No. 630,818. Patented Aug. 8, 1899.

C. K. PICKLES.

PNEUMATIC HAMMER.

(Application filed Jan. 3, 1899.)

(No Model.)

Fig. 1.

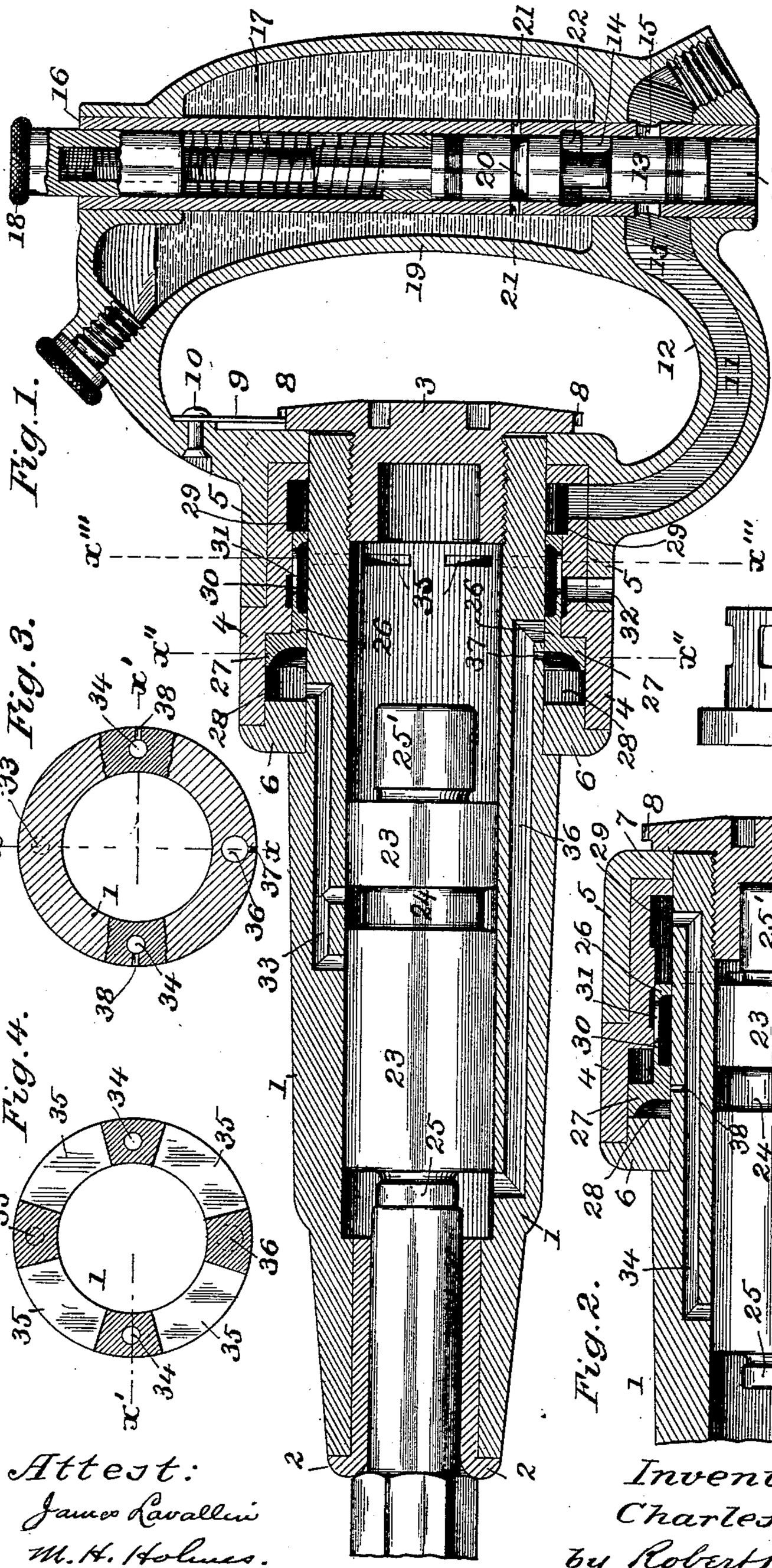


Fig. 6.

