No. 860,910. PATENTED JULY 23, 1907.

N. W. FLETCHER.

THROTTLE VALVE.

APPLICATION FILED JUNE 12, 1906.

Fig. 1.

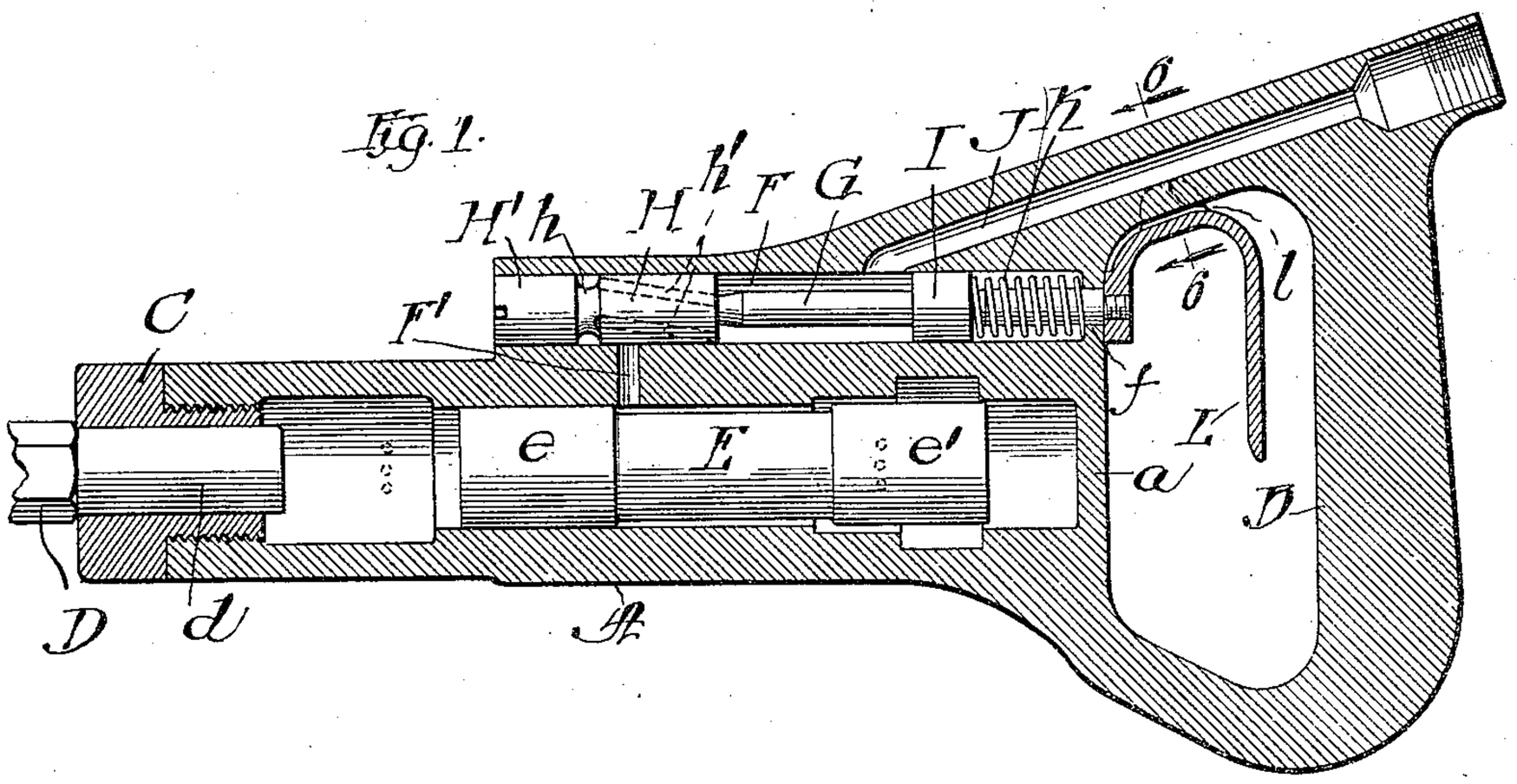


Fig. 2.

