No. 609,162. Patented Aug. 16, 1898.

S. OLDHAM.

PNEUMATIC IMPACT TOOL.

(Application filed Mar. 26, 1898.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.

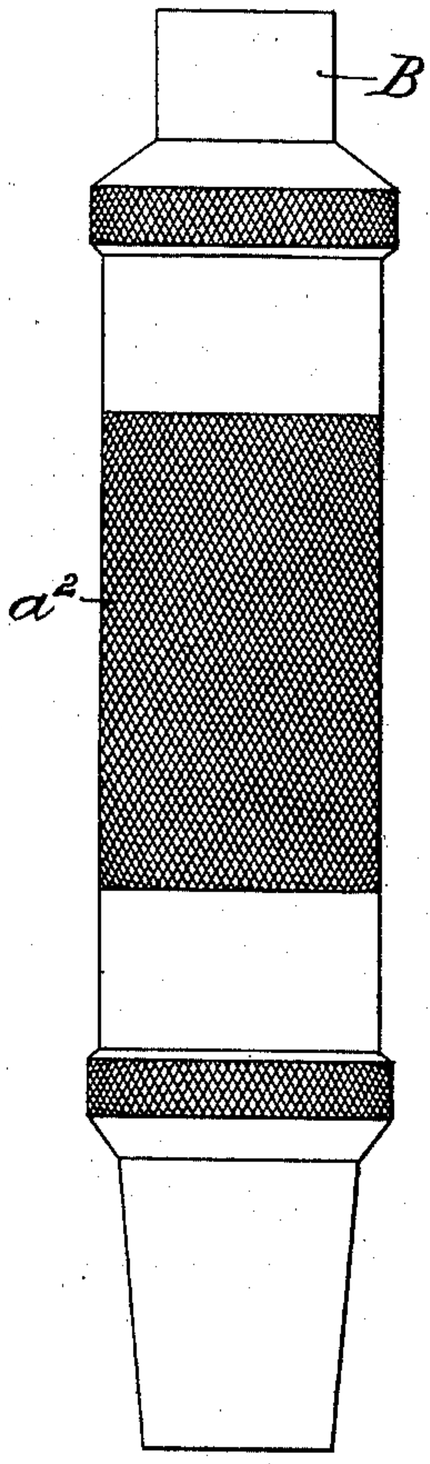

Fig. 2.

