March 2, 1937. H. J. SCHORLE 2,072,607

PERCUSSIVE TOOL VALVE

Filed May 10, 1934

Fig. 1.

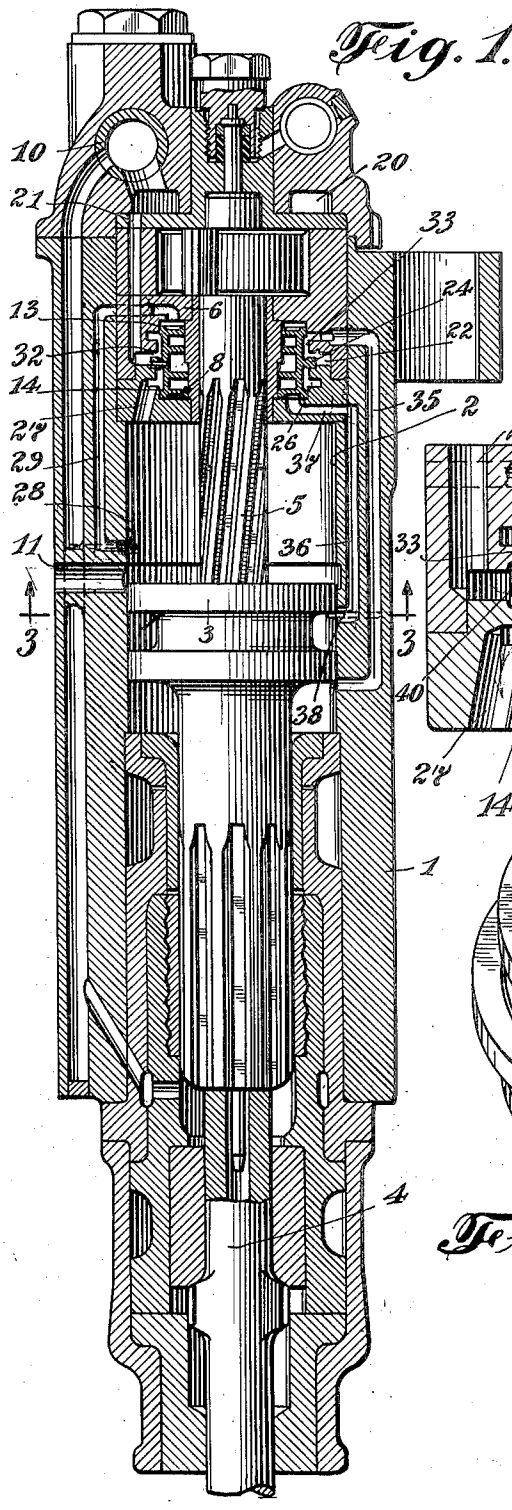


Fig. 3.

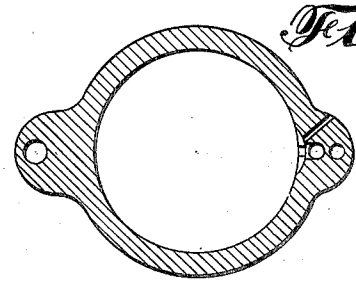


Fig. 2.

Fig. 4.

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PERCUSSIVE TOOL VALVE

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3 Claims. (Cl. 121—18)

This invention relates to percussive tools and more particularly to valves therefor.

An object of the invention is to provide a valve for controlling the distribution of pressure fluid in a percussive tool, which valve is positive and quick in action, one which is thrown by live pressure fluid from the cylinder, and one which will provide a heavy blow of the hammer piston and will materially cut down the consumption of pressure fluid in proportion to the work performed.

With these and other objects in view as may appear from the accompanying specification, the invention consists of various features of construction and combination of parts, which will be first described in connection with the accompanying drawing, showing percussive tool valves of the preferred form, and the features forming the invention will be specifically pointed out in the claims.

In the drawing:

Fig. 1 is a longitudinal section through a percussive tool showing the improved valve applied thereto.

Fig. 2 is an enlarged longitudinal section through the valve chest and valve showing the valve in a different position from which it is shown in Fig. 1.

Fig. 3 is a cross section taken on the line 3—3 of Fig. 1.

Fig. 4 is an isometric view of the valve.

Referring more particularly to the drawing, the improved percussive tool comprises a cylinder 1 having a piston chamber 2 therein in which the piston 3 reciprocates. The piston 3 is of the hammer piston type which strikes the working tool or drill bar 4 to provide the drilling action for the piston and consequently the drill bar 4 will rotate during the drilling operation by means of a rifle bar mechanism 5 of any approved type commonly employed in hammer piston drills.

A valve chest 6 is mounted in the rear end of the cylinder and is provided with a valve chamber 7 therein, in which is mounted the distributing valve 8. The valve 8 controls the distribution of the pressure fluid or compressed air to the cylinder for operating the piston, while the delivery of the pressure fluid to the valve chest 7 is controlled by the throttle valve 10. The cylinder 1 is provided with a free piston-controlled exhaust 11 which opens to the atmosphere.

The distributing valve 8 comprises a substantial cylindrical body 12 which has end flanges 13 and 14 formed at its ends and extending inwardly towards the axis of the body 12. The flange 14 is of greater area than the flange 13. The flanges 13 and 14 are subjected to pressure fluid from the cylinder through suitable ports and passages for throwing the valve. The valve 8 has a pair of internal end flanges 15 and 16 formed thereon inwardly of the end flanges 13 and 14. The flange 16 is of larger area than the flange 15.