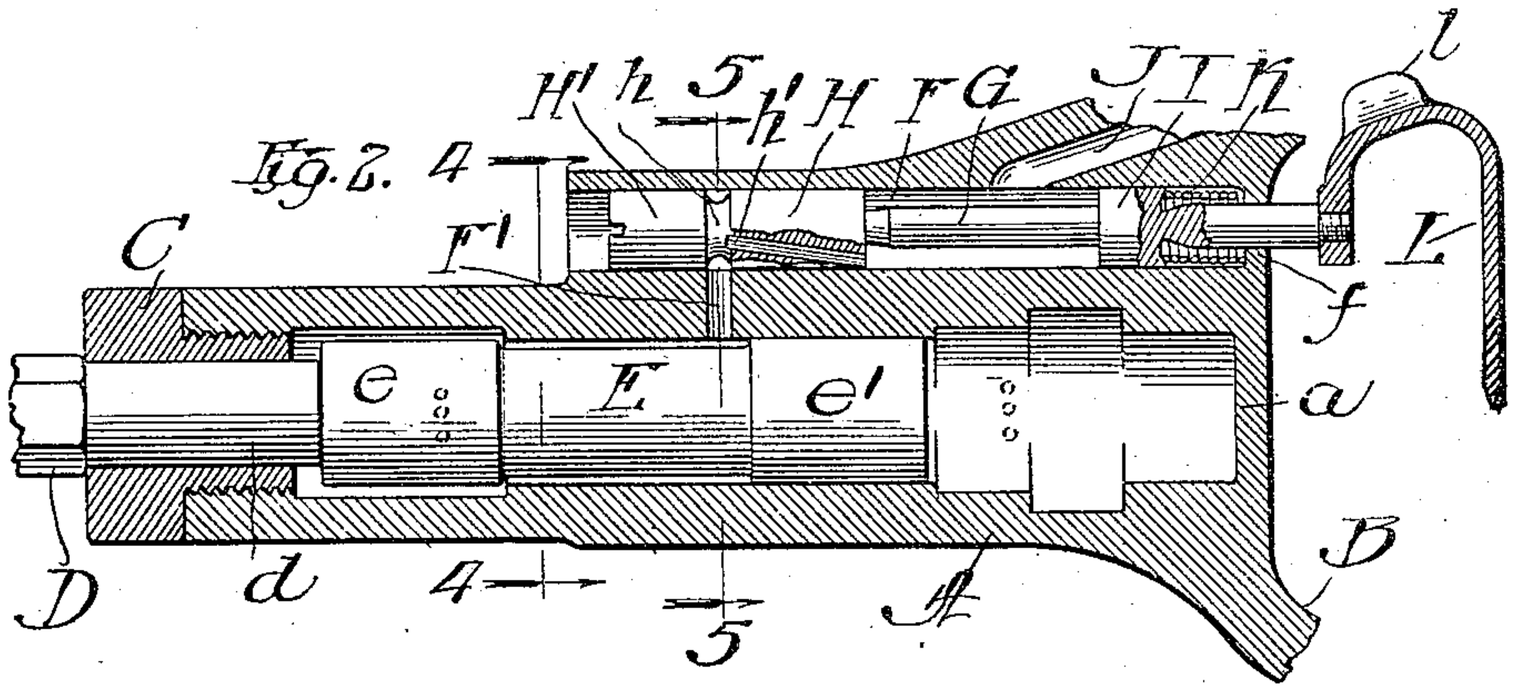


Fig. 3.

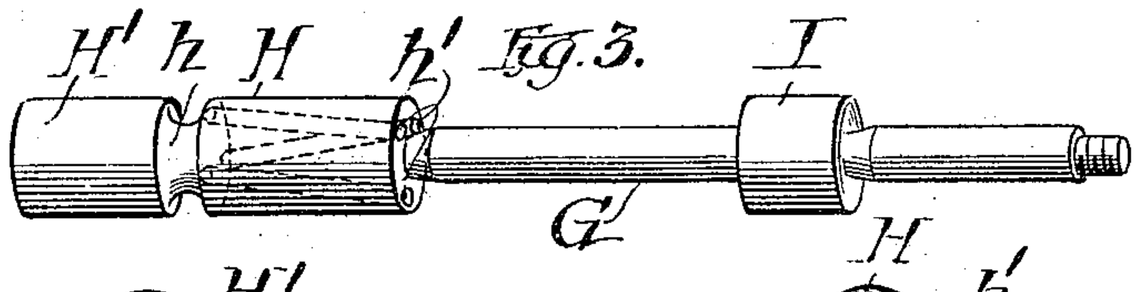


Fig. 4.