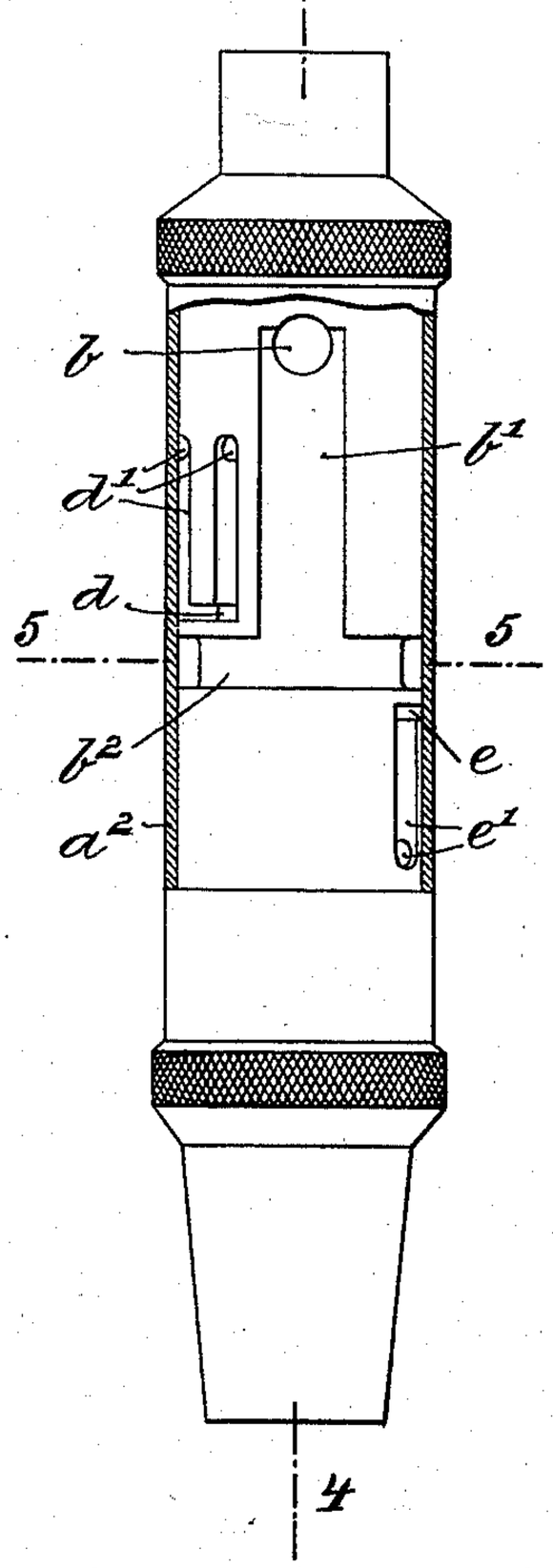

Fig. 3.

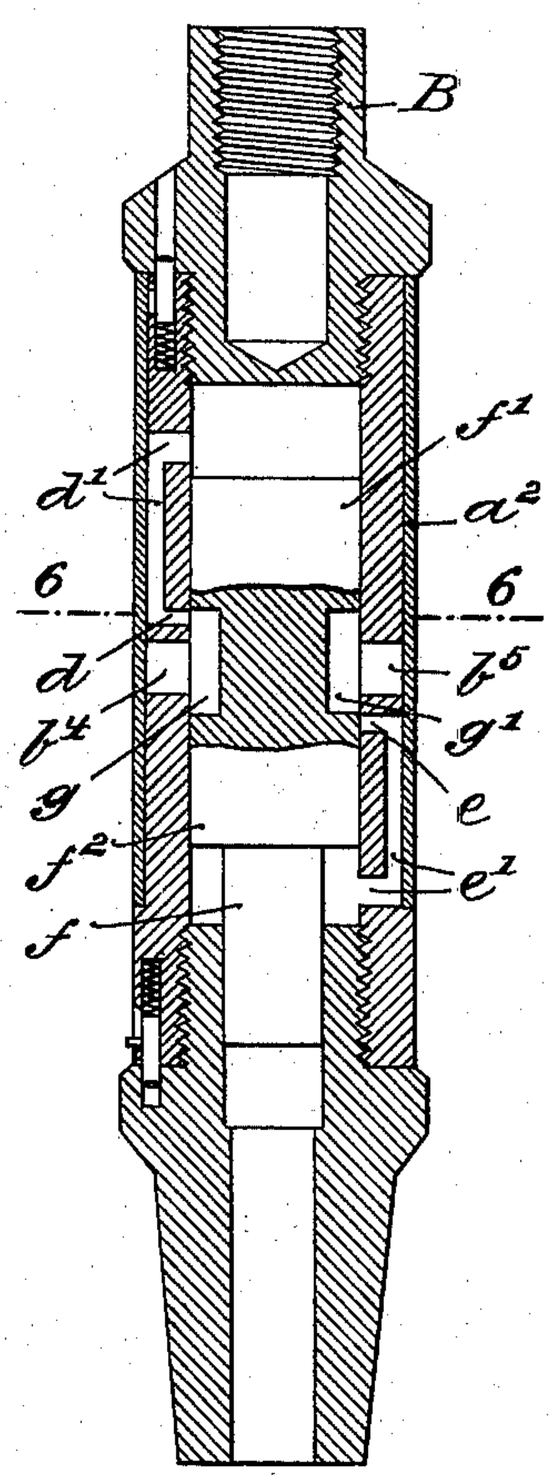

Fig. 5.

