No. 754,956. PATENTED MAR. 15, 1904.

C. W. PECK.

PNEUMATIC TOOL.

APPLICATION FILED JAN. 30, 1901.

NO MODEL.

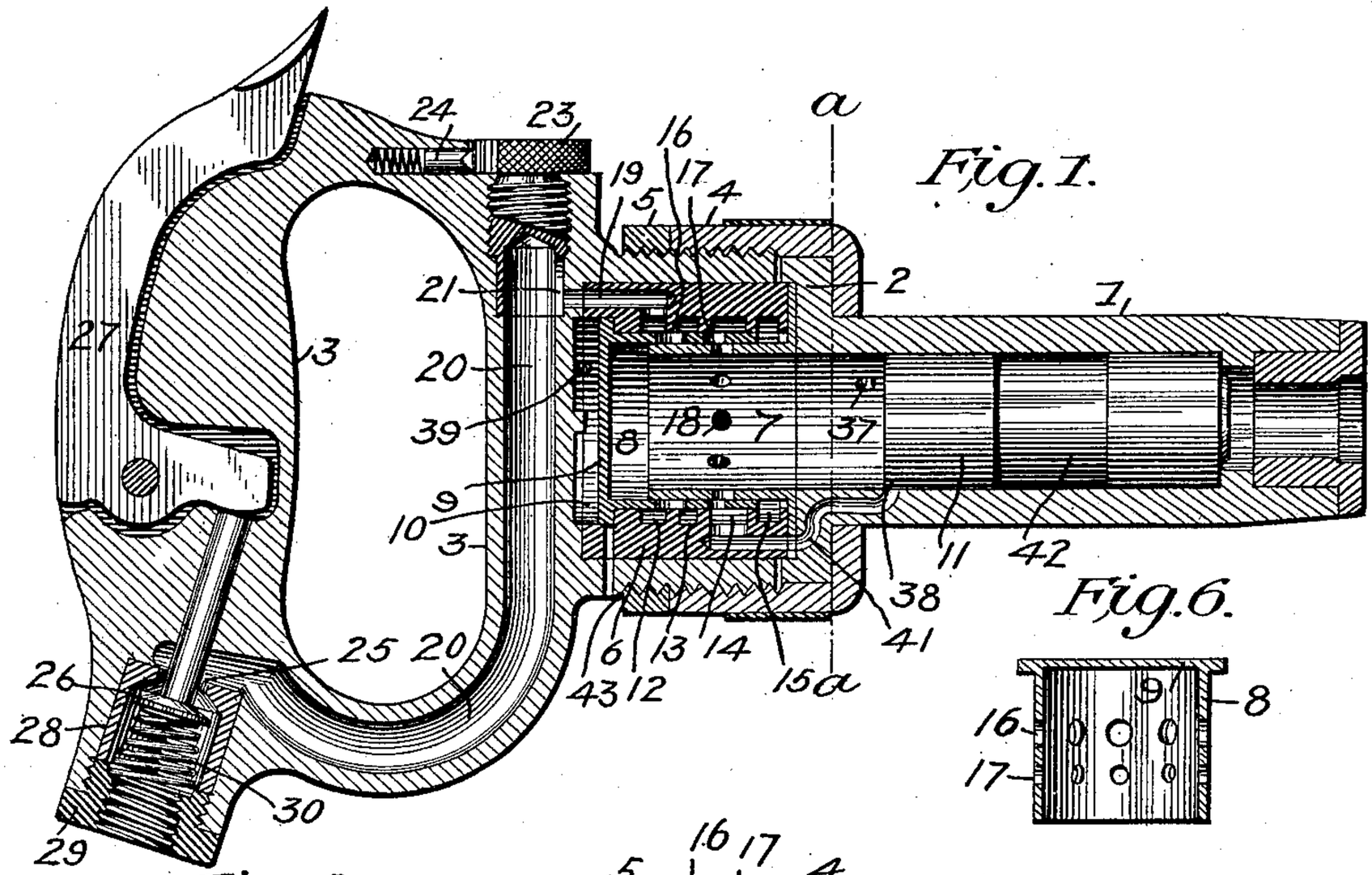

Fig. 1.

