No. 707,735. Patented Aug. 26, 1902.

H. H. VAUGHAN.

FLUID PRESSURE OPERATED TOOL.

(Application filed July 3, 1901.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.

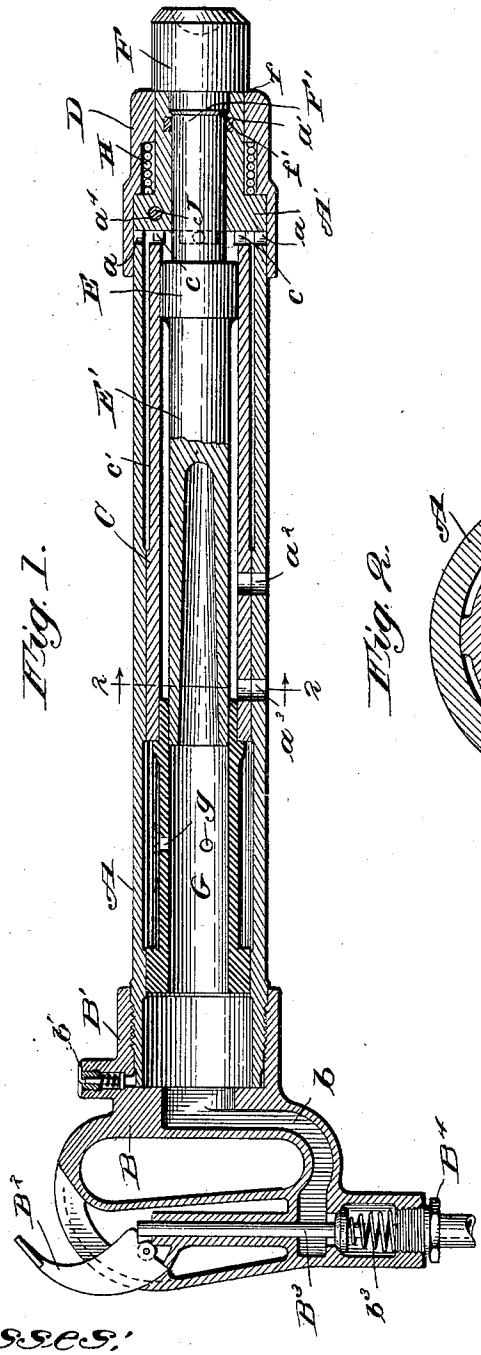
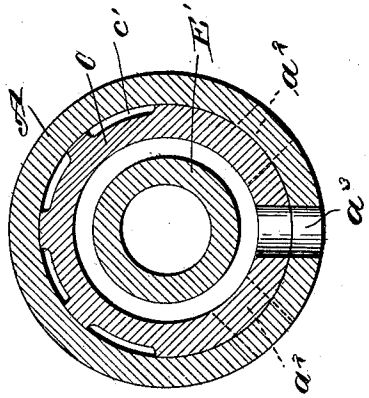


Fig. 2.



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Fig. 3.