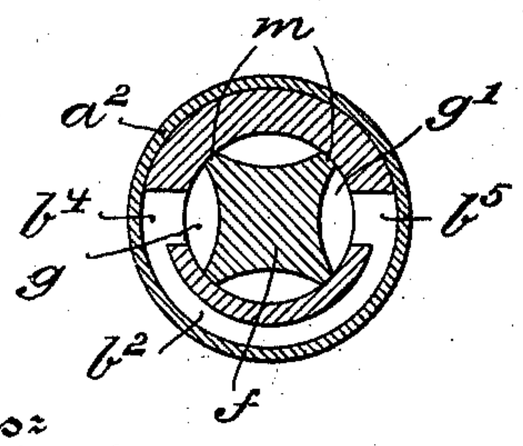

Fig. 6.

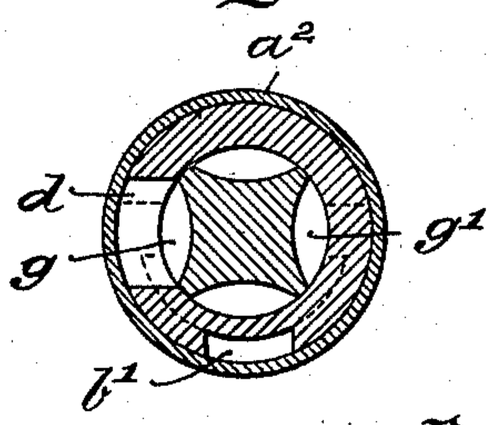

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Fig. 4.

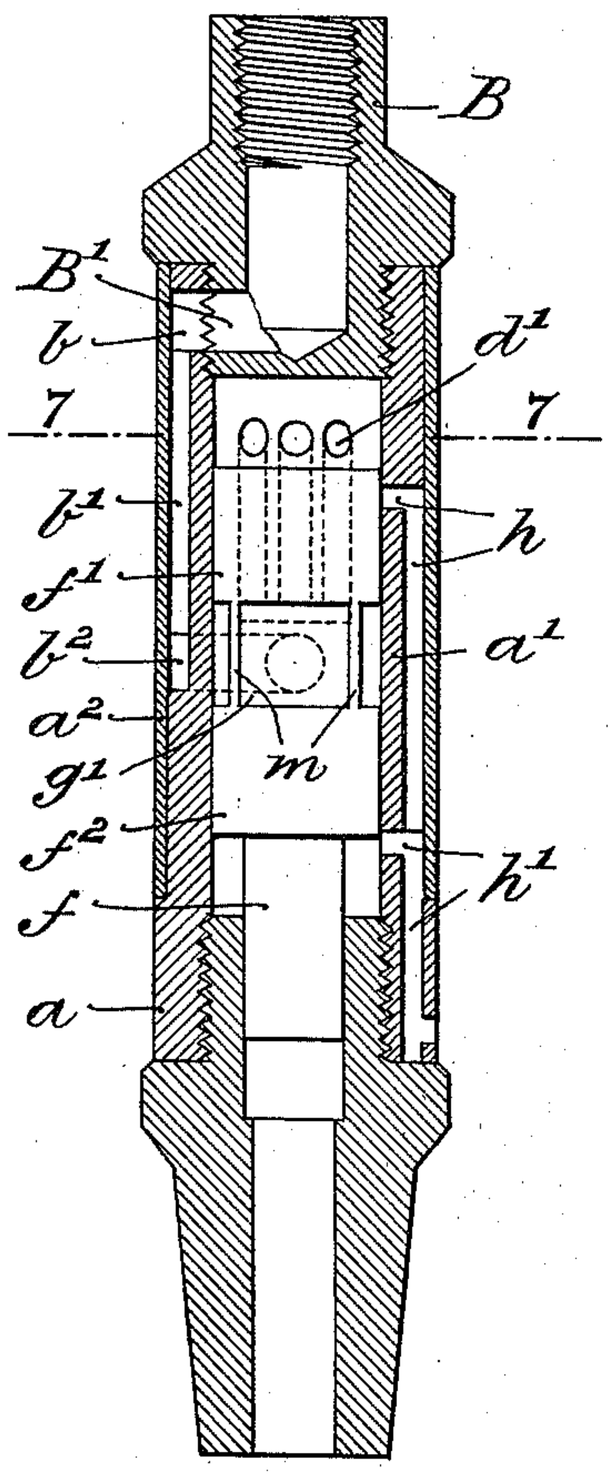


Fig. 8.

