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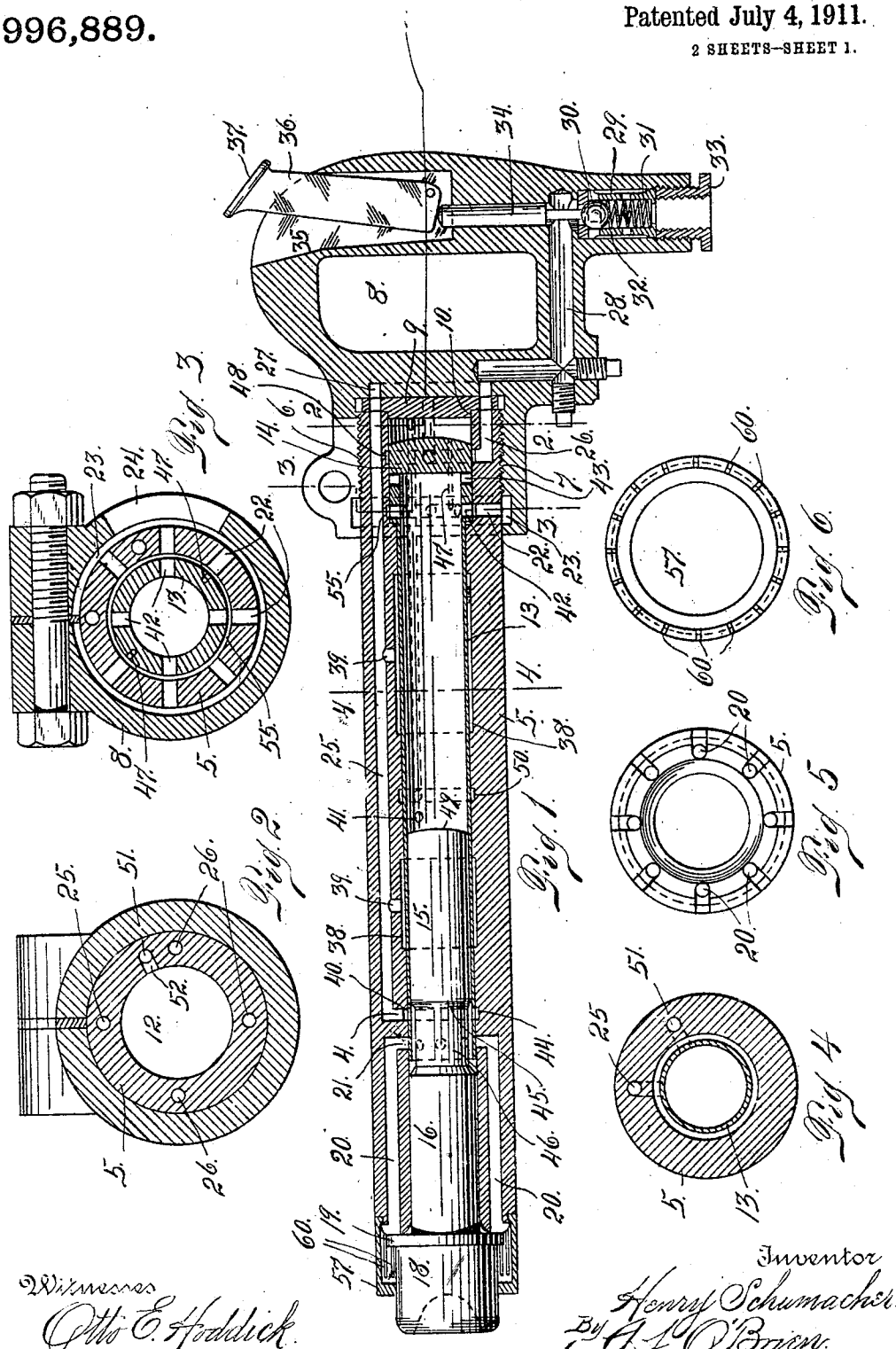
PNEUMATIC HAMMER.

APPLICATION FILED JUNE 30, 1910.

996,889.

