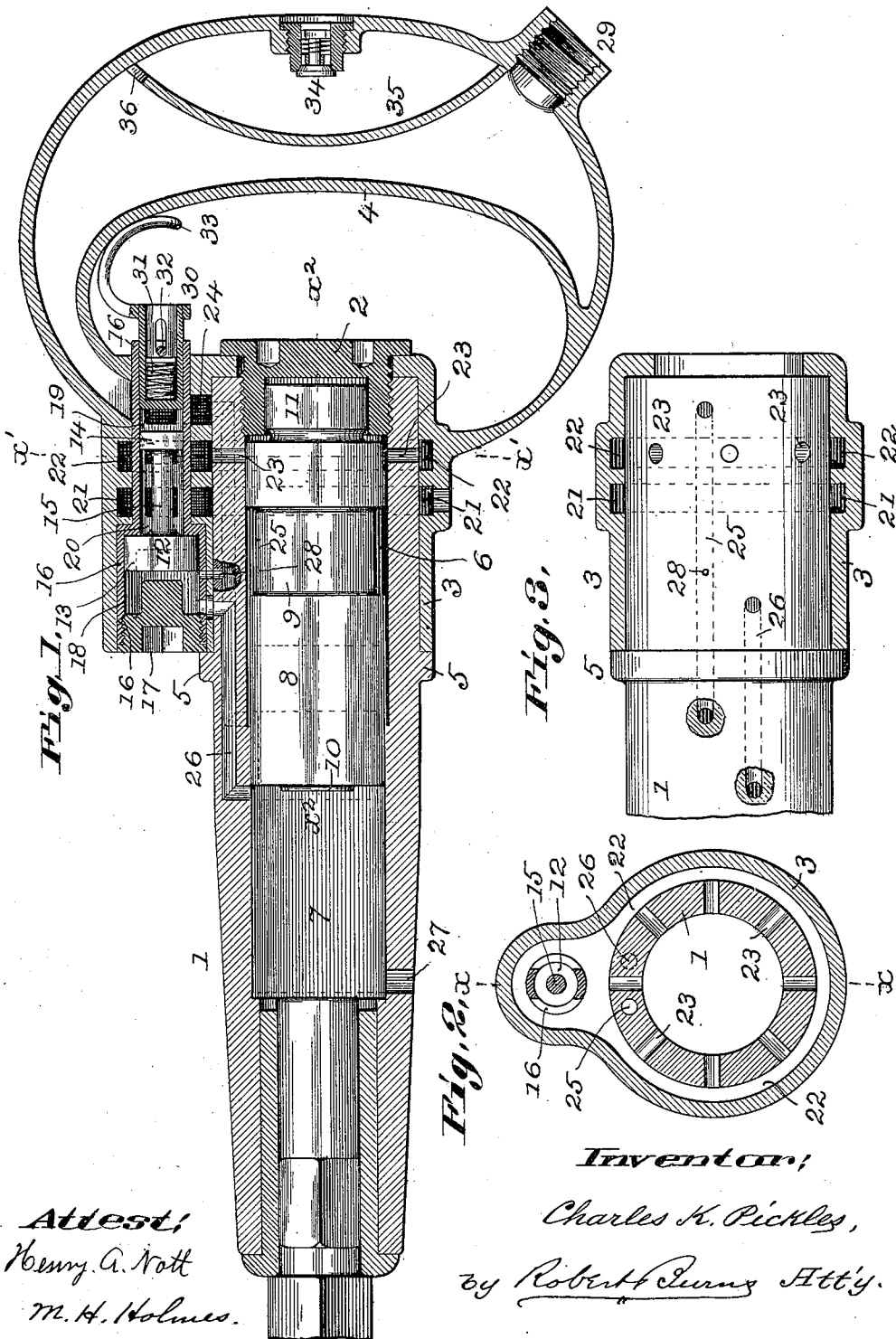


No. 659,418.

Patented Oct. 9, 1900.

C. K. PICKLES.
PNEUMATIC HAMMER.
(Application filed Feb. 10, 1900.)

(No Model.)



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UNITED STATES PATENT OFFICE.

CHARLES K. PICKLES, OF ST. LOUIS, MISSOURI, ASSIGNOR OF ONE-HALF TO
DWIGHT TREDWAY, OF SAME PLACE.

PNEUMATIC HAMMER.

SPECIFICATION forming part of Letters Patent No. 659,418, dated October 9, 1900.