Fig. 6.

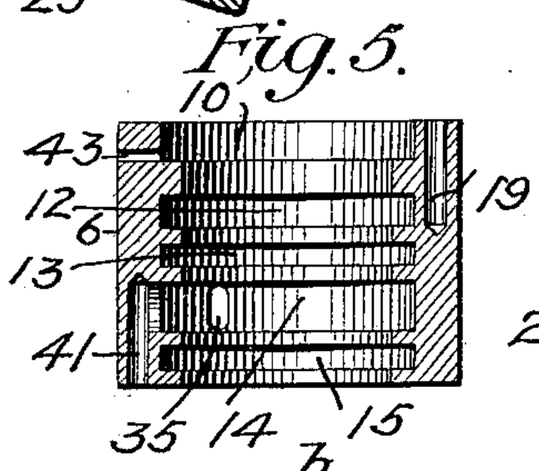

Fig. 5.

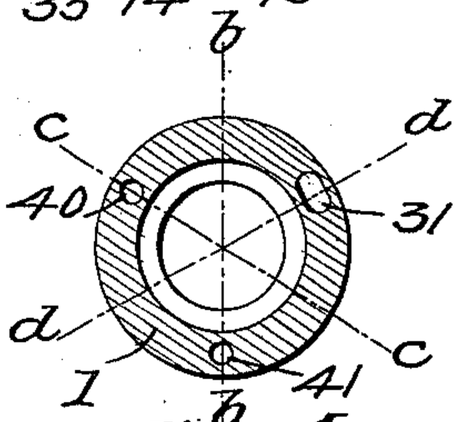

Fig. 4.

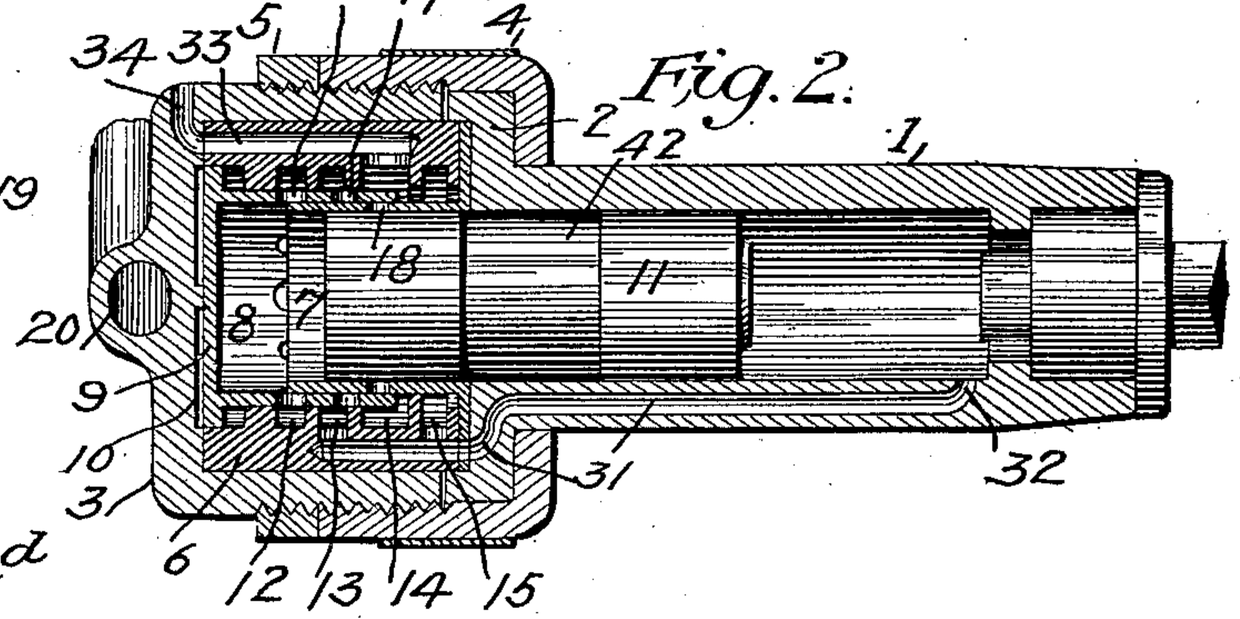

Fig. 2.

