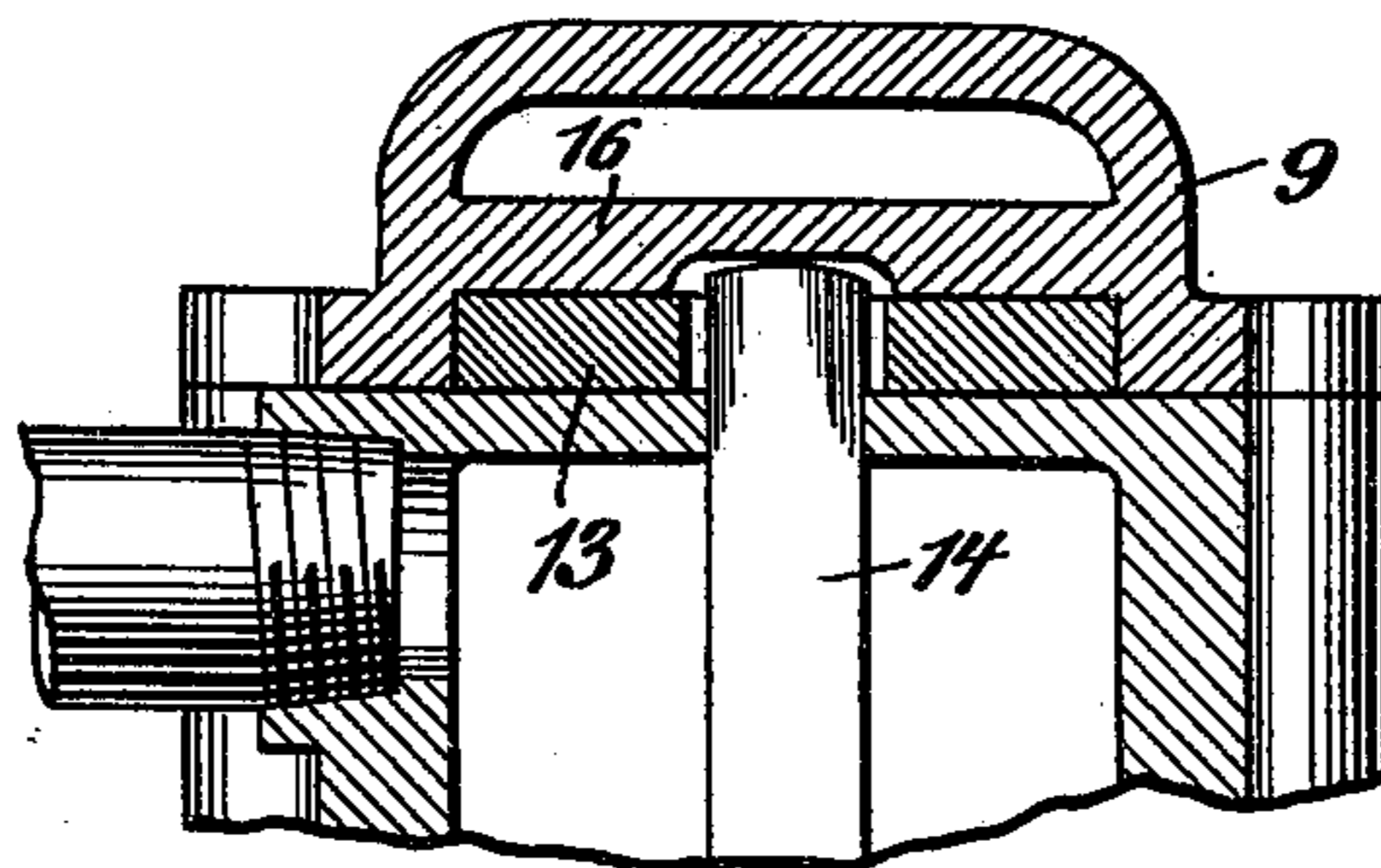


Fig. 4,



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HENRY KOCH, OF TARRYTOWN, NEW YORK, ASSIGNOR TO RAND DRILL COMPANY, OF NEW YORK, N. Y.

ROCK-DRILL.

SPECIFICATION forming part of Letters Patent No. 671,970, dated April 16, 1901.

Application filed September 13, 1900. Serial No. 29,899. (No model.)

To all whom it may concern:

Be it known that I, HENRY KOCH, a citizen of the United States of America, and a resident of Tarrytown, in the county of Westchester and State of New York, have invented certain new and useful Improvements in Rock-Drills, of which the following is a specification, reference being had to the accompanying drawings, forming a part thereof.

My invention relates to improvements in rock-drills, and particularly in improvements to the valve mechanism therefor.

My invention consists in means for balancing or partially balancing the valve against fluid-pressure and in making such provision that the valve so balanced or partially balanced shall be maintained against accidental displacement, due to its own weight, at times when the valve is not held or positively actuated by its operating mechanism.

My invention further contemplates the provision of means whereby the valve when balanced or partially balanced as to fluid-pressure may be held against movement, due to its own weight, in one direction, but shall be free to move by its own weight in the other direction at such times as it is not held or positively actuated by its operating mechanism.