Application filed February 10, 1900. Serial No. 4,803. (No model.)

To all whom it may concern:

Be it known that I, CHARLES K. PICKLES, a citizen of the United States, residing at St. Louis, in the State of Missouri, have invented certain new and useful Improvements in Pneumatic Hammers; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming a part of this specification.

The present invention relates to that type of pneumatic impact-tools in which the impact-piston and its cylinder or housing are formed with differential-pressure areas and in which the reversing-valve is pneumatically operated and automatically controlled by the impact-piston in its movements.

The object of the present improvement is to provide a simple and efficient construction and arrangement of parts in a pneumatic impact-tool and which involves in detail, a construction of parts by which the impact-piston is very efficiently cushioned on its back stroke and an initial forward movement imparted to the same, a differential-valve construction in which the movements of the differential controlling-valve are effected in a positive and certain manner, an arrangement of parts in which the handle portion of the tool is made readily detachable and constitutes the housing for the controlling-valve and thus afford ready access to the valve for cleaning and repair, and the provision in the handle portion of the tool of an inwardly-opening check-valve to afford means for emptying the flexible line or connecting-pipe of the tool previous to a detachment of such tool and in addition afford means for introducing a supply of lubricant to the interior of the tool, all as will hereinafter more fully appear and be more particularly pointed out in the claims. I attain such objects by the construction and arrangement of parts illustrated in the accompanying drawings, in which—

Figure 1 is a longitudinal sectional elevation at line *xx*, Fig. 2, of a pneumatic hammer embodying the present improvements and illustrating the parts in a position in which the piston is just reaching its fully-retracted or backward position and the con-

trolling-valve in a position of exhaust; Fig. 2, a transverse section at line *xx*; and Fig. 3 a fragmentary view of the pneumatic hammer with the handle-attaching sleeve or hub in section at line *xx*, Fig. 1.

Similar numerals of reference indicate like parts in the several views.

Referring specifically to the drawings, 1 represents the main body or cylinder of the hammer, having the usual contracted forward end adapted to receive the shank of the cutting-chisel or other tool and a screw-threaded bore at its rear end adapted to receive the cap-nut 2, that closes the rear end of the cylinder and also serves as a means for securing the attaching ring or sleeve 3 of the hammer handle or grip 4 upon the main body or cylinder 1 and against the circular abutment-flange 5 of such cylinder, as shown in Figs. 1 and 3. In the present construction the cylinder or body 1 is bored to form two chambers 6 and 7, the rearward one of which is the larger, as shown.

8 is the impact piston or plunger formed of two diameters, as usual, to fit the corresponding chambers 6 and 7 of the main cylinder. This piston is of a solid cylindrical form and is provided with an annular peripheral recess or channel 9 in its larger piston portion for purposes hereinafter set forth and with reduced ends or extensions 10 and 11, the forward one 10 constituting the impact portion of the piston, while the rearward one 11 is adapted to enter a central recess or chamber in the cap-nut 2 to cushion the piston as it nears the end of its backward stroke, as hereinafter set forth.

12 is the main reversing-valve of the present construction of the differential-pressure area type and of a cylindrical form and comprises an enlarged forward head 13, a reduced rearward head 14, and a connecting-stem 15. The valve-chamber for the valve 12 comprises tubular enlargement on the side of the attaching ring or sleeve 3 of the hammer handle or grip and a bushing or lining 16, fitting the tubular bore of such enlargement and secured therein by means of the screw-plug 17, that constitutes an end closure for the forward end of the valve-chamber. The bushing or lining 16 is bored to

two diameters corresponding with the different diameters of the valve-heads 14 and 15, and as so formed constitutes the respective piston-chambers 18 and 19 and intermediate chamber 20, that has independent and constant communication with the exhaust-passage of the hammer and independent and intermittent communication with the enlarged main and rearward piston-chamber, in which moves the enlarged rear portion of the main piston 8.

21 is an internal annular chamber formed in the attaching ring or sleeve and constituting the exhaust port or passage for the rear piston-chamber. 22 is a similar annular chamber arranged adjacent to the chamber 21 and having communication with the rear piston-chamber by means of one or more radial passages 23 in the wall of the main cylinder, as shown in Figs. 1, 2, and 3.

24 is the main supply passage or chamber, the handle portion arranged immediately back of the annular chamber 22, as shown.

