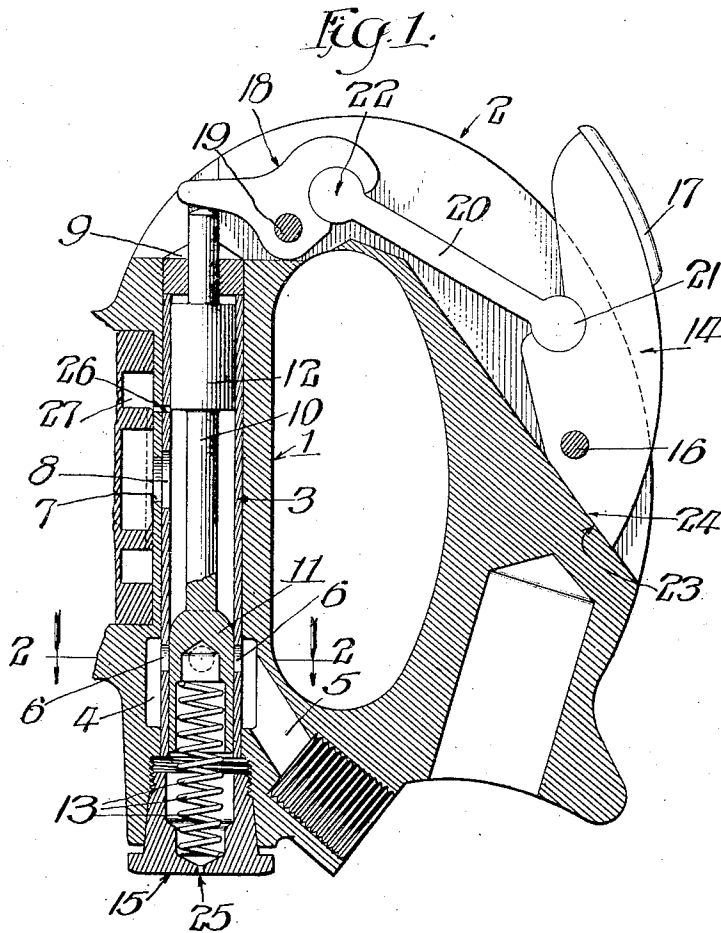
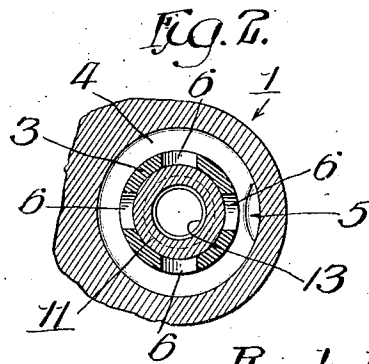


R. A. NORLING.
 THROTTLE VALVE FOR PNEUMATIC HAMMERS.
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910,223.

Patented Jan. 19, 1909.



Witnesses:
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UNITED STATES PATENT OFFICE.

REINHOLD A. NORLING, OF AURORA, ILLINOIS, ASSIGNOR TO AURORA AUTOMATIC MACHINERY COMPANY, OF AURORA, ILLINOIS, A CORPORATION OF ILLINOIS.

THROTTLE-VALVE FOR PNEUMATIC HAMMERS.

No. 910,223.

Specification of Letters Patent.

Patented Jan. 19, 1909.

Application filed April 6, 1908. Serial No. 425,303.

To all whom it may concern:

Be it known that I, REINHOLD A. NORLING, a citizen of the United States, and a resident of Aurora, in the county of Kane and State of Illinois, have invented certain new and useful Improvements in Throttle-Valves for Pneumatic Hammers; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

This invention relates to throttle valves for portable pneumatic hammers or devices of that class embracing a barrel or cylinder, a piston or plunger adapted to slide therein, and a controlling valve through which the air or other fluid under pressure is admitted to or permitted to escape from the opposite ends of the barrel or cylinder to give reciprocatory movement to the plunger therein.

The tool illustrated in the accompanying drawings is designed for a chipping hammer but the same features of construction illustrated in said drawings and herein claimed may be employed in a tool for riveting or other purposes.

The invention consists in the matter hereinafter described and more particularly pointed out in the appended claims.

As shown in the accompanying drawings, Figure 1 is a sectional view of the handle end of a tool embodying my invention, showing the throttle valve and associated parts. Fig. 2 is a transverse cross section taken upon the line 2-2 of Fig. 1.