During the operation of the percussive tool the pressure fluid enters the annular chamber 20 from the throttle valve 10 and passes through the passageway 21 into the annular channel 22 formed in the valve chest 6. When the valve 8 is in its upper position as shown in Fig. 2 of the drawing, the pressure fluid passes through the restricted space 23 formed by the external flange 24 and the adjacent surface of the valve chest. The flange 24 is formed on the valve 8 substantially intermediate the ends of the valve and initially controls the distribution of the pressure fluid. The pressure fluid also passes through the restricted port 25 formed between the periphery of the body 12 of the valve 8 on the adjacent surface of the valve chest, into the annular channel 26 from which it passes through the inlet passageway 27 into the rear end of the piston chamber 2 for moving the piston 3 forwardly. As the piston 3 moves forwardly, it uncovers the port 28 formed in the cylinder and permits pressure fluid to pass through the port 28 into the passage 29 in the cylinder 1. From the passage 29, the pressure fluid passes through the passage 30 in the valve chest 6 and engages against the outer side of the rearward end flange 13 on the valve 8 for moving the valve 8 forwardly and into the position shown in Fig. 1 of the drawing. Pressure against the flange 14 has been relieved by the opening of the passages 37 and 36 to atmosphere.

When the valve 8 is moved into its forward position as shown in Fig. 1 of the drawing, the flange 24 cuts off the passage of pressure fluid from the annular channel 22 to the rear end of the piston chamber 2 and opens the annular channel 22 to the annular channel 31, through the restrictions formed at 32 and 33 between the flange 24 and the valve chest and the body 12 and the valve chest respectively. From the annular channel 31 the pressure fluid passes through the passageway 35 in the cylinder 1 into the forward end of the piston chamber 2 and moves the piston 3 rearwardly. As the piston 3 moves rearwardly it uncovers the port 38 and permits pressure fluid to pass through the port, through the passage 36 in the cylinder 1 and into and through the passage 37 in the valve chest, sub-

jecting the outer surface of the forward end flange 14 to pressure and as pressure above the flange 13 has been previously exhausted through the passages 30 and 29 and through the exhaust opening 11, this live air pressure will move the valve 8 rearwardly and into the position shown in Fig. 2 of the drawing at which time pressure fluid is delivered to the rear end of the piston chamber 2. The pressure above the flange 13 exhausts through the passages 30 and 29 and the exhaust port 11 after the piston 3 has uncovered the port 28 and the exhaust 11 during its downward movement. This cycle of operation is repeated to provide drilling operation.

The flange 24 and body 8 are provided with a leak port 40 which opens from the annular channel 22 into the interior of the body 12 of the valve 8 between the flanges 15 and 16 to permit a limited quantity of pressure fluid to enter the space between the flanges 15 and 16 and act on these flanges for holding the valve in position until the pressure against either of the end flanges 13 or 14 becomes great enough to move the valve. The greater area of the flange 16 with respect to the area of the flange 15 prevents centering of the valve. The difference in area between the flanges 16 and 15 is, however, balanced by the difference in area between the flanges 13 and 14 so that with valve throwing pressure against the larger area of the flange 14, the pressure fluid acting on the under side of flange 24 will hold the valve seated in its rearward position. The differences in area of the flanges 15 and 16 will facilitate the forward throwing or movement of the valve and compensate for the differences in area between the flanges 13 and 14 for holding the valve in its forward position during the proper interval in each cycle of operation of the valve.

By particular reference to Fig. 2 of the drawing, it will be noted that the flange 16 is of greater area than the flange 15. This is provided to prevent centering of the valve during operation. While the flange 16 is shown in the drawing as having a greater area, it is to be understood that either of the flanges 15 or 16 may have the greater area, without departing from the spirit of the present invention.

It will be understood that the invention is not to be limited to the specific construction or arrangement of parts shown but that they may be widely modified within the invention defined by the claims.

What is claimed is:

1. In a percussive tool, the combination, of a cylinder having a piston chamber and an exhaust port therein, a piston in said chamber, a valve chest having a valve chamber therein, inlet passages leading from said valve chamber to said piston chamber, a valve in said valve chamber including a cylindrical body, said valve chest provided with a pressure fluid supply passage, a central flange on said valve body for controlling communication between said supply passage and said inlet passages, valve throwing flanges on the ends of said valve body, a pair of internal flanges formed on said body intermediate said throwing flanges, and a leak port through said body to deliver pressure against said internal flanges for holding said valve in position.

2. In a percussive tool, the combination, of a cylinder having a piston chamber and an exhaust port therein, a piston in said chamber, a valve chest having a valve chamber therein, inlet passages leading from said valve chamber to said piston chamber, a valve in said valve chamber including a cylindrical body, said valve chest provided with a pressure fluid supply passage, a central flange on said valve body for controlling communication between said supply passage and said inlet passages, valve throwing flanges on the ends of said flange body, a pair of internal flanges formed on said body intermediate said throwing flanges, and a leak port through said body to deliver pressure against said internal flanges for holding said valve in position, one of said internal flanges being of greater area than the other to prevent centering of the valve.

3. In a percussive tool, the combination, of a cylinder having a piston chamber and an exhaust port therein, a piston in said chamber, a valve chest having a valve chamber therein, inlet passages leading from said valve chamber to said piston chamber, a valve in said valve chamber including a cylindrical body, said valve chest provided with a pressure fluid supply passage, a central flange on said valve body for controlling communication between said supply passage and said inlet passages, internal end flanges formed at the ends of said body, said cylinder provided with piston-controlled ports and said cylinder and valve chest provided with passages communicating with said ports to deliver pressure fluid against said internal end flanges for throwing the valve, a pair of central internal flanges formed on said body and a leak port through said body to deliver pressure fluid against said central internal flanges for holding said valve in position.

HERMAN J. SCHORLE.