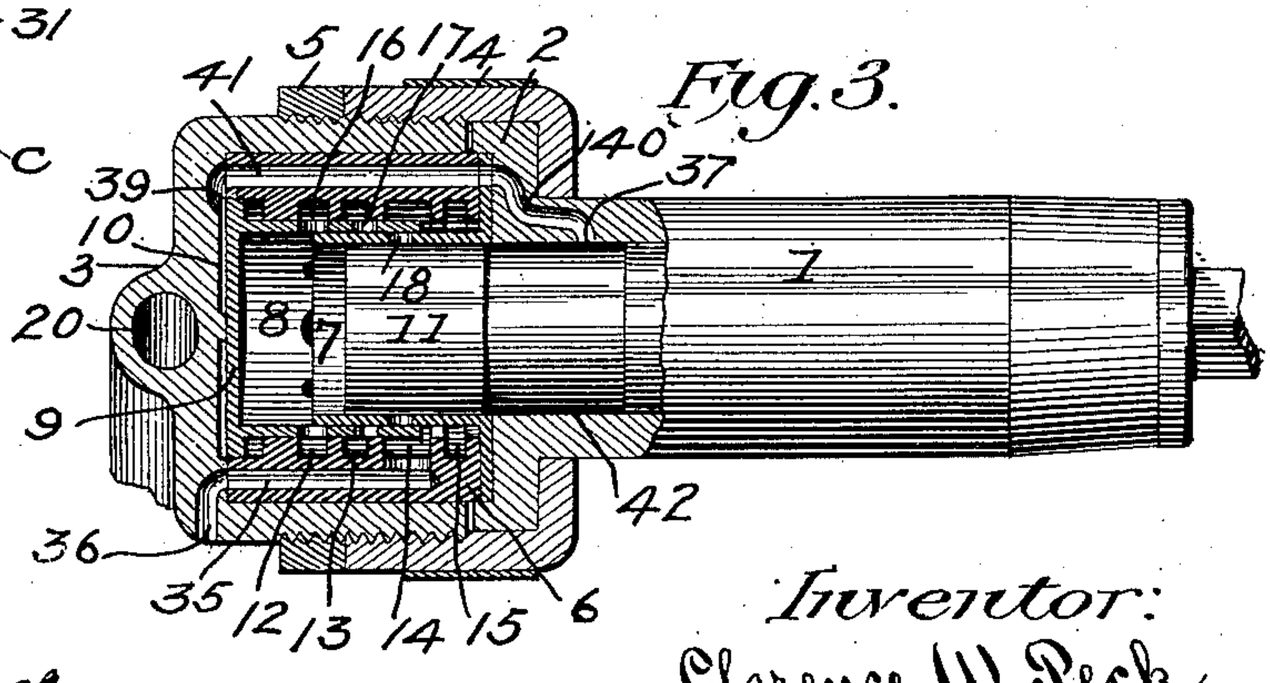

Fig. 3.

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No. 754,956. Patented March 15, 1904.

UNITED STATES PATENT OFFICE.

CLARENCE W. PECK, OF PAINTED POST, NEW YORK, ASSIGNOR, BY DIRECT AND MESNE ASSIGNMENTS, TO IMPERIAL PNEUMATIC TOOL COMPANY, OF ATHENS, PENNSYLVANIA.

PNEUMATIC TOOL.

SPECIFICATION forming part of Letters Patent No. 754,956, dated March 15, 1904.

Application filed January 30, 1901. Serial No. 45,344. (No model.)

To all whom it may concern:

Be it known that I, CLARENCE W. PECK, a citizen of the United States, residing at Painted Post, in the county of Steuben and State of New York, have invented certain new and useful Improvements in Pneumatic Tools, of which the following is a specification.

My invention relates to improvements in pneumatic tools wherein a piston reciprocated by compressed air is made to drive various tools, such as are used in chipping, calking, drilling, and like operations.