As shown in said drawings, 1 indicates the upper end of the cylinder or barrel of the tool, said cylinder being provided with a handle 2 made integral therewith. Extending transversely through the said cylinder head and opening through the outer surface thereof at opposite sides of the same is a transverse bore or passage. Within said bore or passage is located a tubular valve bushing 3 which extends to within a short distance from the ends thereof. Near the receiving end of said passage the same is enlarged in diameter to form a cylindric recess 4, constituting an air chamber surrounding the valve bushing 3. Opening into the recess 4 is an angularly disposed supply passage 5, the outer end of which is enlarged

and provided with screw-threads for attachment thereto of the pipe or hose through which air is supplied to the tool. Said bushing 3 is provided with four admission ports 6, 6, 6, 6 spaced at equal distance apart around the bushing, in the part of the said bushing surrounded by the cylindric recess 4. Between the ends of the valve bushing and communicating with a passage 7, leading to the main controlling valve of the hammer, is an opening 8 which forms the exit port of the throttle valve.

At the end of the transverse passage, remote from its receiving end, is inserted a plug 9 which closes that end of the valve bushing and serves to prevent dust or other foreign matter from entering the throttle valve. Within said valve bushing and extending longitudinally therein is a valve stem 10, one end of which passes loosely through an axial passage in the plug 9. Upon said valve stem are formed two valve pistons 11 and 12 having sliding air tight fit within the bushing. The valve piston 11 is located at the receiving end of the valve bushing and constitutes with the ports 6, 6, 6, 6, the valve by which the admission of air to the hammer is controlled. The valve piston 12 is located between the exit port 7 and the end of the bushing remote from the receiving end and constitutes a balancing piston. The piston 11, by its endwise movement in the bushing, is adapted to cover and uncover the ports 6, 6, 6, 6 and the ports are so arranged that same are opened by movement of said piston in a direction to bring said ports in communication with the central space within the bushing between the pistons 11 and 12 and to thereby establish communication between said ports and the exit port 7. The inner end of the valve piston 11, which co-acts with the port openings 6, 6, 6, 6 in the valve bushing, is rounded in order that as it moves to uncover the said ports, air will be admitted in the minimum quantity at the beginning of the opening movement and the quantity will gradually increase as the rounded shoulder is moved in a direction to uncover the said ports.

Actuating means for operating a valve made as described are provided as follows: The valve stem with the pistons thereon is moved endwise, in a direction to close the valve by means of a spiral spring 13 which

acts against the piston 11 and the valve stem is moved against the action of said spring by means of a trigger finger 14 which acts through intermediate parts on the end of the valve stem extending outwardly through the plug 9. The inner end of the spring 13 which acts on the valve stem, is located in a recess formed in the outer end of the valve piston 11 and the outer end of said spring is supported in a recess in a conical plug 15. Said conical plug is screw-threaded at its inner end and inserted in the adjacent end of the transverse bore, said transverse bore being enlarged, screw-threaded and tapered to conform to said conical plug.

The portion of the tool handle remote from the receiving end of the throttle valve is provided with a slot arranged in the plane of the valve stem and in which is located the trigger lever 14 and the intermediate parts which act on that end of said valve stem which extends through the plug 9. The said trigger lever 14 is supported upon a transverse pivot 16 extending through and terminating at the outside surface of the handle on either side of the slot. The trigger lever extends outwardly from said slot and is provided at its outer end with a thumb plate 17. A bell crank lever 18 also located in said slot, has one arm thereof in contact with the extending portion of the valve stem. Said bell-crank lever is supported upon a pivot 19 which extends through the slot. Between the trigger lever 14 and the bell crank lever 18 is interposed a connecting link 20 which is pivotally connected with said parts and through the medium of which motion is transmitted from the trigger-lever to the bell-crank lever. Said link is connected with the trigger lever at a point outside of its pivot 16, and with the other or outwardly extending arm of the bell-crank lever and is provided at its ends with cylindric heads 21 and 22 which fit into and have free relative motion in correspondingly shaped recesses or sockets in the said trigger lever 14 and the bell crank lever 18. When the trigger lever 14 is swung on its pivot by pressure on its outer end the cylindric head 21 fitting into the socket in the said trigger lever, will be carried toward the bell-crank lever, and the cylindric head 22 in the socket of the bell-crank lever will act on the outwardly extending arm of said bell-crank lever so as to swing or carry the arm thereof which bears on the valve stem, inwardly or in a direction to shift the said valve stem in a direction to open the admission ports against the action of the spring 13, which tends to move the valve stem in the opposite direction.

