No. 656,981. Patented Aug. 28, 1900.

C. H. JOHNSON.

THROTTLE VALVE FOR FLUID OPERATED TOOLS.

(Application filed Feb. 2, 1900.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.

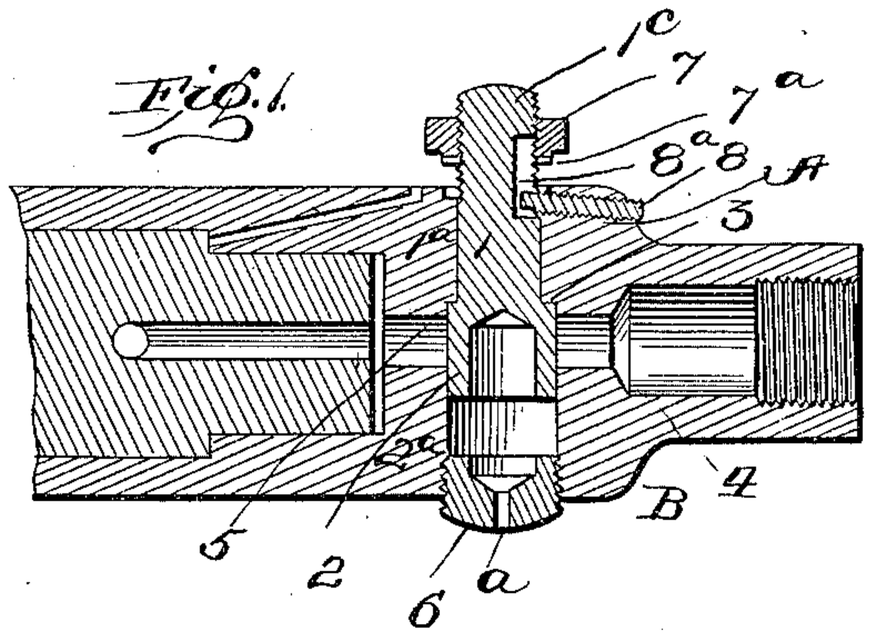

Fig. 2.

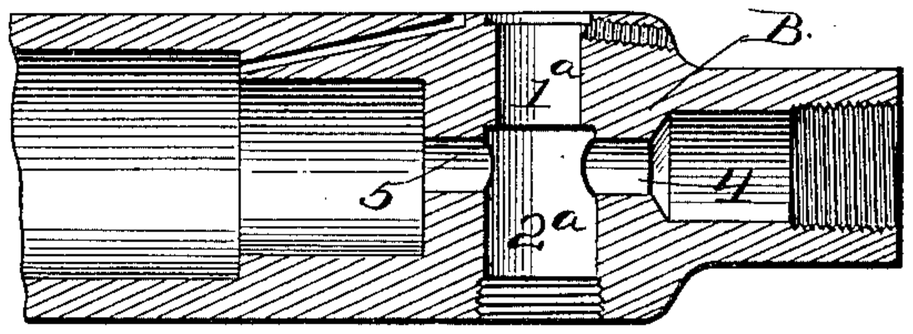

Fig. 3.

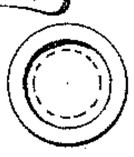

Fig. 4.

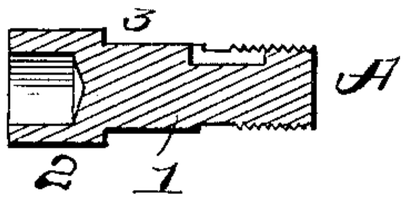

Fig. 5.

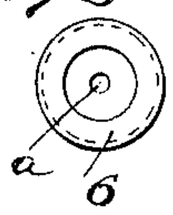

Fig. 6.

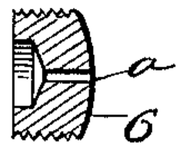

Fig. 7.

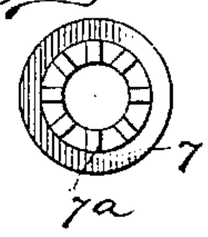

Fig. 8.