Patented July 4, 1911.

2 SHEETS—SHEET 1.



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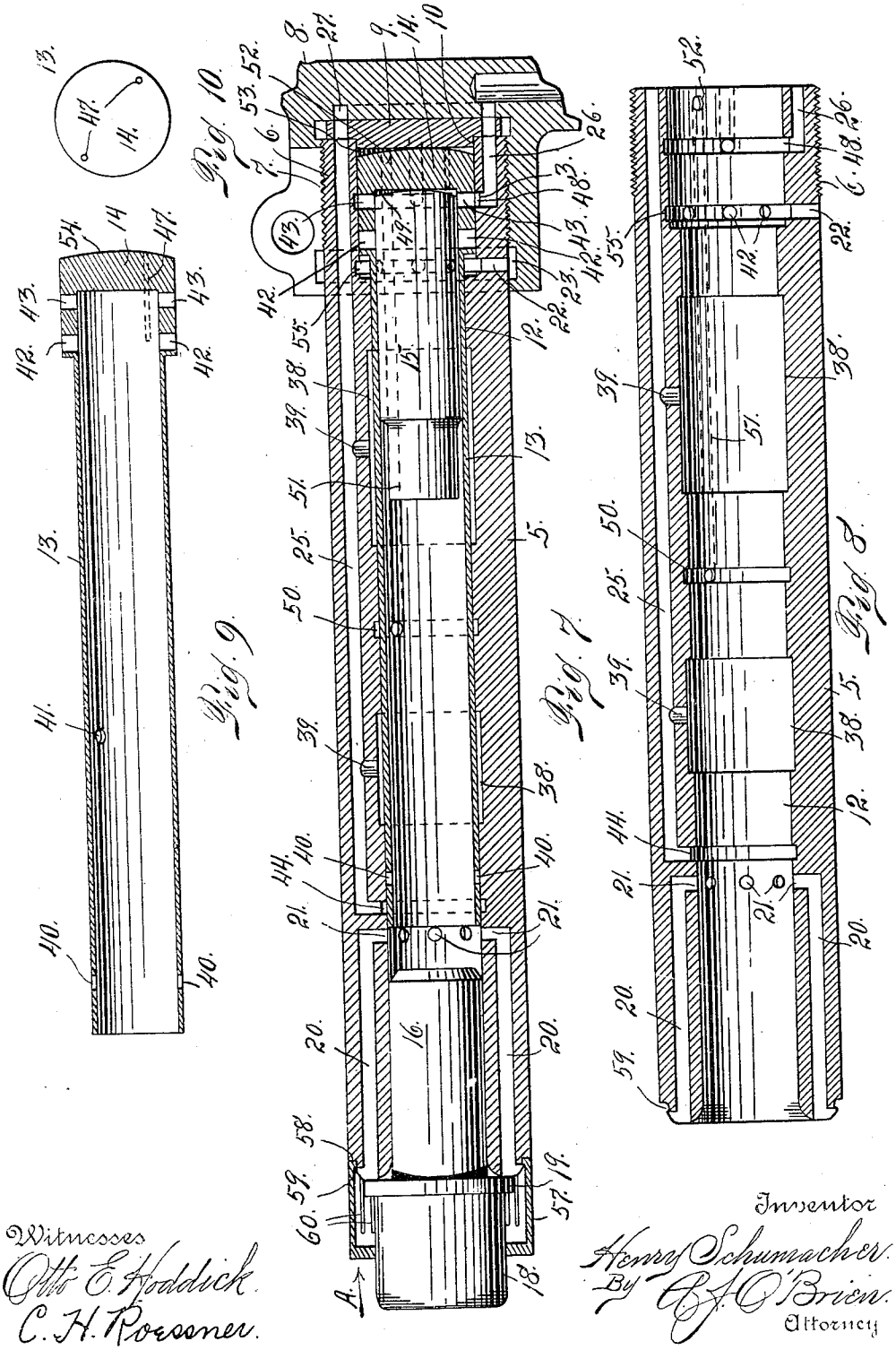

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UNITED STATES PATENT OFFICE.

