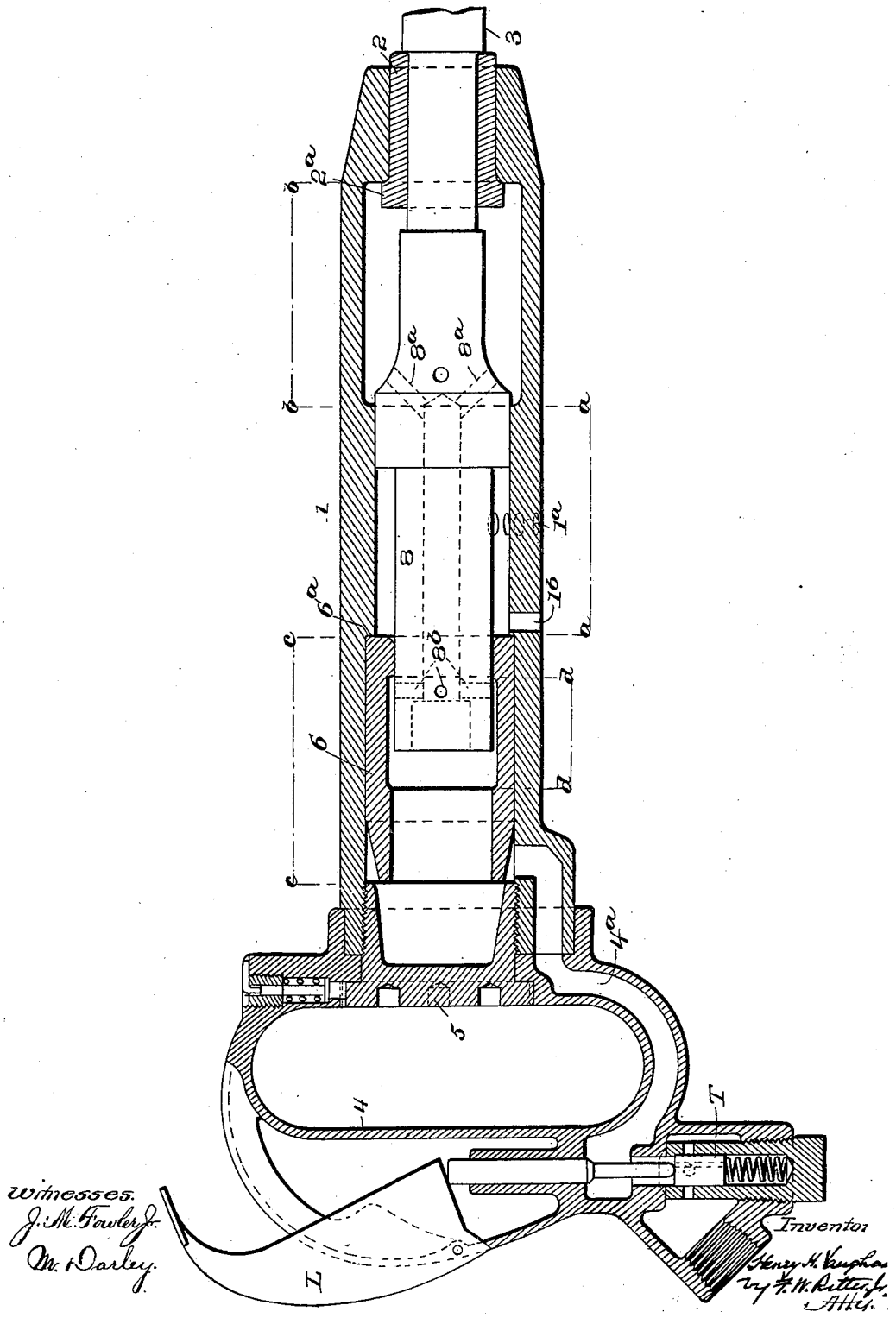
No. 691,420. Patented Jan. 21, 1902.

H. H. VAUGHAN.

MOTOR FLUID OPERATED TOOL.

(Application filed Mar. 19, 1901.)

(No Model.)



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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.

MOTOR-FLUID-OPERATED TOOL.

SPECIFICATION forming part of Letters Patent No. 691,420, dated January 21, 1902.

Application filed March 19, 1901. Serial No. 51,828. (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, in the county of Cook, State of Illinois, have invented certain new and useful Improvements in 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 drawing, wherein is shown a longitudinal central section of a pneumatic hammer or riveter embodying my invention.

My invention relates to that class of motive-fluid-operated tools commonly termed "pneumatic hammers," and especially to that class wherein a differential piston is employed and a constant motive-fluid pressure maintained on the lesser head of the piston during the operation of the device.

The principal objects of the present invention are the simplification of the construction and the avoidance of unnecessary joints in this class of tools.

To this end the main feature of the invention, generally stated, resides in the combination, with a suitable cylinder having an exhaust port or ports, of a differential piston closed at its ends and provided with through ports or passages, those toward the supply end of the cylinder (or lesser head of the piston) being radially arranged, means for closing said radially-arranged ports or passages at or before the time the exhaust-port of the cylinder is opened, and means for maintaining constant pressure upon the lesser head of the piston and in the direction of the tool.

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.

In the drawing, 1 indicates a suitable cylinder, provided at one end (its lower end) with a ferrule 2 for the reception of a "snap" 3 or equivalent tool to be struck by the piston. The ferrule 2 may be provided with a flange 2^a and inserted from within the cylinder and will when the snap 3 is in position constitute one head of the cylinder.

