A. H. TAYLOR.

PNEUMATIC TOOL.

APPLICATION FILED FEB. 17, 1910.

1,068,712. Patented July 29, 1913.

Fig. 2.

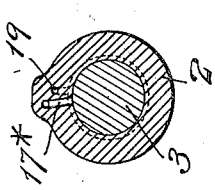


Fig. 1.

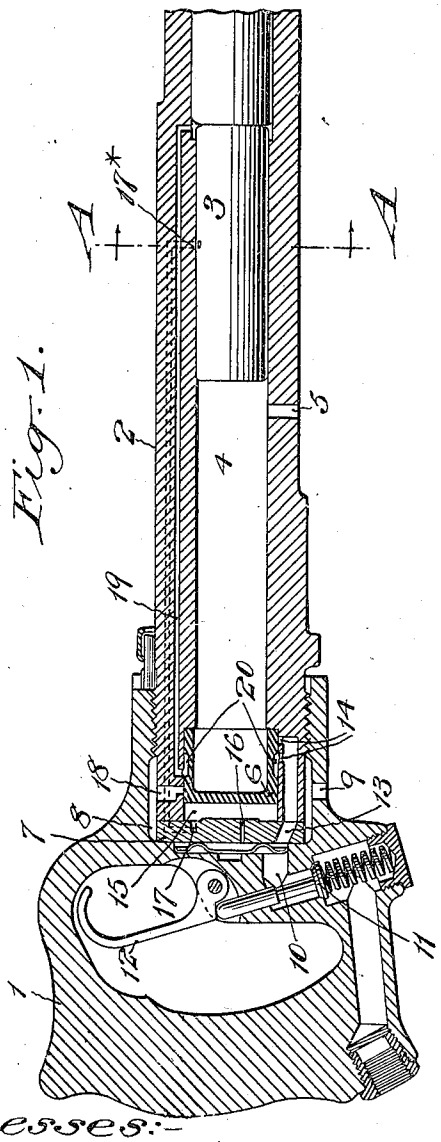
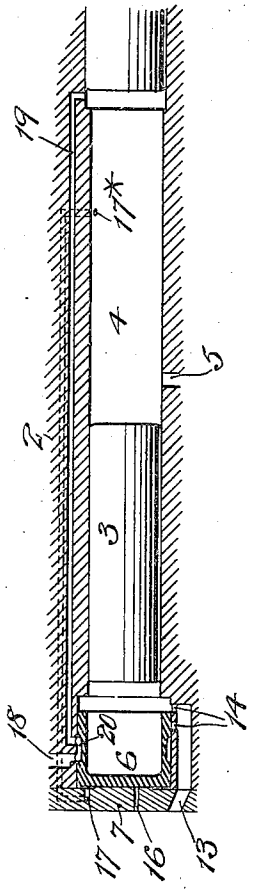


Fig. 3.



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UNITED STATES PATENT OFFICE.

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PNEUMATIC TOOL.

1,068,712. Specification of Letters Patent. Patented July 29, 1913.

Application filed February 17, 1910. Serial No. 544,484.

To all whom it may concern:

Be it known that I, ALBERT H. TAYLOR, a citizen of the United States, and resident of Easton, in the county of Northampton and State of Pennsylvania, have invented a new and useful Improvement in Pneumatic Tools, of which the following is a specification.

This invention relates to a pneumatic tool in which the motive fluid, for example, compressed air, which operates the hammer piston is controlled by a reciprocating valve mounted in the end of the cylinder, the pressure of the motive fluid on the opposite ends of the valve being under the control of the hammer piston.

A practical embodiment of the invention is represented in the accompanying drawings in which,

Figure 1 is a view in longitudinal section through a pneumatic tool, showing the hammer piston at the forward end of its stroke, Fig. 2 is a transverse section in the plane of the line A—A of Fig. 1, and Fig. 3 is a partial longitudinal section showing the hammer piston in a rearward position.