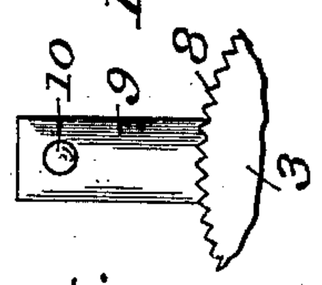


Fig. 5.

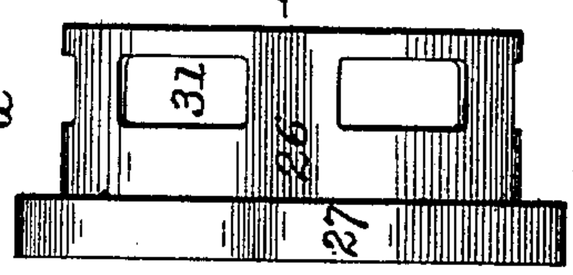
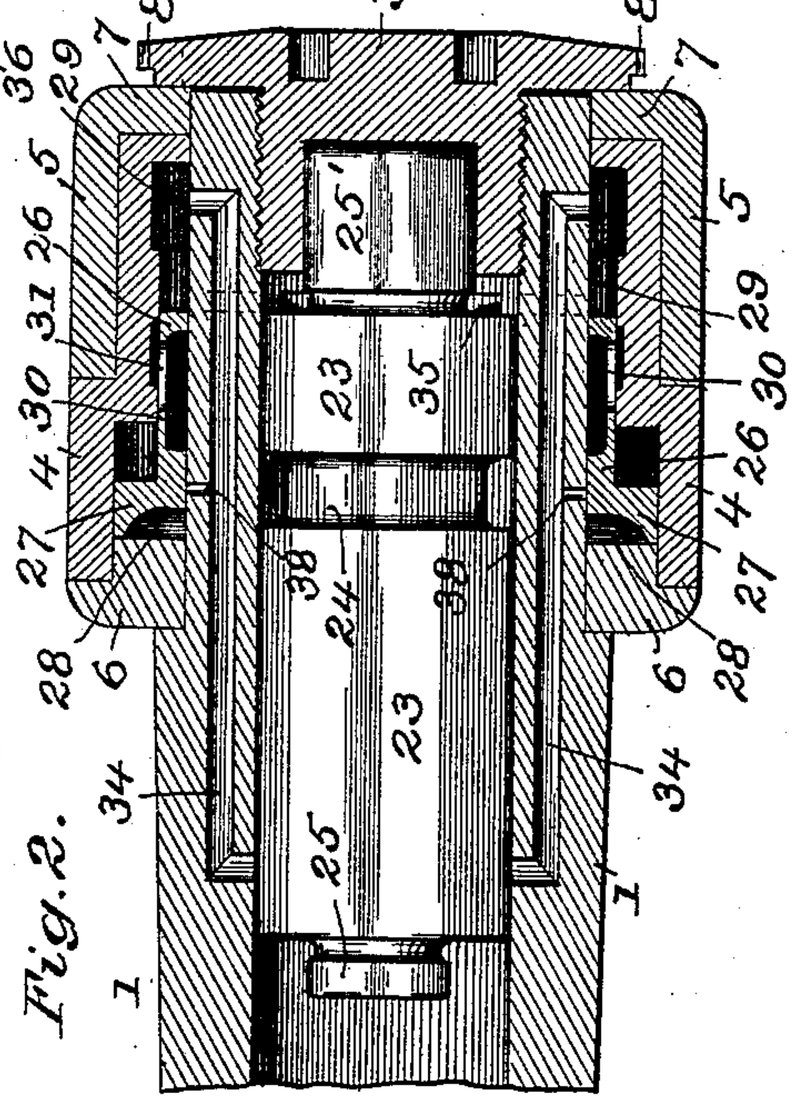


Fig. 3.

