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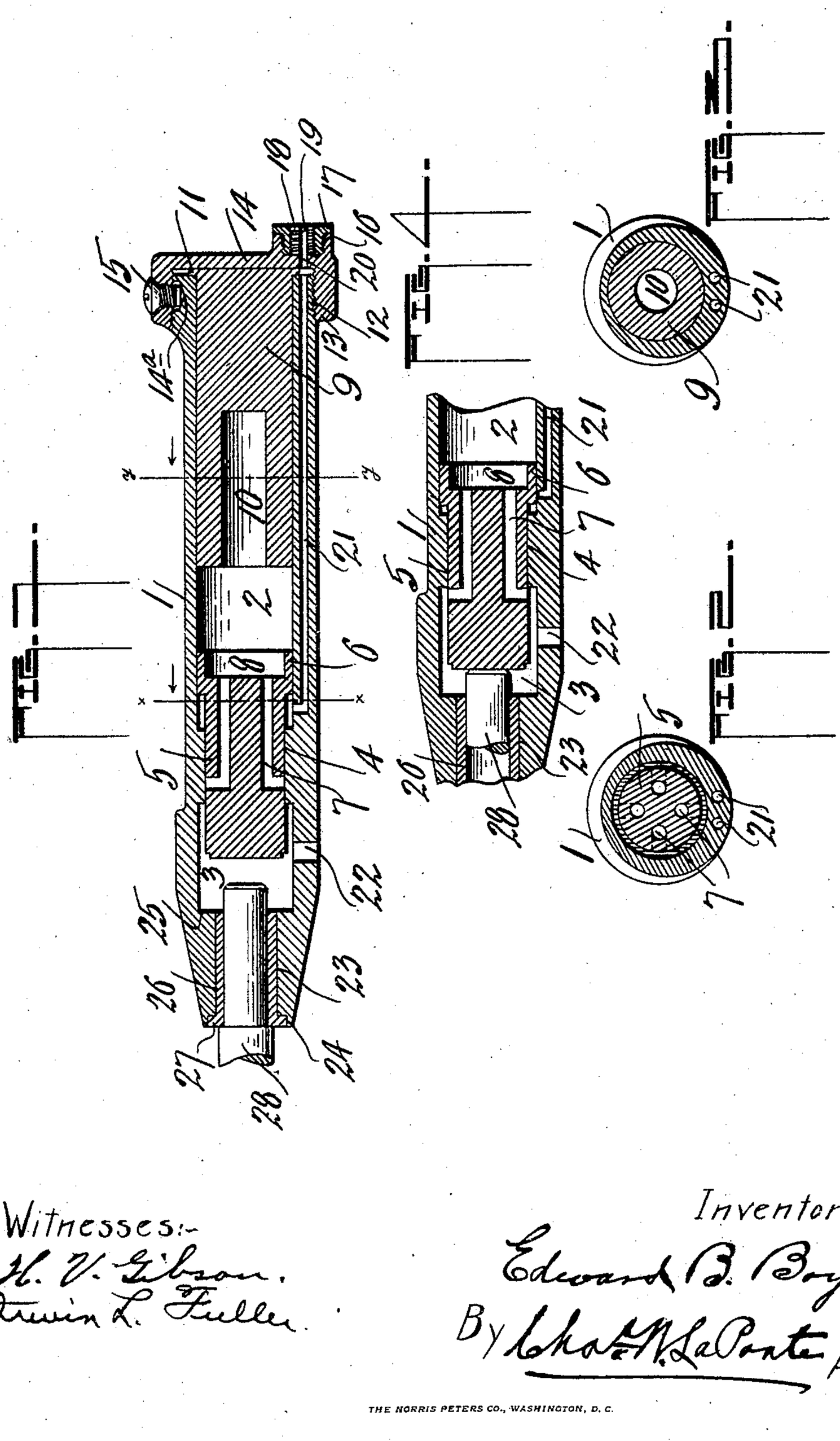
E. B. BOYER.

PNEUMATIC TOOL.

APPLICATION FILED JAN. 2, 1906.