The handle of the tool is denoted by 1, its cylinder by 2 and its hammer piston by 3. The hammer piston chamber 4 is provided intermediate its ends with an exhaust port 5 leading through the cylinder wall to external atmosphere, which exhaust port is alternately closed and opened to the front and rear of the hammer piston as the piston reciprocates. A cylindrical imperforate cup-shaped slide valve 6, in the present instance, a hollow cylinder, is fitted to reciprocate lengthwise of the tool within an enlargement of the piston chamber 4, at the rear end of the cylinder, a plate 7 being interposed between the rear end of the cylinder and the handle. The parts are so constructed and arranged that the piston 3 may enter and cushion in the said cup-shaped valve 6. A chamber 8 surrounds the rear end of the cylinder 2, which chamber is provided with an exhaust port 9 leading through the handle wall to external atmosphere.

The motive fluid feed passage 10 in the handle 1, is manually opened and closed by the usual throttle valve 11 and trigger 12. An air inlet passage 13 leads through the plate 7 and into the wall at the rear end of the cylinder 2, which passage is provided with a port 14 opening to the face of the valve 6. The motive fluid is allowed to enter a chamber 15 at the back of the valve 6, through an inlet port 16 extending through the plate 7 and is allowed to escape from the chamber 15 through an outlet port 17 which extends within the plate 7 toward the outer face of the same and thence extends through the plate 7 into the wall of the cylinder 2 and longitudinally along the wall of the cylinder 2 to a point 17* where it opens into the interior of the hammer piston chamber 4. The point 17* where the port 17 opens into the hammer piston chamber 4, is preferably located a distance back from the forward end of the chamber 4 equal to about one-half the length of the hammer piston so that the port 17 will be closed by the hammer piston when in its forward position as shown in Fig. 1, and will be opened after the piston has moved half its length or thereabout on its backward stroke.

The front of the valve 6 is at all times in open communication with the hammer piston chamber 4, at the back of the hammer piston 3.

An exhaust passage 18 leads from the face of the valve 6 to the chamber 8. Another passage 19 leads from the face of the valve 6 longitudinally along within the wall of the cylinder 2 to the front end of the hammer piston chamber 4.

A circumferential port 20 in the valve 6 serves to open communication from the air inlet port 14 to the passage 19 when the valve 6 is at the limit of its forward movement and to open communication from the passage 19 to external atmosphere through the exhaust passage 18, chamber 8 and exhaust port 9 when the valve is at the limit of its rearward movement. The valve 6 is also so formed that when at the limit of its forward movement, communication from the air inlet port 14 to the chamber 4 back of the hammer piston 3 is closed and when at the limit of its rearward movement communication between the inlet port 14 and the chamber 4 back of the hammer piston 3 is opened.

In operation, suppose the hammer piston 3 to be located at the forward end of its stroke, as shown in Fig. 1, and the valve 6 at the forward limit of its stroke opening communication through its annular port 20 between the inlet passage 13, port 14 and passage 19 to the front end of the hammer

piston. If now the valve 11 be opened, the motive fluid will enter the chamber 15 back of the valve 6, through the port 16 and because of the closure of the port 17 by the piston 3, the confined pressure will hold the valve 6 at the limit of its forward stroke. This will permit the motive fluid to pass through the port 14 and annular port 20 to the passage 19 leading to the front of the piston 3 and will start the piston 3 on its rearward movement. During this starting movement of the hammer piston 3, the hammer piston chamber 4 will be relieved of pressure by the port 5. Soon after the hammer piston 3 closes the port 5 and begins to compress the air in the chamber 4 at the rear of the piston, the port 17 will be opened to the hammer piston chamber 4 in front of the hammer piston at the point 17*, so that as pressure accumulates in the hammer piston chamber 4 at the rear of the piston 3, it will be reduced in the chamber 15 at the back of the valve 6 until as the hammer piston 3 nears the limit of its rearward stroke, the pressure in front of the valve 6 will overbalance the pressure to the rear of the valve 6 and the latter will be thrown rearwardly into the position shown in Fig. 3. This movement of the valve 6 will open the inlet passage 13 through the port 14 to the hammer piston chamber 4 at the rear of the hammer piston and will start the hammer piston on its forward or driving stroke. During the early part of this stroke, the hammer piston chamber 4 will be relieved of pressure in front of the hammer piston both through the port 5 and also through the passage 19 which communicates through the annular port 20 in the valve with the port 18, chamber 8 and port 9 with the external atmosphere. After passing the port 5, the chamber 4 in front of the hammer piston will still be open to atmosphere through the passage 19 and the ports above stated, and as the hammer piston passes the point 17* and delivers its stroke, the closure of the port 17* will cause pressure to accumulate in the chamber 15 back of the valve 6, while pressure in front of the said valve will be relieved through the port 5 and the valve 6 will be promptly thrown forward into the position shown in Fig. 1, when the chain of operations hereinabove enumerated will be repeated.

