(No Model.)

J. KELLER.

PNEUMATIC TOOL.

No. 549,514. Patented Nov. 12, 1895.

Fig. 1.

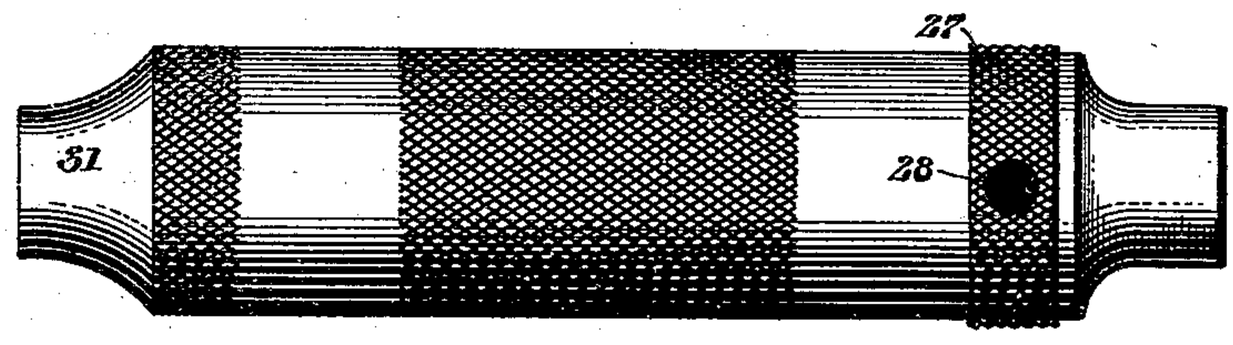


Fig. 2.

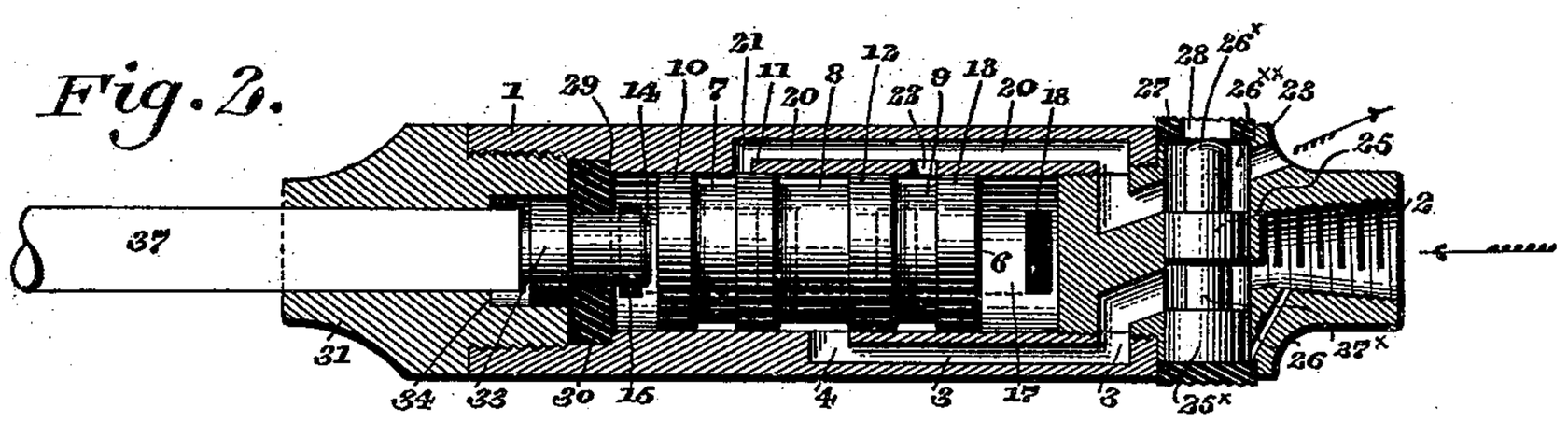


Fig. 3.

