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THROTTLE VALVE FOR PNEUMATIC TOOLS.

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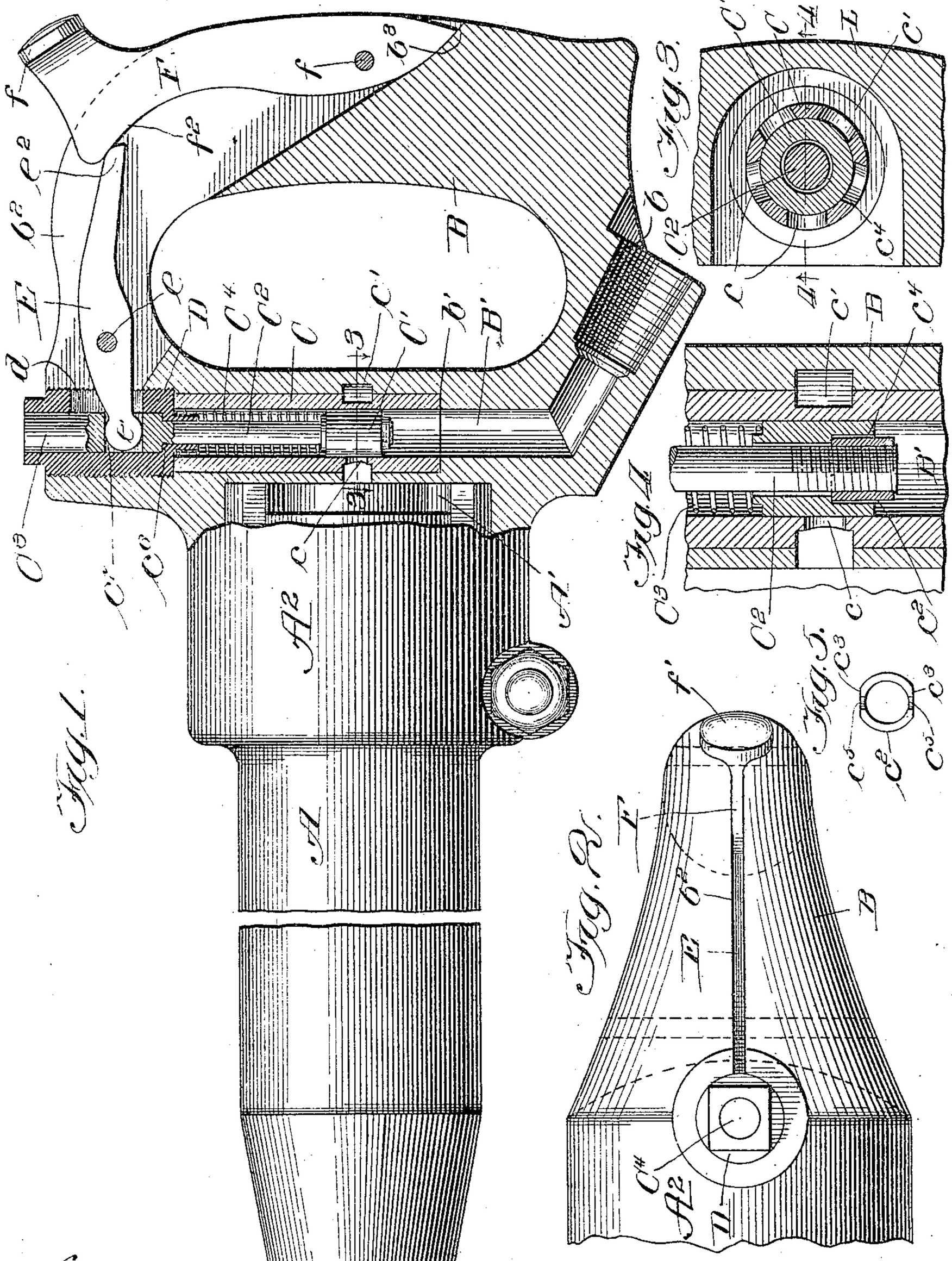

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THROTTLE-VALVE FOR PNEUMATIC TOOLS.