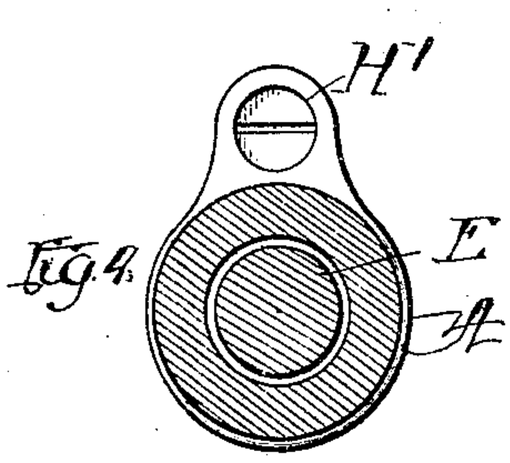


Fig. 5.

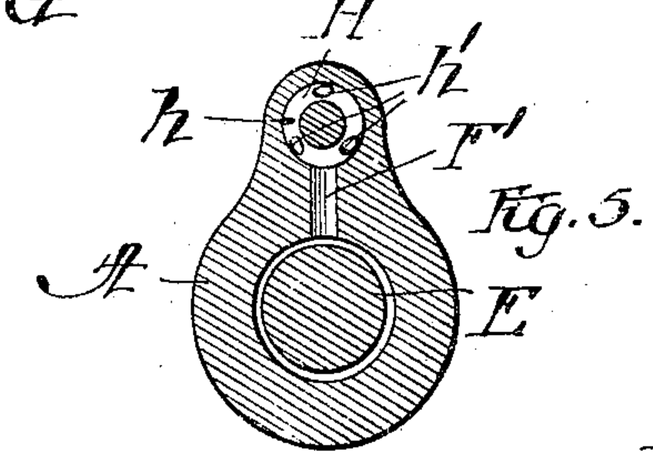
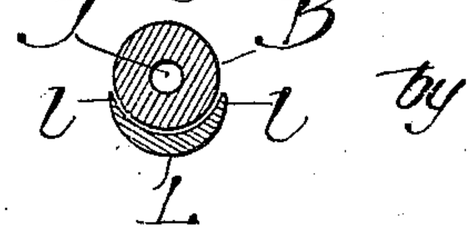


Fig. 6.



Witnesses:
T. L. Hyde
A. W. Bunn

Inventor
Nathan W. Fletcher
by Poole & Brown
his Attorneys.

UNITED STATES PATENT OFFICE.

NATHAN W. FLETCHER, OF CHICAGO HEIGHTS, ILLINOIS, ASSIGNOR OF ONE-HALF TO FRANK A. HECHT, OF CHICAGO, ILLINOIS.

THROTTLE-VALVE.

No. 860,910. Specification of Letters Patent. Patented July 23, 1907.

Application filed June 12, 1906. Serial No. 321,380.

To all whom it may concern:

Be it known that I, NATHAN W. FLETCHER, a citizen of the United States, of Chicago Heights, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Throttle-Valves; 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 for portable pneumatic tools, such as chipping hammers or the like.

The invention is shown in the accompanying drawing in connection with a pneumatic chipping hammer of that class in which admission of the air under pressure to the opposite ends of the barrel or cylinder of the tool is controlled by the endwise movement of the piston or plunger thereof, and which is illustrated and described in a separate application for patent, filed by me in the United States Patent Office on the 1st day of June, 1906, Serial Number 319,669, but the throttle valve constituting my invention is shown in connection with this form of pneumatic tool merely for convenience and it may be applied to any other form of pneumatic tool or motor.

The invention consists in the matters hereinafter described and pointed out in the appended claims.

As shown in said drawing:—Figure 1 is a view in central longitudinal section of a pneumatic tool equipped with a throttle valve constructed in accordance with my invention. Fig. 2 is a like section showing the cylinder or barrel of the tool only and illustrating the throttle valve in changed position. Fig. 3 is a perspective view of the valve stem and pistons of the throttle valve. Fig. 4 is a sectional view, taken upon line 4—4 of Fig. 2. Fig. 5 is a sectional view, taken upon line 5—5 of Fig. 2. Fig. 6 is a sectional view, taken upon line 6—6 of Fig. 1.