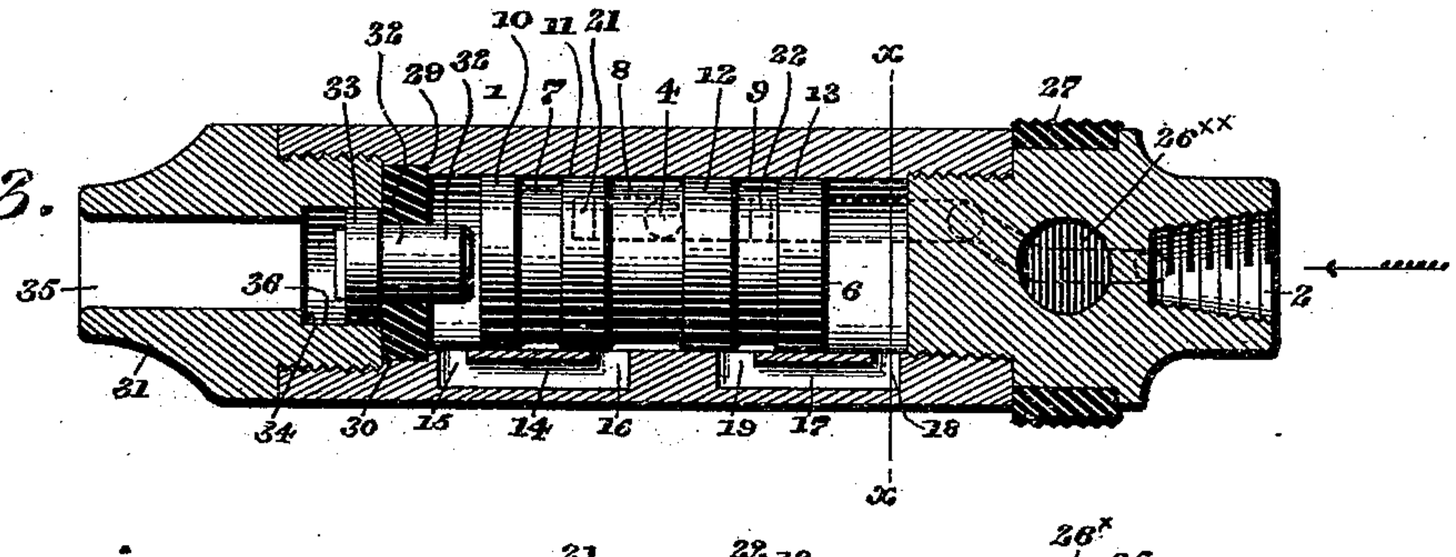


Fig. 4.

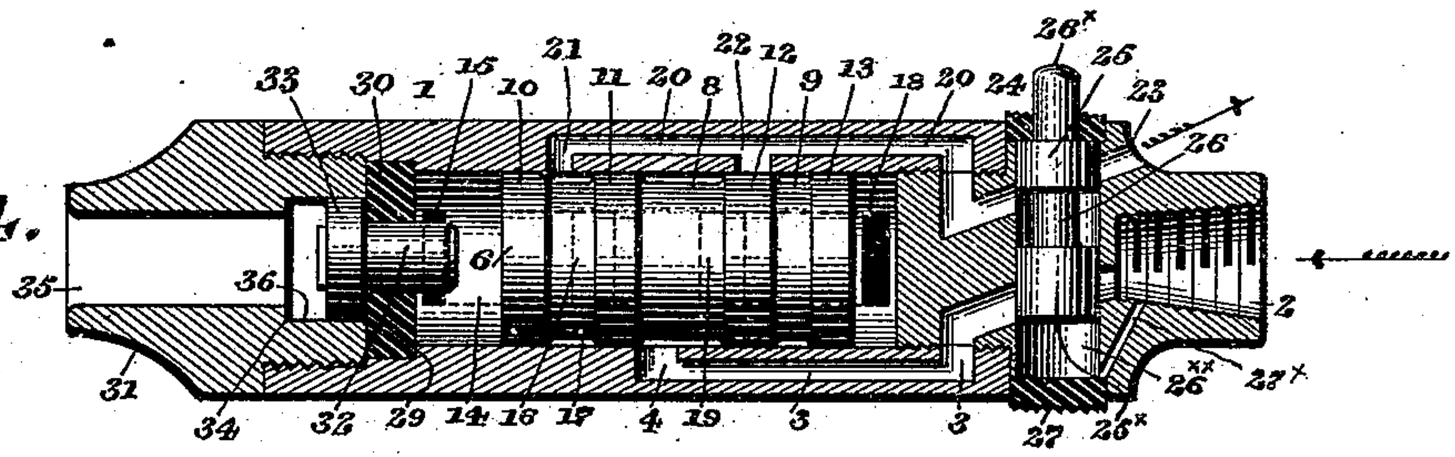


Fig. 6.