The full pressure of the motive fluid momentarily upon the back of the valve 6 tends to throw it forwardly with great promptness, while the relief of this pressure is provided for at the proper time to permit the valve to be thrown promptly rearward.

What I claim is:

1. In a pneumatic tool, a piston, its chamber, an imperforate cup-shaped valve open toward the piston chamber whereby the piston may enter the valve and cushion therein, the valve chamber, a fluid supply source, ports opened and closed by said valve for controlling the operation of the piston and separate reduced pressure and exhaust ports leading from the back of the valve chamber respectively to the supply source and to a point a distance back from the front end of the piston chamber whereby the valve is thrown forwardly by a constant reduced pressure and rearwardly by the compression of air between the valve and piston.

2. In a pneumatic tool, a piston, its chamber, an imperforate cup-shaped valve open toward the piston chamber whereby the piston may enter the valve and cushion therein, the valve chamber forming an extension of the rear end of the piston chamber, a fluid supply source, ports opened and closed by said valve for controlling the operation of the piston and separate reduced pressure and exhaust ports leading from the back of the valve chamber respectively to the supply source and to a point a distance back from the front end of the piston chamber whereby the valve is thrown forwardly by a constant reduced pressure and rearwardly by the compression of air between the valve and piston.

3. In a pnuematic tool, a piston, its chamber, an imperforate cup-shaped valve open toward the piston chamber whereby the piston may enter the valve and cushion therein, the valve chamber, a fluid supply source, ports bringing the piston and valve chambers into communication with each other, the fluid supply source and external atmosphere, said valve having a single port for opening and closing communication between the front end of the piston chamber, the supply source and external atmosphere, the front end of said valve also serving to open and close communication between the rear end of the piston chamber and the supply source and separate reduced pressure and exhaust ports leading from the back of the valve chamber, respectively, to the supply source and to a point a distance back from the front end of the piston chamber whereby the valve is thrown forwardly by a constant reduced pressure and rearwardly by the compression of air between the valve and piston.

4. In a pneumatic tool, a piston, its chamber, an imperforate cup-shaped valve open toward the piston chamber whereby the piston may enter the valve and cushion therein, the valve chamber forming an extension of the rear end of the piston chamber, a fluid supply source, ports bringing the piston and valve chambers into communication with each other, the fluid supply source and external atmosphere, said valve having a single port for opening and closing communication between the front end of the piston chamber, the supply source and ex-

ternal atmosphere, the front end of said valve also serving to open and close communication between the rear end of the piston chamber and the supply source and separate reduced pressure and exhaust ports leading from the back of the valve chamber respectively to the supply source and to a point a distance back from the front end of the piston chamber whereby the valve is thrown forwardly by a constant reduced pressure and rearwardly by the compression of air between the valve and piston.

In testimony, that I claim the foregoing as my invention, I have signed my name in presence of two witnesses, this 14th day of February, 1910.

ALBERT H. TAYLOR.

Witnesses:
RUSSELL H. WILHELM,
GEO. J. HARTMAN.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."