Fig. 4.

Fig. 2.



Attest:
James Lavallee
M. A. Holmes.

Inventor.-
Charles K. Pickles,
by Robert Burns Att'y.

UNITED STATES PATENT OFFICE.

CHARLES K. PICKLES, OF ST. LOUIS, MISSOURI, ASSIGNOR TO JOSEPHINE V. PICKLES, OF SAME PLACE.

PNEUMATIC HAMMER.

SPECIFICATION forming part of Letters Patent No. 630,818, dated August 8, 1899.

Application filed January 3, 1899. Serial No. 701,037. (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 pneumatic hammers, and more especially to that type of the same in which the reversing-valve has a concentric arrangement with relation to the reciprocating piston of the hammer.

The objects of the present improvements are in the main, first, to provide a simple, durable, and effective formation and arrangement of the fluid-actuated reversing-valve and in which such valve has its seat in an annular chamber exterior to and surrounding the piston-cylinder and is adapted to so govern and control the movements of the piston that while a maximum impact is attained in the forward or active movement of the piston the vibration in the pneumatic hammer, due to the return movement of the piston, is reduced to a minimum; second, to provide a simple and effective means for attaining an automatic recurrent lubrication of the piston and other parts of a pneumatic hammer, and, third, to provide a strong and effective means for securing in place the end head or cap-nut of the hammer-cylinder.

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 of a pneumatic hammer at line $x\,x$, Figs. 3 and 4, embodying the present invention and illustrating the parts in that position in which the piston is at the end of its normal forward position with the valve shifted to effect a return stroke of such piston; Fig. 2, a detail longitudinal sectional elevation at line $x'\,x'$, illustrating the parts in that position in which the piston is fully retracted with the valve shifted to effect a forward stroke of such piston; Fig. 3, a transverse section of hammer-cylinder at line $x''\,x''$, Fig. 1, with portions broken away; Fig. 4, a similar transverse section at line $x'''\,x'''$, Fig. 1; Fig. 5, a side elevation of the reversing-valve in a detached condition; Fig. 6, a detail view illustrating the means for locking the end or head or cap of the hammer-cylinder in place.

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

Referring to the drawings, 1 represents the housing or cylinder of the pneumatic hammer, the lower end of which is of the usual contracted nature and provided with a bushing 2 to receive the shank of the cutting or other tool, as usual in the present type of hammers. The bore of the cylinder extends the whole length of the housing 1, its upper end being closed by an end head or cap-nut 3 screwing therein, as shown, while its lower end is closed by the bushing 2, heretofore described.

The cap-nut 3, in addition to forming a closure for the rear end of the piston chamber or cylinder, also serves as a means for securing in place the valve-housing 4 and the attaching-collar 5 of the handle of the hammer.

6 is a circular enlargement on the exterior of the housing or cylinder 2, forming the forward wall of the valve-chamber and offsetted, as shown, to receive the outer end of the cylindrical valve-housing 4.

7 is an inturned rim at the rear end of the collar 5, which is adapted to fit the outer and extreme rear end of the main cylinder 1, as shown, the main portion of said collar fitting the outer periphery of the valve-housing 4 and having abutment against a shoulder or offset on such housing, as illustrated in Figs. 1 and 2, the arrangement being such that an adjustment of the end head or cap-nut 3 of the piston-chamber will effect a general adjustment and holding of the several parts above described in their proper operative position.

In the present improvement the overlapping rim portion of the cap-nut 5 is formed with a series of marginal serrations 8, that are engaged by a serrated dog 9, secured to the handle portion of the hammer by means of an attaching screw or rivet 10, as shown. Such dog is formed of plate or spring metal and is adapted to be sprung out of engagement with the cap-nut to admit of the rotation of the

same and by its resiliency to again return into engagement with the cap-nut to lock the same against further rotation.