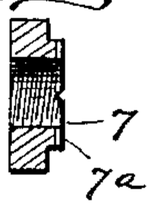

Fig. 9.

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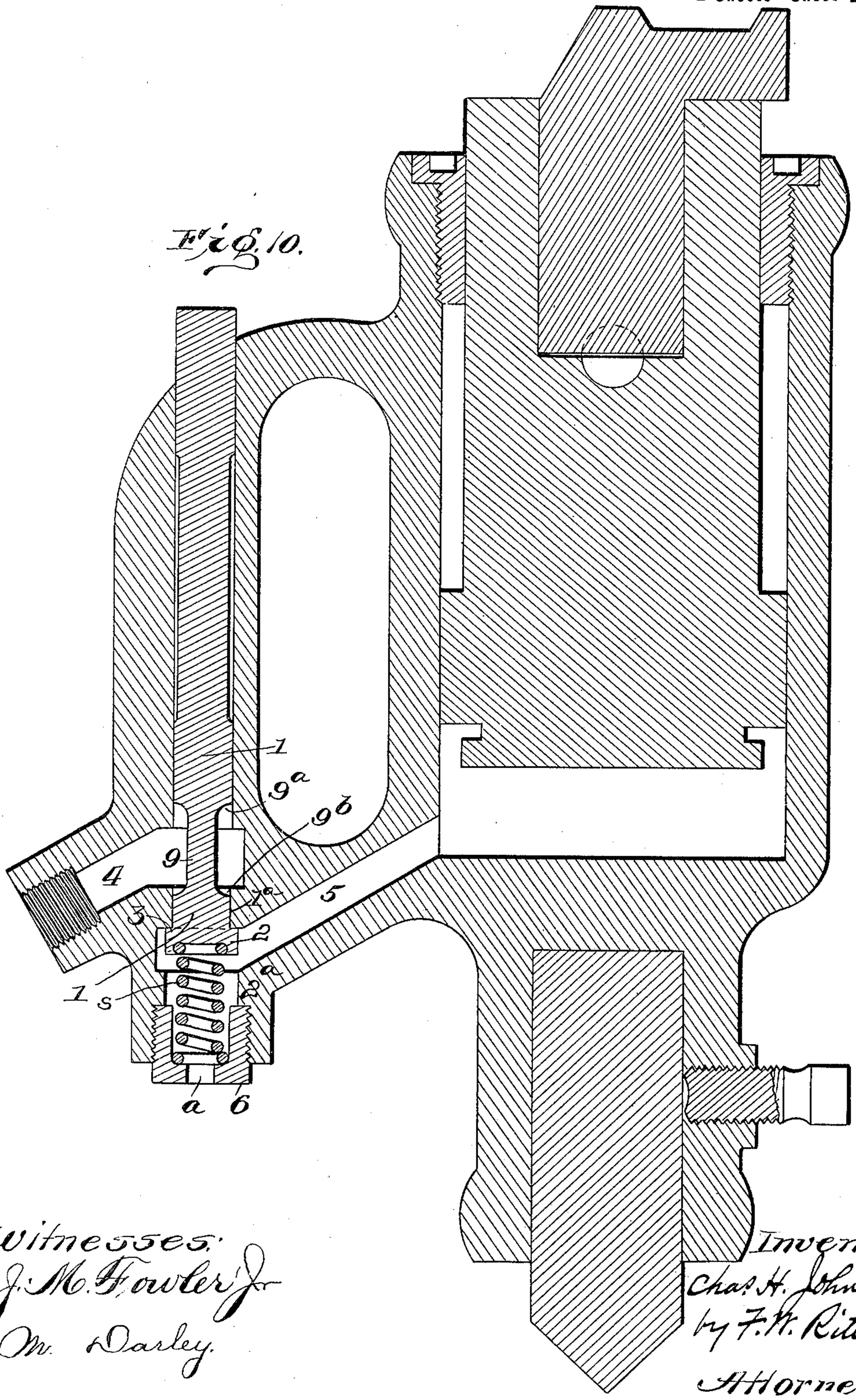
Fig. 10.



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UNITED STATES PATENT OFFICE.

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THROTTLE-VALVE FOR FLUID-OPERATED TOOLS.