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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 Tools; 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 improvements in throttle-valves such as are applied to portable pneumatic tools, such as riveting or chipping hammers, for controlling the supply of compressed air thereto; and the invention refers more specifically to an improved construction and arrangement in the parts constituting the throttle-valve and in the trigger mechanism or actuating devices by which the valve is operated by the hand of the operator which grasps the handle of the tool.

The invention consists in the matters hereinafter set forth, and more particularly pointed out in the appended claims.

In the drawings, Figure 1 is a side elevation, with parts broken away and parts shown in section, of a tool embodying my improvements. Fig. 2 is an edge elevation of the handle part of the tool, showing the location of the throttle-valve trigger. Fig. 3 is an enlarged cross-section taken on line 3 3 of Fig. 1. Fig. 4 is a fragmentary longitudinal section taken on line 4 4 of Fig. 3. Fig. 5 is a detail end view of the nut on the stem of the valve-piston.

As shown in the drawings, A designates as a whole the working cylinder or barrel of the tool within which reciprocates the piston, (not shown,) and B designates as a whole the handle by which the tool is grasped and held when in operation. The handle is cast integral with a head A^2, which contains the main or controlling valve of the tool, and between the handle and the head is formed a transverse integral extension of the head, constituting the casing of the throttle-valve.

B′ designates an air-inlet passage, the main part of which extends longitudinally of the valve-casing and the receiving end of which is directed obliquely outward at one end of the handle and has a screw-threaded inlet, as indicated at *b*, for connection therewith of an air-pipe.

A′ designates the main valve-chamber of the tool which is formed in the head A^2 and in which is located the valve that admits air alternately to the opposite sides of the piston to effect the reciprocation of the latter. Inasmuch as said valve constitutes no part of the present invention, it is not shown in the drawings.

The passage B′ delivers air to the throttle-valve, the valve-chamber of which communicates at one end with and constitutes a continuation of said passage. Said chamber is formed in a bushing C, fitted within a seat in the valve-casing, formed by an enlarged continuation of the passage B′, and bearing at its end nearest the inlet against an annular shoulder *b*′ between the enlarged and smaller part of the said passage. Said bushing is provided with a plurality of annularly-disposed ports *c*, which open into an annular passage *c*′, formed partially in the bushing and partially in the surrounding valve-casing and communicating with the main valve-chamber A′. Fitting within the bushing C and adapted to cover said ports *c* is an endwise-sliding valve-piston C′, which has the form of a short cylindric sleeve, through which passes the end of a stem C^2, extending outwardly toward the side of the handle remote from the inlet end of the passage B′. The outer end of said stem is enlarged to constitute a head C^3, which slides in and has guiding engagement with the cylindric bore of a hollow plug D, which has screw-threaded engagement with a socket in the valve-casing constituting a continuation of the passage B′ and the valve-bushing seat. The said plug bears against the adjacent end of the bushing C so as to close the outer end of the valve-chamber, and the bushing is clamped between the inner end of the plug and the shoulder *b*′.

The valve-piston C′ is held in place on the stem C^2 between a nut c^2, having screw-threaded engagement with the inner end of the stem, and a spring C^4, surrounding the stem and interposed between the said piston and the plug D. As herein shown, the central aperture of the piston is countersunk to receive the nut c^2. After the nut has been adjusted on the stem the end of the stem is

usually upset thereover to avoid accidental detachment of the nut. By reason of the fact that the piston is adapted to slide upon the stem and is held in place thereon by said spring C^4 and the nut c^2 the lap of the valve-piston may be adjusted as desired by moving or shifting the nut on the stem, the spring C^4 permitting such adjustment. Said spring C serves both to give movement to the valve-piston and stem in a direction to close the valve and also serves to hold the valve-piston against the nut c^2 and to thereby retain the said piston in its proper position on the stem. The said valve-piston C′ normally closes the ports c and when retracted past the same air enters from the passage B′ and through said ports into the valve-chamber A′. The closing movement of the valve-stem is arrested by engagement of the shoulder c^6, formed between the head and shank of the stem, with an opposing annular shoulder in the plug D, surrounding the guide-passage or opening in said plug through which the stem extends.