HENRY SCHUMACHER, OF DENVER, COLORADO.

PNEUMATIC HAMMER.

996,889. Specification of Letters Patent. Patented July 4, 1911.

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To all whom it may concern:

Be it known that I, HENRY SCHUMACHER, a citizen of the United States, residing in the city and county of Denver and State of Colorado, have invented certain new and useful Improvements in Pneumatic Hammers; and I do 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 appertains to make and use the same, reference being had to the accompanying drawings, and to the letters and figures of reference marked thereon, which form a part of this specification.

My invention relates to improvements in pneumatic hammers, my object being to provide a construction of this class which shall be simple in construction, durable and economical.

In my improved construction, the hammer reciprocates in an inner casing or sleeve which constitutes the valve. This valve reciprocates in a cylinder provided with portions of its inner cylinder cut away to lessen the surface contact of the valve with the cylinder, thus reducing to a minimum frictional contact of the valve with the cylinder, and forming what is termed a balanced valve sleeve. The cut away portions of the cylinder form chambers between the inner surface of the cylinder and the valve sleeve and entirely surround the latter, the chambers being in communication with the source of motive fluid, whereby a lubricant for lubricating the parts of the device may be conveyed into the said chambers with the motive fluid. Shortly before the hammer reaches the limit of its stroke in either direction, provision is made for shifting the movable valve, whereby the live motive fluid is cut off from the cylinder upon one side of the hammer, and caused to enter the same on the opposite side for producing the return movement. One extremity of the valve is open and the opposite extremity is enlarged and adapted to fit within a correspondingly enlarged chamber of the hammer cylinder.

Having briefly outlined my improved construction, I will proceed to describe the same in detail, reference being made to the accompanying drawing in which is illustrated an embodiment thereof.

In this drawing: Figure 1 is a longitudinal sectional view of my improved pneumatic hammer. Fig. 2 is a cross section taken on the line 2—2 of Fig. 1. Fig. 3 is a cross section taken on the line 3—3 of Fig. 1. Fig. 4 is a cross section taken on the line 4—4 of Fig. 1. Fig. 5 is an end view of the hammer cylinder taken in the direction of arrow A in Fig. 7, with the tappet and retaining cap removed. Fig. 6 is an inner face view of the cap for retaining the tappet in position. Fig. 7 is a longitudinal sectional view of the apparatus showing the handle broken away. Fig. 8 is a longitudinal sectional view of the hammer cylinder showing the valve removed. Fig. 9 is a longitudinal sectional view of the valve. Fig. 10 is an end view of the valve.

The same reference characters represent the same parts in all the views.

Let the numeral 5 designate a hollow cylindrical body portion of the tool provided with a threaded portion 6, adapted to enter a threaded socket 7 formed in the forward part of a handle member 8. The rear extremity of the hollow cylindrical body member is closed by a head 9, whose rear face engages the bottom of the socket 7 while its inner face is shouldered or offset as shown at 10, the offset member entering the rear extremity of the body of the cylinder. This cylinder is hollow and provided with a cylindrical chamber 12, in which is located a balanced valve sleeve 13, whose rear extremity is closed by an enlarged head 14, its forward extremity being open.

Within the balanced valve sleeve is located a hammer 15, which is mounted to reciprocate therewith. When this hammer reaches the limit of its forward stroke it engages the rear end of a tappet 16 having an enlarged portion 18 and a circumferential flange 19. This tappet is mounted in the cylinder chamber to permit of a limited degree of longitudinal movement therein. The cylinder is provided with forwardly located exhaust passages 20. These exhaust passages pass longitudinally of the cylinder from communicating ports 21 to the end of the cylinder, thus preventing the tappet and the cylinder from becoming heated in setting hot rivets.