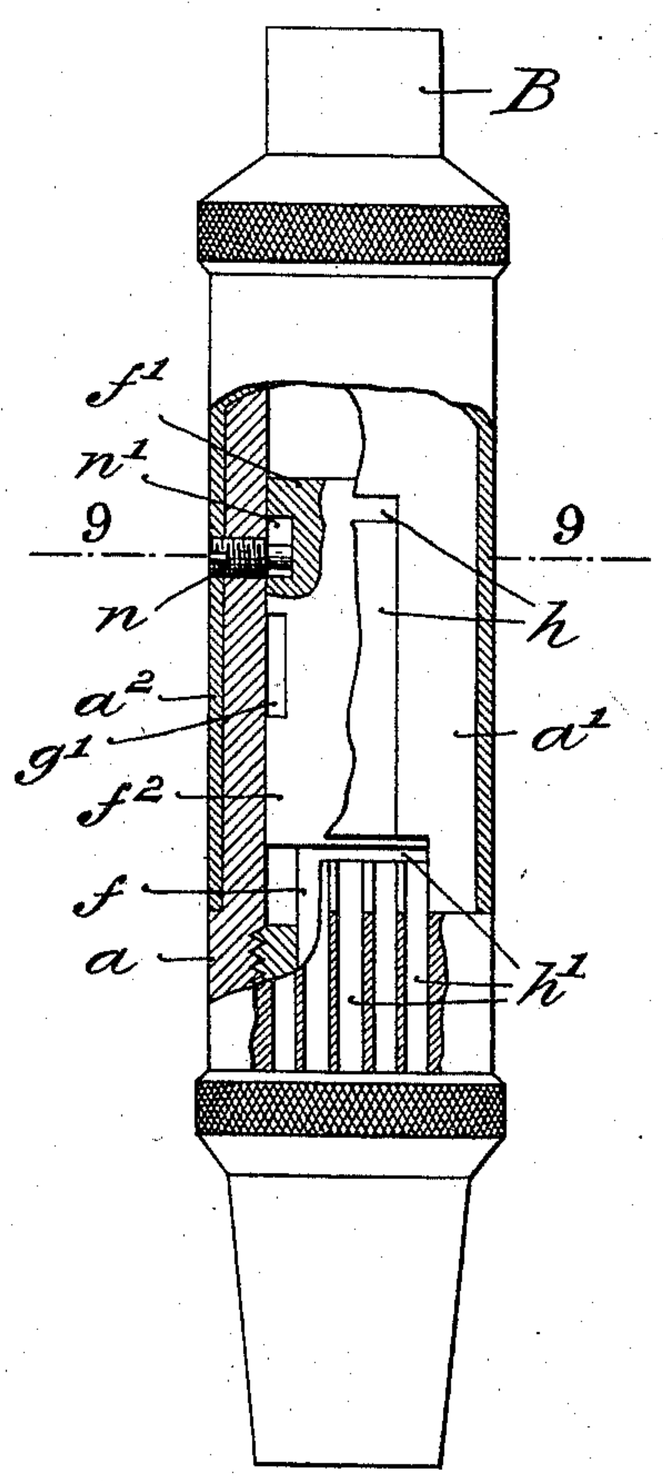


Fig. 7.