The backward movement of the trigger lever 14 is limited by means of a shoulder

23, formed by the bottom surface of the slot in the tool handle, upon which an inwardly extending portion 24 of the said trigger lever 14 rests, the contact margin of said extending portion 24 being so shaped that a considerable portion thereof has bearing against the said shoulder when the trigger lever 14 is held in its normal or inoperative position by the action of the spring 13.

In the preferred construction and arrangement of the parts illustrated, the pivots of the trigger lever 14 and bell-crank lever 18, ends of the connecting link 20 are relatively so located that the inward movement of the trigger lever tends to bring the centers of the cylinder heads 21 and 22 and the pivot 16 into a straight line with each other, and at the same time causes the bell-crank lever 18 and the link 20 to approach a position at right angles to each other. As a result of this construction the leverage will gradually increase as the spring 13 is compressed and offers a correspondingly increased resistance to the opening of the valve. This particular arrangement of the link 20 with the trigger lever 14 and the bell-crank lever 18 constitutes in effect a toggle joint structure, enabling the trigger lever to be moved for opening the valve by a relatively light pressure thereon.

The valve described is balanced by the equal pressure of air on the inner ends of the two valve pistons 11 and 12, and to avoid air pressure on the outer ends of said valve pistons, such as would interfere with the balancing of the valve, the opening in the plug 9 is made large enough to permit the entrance of air to the adjacent end of the bushing while the plug 15 has an aperture 25, affording free communication between the space in the bushing exterior to the piston 11, and the outer air.

In order to provide for the escape of motive fluid, which may enter the valve bushing by leakage through the main valve when the valve pistons are in position to close the valve, a small opening or escapement port 26 is made in the wall of the valve bushing in position to be covered or closed by the inner end of the balancing valve piston 12 when the valve is fully closed and in line with the said opening 12, in the wall of the cylinder head or barrel, is formed a corresponding opening leading into an air chamber 27 which forms the exhaust passage of the main controlling valve and opens to the outer air. This escapement port is covered by the valve piston 12 when the throttle valve is open but is uncovered when the said valve is closed. The main object of such escapement port is to avoid possibility of air leaking through the throttle valve in quantity sufficient to partially operate or give slow movement to the plunger or piston of the hammer, as might occur in the absence of

such escapement port, especially should the main valve piston 11 become somewhat loose in the bushing through wear.

I claim as my invention:—

5 1. The combination with a pneumatic-hammer cylinder provided with a transverse bore or passage and with an air supply passage, of a cylindric valve bushing located in said bore and provided near one end with a
10 plurality of annularly arranged, equally spaced admission ports and between its ends with an exit port, said bore or passage being provided with an enlargement forming an annular air chamber surrounding a part of
15 said bushing containing said admission ports and with which the air supply passage is connected, an endwise movable valve stem in said valve bushing provided with a valve piston, the inner end of which co-acts with
20 said air admission ports to open and close the same; said inner end of the valve piston having a convexly rounded shoulder.

2. The combination with a pneumatic-hammer cylinder provided with a transverse
25 passage or bore and with a handle, of a throttle valve located in said bore and provided with an endwise movable valve stem, a spring acting on said valve stem to move the same in one direction, a pivoted trigger
30 lever on the handle, a bell-crank lever, one arm of which acts on the valve stem, and a link pivotally connected with the trigger lever and with the other arm of the bell-crank lever, said trigger lever and link being
35 arranged to form the members of a toggle joint.

3. The combination with a pneumatic-hammer cylinder provided with a handle, of a throttle valve provided with an endwise movable valve stem, a spring acting on said
40 valve stem to move the same in one direction, a pivoted trigger lever on the handle and means for operating the said valve stem from the trigger lever embracing parts constituting a toggle joint whereby the leverage
45 exerted upon the valve stem is increased as the trigger lever is moved in a direction to open the valve.

4. The combination with a pneumatic-hammer cylinder provided with a handle
50 having an outwardly opening slot, of a throttle valve having an endwise movable valve stem extending transversely of the cylinder, a trigger lever pivoted in said slot, a bell-crank lever also pivoted in said slot,
55 one arm of which acts on the valve stem, said trigger lever and the other arm of the bell-crank lever being provided with cylindric transversely extending recesses, and a link provided at its ends with cylindric heads
60 which fit in said recesses, said link being held in place by contact with the side walls of said slot.

In testimony, that I claim the foregoing as my invention I affix my signature in the
65 presence of two witnesses, this 31st day of March, A. D. 1908.

REINHOLD A. NORLING.

Witnesses:

C. CLARENCE POOLE,
GEORGE R. WILKINS.