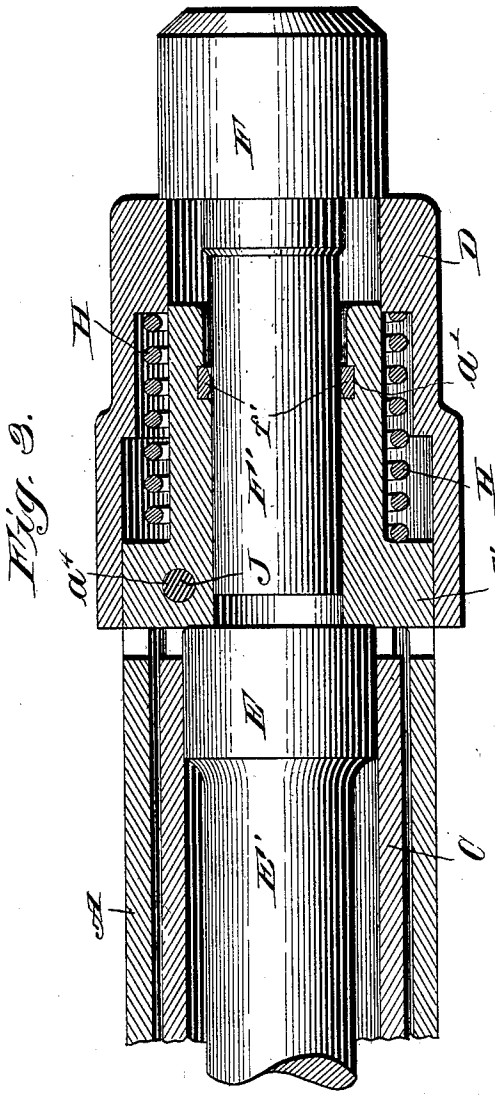


Fig. 5.

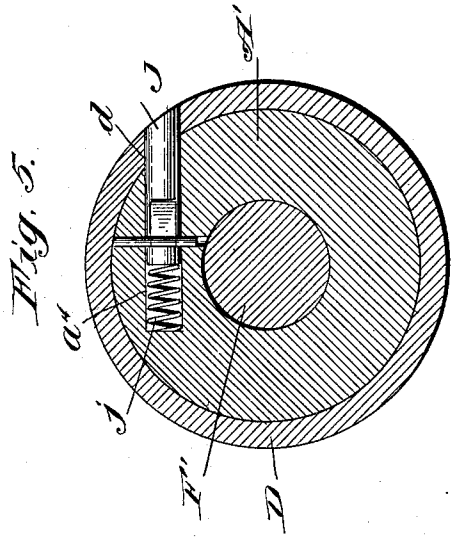
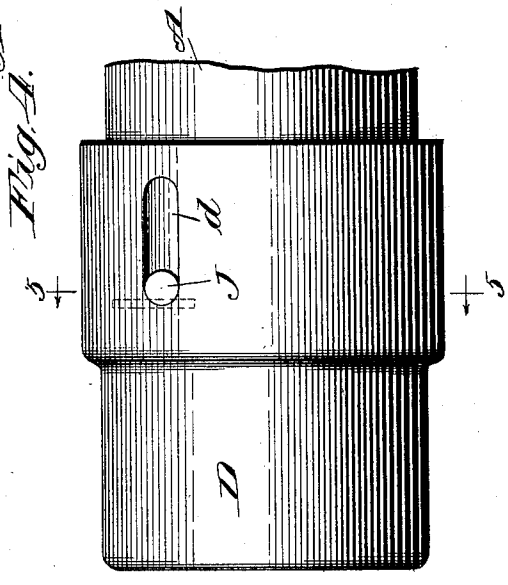


Fig. 4.



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UNITED STATES PATENT OFFICE.

HENRY H. VAUGHAN, OF CHICAGO, ILLINOIS, ASSIGNOR TO RIDGELY AND JOHNSON TOOL COMPANY, A CORPORATION OF ILLINOIS.

FLUID-PRESSURE-OPERATED TOOL.

SPECIFICATION forming part of Letters Patent No. 707,735, dated August 26, 1902.

Application filed July 3, 1901. Serial No. 66,949. (No model.)

To all whom it may concern:

Be it known that I, HENRY H. VAUGHAN, a citizen of the United States, residing at Chicago, county of Cook, State of Illinois, have invented certain new and useful Improvements in Fluid-Pressure-Operated Tools; and I declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use the same, reference being had to the accompanying drawings, which form a part of this specification.

My invention relates in general to fluid-pressure-operated tools, and more particularly to that type of such tools known as "pneumatic hammers or riveters," in which a snap or die is adapted to receive the impact of a reciprocating piston. Tools of this character are of such power that if the throttle-valve is opened when the snap or die is out of contact with the object being worked upon the snap will be violently ejected from the cylinder and thrown a considerable distance, owing to the impact of the piston, and also to the compression of air in front of the piston, which alone is sufficient to blow out the snap even if not actually hit by the piston.

