A. H. TAYLOR.

PNEUMATIC TOOL.

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1,068,711.

Patented July 29, 1913.

Fig. 1.

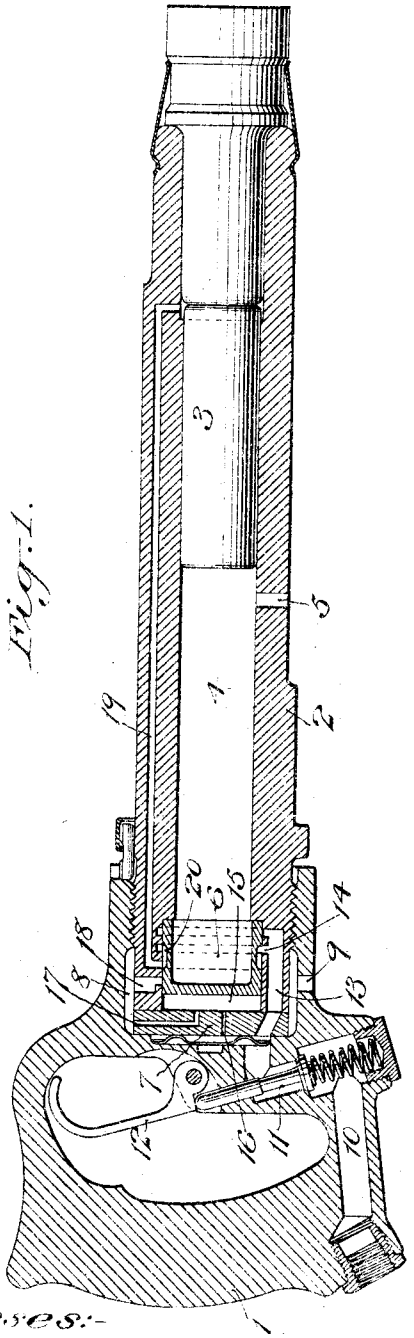
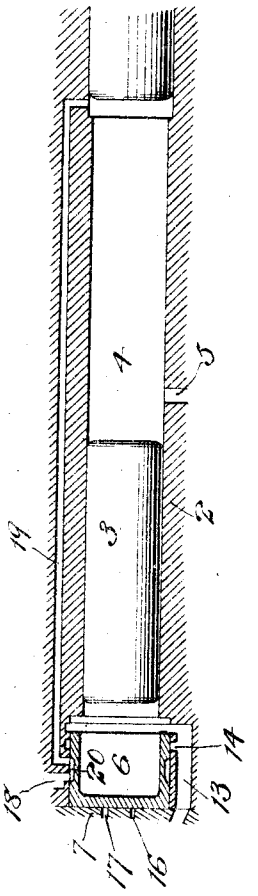


Fig. 2.



Witnesses:-
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UNITED STATES PATENT OFFICE.

ALBERT H. TAYLOR, OF EASTON, PENNSYLVANIA, ASSIGNOR TO INGERSOLL-RAND COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW JERSEY.

PNEUMATIC TOOL.

1,068,711. Specification of Letters Patent. Patented July 29, 1913.

Application filed November 17, 1909. Serial No. 528,533.

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 consists in certain improvements in that type of pneumatic tool in which the valve which controls the operation of the hammer piston is subjected to a constant reduced pressure tending to throw the valve in one direction and an intermittent high pressure for throwing the valve in the other direction.

The object of my invention is to provide a pneumatic tool of the type above set forth, in which the parts are so constructed, arranged and operated that a very small valve may be employed; in which the tool may be operated at a high speed; in which the construction is very simple and by which the tool may be easily held during its operation without undue strain upon the operator.

In the accompanying drawings, Figure 1 is a view in longitudinal central section through a pneumatic tool embodying my invention, the hammer piston being shown at the limit of its forward movement and the valve being shown in position to open air pressure to the front end of the hammer piston, and Fig. 2 is a detail longitudinal central section the hammer piston being shown in a rearward position and the valve being shown in position to open air pressure to the back of the hammer piston and to open the passage leading to the front of the hammer piston to external atmosphere.

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 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 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 compressed air 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 9. A constant reduced pressure is exerted upon the back of the valve 9 by allowing the compressed air to enter the valve chamber 15 through the port 16 and escape from said valve chamber 15 through the port 17 into the chamber 8 and thus to external atmosphere through the exhaust port 9. 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 front end of the hammer piston chamber 4 lengthwise through the cylinder 2 to the face of the valve 6.

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. This valve 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, presupposing the parts to be in the position shown in Fig. 1, with the chamber space back of the hammer piston 3 open to external atmosphere through the exhaust port 5; the constant reduced pressure on the back of the valve 6 will hold the valve at the limit of its forward movement thus closing communication between the air inlet 14 and the chamber 4 back of the hammer piston 3 and opening

communication from said air inlet port 14 to the chamber 4 in front of the hammer piston 3 through the port 20 and passage 19. This pressure will start the hammer piston on its rearward movement. After the hammer piston has passed the exhaust port 5 on its rearward movement, it will compress the air sufficiently to exert a pressure upon the front of the valve 6 to overcome the constant reduced pressure upon the back of the valve thus throwing the valve to the limit of its rearward movement as shown in Fig. 2, and thereby opening the chamber 4 at the back of the piston 3 to the compressed air feed and, at the same time, opening the passage 19 to external atmosphere through the valve port 20, exhaust port 18, chamber 8 and exhaust port 9. This will permit the piston to be forced in the opposite direction, when the cycle of operations hereinbefore described will be repeated as long as the tool is in operation.

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, separate reduced pressure and exhaust ports leading from the back of the valve chamber respectively to the supply source and to external atmosphere 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, 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 supply source.

3. 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 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 external atmosphere 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 an impact tool, a cylinder, a reciprocating piston therein, an imperforate cup-shaped valve open toward and arranged in alinement with said piston whereby the piston may enter and cushion within the valve and means for shifting said valve forwardly by reduced air pressure, and means for enabling said valve to be shifted rearwardly by the movement of said piston.

5. In an impact tool, a cylinder, a reciprocating piston therein, inlet and exhaust passages for the motive fluid, an imperforate cup-shaped valve movable in a chamber at the rear end of the cylinder and open toward the piston whereby the piston may enter and cushion within it, and means for enabling said valve to be shifted forwardly by reduced air pressure and rearwardly by the movement of the piston.

6. In an impact tool, a cylinder, a reciprocating piston therein, an imperforate cup-shaped valve, located at the rear of said piston, in alinement therewith and open toward the piston whereby the piston may enter and cushion within it, said cylinder having ports and passages for causing said valve to be shifted forwardly by reduced air pressure, and means for enabling said valve to be shifted rearwardly by the movement of said piston.

7. In an impact tool, a cylinder, a reciprocating piston therein, an imperforate cup-shaped valve arranged in alinement with said piston and moving in the same direction as the latter, said piston being adapted to enter said valve, means for shifting said valve forwardly by reduced air pressure and means for enabling said valve to be shifted rearwardly by the movement of said piston.

In testimony, that I claim the foregoing as my invention, I have signed my name in presence of two witnesses, this twelfth day of November 1909.

ALBERT H. TAYLOR.

Witnesses:

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