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VALVE FOR PERCUSSIVE TOOLS

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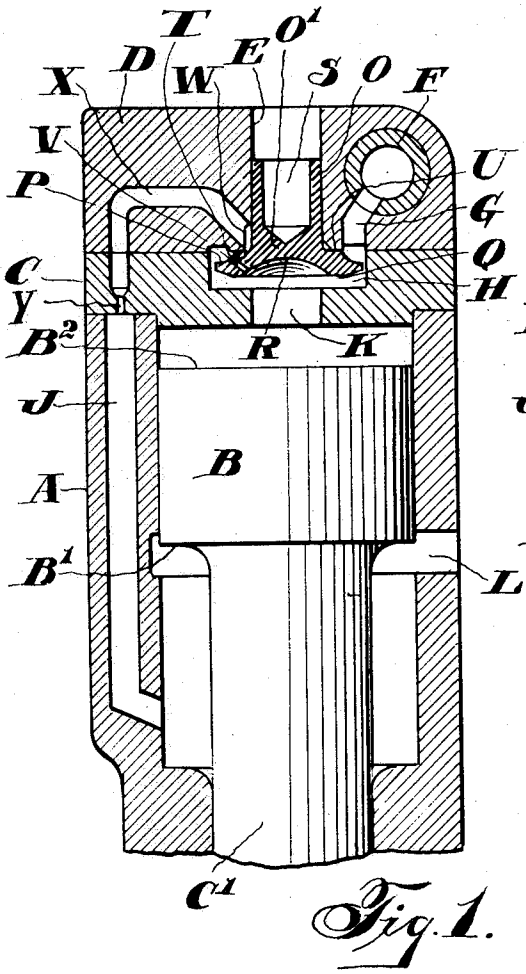


Fig. 1.

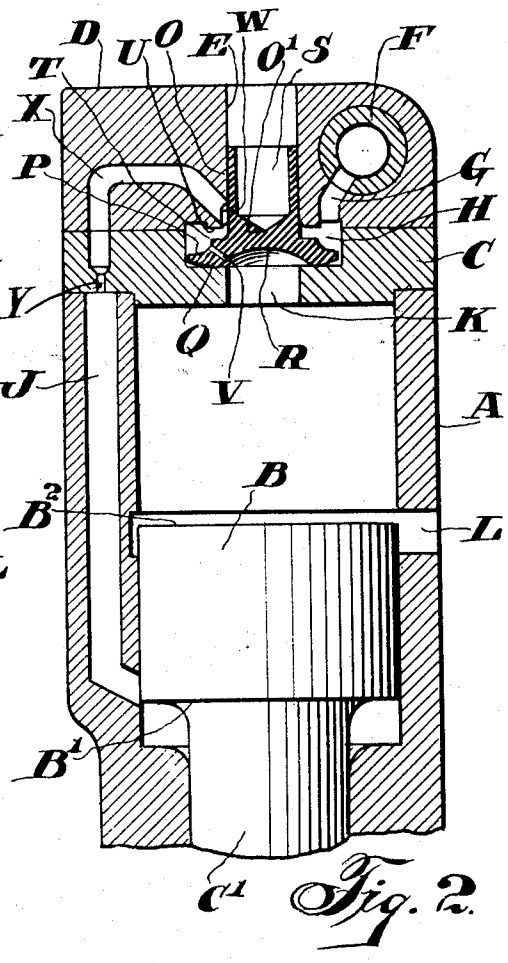


Fig. 2.

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VALVE FOR PERCUSSIVE TOOLS.

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This invention relates to a valve for percussive tools, and more particularly to a valve for that type of tool which is provided with an inlet passage at the extreme end of the cylinder and exhaust passages from points in the cylinder at a distance from the ends of the tool, the valve being in part current thrown.

The objects of this invention are to enable the valve to be actuated rapidly and positively and to materially reduce the consumption of motive fluid for a given amount of work. These objects are obtained by the mechanism illustrated in the accompanying drawings, in which—

Figure 1 is a longitudinal sectional elevation of that part of a percussive tool which will suffice to explain the invention showing the relative positions of the moving parts when the piston is beginning its working stroke, and

Figure 2 is a similar view with the piston on its return stroke.

The tool as shown comprises a cylinder A in which reciprocates a piston B having front and rear faces B′ and B², respectively, and the forward extension C′, which actuates by its impact a drill steel (not shown). A back cylinder washer C forms a closure for the rear end of the cylinder A and to this is secured, by any suitable means, a handle portion D provided with a bore E, a throttle valve F and a passage G leading from the throttle valve to the valve chamber H. Communication between the valve chamber H and the front and rear ends of the cylinder A is provided by the passages J and K respectively. Approximately intermediate the ends of the cylinder A the exhaust port L is placed.