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UNITED STATES PATENT OFFICE.

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PNEUMATIC TOOL.

No. 847,043. Specification of Letters Patent. Patented March 12, 1907.

Application filed January 2, 1906. Serial No. 294,119.

To all whom it may concern:

Be it known that I, EDWARD B. BOYER, a citizen of the United States, residing at Peoria, in the county of Peoria and State of Illinois, have invented certain new and useful Improvements in Pneumatic Tools; and I do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same.

This invention has reference to pneumatic tools wherein a portable device is provided for use as a hammer or cutting-tool, and particularly for use in stone-cutting and similar work.

The object which I have in view is to provide a pneumatic tool which is simple and economical in construction, of a minimum number of parts, and adapted in its operation to consume less of the motive power than machines of this type usually employ.

This invention is an improvement upon the pneumatic tool upon which patent was granted to me by the United States on November 14, 1905, numbered 804,449, and in certain respects is similar to parts of a tool upon which application for patent is made of even date herewith, Serial No. 294,120.

For a further and full description of the invention herein and the merits thereof, and also to acquire a knowledge of the details of construction of the means for effecting the result, reference is had to the following description and the drawings hereto attached.

While the essential and characteristic features of the invention are susceptible of modification, still the preferred embodiment of the invention is illustrated in the accompanying drawings, in which—

Figure 1 is a longitudinal sectional view of a pneumatic tool constructed in accordance with my improvements, showing the hammer-piston during its forward movement and just prior to the same delivering its blow. Fig. 2 is a cross-section of my pneumatic tool as the same would appear on the line *x x* of Fig. 1. Fig. 3 is a cross-section of my pneumatic tool as the same would appear on the line *y y* of Fig. 1; and Fig. 4 is a longitudinal sectional view of the forward portion of the tool as the same appears in Fig. 1, with the exception that the hammer-piston is shown in the act of delivering a blow, at which time the inlet of the motive fluid or other power is completely cut off.

Like numerals of reference indicate corresponding parts throughout the figures.

In the drawings, 1 denotes a tubular casing provided with what will be hereinafter known as the "chambers" 2 and 3, spaced apart by means of the reduced shoulder or flange portion 4 of the inner wall of the said casing, and operating in the said casing and in the chambers 2 and 3 thereof is a hammer-piston 5. The said piston is constructed with portions corresponding to the wall of the chamber 2 and the offset or flange portion 4 of the casing 1. The main body of the said piston corresponds in diameter to the diameter of the offset or flange 4, and at the rear end of the piston the same is provided with the enlarged head or flange portion 6, serving as a piston-head, against which motive fluid or other power is applied, the same being in diameter to correspond with and fitting snugly the inner surface of the wall of the chamber 2. The body of the piston is provided with a series of passage-ways or ports 7, having their front ends arranged to communicate with the exhaust-chamber 3 and their rear ends communicate with the chamber 2 through an annular chamber 8, arranged in the piston-head 6.

9 denotes what will hereinafter be known as an "imperforate" stationary buffer, which is of suitable length and is of the same diameter as the chamber 2 and fits snugly the inner wall of the said chamber. The said stationary buffer has a tubular chamber 10, which opens out of the forward end thereof and faces the rear end of the hammer-buffer or the annular chamber in the head thereof and provides for a proper expansion of the motive fluid when the same is admitted into the chamber 2 through the piston 4 in a manner to be described for the purpose of reciprocating the hammer-buffer in a direction to deliver a blow. The said piston is shown having the annular flange 11 on the rear end thereof, which is adapted to be held in juxtaposition to the outer face or end of the casing 1. The peripheral face of the casing coinciding with and encircling the end thereof with which the flange of the stationary buffer engages is provided with the threaded portion 12, with which has a screw engagement the threaded flange portion 13 of a cap 14, and in the outer face of the casing is provided a depression or socket 14ª, with which engages or is adapted to be seated therein a threaded plug or screw 15, which

has a threaded engagement with the annular flange portion 13 of the cap 14, and the office of the said plug or screw 15 is to engage with the depression 14ª in the casing when the cap has been screwed into position on the said casing and for locking the cap on the casing in an immovable position to guard against any jar or vibration which would likely cause the cap to turn slightly upon the casing, and thereby destroy the communication between an inlet for motive fluid in the cap and one or more motive-fluid passages extending longitudinally through the casing.