11 is the supply-passage for the compressed air or other motive fluid, formed in one of the branches 12 of the hammer-handle and communicating at one end with the annular chamber of the manually-actuated controlling-valve 13 and at the other end with the annular rear end of the main-valve chamber, as illustrated in Fig. 1.

In the construction illustrated in Fig. 1 the valve 13 is of the ordinary piston type, formed with an annular passage 14, adapted to register with oppositively-arranged orifices 15 in the stationary valve-housing 16, secured in the hammer-handle and adapted by its movement to control the supply of motive fluid to the hammer mechanism.

17 is a spring tending to hold the valve 13 in its closed condition. 18 is a head on said valve, projecting outside the hammer-handle, so as to be capable of convenient manipulation by the thumb of the operator.

In the present invention the hammer handle or grip 19 is chambered out to form an oil-containing chamber of some capacity, and through such chamber the tubular valve-housing 16 extends from one end to the other of the hammer-handle, as shown.

20 is a chamber formed in the reciprocating valve 13, that registers with a supply-passage 21 in the valve-housing 16 to receive a body of oil or other lubricant from the main oil-supply chamber of the hammer-handle 19. With a forward movement of said valve the oil in the chamber 20 will be carried into an annular chamber 22, whence it passes in a subsequent movement of the valve into the annular passage 14 of the said valve, and in a still subsequent movement of the valve the oil in the passage 14 will be brought into the path of the motive-fluid supply, to be carried thereby into the valve-chamber and other parts of the hammer.

23 is the reciprocating piston, having a solid cylindrical formation fitting the bore of the cylinder or housing 1 and formed with an annular peripheral chamber 24 near its upper end and upper and lower centrally-projecting ends 25 and 25′ of a reduced nature, as shown, the lower one forming the impact portion of the piston to deliver the blow of the piston to the shank of the chisel or other tool, while the other end 25′ is adapted to enter a central recess in the end head or cap-nut 3 to effect a cushioning action upon the piston as it nears the end of its backward stroke.

26 is the main reversing-valve of an annular form and having an internal diameter equal to the external diameter of the main cylinder 1. Such valve is arranged to have its seat upon the periphery of the cylinder 1 at a point immediately back of the enlargement 6, heretofore described and as illustrated in Figs. 1 and 2.

The valve 26 is of the annular piston type, its forward portion consisting of an enlarged head 27, that has movement in a correspondingly-enlarged portion 28 of the main-valve chamber formed by the valve-housing 4 and the circular enlargement 6 of the main housing.

The rear and main portion of the valve 26 is of a smaller diameter than the forward portion 27 and is adapted to have movement in a correspondingly-reduced portion 29 of the valve-chamber formed by the reduced rear end of the valve-housing 4, as illustrated in Figs. 1 and 2, and as so constructed constitutes a piston-valve having differential areas on its opposite faces and adapted to operate under the differential effects of fluid-pressure.

30 is an annular internal exhaust-chamber in the body of the main valve, and 31 are openings through the wall of said chamber, such chamber and openings being adapted to control communication between the upper and lower piston-chambers and the exhaust-port 32 in the housing 1, that opens to the atmosphere.

In the present construction the motive-fluid pressure is constant against the rearward and smaller area of the annular piston-valve 26 in that the annular rear end of such chamber constitutes a receiving-chamber for the motive fluid employed in actuating the hammer.

33 is a longitudinal port or passage formed in the main housing 1 and connecting the forward side of the valve-head 27 with the lower piston-chamber when the piston is in its rearward position to allow for an exhaust of the motive fluid from the forward end of the valve into the lower piston-chamber.

34 is a longitudinal port or passage formed in the main housing 1 and extending from the annular pressure-supply end of the main-valve chamber to a point in line with the lateral supply-opening of the passage 33, that extends to the forward side of the valve-head 27, the construction being such that with the annular peripheral chamber 24 of the main piston in the position indicated in Fig. 1 the said passages 33 and 34 will be in communication to introduce into the chamber at the front end of the main valve a fluid-pressure to force said valve into its rearward position.