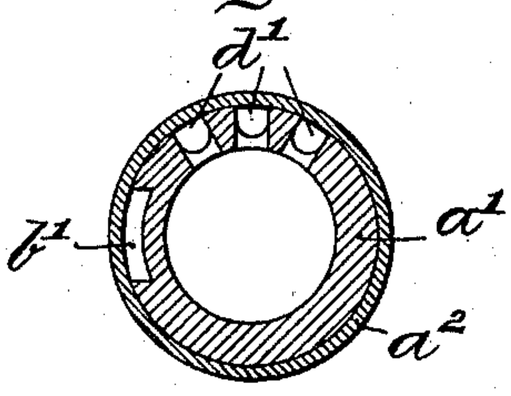
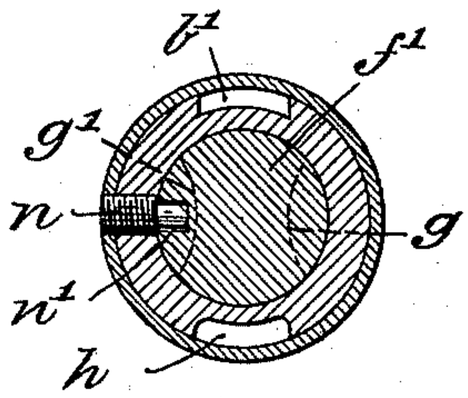


Fig. 9.



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UNITED STATES PATENT OFFICE.

SAMUEL OLDHAM, OF PHILADELPHIA, PENNSYLVANIA.

PNEUMATIC IMPACT-TOOL.

SPECIFICATION forming part of Letters Patent No. 609,162, dated August 16, 1898.

Application filed March 26, 1898. Serial No. 675,256. (No model.)

To all whom it may concern:

Be it known that I, SAMUEL OLDHAM, a citizen of the United States, residing at Philadelphia, (Frankford,) in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Pneumatic Impact-Tools, of which the following is a specification.

My invention has relation to an impact-tool of the valveless class, and in such connection it relates to the construction and arrangement of such a tool.

The principal objects of my invention are, first, to provide an impact-tool of simple construction wherein the reciprocating piston or hammer may be caused to operate with little or no friction on the cylinder of the tool and wherein the piston or hammer is adapted to reciprocate more quickly and to be maintained with a uniform fluid-pressure on its sides or surfaces in use, and, second, to provide an impact-tool with a reciprocating piston or hammer adapted to operate within its cylinder with friction appreciably reduced and with the avoidance of side or surface pressure and with a piston or hammer which is quick to act and is always maintained at a uniform pressure of the motive fluid on its sides or surfaces and, further, in which the said fluid is permitted to freely pass to the upper and lower heads of the piston or hammer without regard to what the position of the piston or hammer may be within its cylinder.

My invention, stated in general terms, consists of an impact-tool constructed and arranged in substantially the manner hereinafter described and claimed.

The nature and scope of my invention will be more fully understood from the following description, taken in connection with the accompanying drawings, forming part hereof, in which—

Figure 1 is a front elevation of an impact-tool embodying main features of my invention. Fig. 2 is a similar view with a portion of the outer sleeve or shell broken away to illustrate the arrangement of the fluid-inlet port of the tool. Fig. 3 is a vertical central section of the tool. Fig. 4 is a transverse sectional view on the line 4 4 of Fig. 2. Fig. 5 is a cross-sectional view on the line 5 5 of Fig. 2. Fig. 6 is a cross-sectional view on the line 6 6 of Fig. 3. Fig. 7 is a cross-sectional view on the line 7 7 of Fig. 4. Fig. 8 is a side elevational view of the tool, partly broken away to show the means for preventing the hammer or piston from turning in the cylinder and also to illustrate the location and arrangement of the exhaust-ports; and Fig. 9 is a cross-sectional view on the line 9 9 of Fig. 8.

Referring to the drawings, a represents the cylinder or casing of the tool. This cylinder a is preferably formed of an inner shell a' and an exterior sleeve a^2 to permit of the formation of the various ports and channels in said cylinder.