The ports and passages of the present construction comprise as follows: The main supply-passage 24 in the handle and the radial passages 23, connecting the same indirectly through the reversing-valve with the rear piston-chamber, as heretofore described; a longitudinal passage 25, formed in the wall of the main cylinder and extending from the supply-chamber 24 to a point near where the rear piston-chamber 6 joins the forward piston-chamber 7, and adapted to introduce constant pressure into the reduced annular space in front of the larger and rearward head or portion of the main piston 8; a longitudinal passage 26, also in the wall of the main cylinder and extending from the forward valve-chamber 18 to the smaller bore of the main cylinder and opening into such bore a short distance in front of the point of juncture of such smaller bore with the larger bore of the main cylinder, such opening being adapted to be uncovered by the main piston as it nears the end of its backward stroke and as shown in Fig. 1 of the drawings; a relief-passage 27, connecting the smaller bore of the main cylinder near its forward end with the atmosphere, and a minute port or passage 28, connecting the main passage 25 with the lower valve-chamber 18.

29 is the usual inlet neck or nipple for the attachment of the flexible supply-pipe that has connection with the source of motive fluid. The bore of the said nipple communicates with the hollow interior of the main handle or grip 4, and such interior connects in turn with the supply passage or chamber 24, heretofore described.

30 is the throttle-valve, which in the present improvement is a hollow cylindrical plug fitting the upper end of the fixed bushing or lining 16 of the main reversing-valve 12 and adapted to control communication between

the supply-chamber 24 and the interior of such sleeve through a lateral opening in such sleeve, as shown in Fig. 1.

31 is a spring tending to force the valve 30 forward into a closed condition.

32 is a stop-pin which, in connection with an elongated slot 32 in the valve, serves to limit the travel of such valve.

33 is a hook-shaped extension of the valve 30, affording convenient means for effecting an opening movement of the valve by a finger of the operator.

34 is an inwardly-opening check-valve controlling communication between the interior of the handle or grip 4 and the atmosphere and adapted when opened to permit the escape of the motive fluid from the interior of such handle as well as from the flexible supply that extends to the source of motive-fluid supply. In addition to the above such check-valve affords a convenient means for introducing a supply of lubricant to the interior of the hammer, and with a view to prevent a flow of the lubricant into the flexible supply-pipe the interior of the handle will be provided with an intermediate partition or diaphragm 35 to constitute a separated oil-receiving chamber or trap, from which the oil passes into the main chamber at a point remote from the motive-fluid inlet 29 through the opening or orifice 36 in such partition.

In the present construction the inlet ports or passages 23 are arranged a short distance forward of the extreme rear piston-chamber 6, so that with a movement backward of the piston past such openings the air will be confined to act as a cushion to retard the further backward movement of the piston, while the air compressed for a more extended period by the piston extension 11 in the cavity of the cap-nut 2 will tend to impart an initial and very gradual return movement to the piston.

With a construction and arrangement of parts as above described the operation of the present pneumatic hammer is as follows: Starting with the piston in the position illustrated in Fig. 1 of the drawings, the motive fluid passes into the main supply-chamber 24 and through the passage 25 into the annular chamber in front of the rearward and larger portion of the piston 8 to maintain constant pressure in such annular chamber. At the same time the motive fluid pressing upon the valve-head 14 forces the reversing-valve 12 forward, the motive fluid in the lower valve-chamber 18 escaping through the passage 26 into the lower piston-chamber 7. With the valve 12 in its forward position the motive fluid passes through the annular chamber 22 and radial passages 23 back of the main piston to forcibly project the same forward and effect the active or impact action of the piston and overcoming the resistance of the motive fluid in the annular space in front of

the larger and rear end of the piston. As the piston 8 nears the limit of its forward stroke the annular chamber 9 of such piston registers the lower ends of the passages 26 and 28, and motive fluid under normal will pass from such annular space through the passage 26 into the forward valve-chamber 18 to cause the valve 12 to move backward into the position indicated in Fig. 1. With the valve in above-described position and the piston in its forward position the constant pressure in the annular space that surrounds the piston will force said piston backward, the supply of motive fluid to the larger rear piston-chamber being cut off by the valve 12 and said larger rear piston-chamber being in communication with the atmosphere through radial passages 23 and annular passages 21 and 22. With a return of the main piston to its backward position the lower end of the passage 26 is uncovered by said piston to allow the escape of motive fluid from the forward valve-chamber 18, which in turn admits the valve to again move forward and commence a fresh cycle of the operations just described.