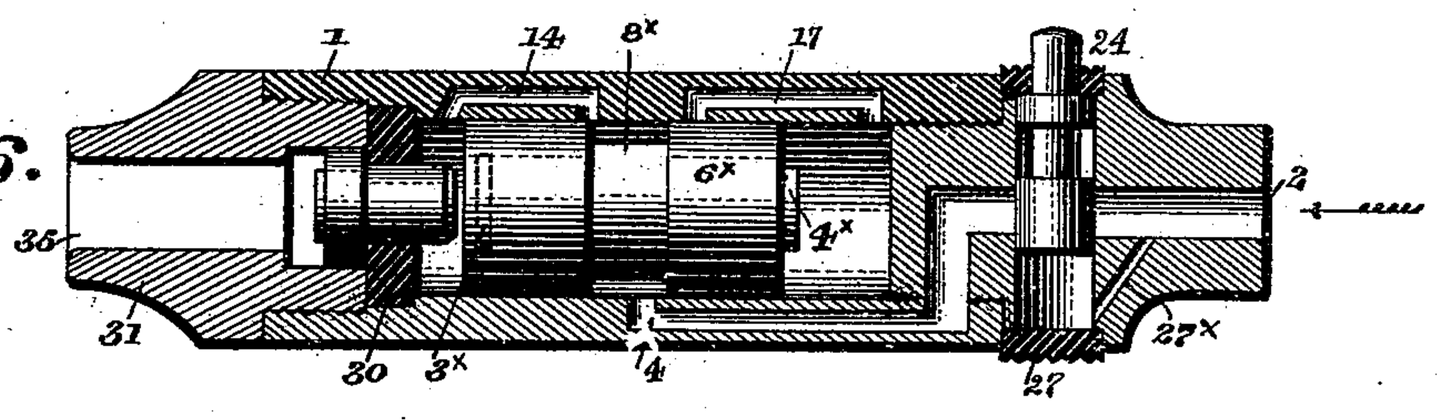
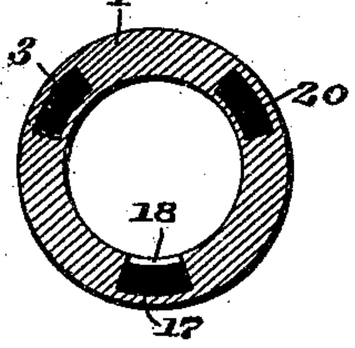


Fig. 5.



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UNITED STATES PATENT OFFICE.

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PNEUMATIC TOOL.

SPECIFICATION forming part of Letters Patent No. 549,514, dated November 12, 1895.

Application filed February 19, 1895. Serial No. 538,963. (No model.)

To all whom it may concern:

Be it known that I, JULIUS KELLER, a citizen of the United States, residing in the city and county of Philadelphia, State of Pennsylvania, have invented a new and useful Improvement in Pneumatic Tools, which improvement is fully set forth in the following specification and accompanying drawings.

My invention consists of an improved construction of pneumatic tool which is especially adapted for use in dressing and carving stones of all kinds, in calking boilers, chipping metals, and for every kind of work in which the hammer or mallet and chisel are ordinarily employed, provision being made for reducing the number of parts and simplifying and cheapening the construction throughout, whereby the durability of the tool is greatly increased and the noise and vibration incident to the extreme rapid movement of the hammer are reduced to a minimum, all as will be hereinafter set forth.

Figure 1 represents an exterior view of a pneumatic tool embodying my invention. Fig. 2 represents a longitudinal sectional view of the same, showing the relation of the hammer to the inlet and exhaust ports. Fig. 3 represents another longitudinal sectional view showing more clearly certain of the inlet and exhaust ports, the hammer being in the same position. Fig. 4 represents a view similar to Fig. 2, the hammer being shown in another position relative to the inlet and exhaust ports. Fig. 5 represents a transverse section on line *x x*, Fig. 3. Fig. 6 represents a longitudinal sectional view showing a modified form of hammer.