The cap 14 has a boss 16 formed thereon, into which a bushing 17 is adapted to be screwed, which said bushing is provided with an interiorly-threaded portion 18, through which a longitudinal opening or inlet-port 19 extends, which communicates with an opening or inlet 20 in the cap, which in turn communicates with passage-ways or inlet-ports 21, extending longitudinally in the wall of the casing. In a machine of this type there is no need of a handle containing valve mechanism for controlling the inlet of motive fluid to the interior of the casing 1, as it is mostly used with motive fluid under a medium or low pressure, and therefore when the machine is in operation or connected up for work a pipe, tube, or some such similar device is adapted to be screwed into the bushing 17, which said pipe contains a valve for controlling the supply to the tool. The connection of the power with the tool does not form any part of this invention, and for that reason has not been shown, but referred to in connection with the cap heretofore described to explain how motive fluid is admitted to the tool.

The passage-ways or ports 21 referred to extend from the rear end of the casing to a point therein just a short distance removed from the offset or flange 4 of the said casing, where the passage-ways or ports 21 turn at right angles and communicate with the chamber 2 in the said casing. In the figures I have provided two passage-ways or ports, such as 21, which are employed for the introduction of motive fluid or other power in the casing for operating upon the hammer-piston, although one or more of the said passages may be employed.

The chamber referred to as 3 in the casing 1 serves as an exhaust-chamber from which the exhaust of the motive fluid which is adapted to pass through the hammer-piston 5 passes out through the exhaust-ports or openings 22, extending through the wall of the casing.

The forward end of the casing is provided with a reduced longitudinal bore or opening 23, which merges into the annular cut-out portion 24 at the extreme end of the said casing and extends from an offset (indicated as 25) forming an end wall of the chamber 3 to the outer end of the casing, and in the opening 23 is carried a tubular bushing 26, which has an annular flange portion 27, coinciding with and adapted to be seated in the cut-out portion 24, which said bushing is adapted to receive the inner end portion of a suitable tool 28, to be operated upon by the hammer-piston 5.

The arrangement of the open ends of the passage-ways or ports 21 of the casing into the chamber 2 are such that in the forward movement of the hammer-piston 5, when the same delivers its blow on the shank of the the tool 28, the open inner ends of the passage-ways 21 will be momentarily cut off, which will permit the expansion of the motive fluid in the rear of the hammer-piston 5 to exert its full force at about the time the blow is delivered by the said piston. The cut off of such passage-ways or ports is accomplished somewhat as seen in Fig. 4 by the head of the piston, and the movement of the said head when the blow is delivered brings the same in close proximity to the offset or flange portion 4 of the casing; but the same does not engage with the said offset, which is clearly seen in Fig. 4, but leaves a very small chamber between the offset of the casing and the head of the piston, whereby a slight compression is formed, and upon the delivery of the blow of the piston on the tool the rebound of the piston is assisted through the cushion thus formed between the head of the piston and the offset aforesaid of the casing, and as the hammer-piston rebounds the motive fluid passing through the passage-ways or ports 21 is again permitted to act on the head of the piston and drives the same rearwardly in the casing, brings the forward openings of the passage-ways or ports 7 thereof coincident with the forward end of the chamber 2, whereby the motive fluid or other power is adapted to enter the ports 7 of the hammer-piston and to pass to the chamber 2 at the rear end of the said hammer-piston and in front of the imperforate stationary buffer and thence into the tubular chamber 10 thereof for the purpose of driving the hammer-piston to a striking position, somewhat as seen in Fig. 4. When the hammer-piston reaches the striking position just referred to, the motive fluid or other power rushes through the ports 7 into the chamber 3 of the casing and then exhausts through the exhaust-ports 22 of the said casing.