As shown in said drawing, A indicates the barrel or cylinder of the tool and B the handle at the inner end thereof. In the particular construction shown the said barrel and handle are made in one piece or casting and the inner end of the barrel is closed by an integral end-wall, indicated by *a*. The outer end of the barrel is provided with a screw-threaded bushing C having a central bore or aperture adapted to receive the shank *d* of a working tool D.

E indicates the piston or plunger of the tool which reciprocates endwise within the bore of the cylinder and is adapted for contact with the shank *d* of the working tool. Said piston E is generally of cylindric form and is provided with a central portion of less diameter than its end portions *e* e^1, which latter are cylindric and are adapted to fit and slide within the bore of the cylinder.

F indicates the valve chamber of the throttle-valve, which has the form of a cylindric bore formed in the casting which constitutes the cylinder A at one side of and parallel with the bore of the cylinder.

F^1 indicates an admission port for the cylinder located centrally of the length of the cylinder so as to communicate with the annular space between the reduced central part of the piston E and the surrounding wall of the cylinder. The outer end of said admission port F^1 opens into the said valve chamber F and forms the discharge or outlet passage of the latter. In said valve chamber F is located a valve stem G carrying three valve pistons H H^1 and I which are of equal diameters and fit and slide endwise within the valve chamber. The piston H operates in connection with the admission port F, while the piston I constitutes a balancing piston, the air or other fluid under pressure being admitted to the valve chamber at a point between said pistons, so that it acts with equal pressure on the same.

The valve piston H^1 is located outside of the piston H, and forms with the adjacent end of the same an annular groove *h* which is connected with the pressure space within the valve chamber between the pistons H and I, by means of a plurality of passages h^1 h^1 extending longitudinally through the said piston H. Said piston H^1 closes the outer end of the valve chamber and also forms a balancing piston when the space or groove *h* is subject to air pressure from the supply passage J. Said passages h^1 are indicated in dotted lines in Fig. 1 and are clearly shown in Figs. 2 and 3. The said valve piston H is so arranged that when at the outward limit of its movement it covers and closes the admission port F^1 but when shifted inwardly or toward the handle B its outer end is carried past said admission port and the groove *h* is brought opposite or in communication with said port. Air under pressure is supplied to the space within the valve chamber F, between the pistons H and I, by means of a supply passage J which is formed in the wall of the throttle valve and preferably extends outward at one side of the handle B. The outer end of said passage J is adapted for connection therewith of a flexible supply pipe, in the usual manner. The inner end of said passage J where it enters the valve chamber F is so located that it will not be covered by either of the pistons H or I in any position thereof, so that said passage will be constantly in communication with the space between said pistons. The valve chamber is thus provided with longitudinally separated inlet, or supply, and delivery ports, of which the inlet port is always in communication with the space between the pistons, while the piston H cuts off the passage of air from the inlet to the discharge port except when the groove *h* in said piston is opposite or in register with the said discharge port.

It follows from the construction described that the air pressure will normally be cut off from the main cylinder A by the piston H, and that prompt and immediate admission of air under full pressure to the main cylinder through the admission port F^1 will, however, take place when the piston H has been moved outwardly far enough to bring the groove *h* into communication with said admission port, full air pressure being always present in the space between the pistons H and I.

At the inner end of the valve chamber F the latter is closed by an end wall *f* in which is formed a central guide aperture through which the valve stem G passes and in which said valve stem slides and closely fits. A coiled spring K surrounds the valve stem between the wall *f* and the piston I. Said spring tends to keep the valve in its closed position or at the outward limit of its movement. Attached to the inner end of said valve stem, which projects through the wall *f*, is a handle or trigger L which has its operating arm located inside of the handle B and in position to be acted upon by the fingers of the hand which grasps said handle B. The inner end of the valve stem is extended past the wall *f* toward the handle B, and is screw-threaded at its end and engaged with a screw-threaded opening in the trigger L. When the said trigger L is drawn toward the handle B for the purpose of opening the throttle valve the spring K will be compressed but upon releasing the pressure on the trigger the spring will throw the throttle valve to its closed position and will maintain said valve in its closed position at all times except when intentionally moved to open the same by pressure of the fingers on trigger L.