35 are one or more ports or passages connecting the source of motive-fluid supply in the rear end of the main-valve chamber with the rear piston-chamber.

36 is a relief or exhaust port connecting the forward piston-chamber with the atmosphere in a controllable manner. In the construction shown the passage 36 extends from the forward end of the forward piston-chamber back to a point in line with the exhaust-chamber 30 of the main valve, so as to be controlled by the movements of said valve. With the parts in the position shown in Fig. 1 the exhaust nature of such passage is rendered dormant by the main valve cutting off communication between the same and the exhaust-chamber 30 of the valve.

37 is a small transverse passage forming a communication between the forward valve-chamber and the passage 36, and which passage 37 is uncovered, with the valve in position indicated in Fig. 1, to introduce a comparatively-restricted supply of motive fluid through the passage 36 into the forward piston-chamber to cause a return or back stroke of the main piston with a minimum amount of jar or impact.

38 is a transverse passage connecting the forward valve-chamber with the longitudinal passage 34 and adapted to introduce a motive-fluid pressure into the forward valve-chamber to hold the valve in its rearward position after said valve has attained such position and in addition thereto afford a supply of motive fluid to the forward piston-chamber through passage 36.

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. 2 and valve in the position illustrated in Fig. 1, the motive fluid entering the reduced valve-chamber 29 will force the valve 26 forward into the position indicated in Fig. 2, so as to uncover the ports 35 to admit motive fluid to the rear piston-chamber to cause a forcible forward or active stroke of the main piston. Such motive-fluid pressure upon the rear end of the piston continues until the annular chamber 24 registers the ports or passages 33 and 34, after which the remainder of the active stroke of such piston will depend upon its momentum. With the ports or passages 34 and 33 registered or in communication by means of the annular chamber 24 of the piston the motive-fluid pressure is admitted to the forward valve-chamber against the enlarged forward end of the valve 26 to force the valve into its rearward position, as indicated in Fig. 1. As such valve reaches its rear position the exhaust-chamber 30 and the openings 31 put the ports 35 of the upper piston-chamber in communication with the exhaust-port 32 of the housing. At the same time the valve 26 uncovers the transverse port 37 to admit motive fluid into the lower piston-chamber through passage 36 to cause a comparatively slow return movement of the piston to its back position. With the return of the piston to its rear position the lower end of the passage 33 is uncovered and communication between the same and the forward piston-chamber is established, so that the pressure in the forward valve-chamber will be relieved to enable the constant pressure in the rear valve-chamber to force the main valve into its forward position to commence a fresh cycle of operations, as heretofore described.

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 fluid-actuated annular valve for controlling the movement of the piston and having its seat upon the exterior of the piston-cylinder, substantially as set forth.

2. In a pneumatic hammer, a fluid-actuated annular valve for controlling the movement of the piston and having its seat upon the exterior of the piston-cylinder, and means controlled by the piston for admitting motive fluid to the lower piston-chamber, substantially as set forth.

3. In a pneumatic hammer, a fluid-actuated annular valve for controlling the movement of the piston, formed with differential pressure areas and having its seat upon the exterior of the piston-cylinder, substantially as set forth.

4. In a pneumatic hammer, a fluid-actuated annular valve for controlling the movement of the piston, formed with differential pressure areas and having its seat upon the exterior of the piston-cylinder, the reduced pressure area of the valve being under constant pressure of the motive fluid, and the larger pressure area of the valve under an intermittent pressure of the motive fluid, substantially as set forth.

5. In a pneumatic hammer, the combination of a piston, a piston-cylinder, a fluid-actuated annular valve located in a chamber exterior to and surrounding the piston-cylinder, in the smaller area of which the motive fluid acts to constantly force the valve in one direction, and a passage controlled by the piston for intermittently admitting the motive fluid to the larger pressure area of said chamber to force the valve in an opposite direction, substantially as set forth.

