W. A. SMITH.

ROCK DRILL.

APPLICATION FILED AUG. 13, 1920.

1,429,786. Patented Sept. 19, 1922.

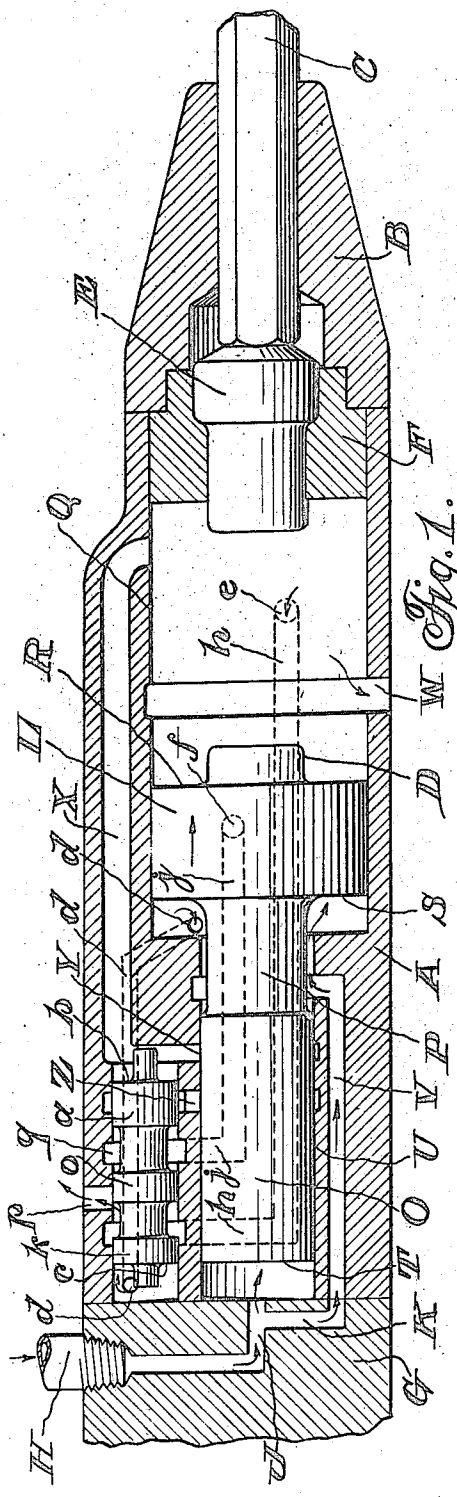


Fig. 1.

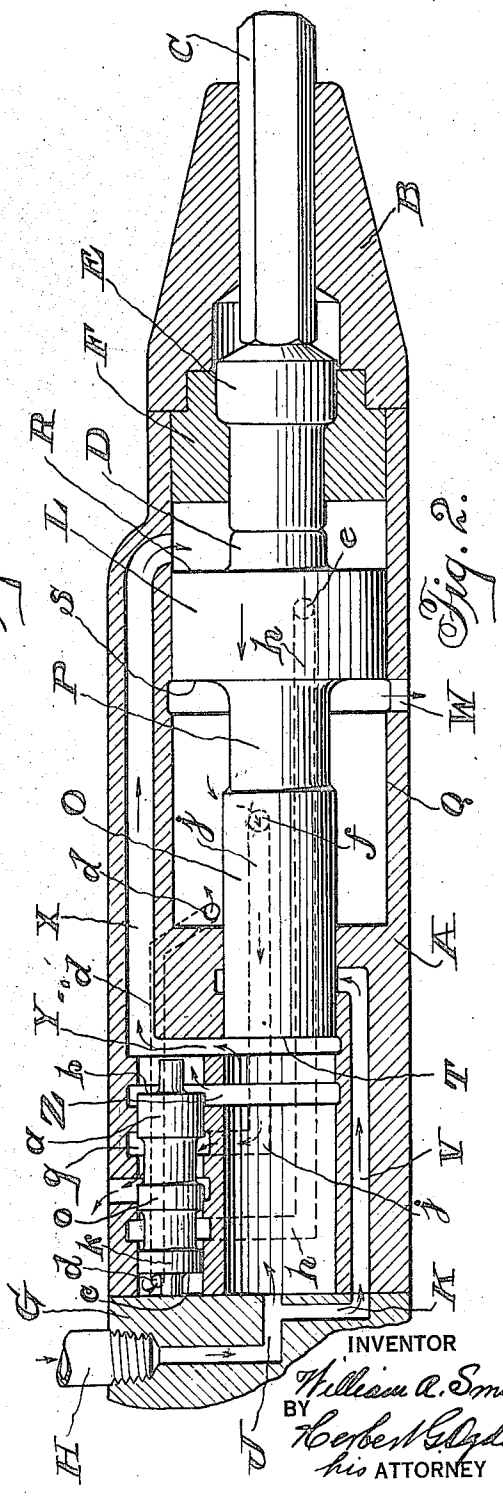


Fig. 2.

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UNITED STATES PATENT OFFICE.

WILLIAM A. SMITH, OF PHILLIPSBURG, NEW JERSEY, ASSIGNOR TO INGERSOLL-RAND COMPANY, OF JERSEY CITY, NEW JERSEY, A CORPORATION OF NEW JERSEY.

ROCK DRILL.

Application filed August 13, 1920. Serial No. 403,357.

To all whom it may concern:

Be it known that I, WILLIAM A. SMITH, a citizen of the United States, a resident of Phillipsburg, county of Warren, State of New Jersey, have invented certain new and useful Improvements in Rock Drills, of which the following is a specification.