The ports or passages h^1 are shown as extending obliquely through the inner part of the valve piston H, this construction being employed in order to facilitate the boring of said holes when the valve stem and pistons thereon are made from a single piece of metal, as is preferred in order to give strength and durability to the valve.

The outer valve piston H^1 has closely fitting sliding engagement with the surrounding wall of the valve chamber which latter has, and need have, no means other than said piston H^1, for closing its outer end. The connected valve pistons and stem are inserted into the valve chamber through said outer end thereof. The outer end of the valve piston H^1 is shown as provided with a transverse groove or notch, for the application of a screw-driver, which is applied to turn the valve stem in attaching it to the trigger L. Said trigger is provided with two lateral lugs *l l*, which extend at opposite sides of the adjacent parts of the handle B, and serve to prevent the valve stem from turning in the valve chamber and thereby hold the trigger always in the proper position relatively to said handle B.

The throttle valve described has the advantage of being very simple in construction, easily taken apart and assembled, and of being certain and reliable in operation. An important advantage is gained by making the valve stem and pistons integral with each other or of one piece of metal, and attaching the trigger directly to the end of the stem which extends from the valve chamber toward the handle of the tool; this construction making the valve as a whole, simple, strong and durable, and little liable to get out of repair.

I claim as my invention:—

1. A throttle valve provided with a cylindric valve chamber having longitudinally separated, lateral supply and delivery ports, and an endwise sliding valve provided with three valve pistons between which are formed two spaces adapted for communication one with the supply and the other with the delivery port, the intermediate valve piston being arranged to co-act with the delivery port and being provided with a passage extending longitudinally through said intermediate valve piston and affording constant communication between the said spaces.

2. A throttle valve comprising a valve casing provided with a cylindric valve chamber having longitudinally separated, lateral admission and delivery ports, a valve stem provided with three valve pistons, the intermediate one of which co-acts with the delivery port and is provided with longitudinal passages connecting with each other the spaces at the opposite ends of said intermediate piston, a spring interposed between one of the external pistons and the adjacent end wall of the valve chamber and a trigger attached to the valve stem outside of the valve chamber, for operating the valve.

3. A throttle valve comprising a valve casing provided with a cylindric valve chamber having longitudinally separated, lateral supply and delivery ports, said valve chamber being closed at one end by an end wall having a guide aperture, a valve stem provided with three valve pistons, and which extends at one end through said guide aperture, the intermediate piston being provided with longitudinal passages, a spring interposed between the end wall of the valve chamber and the valve piston adjacent thereto, and a trigger attached to the said stem outside of the valve casing.

4. A throttle valve comprising a valve casing provided with longitudinally separated, lateral supply and delivery ports, a valve stem having a main valve piston which co-acts with the delivery port and two balancing pistons, one of which forms with the intermediate piston a space into which the supply port opens and which is longer than the stroke of the valve to afford constant communication between said supply port and said space, and the other of which is separated from the said main piston by a space or groove adapted for communication with the delivery port when the valve is in its open position, said main piston being provided with longitudinal passages for connecting said delivery port with said space into which the supply port opens.

5. A throttle valve comprising a valve casing provided with a cylindric valve chamber, having longitudinally separated, lateral supply and delivery ports, a valve stem having three rigidly attached valve pistons, the intermediate valve piston being adapted to co-act with the delivery port and being provided with longitudinal passages and a trigger rigidly attached to the valve stem, said trigger being provided with guide lugs engaging guiding surfaces on the valve casing to hold the said trigger from turning.

6. The combination with the cylinder and attached handle of a pneumatic tool, of a throttle valve having a cylindric valve chamber parallel with the bore of the cylinder, said valve chamber having longitudinally separated, lateral supply and delivery ports, an endwise movable valve stem in said valve chamber, provided with three pistons, the intermediate piston being provided with longitudinal passages, a spring applied to throw the valve toward its closed position, and a trigger attached to the end of the valve stem adjacent to the handle and having its operating arm arranged inside of and parallel with the grasping part of said handle.

In testimony, that I claim the foregoing as my invention I affix my signature in presence of two witnesses, this 8th day of June A. D. 1906.

NATHAN W. FLETCHER.

Witnesses:
TAYLOR E. BROWN,
GEORGE R. WILKINS.