The object of my invention is to construct a fluid-pressure-operated tool of the class referred to which will obviate the objections above mentioned. I accomplish this object by providing means to prevent the piston hitting the snap when the throttle-valve is opened unless the snap is pressed against an object and also by providing means to permit the escape of compressed fluid from the end of the cylinder adjacent to the snap when the latter is out of contact with the material being worked upon.

A further object is to provide a tool of the class described which will be simple in construction and efficient in operation.

The invention will be more fully described hereinafter with reference to the accompanying drawings, in which the same is illustrated as embodied in a convenient and practical form, and in which—

Figure 1 is a longitudinal section of my invention, parts being shown in elevation and parts being broken away; Fig. 2, a cross-section on the line 2 2, Fig. 1, looking in the direction of the arrows; Fig. 3, an enlarged longitudinal section of the end of the tool with the snap or die in a different position from that in Fig. 1; Fig. 4, a plan view of the end of the tool, showing the engagement of the collar with the cylinder; and Fig. 5, a transverse section on the line 5 5, Fig. 4, looking in the direction of the arrows.

Similar reference characters indicate the same parts in the several figures of the drawings.

Reference-letter A indicates the cylinder of the tool, which is provided with a screw-thread at one end adapted to engage with the screw-thread formed on the inner surface of the tubular projection B′ of the handle B. A spring-actuated catch b' engages one of a series of notches formed in the end of the cylinder A and prevents the cylinder and the handle from relative rotation.

The handle B is provided with a pivoted lever B^2, which is adapted to depress the throttle-valve B^3 to admit fluid-pressure from the supply-pipe connected to the interior of the screw-threaded nut B^4. The throttle-valve is normally held to its seat by a spring b^3, which also, through the engagement between the stem of the valve and the lever B^2, holds the latter in the position shown in Fig. 1. The handle B is provided with a passage-way b, leading from the seat of the throttle-valve to the end of the cylinder A.

A bushing or reducing-sleeve C is located within the cylinder A. A series of longitudinal recesses c' are formed in the bushing C throughout that portion of the bushing which is in engagement with the interior of the cylinder A, forming a free passage-way for the flow of fluid-pressure between the bushing and the cylinder. The part of the bushing which is not in direct contact with the cylinder is of a diameter sufficiently smaller than the cylinder to leave an annular space between the bushing and the cylinder.

The end of the cylinder opposite the handle is provided with a shoulder A′, which extends within the cylinder and partially across the opening in the end of the bushing C. In the shoulder A′ and the reduced end of the

cylinder projecting therefrom is formed a tubular opening, within which is fitted the snap or die F.

The snap or die F is provided with a shank or reduced projecting portion F′ of a diameter corresponding to the diameter of the opening through the shoulder A′ and the projecting end of the cylinder. The snap F may be movably retained in the end of the cylinder by any desired yielding means—such, for instance, as a spring-ring f', which is seated within an annular recess a', formed in the opening through the end of the cylinder, the ring f' being expanded when a die is pressed through it, and thereby frictionally holding the die in the cylinder. A collar D is located at and surrounds the end of the cylinder A.

The collar D is provided with an interior flange formed by reducing the tubular opening through the collar, such flange engaging the exterior of the shoulder A′ when the collar is in the position shown in Fig. 1. A second annular shoulder or flange is provided in the collar D, against which one end of a spring H engages, the other end of such spring being in contact with the exterior of the shoulder A′. The spring H surrounds the reduced end of the cylinder and is located within an annular chamber formed between such reduced end of the cylinder and the collar D. The end of the collar D engages a shoulder f, formed on the snap or die F by reducing the diameter of the die to produce the portion F′, which fits within the end of the cylinder.