The objects of my invention are to save wear between the valve and its seat, to save wear on the rocker and on the piston, to prevent accidental movement of the valve when not desired and when not positively held or actuated, and to permit a free movement of the valve when desired independent of its actuated operating mechanism.

I will now proceed to describe a rock-drill fitted with an improved valve and valve-gear embodying my invention and will then point out the novel features in the claims.

In the drawings, Figure 1 represents a central vertical section of a rock-drill fitted with a valve and valve-gear embodying my invention. Fig. 2 is an enlarged sectional view of certain parts. Fig. 3 represents a horizontal section on the plane of the line 3 3 of Fig. 2. Fig. 4 is a cross-sectional view taken on the plane of the line 4 4 of Fig. 2.

In Fig. 1 I have represented the drill as being in a position in which a drill of this character is very commonly used—that is to say,

it is pointing toward the ground at an angle of about fifteen degrees away from a line perpendicular thereto. The drill comprises a cylinder 5, having a reciprocating piston 6 mounted therein, the said piston provided with a piston-rod 7 and a drill-chuck 8. The usual or any desired form of drill may be secured to the said drill-chuck. A valve-chest 9 is provided and is suitably secured to the cylinder 5, and distributing-ports 10 and 11 are provided, which afford communication between the opposite ends of the cylinder and the valve-chest. A suitable exhaust-cavity 12 is also provided. A reciprocating slide-valve 13 is fitted within the valve-chest 9 and slides upon a suitable valve-seat, which is provided for such purpose. The slide-valve 13 controls the distributing-ports 10 and 11 and the exhaust-cavity 12. The said valve is operated by a rocker or tappet 14, suitably mounted in a recess in the cylinder-casting and supported upon a rocker-pin 15. The rocker or tappet 14 is positively moved in one direction or the other to operate the valve by engagement with shouldered portions of the piston 6, all in a manner too well known to require detailed description. The valve-chest 9 has suitably secured therein a plate 16, which for purposes of this specification I entitle a "pressure-plate." The valve 13 is accurately fitted between the said pressure-plate 16 and the valve-seat. The effect of the same will be to prevent fluid-pressure acting upon the valve 13 in such a way as to cause undue frictional contact between it and its seat. This will effect a saving of wear and tear on the valve and its seat, on the rocker, and on the piston.

It will be readily understood by reference to the drawings and by noting the proportion of the parts that there is a certain period in the movement of the piston 6 in which the tappet is free of any contact therewith, and hence is not controlled thereby. This period is usually about one-third of the full stroke of the piston. In the relative position of the parts as shown in Fig. 1 of the drawings the tappet is clear of the piston and with the piston moving downwardly will remain clear of the same until the upper shoulder of the piston comes in contact with the tappet. During all of this last-named movement the tap-

pet will not only be out of contact, but will be free, as far as the piston itself is concerned, to move. If now the valve 13 were entirely balanced as to fluid-pressure, the weight of the valve, aided by the preponderance of weight of the rocker on the valve side of its pivotal support, would be sufficient to cause the valve to move downwardly, and thereby reverse the direction of the incoming motive fluid before the time required, which would tend to lift the piston before a blow had been struck or would cushion the blow to such an extent as to destroy the efficacy thereof. To obviate this, I have provided a means whereby a sufficient pressure is permitted to be exerted upon the valve to maintain the same against accidental displacement, due to its own weight, at times when the rocker is free of the piston. Such means in this instance consists in arranging the distributing-port 10 relatively to one edge of the pressure-plate in such a manner that the pressure-plate shall only partially cover the said port. Such arrangement permits a sufficient amount of fluid-pressure to be exerted upon the valve as to hold it against accidental movement due to its own weight, and the valve will be held in position in which it is shown in Fig. 1 until the top shoulder of the piston engages with the rocker and positively reverses the valve. This will move the valve downwardly, and the lower port therein will then be in register with the port 10. In this position the valve will be free of the fluid-pressure which was exerted upon it at that part therein opposite the distributing-port 10 which the said pressure-plate did not cover, and the valve will then be substantially balanced as to fluid-pressure and will be free to move. Upon the upstroke, therefore, the valve will offer no resistance to movement except that which is exerted by its own weight.

The valve will act in the manner described in all the positions in which the drill may be set, from the one in which it is shown in the drawings up to the horizontal position. At the horizontal position there would be no tendency for the valve to move by its own weight, and hence there would be no necessity for preventing the accidental movement of the valve in either direction.