SPECIFICATION forming part of Letters Patent No. 656,981, dated August 28, 1900.

Application filed February 2, 1900. Serial No. 3,727. (No model.)

To all whom it may concern:

Be it known that I, CHARLES HARRIS JOHNSON, a citizen of the United States, residing at Chicago Heights, in the county of Cook, State of Illinois, have invented certain new and useful Improvements in Throttle-Valves for Motive-Fluid-Operated Tools; and I hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, in which—

Figure 1 is a sectional view of a throttle-valve embodying my invention shown as applied to a pneumatic hammer, a portion of said hammer being also shown. Fig. 2 is a detached sectional view of the valve-chamber and portion of hammer-cylinder shown in Fig. 1. Fig. 3 is an end view, and Fig. 4 a longitudinal sectional view, of the valve detached. Fig. 5 is an end view, and Fig. 6 is a sectional view, of the perforated screw-cap for closing the end of the valve-chamber. Fig. 7 is an under side view, and Fig. 8 is a sectional view, of the collar or ratchet-nut for regulating the opening of the throttle-valve; and Fig. 9 is a detached view of the pin which prevents the rotation of the throttle-valve and accidental change of adjustment. Fig. 10 is a sectional view of a modified form of throttle-valve embodying my invention, the same being shown as applied to a pneumatic "holdon."

Like symbols refer to like parts wherever they occur.

My invention relates to the construction of that class of devices commonly termed "throttle-valves," and is especially directed to the production of a simple and efficient throttle for controlling and regulating the supply to motive-fluid-operated tools, such as pneumatic hammers, drills, &c.

To this end the main feature of my invention, generally stated, embraces the combination, with a suitable valve-casing, of differential piston-valve and means for increasing or reducing the pressure upon that head of the piston-valve having the greatest area, whereby the valve may be readily opened or closed at the will of the operator.

A secondary feature of my invention embraces the combination, with the stem of the piston-valve, of an adjustable collar or nut for controlling and regulating the extent of opening of the piston-valve and supply of motive fluid to the tool.

There are other minor features of invention, all as will hereinafter more fully appear.

I will now proceed to describe my invention more fully, so that others skilled in the art to which it appertains may apply the same.

The valve, considered as a whole, consists of a differential piston A and a valve-casing B corresponding thereto, the casing having an opening, as at *a*, on that side of the piston-valve having the greatest area and the piston-valve adapted to be manually operated in one direction to open the same and automatically operated by the fluid-pressure to close the same. The piston A, which constitutes the valve, is of two different diameters, as at 1 and 2, forming an annular shoulder 3 at their point of union, said shoulder presenting toward the induction-port of the valve. The valve-casing B is of a corresponding form, having the lesser internal diameter 1^a and the greater internal diameter 2^a corresponding with the diameters 1 and 2 of the piston. The casing B is provided with induction-port 4 and eduction-port 5, and the valve-chamber may be closed by a screw-plug 6, having an air-port *a* for admission of atmospheric pressure to that side of the piston-valve having the greatest area. That portion of the piston-valve A having the least diameter is allowed to project through the casing at the opposite end to that closed by the perforated plug 6, as at 1^c, (see Fig. 1,) and will serve as a means of manually operating the valve to open the same.

The degree of movement of the piston-valve A and the consequent extent of opening of the valve may be adjusted and controlled by the extent to which the perforated plug 6 is screwed into the end of the cylinder or shell B, or, if desired, a simple screw-ring may take the place of the perforated screw-plug 6; but as a means of graduating the supply of motive fluid, which means will be capable of easy and instantaneous manipulation by the hand of the operator, I prefer to thread the projecting end 1^c of piston-valve A (see Figs. 1, 3, 7, and 8) and provide the same with a nut 7, having on its under surface a ratchet-ring 7^a, and to prevent the rotation

of the piston-valve A, whereby the adjustment might be accidentally disturbed, I provide therein a longitudinal recess 8^a, adapted to receive the end of a screw or equivalent pin 8, which projects through the valve casing or shell B into the path of the piston-valve A.