The rear extremity of the cylinder is provided with exhaust ports 22 communicating with a circumferential groove 23 located in the socket portion 7 of the hammer member 8. This circumferential groove 23 communi-

cates with a port 24 which is open to the atmosphere. The cylinder is also provided with induction passages 25 and 26 respectively. The passage 25 passes through the flange of the head 9 and communicates with a circumferential groove 27 formed in the hammer member in the rear of the head 9. The induction passages 25 and 26 together with the circumferential groove 27, are in communication with an induction passage 28 formed in the handle member and communicating with a chamber 29, also formed in the handle member, and in which is located a valve 30 acted upon by a coil spring 31, whereby the valve is normally held in position to shut off the air or the motive fluid. Surrounding the spring 31 is a sleeve 32 which forms a suitable casing and seat for the spring. This sleeve is held in position in the chamber 29 by means of a collar 33 threaded in the chamber and adapted to abut against the sleeve 32. This collar 33 is also interiorly threaded so that the extremity of a fluid conduit leading from a source of supply may be connected therewith. The valve 29 is provided with a stem 34, one extremity of which protrudes into a recess 35 formed in the handle member. Pivoted in the recess 35 is a pawl 36 engaging the extremity of the stem 34. This pawl 36 protrudes beyond the recess and is provided with a thumb-engaging portion 37 conveniently located, to be pressed by the hand of the user of the tool, for the purpose of pressing the valve stem forwardly for opening the valve to allow the motive fluid to enter the passage 28. Portions of the inner surface of the cylinder 5 are cut away to lessen the surface contact of the valve sleeve with the wall of the cylinder, and to form lubricant chambers 38 entirely surrounding the valve sleeve. These chambers communicate with the induction passage 25 by means of ports 39, whereby lubricant may be conveyed with the motive fluid into the said chambers, thus all parts of the valve sleeve may be constantly lubricated during the operation of the device.

The valve sleeve 13 is provided with ports designated 40, 41, 42 and 43. The ports 42 and 43 are located within the enlarged extremity of the valve sleeve 13.

When the hammer is at its forward limit of movement the motive fluid enters the hammer chamber from the passage 25 by way of a port 4 to a circumferential groove 44, which is in communication with the port 40 of the valve sleeve. When the hammer is in this position the motive fluid acts upon a shoulder 45 to impart the rearward movement to the hammer. Forward of the shoulder 45, the hammer is provided with a reduced portion 46 which comes in direct contact with the tappet 16. As the hammer moves rearwardly the motive fluid in the rear portion of the hammer chamber exhausts through the port 42 of the valve sleeve to the circumferential groove 23 formed in the socket portion of the handle 9. Before the hammer reaches its rearward limit of movement, and after it has passed the port 41 of the valve sleeve, the air cushions between the hammer and the rear head of the valve sleeve, whereby the latter is caused to move rearwardly until the head of the sleeve engages the inner surface of the head 9 of the cylinder. In the meantime the motive fluid in the rear of the head 14 of the valve sleeve has leaked out into the circumferential groove 23 of the socket portion of the handle member 8, through relatively small motive fluid passages 47 formed in the wall of the sleeve and the inner extremity of the enlarged portion 14 and leading to the circumferential groove 23. After the valve sleeve together with the hammer has reached its rearward limit of movement, the motive fluid enters a circumferential groove 48, formed in the wall of the cylinder, communicating with a port 43 formed in the valve sleeve. At this time the exhaust is cut off, since the port 42 of the sleeve is out of register with the circumferential groove 23 of the socket portion of the handle member. The motive fluid now enters the valve sleeve in the rear of the hammer from the passage 26 through a port 3 formed in the wall of the cylinder, to a circumferential groove 48 and the port 43 of the valve sleeve, for the purpose of moving the hammer forwardly.

It might be stated here that the upper portion of the hammer 16 is rounded as shown at 49, whereby the motive fluid enters between the hammer and the extremity of the valve sleeve, thus forming a wedge-like action against the hammer to force the same away from engagement with the head of the valve sleeve. As the hammer 15 moves forwardly, it uncovers the port 41 formed in the valve sleeve and communicating with a circumferential groove 50 formed in the wall of the cylinder. From the groove 50 a passage 51 leads rearwardly and communicates with a port 52 leading to a space 53 formed back of the enlarged head 14 of the valve sleeve between the head 9 of the cylinder chamber, hence the motive fluid is allowed to pass to the rear of the valve sleeve after the hammer 15 has opened the port 41, thus causing the valve sleeve to be shifted from its position shown in Fig. 7 to the position shown in Fig. 1.