Preferably the valve is balanced by admitting air behind the valve-piston C′, and this is effected in the present instance by the following construction: The stem C^2 fits loosely within the aperture of the piston, as shown in Figs. 3 and 4, thereby permitting air to pass between the same and the sleeve. The nut c^2, located in the countersunk recess in the piston a, is flattened on two opposing sides, as indicated at c^3, to constitute between said flattened sides and the countersunk recess of the piston passages c^4, through which air may enter from the passage B′. The nut is also provided at its inner end, which bears against the piston, with radial notches c^5, Fig. 5, which form, with the space between the stem and the piston, a passage through which air may pass from the inlet end of the valve-chamber to the outer or closed end thereof. In this manner the valve is balanced.

The trigger-actuating device for moving the piston against the action of the spring C^4 is made as follows: The head C^3 of the valve-stem is provided with a socket c^7 to receive the lower end of a pivoted operating-lever E, that is located in a suitable slot b^2, formed in the adjacent part of the handle, as shown in Figs. 1 and 2. Said lever E is pivoted between its ends to a pivot-pin e, that extends transversely through the handle and the slot b^2. The lower end of the lever is formed to provide a rounded head e' for engagement with said socket. The hollow plug D is provided in its upper side in line with said socket with a longitudinal slot d, through which extends the lower end of the lever E for engagement with said socket c^7, said slot being made of a length to permit the required swinging movement of the lever E. The lever E is swung on its pivot in a manner to reciprocate the valve-stem through the medium of a trigger F, which is located in said slot b^2 of the handle. Said trigger is pivoted near one end to a pivot-pin f, that extends transversely through the handle and through said slot. The trigger is formed to provide at its outer end, outside the slot b^2, a button f', located in position to be engaged by the thumb or finger of the hand of the operator which grasps the handle, for the purpose of depressing said trigger and actuating the lever. The trigger is provided at the inner or lower edge of its free end with a curved or cam face f^2, that engages the outer end e^2 of the valve-actuating lever E, and said cam-surface of the trigger and the end of the lever are so formed that when the trigger is depressed the upper or outer end of the lever is swung inwardly and the inner end thereof swung outwardly in a manner to shift the piston outwardly and open the valve. When pressure on the trigger is released, the spring C^4 restores the lever and trigger and closes the valve. The button at the free end of the trigger is adapted to form a shoulder, which strikes an opposed part or surface of the handle to limit the inward swing of said trigger and to control the extent of opening movement of the valve. The swinging movement of the trigger in the opposite direction is limited by a shoulder b^3, formed at the end of the slot b^2 adjacent to the pivot of said trigger. Said shoulder prevents the free end of the trigger from swinging so far outwardly as to carry its curved surface f^3 out of contact with the outer curved end of the lever E. The location of the button of the trigger is such as to enable the trigger to be readily actuated by the thumb of the hand of the operator which grasps the tool and holds it while in operation. The cam-surface f^2 on said trigger is so shaped as to give a desired gradual opening movement to the valve.

The plug D is turned tightly against the end of the bushing C to form an air-tight joint. If by reason of the screw-threaded connection of the plug with the handle the plug does not seat tightly against the bushing when the slot d of the plug is in line with the slot b^2 of the handle and the socket of the head of the valve-stem, a packing of suitable thickness may be interposed between the plug and the bushing to afford the necessary tight joint.

I claim as my invention—

1. A throttle-valve comprising a cylindric valve-chamber provided with a lateral port, a sliding valve-piston in said valve-chamber, a valve-stem connected with the piston, said piston being provided with an aperture to receive the valve-stem, a nut adjustable on the valve-stem to change the position of the valve-piston on the stem, and a spring applied to hold the valve-piston against said nut.