6. In a pneumatic hammer, the combination of a piston, a piston-cylinder, a fluid-actuated annular valve located in a chamber exterior to and surrounding the piston-cylinder, and formed with differential pressure areas, against the smaller of which the motive fluid acts to constantly force the valve in one direction, a passage controlled by the piston and opened by the latter on its forward stroke to admit motive fluid to the larger area of the valve, and an exhaust-passage leading from said larger area of the valve and opened by the piston in its backward stroke, substantially as set forth.

7. In a pneumatic hammer, a fluid-actuated annular valve for controlling the movement of the piston, formed with differential pressure areas and having its seat upon the exterior of the piston-cylinder, the reduced pressure area of the valve being under constant pressure of the motive fluid, and the larger pressure area of the valve under an intermittent pressure of the motive fluid and a longitudinal passage connecting the forward piston-chamber with the valve-chamber, substantially as set forth.

8. In a pneumatic hammer, a fluid-actuated annular valve for controlling the movement of the piston, formed with differential pressure areas and having its seat upon the ex-

terior of the piston-cylinder, the reduced pressure area of the valve being under constant pressure of the motive fluid, and the larger pressure area of the valve under an intermittent pressure of the motive fluid, a longitudinal passage connecting the forward piston-chamber with the valve-chamber, and a transverse passage from the said longitudinal passage to the valve-chamber, that is adapted to be uncovered by the valve to admit motive fluid, to the forward piston-chamber, substantially as set forth.

9. In a pneumatic hammer, a fluid-actuated annular valve for controlling the movement of the piston, formed with differential pressure areas and having its seat upon the exterior of the piston-cylinder, the reduced pressure area of the valve being under constant pressure of the motive fluid, and the larger pressure area of the valve under an intermittent pressure of the motive fluid, and a passage or passages adapted to introduce motive-fluid pressure to the forward end of the valve-chamber to hold the valve in its rearward position, substantially as set forth.

10. The combination in a pneumatic hammer, of an operating mechanism, ports and passages to said operating mechanism, an oil-reservoir, and means for controlling communication between said reservoir and said ports and passages, and adapted to feed the lubricant directly into the path of the motive fluid, substantially as set forth.

11. The combination in a pneumatic hammer, of an operating mechanism, ports and passages to said operating mechanism, an oil-reservoir, and means for controlling communication between said reservoir and said ports and passages, and adapted to effect a forced feed from said reservoir into such ports or passages, directly into the path of the motive fluid, substantially as set forth.

12. The combination in a pneumatic hammer, of an operating mechanism, ports and passages to said operating mechanism, a handle or grip formed with an oil-reservoir, and means for manually controlling communication between said reservoir and said ports and passages, substantially as set forth.

13. The combination in a pneumatic hammer, of an operating mechanism, ports and passages to said operating mechanism, an oil-reservoir, and means for controlling communication between said reservoir and said ports and passages, the same comprising a piston-valve moving in a tubular housing, and chambers and passages in said piston-valve and housing, so arranged that at each movement of the piston-valve a positive feed of the lubricant will be effected, substantially as set forth.

14. The combination in a pneumatic hammer, of an operating mechanism, ports and passages to said operating mechanism, a throttle-valve of the piston type controlling the inlet-passage of the hammer, a handle or grip formed with an oil-reservoir, a tubular housing for the valve, and chambers and passages in said piston-valve and housing, so arranged that at each movement of the valve a positive feed of the lubricant will be effected, substantially as set forth.

15. In a pneumatic hammer, an end head or screw-cap closing the rear end of the main cylinder, and provided with a marginal serrated portion, and a resilient dog secured to the hammer-housing and having a serrated edge adapted to engage the serrated margin of said end cap, substantially as set forth.

In testimony whereof witness my hand this 30th day of December, 1898.

CHARLES K. PICKLES.

In presence of—
ROBERT BURNS,
JAMES LAVALLIN.