The objects of my improvements are, first, to provide a tool of this nature with a valve and valve-box which shall be simple in construction and operation and whereby certain desirable results may be attained, as will hereinafter appear; second, to provide means for cushioning the piston on the return stroke, whereby the jar upon the operator is greatly lessened, and to utilize the cushioning effect to actuate the valve; and, third, to provide certain other novel features of construction, such as will appear hereinafter and be more particularly pointed out in the claims.

I attain the objects of my improvements by means of the construction and arrangement of parts as illustrated in the accompanying drawings, wherein I have shown my invention as applied to a pneumatic hammer, and in which—

Figure 1 represents a vertical longitudinal section of my complete tool on the line *b b* in Fig. 4; Fig. 2, a section of the cylinder and valve-chest on the line *d d* in Fig. 4; Fig. 3, a similar section on the line *c c* in Fig. 4; Fig. 4, a transverse section of the barrel on the line *a a* in Fig. 1, and Figs. 5 and 6 details showing the valve and valve-box in longitudinal section.

Similar numerals refer to like parts throughout the several views.

1 represents the barrel of the tool, which is coupled to the handle 3 by means of its flange 2 and the coupling-nut 4, this nut 4 being locked upon the handle 3 by means of the jam-nut 5. Within an annular chamber in the handle 3 is located a cylindrical valve-box 6, and within this valve-box is located a bushing 7, which forms a prolongation of the barrel 1. This bushing and the valve-box are held in place within the handle by means of the flange 2 on the barrel in the manner shown.

8 represents a cylindrical cup-shaped valve, the walls of which travel in the annular space provided therefor between the bushing 7 and the valve-box 6. This valve is provided with a head 9, which is larger in diameter than the valve-body and travels within the chamber 10 at the inner end of the valve-box 6. The piston 11 is shown at the extreme of its outward throw in Fig. 1 and near its innermost position in Figs. 2 and 3.

12, 13, 14, and 15 represent annular grooves in the inner wall of the valve-box 6, which communicate with the several ports and passages to and from the cylinder, as will hereinafter appear. The valve 8 is provided with two series of ports 16 and 17, whereby the admission and exhaust are controlled.

18 represents a series of ports in the bushing 7 with which the ports 17 in the valve communicate.

Admission to the valve-box 6 takes place through the passage 19, which leads from the inlet-passage 20 in the handle to the groove 12 in the valve-box. The amount of opening from the inlet-passage 20 to the passage 19 is controlled by the screw-plug 23, the inner end of which is provided with a bore corresponding with that of the passage 20 and with a slot at 21 so positioned as to give full opening between passages 19 and 20 when the plug is screwed down into the position shown in Fig. 1. The head of the plug 23 is serrated at one side, the serrations being engaged by the spring-pressed pin 24, whereby the plug is held in any position it may be set, it being apparent that as the plug is screwed outwardly the slot 21 will close the opening between passages 19 and 20 more or less, according to the degree of turn given to the plug. Thus the passage 19 may be set at full-open, half-open, quarter-open, &c., and the speed of the

piston regulated and controlled accordingly. This provides for a positive and steady control of the piston speed, which will be found difficult to acccomplish by the throttle-valve alone.

Admission to the inlet-passage 20 is controlled by the throttle-valve 26, which closes against the valve-seat 25 and is operated by the lever 27. The valve-seat 25 is formed at the end of a cylindrical bushing 28, which is inserted in a bore in the handle 3 and held therein by the cap 29, which cap is bored and tapped to receive the coupling from the air-hose. The valve 26 is held up normally against this seat by the spring 30 and by the air-pressure when coupled to the supply-hose. This arrangement of the throttle-valve and its seat will be found simple and effective and by it, conjointly with the regulating-plug or controller 23, full and perfect control of the air-supply to the valve-box 6 is attained.