The cylinder A is provided with a reducing-sleeve G, one end of which is provided with an annular flange of a diameter corresponding to the interior diameter of the cylinder A, while the other end of the reducing-sleeve G is provided with another annular flange, forming a seat against which rests the end of the bushing C, the latter end of the reducing-sleeve G fitting within the end of the bushing C.

A piston is located within the cylinder, and consists of an enlarged head E of a diameter corresponding to the diameter of the opening through the bushing C and a reduced hollow portion E′ of a diameter corresponding to the diameter of the opening through the reducing-sleeve G.

Openings g through the reducing-sleeve G afford a passage-way for the fluid-pressure, while ports c in the end of the bushing C adjacent to the shoulder A′ permit the passage of the fluid-pressure to the enlarged end E of the piston.

Ports a are formed through the cylinder A at the end adjacent to the shoulder A′, such ports being controlled by the collar D, which surrounds the cylinder at that end.

a^2 a^2 indicate exhaust-ports through the bushing C and the cylinder A, and a^3 indicates an opening also through the collar and cylinder for permitting the escape of any fluid which may leak into the space surrounding the reduced end E′ of the piston and also permitting the escape of air between the enlarged head of the piston and the end of the reducing-sleeve G when the piston moves toward the handle. The collar D may be retained in position on the end of the cylinder, so as to permit it to reciprocate thereon, by any suitable means—such, for instance, as a pin J, which is located in an opening a^4, formed in the shoulder A′. A spring j normally forces the pin J into engagement with a slot d, formed in the collar D. The engagement between the pin J and the slot d permits the movement of the collar upon the end of the cylinder and at the same time affords means for removing the collar from the piston by merely forcing the pin J within the opening a^4 against the tension of the spring j, thereby removing the pin from its engagement with the slot d.

The operation of my invention is as follows: Fluid-pressure is admitted through the hollow nut B^4 from a source of supply when the lever B^2 is actuated to unseat the throttle-valve B^3. The fluid-pressure passes through the passage-way b into the end of the cylinder, thence through the ports g in the reducing-sleeve G, thence through the grooves c', formed between the bushing C and the cylinder, thence through the annular space between the bushing and the cylinder through the ports c to the enlarged end E of the piston. The piston being differential will be forced toward the handle, as the end of the enlargement E, exposed to the pressure, is of an area greater than the reduced end E′, which is also exposed to the same pressure. When the piston is forced toward the handle, its reduced end closes the ports g and cuts off the supply of pressure to the large end of the piston. A further travel of the piston, owing to the expansion of the fluid, opens the exhaust-ports a^2 through the bushing C and the cylinder, thereby permitting the pressure to exhaust from the large end of the piston, whereupon the pressure upon the small end of the piston will cause it to reciprocate and engage the reduced end F′ of the die F when the die is held in the position shown in Fig. 1, owing to its contact with the object being worked upon. If the throttle-valve is opened when the die is out of contact with an object, as shown in Fig. 3, the spring H forces the collar D outwardly, thereby opening the ports a, which permits the pressure to escape to the atmosphere. This movement of the collar D, through its engagement with the shoulder f on the die F, carries the die outwardly, so that its reduced end F′ is withdrawn beyond the shoulder A′, and consequently out of the path of the piston. The throw of the piston toward the die is then limited by the shoulder A′, and no engagement consequently takes place between the piston and the die.

While I have shown my invention as applied to a riveter or hammer of the valveless type, I do not, however, wish to restrict myself to this type, as my invention is equally applicable to other forms of such tools.

While I have described more or less precisely the various details of construction, I do not wish to be understood as limiting myself thereto, as I contemplate changes in form, the proportion of parts, and the substitution of equivalents, as circumstances may suggest or render expedient, without departing from the spirit of my invention.