At preferably the upper end of the cylinder a is formed an opening b, which extends through the inner shell a'. This opening b is in communication with an opening B′, formed in a screw-cap B, closing the upper end of the cylinder a, to which cap is preferably secured the tube conveying air, gas, or other motive fluid. From the opening b and between the inner and outer casings of the cylinder a is provided a vertical channel b'. This channel b' terminates in a semicircular groove or channel b^2 in cross-section in inlet-ports b^4 and b^5 in the interior of the cylinder a. The inlet-port b^4 is preferably diametrically opposite to the inlet-port b^5. At a short distance above the port b^4 in the wall of the cylinder a is provided a port d and channels d', leading to the upper end of the cylinder, and below the port b^5 is provided a similar port e and channels e', leading to the lower end of the said cylinder a. Within this cylinder a and snugly fitting its bore is a reciprocating piston or hammer f, having the cylindrical upper and lower heads f' and f^2 of the same provided with a series of concavities g and g', which when the members of the tool are assembled are located opposite to and in communication, respectively, with the inlet-ports b^4 and b^5, as clearly illustrated in Figs. 3 and 5. A concavity g of the series of the piston or hammer f serves in one position to form a means of communication between the inlet-port b^4, port d, and channels d' to the interior of the cylinder a above the upper head f' of the piston or hammer f, while in the other position of the said piston or hammer f another concavity g' of the series forms a means of communication

between the inlet-port b^5, port d, and channel e' to the interior of the cylinder a below the lower head f^2 of the piston or hammer f. The upper head f' during the movement of the piston or hammer f will alternately open and close the port d, and the lower head f^2 at the same time will alternately close and open the port e. From the interior of the cylinder a extends the exhaust ports or channels h, leading from a space at the upper end of the cylinder to preferably the lower end of the casing a', and from a space at the lower end of the cylinder the exhaust ports or channels h' lead, preferably, to the same end of the casing a', as illustrated in Fig. 8.

In certain of the figures of the drawings four concavities in the piston or hammer f have been shown and described, while in certain of the other figures of the drawings but two concavities have been shown and described, and hereinafter is fully explained the advantages incident to the use of such in a tool of my invention.

When four concavities are employed in the piston or hammer, there is formed at the end walls of the same ribs m, which bear against the wall of the cylinder a and appreciably reduce the frictional contact of the piston or hammer f with its cylinder a as compared with the use of two concavities and with the remaining portions between the said two concavities rounded off and resting against the wall of the cylinder a. Another advantage of forming the piston or hammer with four concavities instead of two is that the piston or hammer will freely turn in the cylinder a and be always in a position to present concavities opposite the inlet-ports b^4 and b^5, thereby insuring the uniform wear through use of the piston or hammer f.

To prevent the piston or hammer f so turning that the concavities of the same might fail to register with the said inlet-ports b^4 and b^5 of the cylinder a, the construction of piston or hammer f as illustrated in Fig. 8 may be employed, and in which in addition to having only two concavities g and g' there is provided in the wall of the cylinder a a screw-pin n, adapted to enter a vertical slot n' in one of the heads of the piston or hammer f. This arrangement, while it permits of the reciprocation of the piston or hammer, will prevent turning thereof during operation of the tool. Under this arrangement of the piston or hammer there is only required for the operation of the tool the provision of two concavities opposite each other.

The mode of operation of the tool hereinbefore described is as follows: The motive fluid is caused to enter the cap B through the opening B', and it then passes into the opening b in the wall of the cylinder a. From the opening b the said fluid passes through the channel b' into the groove b^2, then through the ports b^4 and b^5, respectively, and is presented to the concavities of the piston or hammer f on opposite sides of the same. When the piston or hammer f is in the position as illustrated in Fig. 3, the motive fluid in one of the concavities g will pass through the port d and the channels d' to the interior of the cylinder a above the upper head f' of the piston or hammer f to depress the same. During the downward movement of said piston or hammer the exhaust in the lower end of the cylinder is forced out through the exhaust-ports h', which are kept open until the piston or hammer reaches its lowermost position, when the lower head f^2 will close the ports h' and will clear the port e and permit it to communicate with a concavity g', opposite to that above mentioned. At the same time the head f' will close the port d and will clear the exhaust-port h. In this latter position the fluid which has heretofore remained passive in one of the concavities will now pass through the port e and the channel e' to the lower end of the cylinder a, below the lower head f^2 of the piston or hammer f, whereby it will be raised. In the upward movement of the piston or hammer f its upper head f' will force the air in the upper end of the cylinder a through the exhaust-ports h.