Having thus described the principal parts of my device and their relative arrangement, the operation will be found to be as follows: The controller 23 having been set for the desired air-supply and the tool having been placed in position with the throttle-valve thrown open, the air will pass from the hose through the passage 20 into the passage 19 and thence into the groove 12. In the position assumed for the parts in Fig. 1 the piston 11 is at its extreme outward throw and the valve 8 is shown in position to supply air for the return stroke. For this purpose the air will pass through groove 12 by way of the ports 16 into the groove 13, thence passing by way of the passage 31 and port 32 (see Fig. 2) to the outer end of the cylinder, thereby throwing the piston inward. The air from behind the piston is exhausted by way of the ports 17 and 18 in the bushing 7 and valve 8, respectively, into the groove 14, whence it passes through the passages 33 and 35 to the exhaust-openings 34 and 36. (See Figs. 2 and 3.) As the piston approaches the end of its inward stroke the groove 42, formed in the periphery of the piston, will place the ports 37 and 38 in communication with one another, thereby opening the chamber 10 behind the valve-head 9 to the exhaust by way of the port 39 and passages 40 (see Fig. 3) and 41. (See Fig. 2.) This relieves the pressure from behind valve 8, and as soon as the piston has passed beyond the ports 18 the air confined between the piston and the head 9 of the valve 8 will cause the valve to be thrown to its inward position, as shown in Figs. 2 and 3, and the compression of the air will also cushion the piston at this end of its stroke. As soon as the valve 8 has assumed its inward position the ports 16 will open communication from the groove 12 to the cylinder behind the piston over the rim of the bushing 7, as shown in Figs. 2 and 3, the ports 17 being thrown out of register with the ports 18. The piston will now be thrown forward on its outward stroke, exhaust of the air in front of the piston taking place through port 32 and passage 31 into groove 15, whence it finds its way into groove 14 and thence to the exhaust-outlets by way of the annular passage between these two grooves, thrown open by the valve 8 on its inward movement. When the piston has reached its outward position, the air behind it will pass through port 37, passage 40, and port 39 into chamber 10 and pressing upon the head 9 of the valve, will throw the valve outward into the position shown in Fig. 1, this motion of the valve being due to the larger diameter of the head 9 in the chamber 10, the rim of the head being relieved from back pressure within the chamber 10 by reason of the passage 43. The ports are now in position for the return stroke, and the cycle of operation, as above described, will be repeated until the throttle-valve has been closed and at a speed corresponding to the adjustment of the controller.

It will be noted that by reason of the cup-shaped valve in axial alinement with the cylinder and the inward prolongation of said cylinder by the bushing 7 the distance between the handle and the end of the tool has been made as short as possible without lessening the throw of the piston and that also by reason of this valve-and-cylinder arrangement the size and weight of the tool will be at a minimum. The parts of the valve mechanism are very few in number and simple in construction. As shown herein, the bushing 7 is formed of a separate piece, being held in place between the flange 2 of the barrel and the valve-box 6 by means of its flanged rim. I do not wish, however, to be limited to this construction, as it will be apparent to those skilled in the art that this bushing or prolongation of the cylinder may be formed integrally with the cylinder itself. I would also point out that by reason of my construction all the parts of the valve mechanism may be readily removed for cleaning and repairs by simply uncoupling the cylinder 1 from the handle 3 and that when placed in proper relative positions they will be firmly held in such positions by means of the coupling-nut 4 and jam-nut 5. Finally, while I have shown and described the valve as being actuated for its rearward stroke by the air compressed between it and the returning piston I do not limit myself to this, since the cup-like valve may be used to good purpose without utilizing the compressed air for shifting the valve and still remain within the intended scope of my invention.

Having thus described my improvements, what I claim as my invention, and desire to secure by Letters Patent, is—

1. The combination, in an impact-tool, of a cylinder, a reciprocating piston therein, an open-ended ported valve movable in line with the piston in a chamber at one end of the cyl-

inder, said valve having a head of greater diameter than its body, and means for directing a flow of motive fluid to said enlarged head to throw the valve in one direction, the valve being moved in the opposite direction by the motive fluid compressed within the interior of the same by the moving piston.