I have shown the pressure-plate 16 as entirely covering the upper distributing-port 11 and have shown no means whereby the valve may be maintained against movement, due to its own weight, in a rearward direction were the drill inverted. It is obvious, of course, that I might arrange means for preventing such movement of the valve, if desired, as has been just described for preventing the movement of the valve when the drill is in a normal position; but I preferably arrange and construct the parts as shown and described herein for the following reasons: When the drill is in what may be called its "normal" position—that is to say, when it is pointing downwardly—the weight of the pis-

ton, the piston-rod, the drill-chuck, and drill are all in favor of the downward movement, and the arrangement of ports and the relationship of the parts are such as will give the best results with the drill in such position. When now the drill is inverted, the weight of the piston, the piston-rod, the drill-chuck, and drill will all be against the forward, or what will now be the upward, stroke of the piston and in favor of the return stroke. The effect of this will be to accelerate the return movement and to increase the liability of the piston to strike a heavy blow upon the rear cylinder-head. It would therefore be an advantage to reverse the valve upon the return stroke when the drill is in such inverted position very much earlier in the stroke than if the drill were in a normal position. By balancing the valve as to pressure when in position to move rearwardly the said valve would move by its own weight immediately it were released from positive engagement with the piston through the rocker or tappet, and the consequent reversing of the motive fluid would act as a powerful cushion to retard the rearward movement of the piston and obviate the liability of the same pounding the rear cylinder-head. Thus I preferably balance the valve as nearly as possible as to fluid-pressure while it is at one end of its stroke, but leave the same sufficiently unbalanced at the other end of its stroke to maintain it against accidental movement, as before stated.

It is obvious that many modifications of my device might be resorted to without departing from the spirit and scope of my invention, and hence I do not only claim the precise construction as herein set forth; but

What I do claim, and desire to secure by United States Letters Patent, is—

1. In a rock-drill, the combination with a cylinder, a piston, a distributing slide-valve, and valve-operating mechanism which operates the valve at certain points in the stroke of the piston, but leaves the valve free to move at other periods in the operation thereof, of means for balancing the valve and for holding it against accidental movement, due to its own weight, at times when it is not held or positively actuated by the valve-operating mechanism.

2. In a rock-drill, the combination with a cylinder, a piston, a distributing slide-valve, and valve-operating mechanism, which operates the valve at certain points in the stroke of the piston, but leaves the valve free to move at other periods in the operation thereof, of means for holding the valve against movement, due to its own weight, when the drill is pointing downwardly and the said valve is not held or positively actuated by the valve-operating mechanism but whereby the valve is free to move by its own weight when the drill is pointing upwardly and the said valve is not held or positively actuated by its operating mechanism.

3. In a rock-drill, the combination with a cylinder, a piston, a distributing slide-valve, and a valve-operating mechanism which operates the valve at certain points in the stroke of the piston, but leaves the valve free to move at other periods in the operation thereof, of a valve-balancing device which partially balances the valve as to pressure, but permits sufficient pressure against same to hold it against accidental movement, due to its own weight, at times when it is not held or positively actuated by the valve-operating mechanism.

4. In a rock-drill, the combination with a cylinder, a piston having shoulders for operating a rocker or tappet, a distributing slide-valve, and a rocker or tappet, of means for balancing the valve and for holding it against movement, due to its own weight, at times when the tappet is not engaged by the piston.

5. In a rock-drill, the combination with a cylinder, a piston having shoulders for operating a rocker or tappet, a distributing slide-valve, and a rocker or tappet, of means for balancing the valve and for holding it against movement, due to its own weight, at times when the tappet is not engaged by the piston, and the drill is pointing downwardly, but whereby the valve is free to move by its own weight when the tappet is not engaged by the piston and the drill is pointing upwardly.

6. In a rock-drill, the combination with a cylinder, a piston, and a distributing slide-valve, of a valve-balancing device which balances the valve as to pressure while the same is at one end of its stroke, but leaves the same unbalanced while at the other end of its stroke.

7. In a rock-drill, the combination with a cylinder, a piston, and a distributing slide-valve, of a valve-balancing device which balances the valve to a greater extent at one end of its stroke than at the other.

8. In a rock-drill, the combination with a cylinder having suitable distributing-ports therein, a piston, and a distributing slide-

valve for controlling the said ports, of a pressure-plate for the valve arranged to partially cover the said ports.

9. In a rock-drill, the combination with a cylinder, having suitable distributing-ports therein, a piston, and a distributing slide-valve for controlling the said ports, of a pressure-plate for the valve arranged to wholly cover one of the said ports and to partially, but not wholly, cover another of said ports.

10. In a rock-drill, the combination with a cylinder, a piston having shoulders for operating the rocker or tappet, a distributing slide-valve and a rocker or tappet, of a valve-balancing device which balances the valve as to pressure while the same is at one end of its stroke, but leaves the same unbalanced while at the other end of its stroke.

11. In a rock-drill, the combination with a cylinder, a piston having shoulders for operating a rocker or tappet, a distributing slide-valve and a rocker or tappet, of a valve-balancing device which balances the valve to a greater extent at one end of its stroke than at the other.

12. In a rock-drill, the combination with a cylinder having suitable ports therein, a piston having shoulders for operating a rocker or tappet, a distributing slide-valve for controlling the said ports, and a rocker or tappet, of a pressure-plate for the valve arranged to partially cover the said ports.

13. In a rock-drill, the combination with a cylinder having suitable ports therein, a piston having shoulders for operating a rocker or tappet, a distributing slide-valve for controlling the said ports, and a rocker or tappet, of a pressure-plate for the valve arranged to wholly cover one of the said ports and to partially, but not wholly, cover another of the said ports.

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Witnesses:

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D. HOWARD HAYWOOD.