The minute port 28 acts to introduce a constant yet limited supply of motive fluid into the forward valve-chamber 18 to insure a positive and full movement of the valve and prevent any fluttering and incomplete movements of said valve, which would otherwise be liable to occur.

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

1. In a pneumatic hammer, a cylinder, an impact-piston, a sleeve detachably secured to the cylinder, a valve-chamber formed in one side of said sleeve and wholly independent of and parallel with the cylinder, and a pneumatically-actuated piston-valve arranged in said valve-chamber, substantially as set forth.

2. In a pneumatic hammer, a cylinder, an impact-piston, a sleeve detachably secured to the cylinder, a differential-area valve-chamber formed in one side of said sleeve and wholly independent of and parallel with the cylinder, and a pneumatically-actuated and differential piston-valve arranged in said valve-chamber, substantially as set forth.

3. In a pneumatic hammer, a cylinder, an impact-piston, a handle portion having a sleeve by which it is detachably secured to the cylinder, a valve-chamber formed in one side of said sleeve and wholly independent of and parallel with the cylinder and a pneumatically-actuated piston-valve arranged in said valve-chamber, substantially as set forth.

4. In a pneumatic hammer, a cylinder, an impact-piston, a handle portion having a sleeve by which it is detachably secured to the cylinder, a differential-area valve-chamber formed in one side of said sleeve and wholly independent of and parallel with the

cylinder, and a pneumatically-actuated and differential piston-valve arranged in said valve-chamber, substantially as set forth.

5. In a pneumatic hammer, a cylinder, an impact-piston, a sleeve detachably secured to the cylinder, a valve-chamber formed in one side of said sleeve and wholly independent of and parallel with the cylinder, a pair of annular passages formed in said sleeve, and a pneumatically-actuated piston-valve arranged in said valve-chamber, substantially as set forth.

6. In a pneumatic hammer, a cylinder, an impact-piston, a sleeve detachably secured to the cylinder, a valve-chamber formed in one side of said sleeve and wholly independent of and parallel with the cylinder, a pair of annular passages formed in said sleeve, a cylindrical bushing or lining for said valve-chamber, and a pneumatically-actuated piston-valve arranged in said valve-chamber, substantially as set forth.

7. In a pneumatic hammer, a cylinder, an impact-piston having a reduced rearward extension, a pneumatically-actuated valve for controlling the movement of said piston, and an inlet-port to the rear piston-chamber arranged forward of the rear end of such chamber a distance less than the length of said piston extension, substantially as set forth.

8. In a pneumatic hammer, a cylinder, an impact-piston, a hollow handle portion having an inlet-neck for the attachment of the flexible supply-pipe, and an inwardly-opening check-valve arranged in said handle portion, substantially as set forth.

9. In a pneumatic hammer, a cylinder, an impact-piston, a hollow handle portion having an inlet-neck for the attachment of the flexible supply-pipe, an inwardly-opening check-valve arranged in said handle portion, and a lubricant-trap arranged intermediate of the inlet-neck and the check-valve, substantially as set forth.

10. In a pneumatic hammer, a cylinder, an impact-piston, a sleeve detachably secured to the cylinder, a valve-chamber formed in one side of said sleeve and wholly independent of and parallel with the cylinder, a pneumatically-actuated piston-valve arranged in said valve-chamber, and a piston throttle-valve arranged in axial alinement with said valve, substantially as set forth.

11. In a pneumatic hammer, a cylinder, an impact-piston, a sleeve detachably secured to the cylinder, a valve-chamber formed in one side of said sleeve and wholly independent of and parallel with the cylinder, a cylindrical bushing or lining for said valve-chamber, a pneumatically-actuated piston-valve arranged in one portion of said bushing, and a manually-controlled piston-valve arranged in the other portion of said bushing, substantially as set forth.

12. In a pneumatic hammer, a cylinder, an

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impact-piston, a sleeve detachably secured to the cylinder, differential-area valve-chamber formed in said sleeve, a pneumatically-actuated and differential piston-valve arranged
5 in said chamber, and a minute passage connecting with the larger valve-chamber and adapted to introduce normal motive-fluid pressure into said chamber to hold said valve

in its rearward position, substantially as set forth. 10

In testimony whereof witness my hand this 3d day of February, 1900.

CHARLES K. PICKLES.

In presence of—

ROBERT BURNS,
HENRY A. NOTT.