2. The combination, in an impact-tool, of a cylinder, a reciprocating piston therein, an open-ended ported valve movable in line with the piston in a chamber at one end of the cylinder, said valve having a head of greater diameter than its body, means for directing the motive fluid around the outside of said body so that the valve will be balanced in its chamber during the inlet and exhaust of the motive fluid, and means for directing a flow of motive fluid to the enlarged head of the valve to throw the same in one direction, the valve being thrown in the opposite direction by the motive fluid compressed within the interior of the valve by the moving piston.

3. The combination, in an impact-tool, of a cylinder, a reciprocating piston therein, inlet and exhaust passages for the motive fluid, a cup-like valve movable in a chamber at the rear end of the cylinder, into which chamber the rear end of the piston passes as it approaches the rearward end of its stroke, and means for shifting said valve by the motive fluid to change the direction of flow of the motive fluid to and from the ends of the cylinder.

4. The combination, in an impact-tool, of a cylinder, a reciprocating piston therein, inlet and exhaust passages for the motive fluid, a cup-like valve movable in a chamber at the rear end of the cylinder, into which chamber the rear end of the piston passes as it approaches the rearward end of its stroke, and a passage for admitting the motive fluid under normal pressure to the rear end of said valve-chamber, whereby the valve will be moved forward by motive fluid under normal pressure and to the rear by motive fluid compressed therein by the piston.

5. The combination in an impact-tool of a cylinder, a reciprocating piston therein, inlet and exhaust passages for the motive fluid, a cup-like valve movable in a chamber at the rear end of the cylinder, into which chamber the rear end of the piston passes as it approaches the rearward end of its stroke, said valve having a head of greater area than the piston-receiving chamber formed by the valve, and means for exerting the normal pressure of the motive fluid upon said enlarged head of the valve, whereby the valve will be moved in one direction by the motive fluid under normal pressure and in the opposite direction by the motive fluid compressed therein by the piston.

6. The combination in an impact-tool of a cylinder, a reciprocating piston therein, inlet and exhaust passages for the motive fluid, a cup-like valve movable in a chamber at the rear end of the cylinder, into which chamber the rear end of the piston passes as it approaches the rearward end of its stroke, and an enlarged head on said valve, and a passage leading from the chamber which receives said enlarged head to a point in the cylinder where it will be uncovered by the piston when the latter reaches the forward end of its stroke, whereby the valve will be moved in one direction by motive fluid under normal pressure and in the opposite direction by motive fluid compressed by the piston.

7. A pneumatic tool comprising a cylinder, a piston reciprocating therein, a valve-box at one end of the cylinder in axial alinement therewith, a prolongation of the cylinder within the valve-box, a cylindrical cup-like valve reciprocating within the valve-box in an annular space between the box and said prolongation, admission and exhaust passages to and from the valve-box, means for admitting air under pressure to the admission-passage, and ports and passages whereby the opposite sides of the piston and valve are placed in alternate communication with said admission and exhaust passages.

8. A pneumatic tool comprising a cylinder, a piston reciprocating therein, a cylindrical valve-box encircling one end of the cylinder, a cylindrical valve reciprocating in an annular space provided therefor between valve-box and cylinder, a head on the valve of larger diameter reciprocating in a chamber provided therefor at one end of the valve-box, admission and exhaust passages to and from the valve-box, means for admitting air under pressure to the admission-passage, and ports and passages whereby the opposite sides of the piston are placed by the valve in alternate communication with said admission and exhaust passages and whereby the valve is actuated by direct air-pressure at one stroke of the piston and by compression of the air between it and the piston during the return stroke.

9. A pneumatic tool of the type described comprising the handle 3, the cylinder 1 provided with the flange 2, the coupling-nut 4 and jam-nut 5 whereby the handle and cylinder are fastened together, the valve-box 6 and bushing 7 secured in place within the handle by means of the cylinder-coupling, the valve 8 reciprocating within the valve-box in the space between it and said bushing, and the several ports and passages whereby the piston and valve are operated in the manner set forth.

In testimony whereof I have affixed my signature in presence of two witnesses.

CLARENCE W. PECK.

Witnesses:
ANNA L. ALLEN,
THEODORA COREY.