4 indicates a suitable handle provided with the motive-fluid-supply passage 4^a, which communicates with that end of the cylinder 1 which contains the piston-head having the lesser area, so as to maintain a constant motive-fluid pressure on the lesser head of the piston and acting in the direction of the tool. The supply-passage 4^a is controlled by a suitable throttle-valve T, operated by a lever L, pivoted on the handle 4, and said handle 4 is connected to the cylinder 1 by a plug or screw-cap 5, which forms the other head of cylinder 1. The inner diameter of the cylinder, at its middle, as from *a* to *a*, corresponds with the diameter of that head of the piston having the greatest area, while from *b* to *b* the inner diameter of the cylinder is somewhat greater to allow for clearance, and from *c* to *c* is also greater to form a shoulder 6^a to afford a bearing for a reducing-sleeve 6, which receives that head of the piston having the lesser area. The cylinder 1 is provided with an exhaust-port 1^a for that end of the cylinder which contains the head of the piston having the greater area and above the same with a relief-port 1^b to prevent pressure from leakage on the lift or reverse movement of the piston.

6 indicates a reducing-sleeve removably inserted in the upper end of the cylinder or that end which contains the lesser head of the piston, and said sleeve will be held on its seat 6^a during the operation of the tool by the constant pressure of the motive fluid. The internal diameter of this reduction-sleeve at and adjacent to its two ends corresponds with the diameter of that head of the piston having the lesser area; but said diameter is increased at the middle of the sleeve, as from *d* to *d*, to afford a recess or clearance for the piston and permit the motive fluid to enter for a limited time the supply-ports which pass through the piston to the other end thereof to effect the lift or reverse movement of the piston.

8 indicates the piston, which is of tubular form, (see dotted lines,) but is closed at both ends, with the exception of the supply-ports 8^a and 8^b, the latter of which, located adjacent to the upper end of the piston, (or that head having the lesser area,) being radially disposed, so as to open on the periphery of the piston, and therefore to be closed by the walls of the cylinder (or the walls of the reducing-sleeve 6, which is the same thing) at or before the lift or reverse movement of the piston has unclosed the exhaust-port 1^a.

The construction being substantially such as hereinbefore set forth, the operation of the devices will be as follows: The motive fluid having been admitted to that end of the cylinder which contains the lesser head of the differential piston, or the head having the lesser area, and the piston having delivered its blow or being in the position shown in the drawing, the motive fluid will pass around the lesser head of the piston and into its tubular center through the radially-disposed supply-ports 8^b and out through the supply-ports 8^a at the opposite end of the piston into that end of the cylinder which contains the head of the piston having the greater area. The piston will then under direct pressure immediately commence its lift or reverse movement, which will continue under the direct pressure of a motive fluid flowing through the piston until the supply of air through the ports or passages 8^b is cut off by the wall of the cylinder or sleeve, after which the motive fluid, acting on the lower end of the piston or head having the greater area, will continue the movement of the piston until the exhaust-port 1^a is unclosed, whereupon exhaust will occur, and the constant motive-fluid pressure on the lesser head of the piston will project the piston acting toward or in the direction of the tool and deliver the working blow thereof. This operation of the devices will be repeated and continued so long as the motive-fluid pressure is maintained in the cylinder.

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

1. In a constant-pressure motive-fluid-operated tool, the combination with a suitable cylinder having an exhaust-port for that end of the cylinder which contains the greater head of the piston, of a differential piston having through-ports which are radially disposed at or adjacent to its lesser head, and means for maintaining constant pressure of the motive fluid on the lesser head of the piston in the direction of the tool, substantially as and for the purposes specified.

2. In a constant-pressure motive-fluid-operated tool, the combination of a cylinder and a differential piston, the cylinder having an exhaust-port for that end which receives the greater head of the piston and a clearance space or recess in its walls at that end of the cylinder which receives the lesser head of the piston, means for maintaining constant pressure upon the lesser head of the piston in the direction of the tool, and a piston provided with a through port or passage radially disposed at the lesser head of said piston or at the receiving end of said passage, substantially as and for the purposes specified.

3. In a constant-pressure motive-fluid-operated tool, the combination with a suitable cylinder having an exhaust-port for that end of the cylinder which contains the greater head of the piston, of a differential piston having through-ports which open on its circumference at or adjacent to the smaller end or lesser head, and means for maintaining constant pressure of the motive fluid on the lesser head of the piston in the direction of the tool, substantially as and for the purposes specified.

4. In a constant-pressure motive-fluid-operated tool, the combination of a cylinder and a differential piston, the cylinder having an exhaust-port for that end which receives the greater head of the piston and a clearance space or recess in its walls at that end of the cylinder which receives the lesser head of the piston, means for maintaining constant pressure on the lesser head of the piston in the direction of the tool, and a piston provided with a through port or passage which opens on its circumference at or adjacent to the lesser head of said piston, substantially as and for the purposes specified.

5. In a constant-pressure motive-fluid-operated tool, the combination with a suitable cylinder, of a differential piston closed at its ends and provided with through-ports which open on its circumference adjacent to its heads, said cylinder having an exhaust-port for the end of the cylinder which contains the greater head of the piston, and means for maintaining constant pressure on the lesser head of the piston in the direction of the tool, substantially as and for the purposes specified.

In testimony whereof I affix my signature, in presence of two witnesses, this 15th day of March, 1901.

HENRY H. VAUGHAN.

Witnesses:
GEORGE I. MCELDOWNEY,
H. E. MORISON.