The upper surface of the enlarged head portion 14 of the valve 13 is convex as shown at 54, whereby a sufficient space is left between the enlarged head and the end of the cylinder when the valve sleeve is at the rear end of its travel, to permit the motive fluid to enter between the rear end of the valve sleeve and the end of the cylinder,

at the same time providing a greater surface for the motive fluid to act on than if the head where a flat surface. When the valve sleeve 13 is being shifted to the position shown in Fig. 1 from that shown in Fig. 7, the hammer moves forwardly with it, and as the latter strikes the tappet 15 the motive fluid is allowed to enter the hammer chamber forward of the hammer, whereby the latter is caused to move rearwardly, thus maintaining the proper reciprocating movement of the hammer and the valve sleeve. As soon as the valve sleeve is moved forwardly its enlarged head 14 moves to a position to cut off communication between the live motive fluid and the hammer chamber in the rear of the hammer and at the same time the valve sleeve is in position to allow the motive fluid in the rear of the hammer to exhaust through the port 42 to a circumferential groove 55 formed in the wall of the cylinder 5, thence through the ports 22 to the circumferential groove 23 formed in the socket portion 7 of the handle member 8, from whence it passes through the exhaust port 24.

When the valve sleeve has reached its rearward limit of movement, the induction port 40 of the valve sleeve is moved out of register or communication with the live fluid passage 25, whereby the live motive fluid is cut off from the hammer chamber in front of the hammer. This rearward movement of the valve sleeve uncloses ports 21 formed in the forward extremity of the cylinder and communicating with the passages 20, whereby the motive fluid within the chamber in front of the hammer is allowed to exhaust at the forward extremity of the cylinder.

The forward extremity of the cylinder is provided with a cap 57 having an inwardly projecting flange 58 adapted to fit within an exteriorly located circumferential groove 59 of the cylinder. This cap is slotted from its upper edge downwardly as shown at 60, thus making the cap resilient and forming escape passages for the motive fluid passing through the passages 20.

From the foregoing description the operation of my improved pneumatic hammer will be readily understood. Referring to Fig. 1 of the drawing and assuming that all of the parts are in the position shown therein, the user of the hammer, by pressing the thumb on the pawl 36, the valve 30 will be forced outwardly to allow the motive fluid to enter through the passage 28, circumferential passage 27 and induction passage 25 and thence through the port 4 to the hammer chamber forward of the shoulder 45 on the hammer, whereby the motive fluid acting on the hammer drives the hammer rearwardly, and when it has nearly reached its rearward limit of movement the air cushions between the rear end of the hammer and the head of the valve sleeve, thus forcing the valve sleeve rearwardly against the rear head 9 of the cylinder, the air in the meantime having leaked out from between the head of the valve sleeve and the head of the cylinder through the relatively small passages 47 to the circumferential groove 55, exhaust ports 22 of the cylinder chamber and circumferential groove 23 and exhaust port 24. As soon as this occurs the motive fluid is allowed to enter the hammer chamber from the circumferential groove 48 through the port 3 of the cylinder and the port 43 of the valve sleeve. The motive fluid then acts on the convex extremity 49 of the hammer to drive the latter forwardly. After the hammer has uncovered the port 41 during its forward movement, the motive fluid passes to the rear of the valve sleeve through the passage 51 and the port 52. This motive fluid acting on the convex portion 54 of the valve sleeve head 14 causes the latter to move forwardly with the hammer, whereby the live motive fluid is cut off from the hammer chamber in the rear of the hammer, and the air in said chamber in the rear of the hammer allowed to exhaust through the ports 42 of the valve, circumferential groove 55 of the cylinder, ports 22, circumferential groove 23 of the socket portion of the handle member 8, thence through the exhaust port 24 to the atmosphere. After this has occurred, communication is open between the live motive fluid and the hammer chamber in front of the hammer to move the latter rearwardly and the operations heretofore explained are repeated.