The action of the motive fluid or other power upon the hammer-piston for reciprocating the same to a position in proximity to the forward end of the imperforate stationary buffer, the expansion of such motive fluid in the chamber 2 between the said piston and buffer, and then driving the said hammer-piston forwardly to a striking position is similar to that described and shown in

the patent above and in all respects is like unto that shown in the application filed of even date herewith—that is, motive fluid or other power used to force the hammer-piston rearwardly in the casing is at the end of the rear stroke of said piston admitted into the chamber 2, and there either alone or with an additional supply, which may find ingress to the said chamber, cause the piston to move forward to deliver its blow.

In a tool of this character, and especially where the same is constructed with a view of doing light work, such as would be used in stone-cutting, there is not needed the power which would be necessary in a pneumatic tool constructed with a view of using the same for riveting, corking, and like work. Hence the need of arranging the inner working parts of the device to obviate or suppress the impulse or shock when the hammer delivers its blow is done away with, and it is only necessary to provide for the proper expansion of the motive fluid in the chamber 2 between the hammer and imperforate buffer to drive the hammer-piston to a striking position, and this is accomplished through the arrangement of the imperforate buffer with the tubular chamber, as shown.

Having thus fully described my invention, what I claim, and desire to secure by Letters Patent of the United States, is—

1. The combination of a cylinder having longitudinally-disposed chambers spaced apart by a flanged portion, said cylinder having a longitudinally-disposed inlet-port extending from the rear end thereof to a point adjacent the flanged portion, a hammer-piston arranged in said cylinder, said piston fitting the bore in said flanged portion and said piston having an enlarged head fitting the bore of the cylinder, said piston being formed with longitudinally-disposed ports with lateral extensions opening through the sides of the piston, said cylinder having an exhaust-port in its side wall in front of said flanged portion thereof, said piston having an annular chamber in its rear end with which the ports in the piston communicate and a stationary imperforate buffer arranged in the rear end of the cylinder, said buffer being provided with a tubular chamber at its forward end of a length substantially equal to the length of that portion of the bore of the cylinder in which the head of the piston reciprocates.

2. The combination of a cylinder having longitudinally-disposed chambers spaced apart by a flanged portion, said cylinder carrying a longitudinally-disposed inlet-port extending from the rear end thereof to a point adjacent to the flanged portion, a hammer-piston slidably mounted in said flanged portion and arranged within the cylinder, said piston having an enlarged cup-shaped end, said end being of a size substantially the same as said cylinder and adapted to slide therein, said piston being formed with longitudinally-disposed ports with lateral extending ports passing through the sides of the piston and communicating one of said chambers with the other of said chambers after the hammer-piston has completed its forward movement, said cylinder being provided with an exhaust-port opening into one of said chambers, a stationary imperforate buffer arranged in the rear end of the cylinder, said buffer being provided with a tubular chamber of a length substantially equal to the length of that portion of the bore of the cylinder in which the head of the piston reciprocates.

3. The combination with a cylinder having longitudinally-disposed chambers spaced apart by a flanged portion, said cylinder having a longitudinally-disposed inlet-port extending from the rear end thereof to a point adjacent to the flanged portion, a hammer-piston arranged in said cylinder, the body portion of said piston adapted to slide within said flanged portion, said piston having an enlarged end portion, said enlarged end portion adapted to close the inlet-valve, said piston being provided with longitudinally-disposed ports with laterally-extending extremities opening through the sides of the piston, said cylinder having an exhaust-port in its side wall in front of said flanged portion thereof, said longitudinal ports in the hammer-piston adapted to communicate with the chamber into which the exhaust-port leads upon the contact of said chamber-piston with the tool, thereby providing means by which the steam is exhausted from the compression-cylinder, a stationary imperforate buffer arranged in the rear end of the cylinder, said buffer being provided with a tubular chamber at its forward end of a length substantially equal to the length of that portion of the bore of the cylinder in which the head of the piston reciprocates.

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

EDWARD B. BOYER.

Witnesses:
CHAS. W. LA PORTE,
H. V. GIBSON.