Located in the valve chest and movable lengthwise of its axis is the valve O′, which consists of a cylindrical stem O from which projects a flange P having a flat ring portion Q and a concave face R of greater area than the flange P. In this instance the cylindrical stem of the valve is hollow as at S and its rearward end is constantly exposed to atmospheric pressure. However, it is understood that in practice this stem may or may not be hollow. The rearward face of the flange is provided with the flat portion T and on the rearward face of the valve chamber is the corresponding flat portion U.

When the valve is in its extreme forward position the only communication between the valve chamber H and the back end of the cylinder A is provided by a passage V preferably formed in the valve flange P. The passage V is in constant communication with the pressure fluid supply and is intended primarily for starting the operation of the tool in case the valve O′ should be in its extreme forward position and the piston B in its extreme rearward position. However, this passage V also serves to convey a constant limited supply of pressure fluid to the rearward end of the cylinder to augment the air compressed by the piston for throwing the valve rearwardly.

Leading from a ring groove W and in direct communication with the passage J is a passage X formed in the handle portion D and the cylinder washer C.

The passage J is made large enough to act as a clearance chamber for the front end of the cylinder A in order to keep the pressure therein as low as is possibly consistent with the efficient operation of the tool. A restriction Y in the passage X prevents the waste of pressure fluid since only a small quantity of pressure fluid is required to start the tool.

In operation, supposing the parts to be in the position shown in Figure 2, pressure fluid is admitted to the valve chamber and passes through the passages X and J to the forward end of the cylinder A. The pressure builds up and causes the piston B to move to the rear, closing the exhaust port L and causing pressure to be built up in the rear end of the cylinder A due to the air entrapped therein aided by pressure fluid flowing through the port V. Since the area of the concave surface R exposed to the pressure in the rearward end of the cylinder A is considerably greater than the unbalanced area of the valve flange P exposed to the line pressure, the valve O will be thrown rearwardly before the pressure in the rearward end of the cylinder A attains a value equal to the line pressure. When the valve O′ is thrown, live pressure fluid enters the rearward end of the cylinder A, clearance being provided between the chamber H and the valve flange P, and at the same time pressure fluid escapes from the forward end of the cylinder A through the exhaust port L, which has been uncovered by piston B.

The piston B is next thrown forward on its working stroke, and when it has moved forward a fraction of its total stroke the valve O′ is forced to move forward, closing the passage K. The forward movement of the

valve O′ is due to the movement of the current of motive fluid past the edge of the valve, and the reduced pressure on the underside of the valve O′ due to the velocity of the motive fluid and the rapid drop in pressure in the rear end of the cylinder A caused by the forward movement of the piston B.

Of course it is understood that the areas of the rings Q and T and of the concave face R can be varied, and only one application of the invention is shown here since the principle of operation is the same regardless of the dimensions of those parts of the valve.

What I claim is:

1. In a fluid actuated rock drill, the combination of a cylinder, a valve chest having a valve chamber, inlet passages leading from the valve chamber to the cylinder, a distributing valve in the chamber comprising a stem and a flange, an actuating face on the rearward side of the flange constantly exposed to live pressure fluid for throwing the valve forwardly to admit pressure fluid to the front end of the cylinder, and an actuating face of greater area than the first said actuating face at the front end of the flange intermittently exposed to air compressed by the piston for throwing the valve in position to admit pressure fluid to the rearward end of the cylinder.

2. In a fluid actuated rock drill, the combination of a cylinder, a valve chest having a chamber with an enlarged bore at one end, a seat in the bore, inlet passages leading from the ends of the enlarged bore to the ends of the cylinder, a distributing valve in the chamber comprising a stem and a flange, said stem being of smaller cross sectional area than the seat, an actuating face at the rearward end of the flange constantly exposed to live pressure fluid for throwing the valve forwardly to admit pressure fluid to the front end of the cylinder, and an opposed actuating surface of greater area than the first said actuating surface, the last said actuating surface being intermittently exposed to air compressed by the piston for throwing the valve rearwardly to admit pressure fluid to the rearward end of the cylinder.

3. In a fluid actuated rock drill, the combination of a cylinder, a valve chest having a chamber with an enlarged bore at one end, a seat in the bore, inlet passages leading from the ends of the enlarged bore to the ends of the cylinder, a distributing valve in the chamber comprising a stem and a flange, said stem being of smaller cross sectional area than the seat, the free end of said stem being constantly exposed to atmospheric pressure, an actuating face at the rearward end of the flange constantly exposed to live pressure fluid for throwing the valve forwardly to admit pressure fluid to the front end of the cylinder, and an opposed actuating surface of greater area than the first said actuating surface, the last said actuating surface being intermittently exposed to air compressed by the piston for throwing the valve rearwardly to admit pressure fluid to the rearward end of the cylinder.

In testimony whereof I have signed this specification.

GORDON LEE.