While I have described and illustrated a specific construction of pneumatic hammer, it is understood that the same may be constructed in modifications without departing from the spirit of the invention, and not without the scope of the claims.

Having thus described my invention, what I claim is:

1. In a pneumatic hammer, the combination with a hollow cylinder having inlet and exhaust passages, of a valve sleeve mounted in the hollow of the cylinder and having coöperating inlet and exhaust passages, a hammer mounted to reciprocate in the valve sleeve, the said valve sleeve being arranged to alternately admit fluid rearwardly and forwardly of the hammer, the inner wall of the cylinder having portions of its surface cut away, the said cut away portions forming chambers, the said chambers communicating with one of the intake passages, whereby lubricant is admitted into the said chambers with the motive fluid, substantially as described.

2. A pneumatic hammer consisting of a hollow cylinder having inlet and exhaust passages and a valve sleeve mounted within the hollow of the cylinder and having inlet

and exhaust passages coöperating with the inlet and exhaust passages of the cylinder, a hammer mounted to reciprocate in the valve sleeve and arranged to alternately admit fluid rearwardly and forwardly of the hammer, the cylinder having portions of its inner surface cut away to lessen the surface contact of the valve sleeve with the cylinder and to form lubricant chambers, the said chambers being in communication with one of the intake passages, whereby lubricant is conveyed into the said chambers with the motive fluid, substantially as described.

3. In a pneumatic hammer, the combination with a hollow cylinder, of a valve sleeve mounted within the hollow of the cylinder, a hammer mounted to reciprocate within the valve sleeve, the cylinder having inlet and exhaust passages, the valve sleeve having cooperating inlet and exhaust passages, the valve sleeve being arranged to admit motive fluid rearwardly and forwardly of the hammer, the inner wall of the cylinder having portions thereof cut away adjacent the valve sleeve to lessen the surface contact of the valve sleeve with the cylinder, the said cut away portions being in communication with one of the inlet passages of the cylinder, whereby lubricant may be conveyed to the said cut away portions with the motive fluid, for the purpose set forth.

4. In a pneumatic hammer, the combination with a hollow cylinder, of a valve sleeve mounted in the hollow of the cylinder, a hammer mounted to reciprocate in the sleeve, the cylinder and valve sleeve having cooperating inlet and exhaust passages, the valve sleeve being arranged to alternately admit fluid rearwardly and forwardly of the hammer, the inner wall of the cylinder having portions cut away adjacent the valve sleeve, the said cut away portions forming lubricant chambers, and means for introducing lubricant to the said chambers simultaneously with the induction of the motive fluid for operating the hammer, substantially as described.

5. In a pneumatic hammer, the combination with a hollow cylinder, of a valve sleeve mounted in the hollow of the cylinder, a hammer mounted to reciprocate in the sleeve, means for admitting fluid to actuate the hammer, the valve sleeve being arranged to alternately admit fluid rearwardly and forwardly of the hammer, lubricant chambers being formed between the valve sleeve and the cylinder, and means for introducing lubricant into the said chambers with the induction of the motive fluid for operating the hammer, substantially as described.

6. In a pneumatic hammer, the combination with a hollow cylinder, of a valve sleeve mounted in the hollow of the cylinder, a hammer mounted to reciprocate in the sleeve, the cylinder and valve sleeve having cooperating inlet and exhaust passages, the valve sleeve being arranged to alternately admit fluid rearwardly and forwardly of the hammer, lubricant chambers being formed between the valve sleeve and the cylinder, and means for introducing lubricant into the said chambers with the induction of the motive fluid, substantially as described.

7. A pneumatic hammer comprising a hollow cylinder, and a reciprocable valve sleeve mounted therein, the inner wall of the cylinder having portions cut away adjacent the valve sleeve, the said cut away portions forming lubricant chambers, means for introducing fluid for operating the hammer, and means whereby lubricant is introduced into the said chambers simultaneously with the induction of the motive fluid for operating the hammer, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

HENRY SCHUMACHER.

Witnesses:
JNO. G. POWELL,
HORTENSE UHLRICH.