This invention relates to fluid actuated rock drills of the hammer type, but more particularly to a rock drill having a percussive element provided with an auxiliary valve for controlling admission of fluid to one end of the cylinder so that the passage for conveying fluid, although ultimately controlled by the piston, will remain open for a greater porton of the return stroke than of the forward stroke.

Such a rock drill is disclosed in U. S. Patent No. 1,096,987 granted May 19, 1914, to Lewis C. Bayles, and the object of the present invention is to provide means controlled by the valve mentioned for relieving compression at one or both ends of the stroke, in order to incorporate the anti-compression feature which proves advantageous with a rock drill of this type in certain classes of work.

To these ends the invention is shown in one of its preferred forms in the accompanying drawings, in which—

Figures 1 and 2 are diagrammatic longitudinal sectional elevations of a rock drill embodying the invention, showing the piston hammer in two different positions.

Referring to the drawings, the cylinder A may be provided with a front head B to receive the drill steel C, and the impact blows of the piston hammer D in this instance are received upon the anvil block E guided in the anvil block holder F. The usual back head G is provided with the inlet H and passages J and K for distribution of motive fluid.

The piston D is of the differential type having a main head L and a shank O of smaller diameter connected to the head L by the reduced neck P. The main head operates in the larger bore Q of the cylinder and the front surface R and the rear surface S of the head respectively form rearwardly and forwardly driving pressure surfaces, in this instance intermittently supplied with fluid pressure in the ends of the larger bore Q. The rear surface T of the shank O forms another forwardly driving surface constantly supplied with fluid pressure in the smaller cylinder bore U.

Fluid pressure is supplied to the rear end of the larger bore of the cylinder through the passage V controlled by the piston shank and communicating with the supply passage K in the back head. The main cylinder bore is exhausted by means of the usual piston controlled exhaust port W.

Fluid pressure is supplied to the front end of the larger bore of the cylinder through the forward supply passage X opening into the constant pressure chamber formed by the smaller cylinder bore through the forward admission port Y adapted to be over-run by the piston shank on its forward stroke and a second or rearward admission port Z controlled by the valve *a* is provided as in U. S. Patent No. 1,096,987. The valve *a* is subjected to the fluctuating pressure in passage X on one operative surface *b* and is subject on an opposed operative surface to the fluctuating pressure behind the main piston head L through the passage *d* communicating with the rear end of the larger cylinder bore.

The rearward admission port Z is so placed that it is uncovered by the piston soon after the piston has passed the median point of its forward stroke. The forward admission port Y is not uncovered until the piston is practically at the forward end of its stroke.

In this instance anti-compression or reliever ports *e* and *f* are shown for the forward and rearward ends of the main cylinder bore Q, communicating with the valve chamber *g* of the valve *a* by means of the passages *h* and *j* respectively, and the valve is provided with the heads *k* and *o* for controlling communication between said anti-compression ports and the atmospheric port *p*. Either or both of said anti-compression ports may be provided as desired.

In the operation of the machine, let it be assumed that the piston is at the end of its rearward stroke and is starting forward as in Figure 1. The valve *a* is in its forward position, closing the rearward admission port Z because the valve surface *b* is open to atmospheric pressure through the passage X and exhaust port W. No fluid will be admitted into the front end of the larger

cylinder bore until the rear surface T of the piston shank has uncovered the forward admission port Y, which will admit fluid pressure to the passage X, and throw the valve to its rearward position shown in Figure 2, because the pressure on the surface C of the valve has been relieved, thus opening the rearward admission port Z and permitting fluid to pass to the forward end of the cylinder through both ports Y and Z, as the port Z is not covered by the piston shank until the piston has traveled a considerable part of its rearward stroke. The admission to the forward end of the cylinder will thus continue for a considerably longer period during the backward stroke of the piston than during the forward stroke.

The object of this construction is that although the fluid is admitted to the forward end of the cylinder through the port Z for the same period of the backward stroke as it would be if there were no valve *a* and thus a full return stroke of the piston is obtained, no fluid is admitted to the forward end of the cylinder during the forward stroke of the piston until it has reached approximately the forward end of its stroke so that a heavy uncushioned blow of the piston is obtained without any increase of fluid consumption.

In addition to the advantages obtained with this construction, there is the added advantage of the anticompression port or ports *e* and *f*, controlled by the same valve which controls the rearward admission port Z so that the machine operates even more efficiently under certain conditions of work.

I claim:

In a fluid operated rock drill of the hammer type, the combination of a cylinder and differential piston having two surfaces for driving it forwardly and one surface for driving it rearwardly, means for constantly supplying fluid pressure to one of the forwardly driving pressure surfaces, passages controlled by the piston for admitting and exhausting pressure in the cylinder to exert an intermittent pressure on the other of the forwardly driving pressure surfaces, means for exerting intermittent pressure on the rearwardly driving pressure surface including a forward supply passage opening into the rearward end of the cylinder through a forward admission port controlled by the piston, anti-compression ports for relieving compression in the intermittently supplied portions of the cylinder and a fluid actuated valve controlling a rearward admission port and the supply of fluid through said forward supply passage to the rearwardly driving pressure surface and also controlling communication between the said anti-compression ports and the atmosphere, said valve having operative surfaces exposed to the pressure on said intermittently supplied surfaces.

In testimony whereof I have signed this specification.

WILLIAM A. SMITH.