From the foregoing description it will be readily understood that the piston or hammer in operation is balanced by reason of its being subjected to equal or substantially equal pressure of the fluid on opposite sides and that the fluid in operating the piston or hammer alternately traverses the wall of the cylinder at points also diametrically opposite. It will also be understood that inasmuch as the fluid is conveyed directly from opposite concavities to opposite ends of the cylinder and does not traverse the piston or hammer the operation of the same will be more rapid, since it will respond almost instantly to the pressure of the fluid. Again, by concaving the piston or hammer so as to leave ribs at the ends of the concaved portions of the same friction between the piston or hammer and internal bore of the cylinder is reduced correspondingly and there is also permitted thereby a free turning of the piston or hammer during either movement of the same within the bore of the tool, thereby insuring uniform wear of the piston or hammer in use.

It will be observed, due to the particular construction and arrangement of the piston or hammer in its bore or cylinder as illustrated in Figs. 1 to 7, inclusive, that it matters not what the particular position of the same may be the motive fluid will always be conducted to either the upper or lower heads of the piston or hammer, even if certain of the ribs formed by the walls of the concavities on said piston or hammer are directly opposite the respective inlet-ports b^4 and b^5 of the cylinder, because the motive fluid will pass in such instances in two of the concavities on either side of the piston or hammer without interfering with the effective working of the piston

or hammer *f* or conduct of the motive fluid to the upper and lower heads thereof.

Having thus described the nature and objects of my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a pneumatic impact-tool, a cylinder provided with a fluid-inlet, a channel leading from said inlet and a groove forming the terminal of said channel, ports communicating with said cylinder and leading from said groove, a piston or hammer having concavities opposite each other and adapted to register with said ports, inlet-ports and channels leading respectively from one of the concavities of said piston or hammer to the upper portion thereof and from the other of the concavities of said piston or hammer to the lower portion of the same, substantially as and for the purposes described.

2. In a pneumatic impact-tool, a cylinder having a fluid-inlet, a channel leading from said inlet and provided with a semicircular groove forming the terminal of said channel, two diametrically opposite ports communicating with the interior of the cylinder and leading from the terminal of said groove, a piston or hammer having two concavities diametrically opposite to each other and adapted to register with said ports and two inlet-ports and channels leading respectively from one of said concavities to the upper portion of said piston or hammer and from the other of said concavities to the lower portion of the same, substantially as and for the purposes described.

3. In a pneumatic impact-tool, a cylinder having an inlet-port in its wall, a channel leading from said port, a groove forming the terminal of said channel, fluid-inlets leading from said groove to the interior of said cylinder opposite to each other, a piston or hammer adapted to reciprocate in said cylinder and having a series of concavities, whereof each is in communication with one of said fluid-inlets, a port leading from certain of said concavities to a space above the upper head of said piston or hammer, a port leading from certain other concavities to a space below the lower head of said piston or hammer, said ports adapted to be alternately brought into open communication with said fluid-inlets through said concavities during reciprocation of said piston or hammer, and exhaust-ports leading from a space above and a space below said piston-heads and adapted to be alternately opened and closed by movement of said piston or hammer, substantially as and for the purposes described.

In testimony whereof I have hereunto set my signature in the presence of two subscribing witnesses.

SAMUEL OLDHAM.

Witnesses:
J. WALTER DOUGLASS,
RICHARD C. MAXWELL.