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

1. In a fluid-pressure-operated tool, the combination with a cylinder, of a reciprocating piston therein, a die movably fitted in the end of said cylinder, yielding means for retaining said die within the end of the cylinder, and means for automatically removing the die from the path of the piston to prevent the ejectment of the die from the cylinder by a blow from the piston, substantially as described.

2. In a fluid-pressure-operated tool, the combination with a cylinder, of a reciprocating piston therein, a die movably fitted in the end of said cylinder, yielding means for retaining said die within the end of the cylinder, a shoulder extending into the cylinder to limit the throw of the piston, and means for withdrawing the die from the path of the piston, to prevent the ejectment of the die from the cylinder by a blow from the piston, substantially as described.

3. In a fluid-pressure-operated tool, the combination with a cylinder, of a reciprocating piston therein, a die movably fitted in said cylinder, yielding means for retaining said die within the end of the cylinder, a shoulder extending into the cylinder to limit the throw of the piston, and a spring-actuated collar engaging said die and withdrawing the same from the path of the piston to prevent the ejectment of the die from the cylinder by a blow from the piston, substantially as described.

4. In a fluid-pressure-operated tool, the combination with a cylinder having ports therethrough, of a reciprocating piston in said cylinder, a die movably fitted in said cylinder, and a spring-actuated collar closing said ports through the cylinder when the die is forced against an object, and uncovering said ports when the die is not in contact with an object, substantially as described.

5. In a fluid-pressure-operated tool, the combination with a cylinder having ports therethrough, of a reciprocating piston in said cylinder, a die movably fitted in said cylinder, a spring-actuated collar surrounding the end of said cylinder and engaging said die, said collar being moved so as to cover said ports when the die is forced against an object and being moved by spring-pressure to uncover said ports when the die is not in contact with an object, substantially as described.

6. In a fluid-pressure-operated tool, the combination with a cylinder having ports therethrough, of a reciprocating piston in said cylinder, a die movably fitted in said cylinder, a collar surrounding the end of said cylinder and engaging said die, a spring interposed between said cylinder and collar whereby the die when forced against an object compresses said spring and moves said collar over the ports and when the die is disengaged from an object said spring expands and thereby moves said collar to uncover the ports, substantially as described.

7. In a fluid-pressure-operated tool, the combination with a cylinder having ports therethrough, a reciprocating piston in said cylinder, a shoulder extending into said cylinder to limit the throw of the piston, a die movably fitted in said cylinder, a collar controlling said ports and engaging said die, and a spring interposed between the cylinder and collar, substantially as described.

8. In a fluid-pressure-operated tool, the combination with a cylinder having an exhaust-port therethrough, of a reciprocating piston in said cylinder, and automatic means for closing and opening said exhaust-port when the tool is respectively pressed against and out of contact with an object, substantially as described.

9. In a fluid-pressure-operated tool, the combination with a cylinder having ports therethrough, of a reciprocating piston therein, a die movably fitted in said cylinder, and a spring-actuated collar closing said ports through the cylinder when the die is pressed against an object, and uncovering said ports and withdrawing said die from the path of the piston when the die is not in contact with an object, substantially as described.

10. In a fluid-pressure-operated tool, the combination with a cylinder having ports therethrough, of a reciprocating piston in said cylinder, a die movably fitted in said cylinder, a collar surrounding the end of said cylinder and engaging said die, a spring interposed between said cylinder and collar whereby the die when forced against an object compresses said spring and moves said collar over the ports and when the die is disengaged from an object said spring expands and thereby moves said collar to uncover the ports and coincidentally withdraws the die from the path of the piston, substantially as described.

11. In a fluid-pressure-operated tool, the combination with a cylinder, of a reciprocating piston therein, a die movably fitted in the end of said cylinder and yieldingly retained therein, and means for automatically moving the die out of the range of impact of the piston to prevent its ejectment from the cylinder by the piston.

In testimony whereof I sign this specification in the presence of two witnesses.

HENRY H. VAUGHAN.

Witnesses:
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CLARA C. CUNNINGHAM.