In the case of the modification shown in Fig. 10, where the induction-port 3 and eduction-port 4 are in different planes, in order to secure a port or passage for the motive fluid the piston-stem may be reduced in diameter, as at 9, so as to obtain annular shoulders 9^a 9^b of equal area and an equilibrium of pressure on the piston-valve when the piston-valve is closed, as shown in the drawings, and in such case a spring *s* may be employed to insure the retention of the piston-valve in its closed position, which spring will be overcome by the increased area of the opposite head of the piston-valve when shoulder 3 is exposed—that is to say, when the valve is open.

The construction of the devices being substantially that hereinbefore set forth their operation will be as follows: The throttle-valve being closed, as shown in the drawings, and it being desired to open the same to admit the motive fluid to the tool to be operated thereby, the piston-valve A is depressed until its smaller diameter (in the case of the modification the portion 9) stands between the induction-passage 4 and eduction-passage 5 of the valve-casing and the greater diameter of the valve occupies the greatest diameter (2^a) of the casing below the eduction-port 5, being subjected only to the atmospheric pressure. This confines the motive fluid to one and in the case of the preferred construction (shown in Figs. 1 and 4) to the lesser area (shoulder 3) of the piston-valve A, holding the valve open automatically, and by the pressure of the motive fluid until such time as the operator desires to cut off the motive fluid and arrest the operation of the tool, whereupon he closes the opening *a* by means of his finger or in other suitable manner converts the lower end of the valve-casing B into a closed chamber, when the motive fluid will leak past the valve and exerting its pressure upward upon that end of the piston-valve having the greatest area will automatically shift or close the valve. In the case of the modification shown in Fig. 10 of the drawings the closing-operation will be in a measure quickened by the reaction of spring *s*, though, as will be noted by reference to Fig. 1 of the drawings, an auxiliary spring is not essential to the operation of the valve, being simply a desirable adjunct in the case of the particular construction shown in the modification, where an equilibrium of pressure is established when the valve is closed and a slight preponderance of pressure is desired to retain the valve closed.

As hereinbefore pointed out, by the adjustment of the ratchet-nut 7 on the threaded stem 1^c the admission of the motive fluid to the tool may be graduated to suit any requirement and changed from time to time while the tool is in operation, any accidental change during the operation of the tool being prevented by the engagement of pin 8 with the ratchet 7^a on the under side of the nut.

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

1. In a throttle-valve, the combination of a differential piston-valve, a casing corresponding therewith, provided with a port for varying the pressure upon that head of the piston-valve which has the greatest area, and means for manually operating the piston-valve in one direction, substantially as and for the purposes specified.

2. In a throttle-valve, the combination with a piston-valve having heads of unequal area, of a suitable casing therefor, said casing provided with an air-port in the end which corresponds with that head of the piston-valve which has the greatest area, substantially as and for the purposes specified.

3. In a throttle-valve, the combination with a suitable casing and provided with an induction-port and an eduction-port, of a differential piston-valve which projects through the casing at one end, said casing having an air-port at the end opposite to that through which the piston-valve projects, substantially as and for the purposes specified.

4. In a throttle-valve, the combination with a suitable casing having induction and eduction ports, of a differential piston-valve which projects through the casing at one end, and an adjustable collar on the projecting end of the piston-valve, substantially as and for the purposes specified.

5. In a throttle-valve, the combination with a suitable casing having induction and eduction ports, of a differential piston-valve threaded upon one end and having a longitudinal recess adjacent to its threaded portion, a pin which projects into the casing and enters the recess in the piston-valve, and a ratchet-nut on the threaded end of the piston-valve, substantially as and for the purposes specified.

6. In a throttle-valve, the combination with a suitable casing having induction and eduction ports of a differential piston-valve which projects through the casing at one end, and a plug or cap having an air-port, said plug or cap adjustably fitted within that end of the casing opposite to the end through which the piston-valve projects, substantially as and for the purposes specified.

In testimony whereof I affix my signature, in presence of two witnesses, this 30th day of January, 1900.

CHARLES HARRIS JOHNSON.

Witnesses:
H. H. VAUGHAN,
GEORGE I. MCELDOWNEY.