2. A throttle-valve comprising a cylindric valve-chamber provided with a lateral port, a sliding valve-piston in said chamber, and an endwise-movable valve-stem connected with the valve-piston, said valve-piston being provided with a central aperture to receive the valve-stem, a nut adjustable on the valve-stem to change the position of the piston on said stem, and a coiled spring surrounding the valve-stem and acting on the valve-piston both to hold the said valve-piston against the nut and to give endwise movement to the valve piston and stem.

3. A throttle-valve embracing a cylindric valve-chamber communicating at one end with an inlet-passage and closed at its opposite end, said valve-chamber being provided between its ends with a lateral exit-port, an endwise-sliding valve-piston in said chamber adapted to cover said port when advanced toward the inlet-passage and to uncover said port when retracted toward the closed end of the chamber, and a valve-stem connected with the piston and extending outwardly through the closed end of the valve-chamber, said valve-piston being provided with a passage for the leakage of air therethrough to the closed end of the valve-chamber to balance the valve.

4. A throttle-valve comprising a cylindric valve-chamber communicating at one end with an inlet-passage and closed at its opposite end, a sliding valve-piston in said chamber, and an endwise-movable valve-stem connected with the valve-piston and extending outwardly through the closed end of the valve-chamber, said valve-piston being provided with a central aperture for the valve-stem, larger in diameter than the portion of the stem which passes therethrough, a nut on the valve-stem, and a spring applied to hold the valve-piston in contact with said nut.

5. A throttle-valve comprising a cylindric valve-chamber communicating at one end with an inlet-passage, closed at its opposite end and provided with a lateral exit-port, a sliding valve-piston in said valve-chamber, a valve-stem connected with the piston and extending through the closed end of the valve-chamber, said piston being provided with an aperture to receive the valve-stem, and the valve-stem being provided with a nut adjustable thereon to change the position of the valve-piston, and a spring applied to hold the valve-piston against said nut, the central opening in the valve-piston being larger than the part of the valve-stem which passes through the same and said nut being porvided with a notch which forms with the space between the valve-piston and valve-stem, a passage to permit leakage of air past the piston to balance the valve.

6. A throttle-valve comprising a valve-casing provided with a cylindric passage opening at both ends through the sides of the casing and with one end of which is connected an air-supply pipe, said passage having a shoulder at its inlet end, a cylindric valve-bushing seated in said passage, and bearing at its inner end against said shoulder, said bushing having a lateral exit-port and forming a valve-chamber which communicates at one end with the inlet end of said passage, a hollow plug secured in and closing the end of the passage remote from its inlet end, and bearing at its inner end against the outer end of the valve-bushing, said plug having a central guide-aperture extending therethrough, a sliding valve-piston in the valve-chamber, a valve-stem connected with said piston and sliding at its outer end in said hollow plug, and provided at its outer end with a lateral socket, a coiled actuating-spring surrounding the said valve-stem between the inner end of said plug and the said piston, and an actuating-lever pivoted to the casing and engaging with the socket in the outer end of the valve-stem.

7. A throttle-valve comprising a valve-casing provided with a cylindric passage opening at both ends through the sides of the casing and with one end of which is connected an air-supply pipe, said passage having a shoulder adjacent to its inlet end, a cylindric valve-bushing seated in said passage and bearing at its inner end against said shoulder, said bushing having a lateral exit-port and forming a valve-chamber which communicates at one end with the inlet end of said passage, a hollow plug secured in and closing the end of said passage remote from the inlet end, and bearing at its inner end against the outer end of the valve-bushing, said plug having a central guide-aperture extending therethrough, a sliding valve-piston in the valve-chamber, a valve-stem connected with said piston and sliding at its outer end in said hollow plug, said valve-stem having an enlarged head at its outer end which fits and slides in the guide-aperture of the plug, and is provided with a lateral socket, said plug having a lateral slot opposite said socket, and an actuating-lever pivoted to the casing one end of which extends through said slot in the hollow plug and engages said socket in the head of the valve-stem

In testimony that I claim the foregoing as my invention I affix my signature, in presence of two witnesses. this 20th day of February, A. D. 1905.

REINHOLD A. NORLING.

Witnesses:

J. A. NIELD,

C. E. SEUREY.