Similar numerals of reference indicate corresponding parts in the several figures.

Referring to the drawings, 1 designates the cylinder or casing which incloses the principal operative parts of the device.

2 designates the inlet-opening for the motive fluid, which is preferably compressed air, from which point 2 extends the inlet-port 3, which communicates at 4 with the internal portion of the cylindrical casing 1, within which is nicely fitted the hammer 6, which has its diameter reduced at the points 7, 8, and 9, thus forming annular grooves, said hammer also having enlarged portions 10, 11, 12, and 13, which contact with the interior walls of the cylinder, it being understood that the annular groove 8 of the hammer serves in conjunction with the port 4 to control the admission of the compressed air or other motive fluid to each end of the cylinder, while the annular grooves 7 and 9, in conjunction with suitable outlet-ports, allow the dead air to be exhausted alternately from the ends of the cylinder, as will be explained.

14 designates a port in the cylinder 1, which has one end 15 communicating with the left-hand extremity of the interior of the cylinder, while its other end 16 also communicates therewith a little to one side of the center thereof. In like manner the port 17 has its end 18 opening into the right-hand end of the interior of the cylinder, while its other end 19 opens thereinto at one side of the center.

20 designates the exhaust-passage, which communicates with the interior of the cylinder by the ports 21 and 22, which are located one on each side of the center, as will be evident from Figs. 2 and 4, said exhaust-passage 20 communicating at the point 23 with the air.

24 designates a throttle-valve, which consists of the pistons 25 and $25^{\times}$, connected by the neck 26, said piston 25 having the stem $26^{\times}$ projecting beyond it for a purpose to be referred to. The said valve 24 is adapted to be reciprocated in the passage $26^{\times\times}$, which latter, it will be seen from Figs. 2 and 4, extends transversely to the inlet and exhaust passages 3 and 20, so that the pistons $25^{\times}$ and 25 control the same, respectively, the outward movement of said pistons being caused by the compressed air which is introduced through the port $27^{\times}$ to below the piston $25^{\times}$, the movement in the opposite direction being caused by rotating the collar 27, whereby the stem $26^{\times}$, which may have its top portion beveled or chamfered, may be readily depressed into the position seen in Fig. 2, so that the pistons 25 and $25^{\times}$ will be moved out of the inlet and exhaust passages, and the same will not be throttled, in which latter position the valve is shown in Fig. 2. When the collar 27 is rotated farther until the hole 28 is in alignment with the valve 24, the compressed air which enters the port $27^{\times}$ will force said valve into the position seen in Fig. 4, as is evident.

The left-hand end of the cylinder 1 is screw-

threaded and provided with a shoulder 29, against which the plate 30 is firmly held by means of the abutting portion of the nose-piece 31, which is screwed against it. The said plate 30 has a central opening therein, through which extends the shank 32 of the head 33, which latter is of larger diameter and is held in position and guided by means of said nose-piece, the movement of said head being limited by the shoulder 34, which is formed at the junction of the bores 35 and 36, the latter serving to guide the head 33 and the former serving to hold the shank of a tool 37. (Shown in Fig. 2.)

The construction in Fig. 6 is substantially the same as Figs. 1 to 5, inclusive, except that the hammer $6^{\times}$ within the cylinder 1 has only the central annular groove $8^{\times}$, the end grooves 7 and 9 (shown in the other hammers) being dispensed with, the arrangement and operation of the inlet-ports, throttle-valve, collar, &c., being the same in the other previously-described constructions, the cylinder exhausting through the ports $3^{\times}$ and $4^{\times}$, as is evident.

The operation is as follows: Referring first to Figs. 2 and 3, in which the hammer 6 is at nearly its extreme left-hand position, the compressed air or other motive fluid enters the inlet 2, passes through the passage 3 and port 4 into the interior of the cylinder 1, and since the hammer is provided with the central annular groove 8 the fluid passes into port 16 and out of port 15, and the hammer 6 will be moved from left to right, the cylinder exhausting through the ports 18, 19, and 22 into the passage 20, and thence freely to the air when the exhaust-passage is open, as in Fig. 2. In like manner the hammer 6 will be moved from right to left, as will be understood from Fig. 4, where said hammer is shown at its extreme right-hand position, the motive fluid entering the port 4, as before, and passing thence through the ports 19 and 18 to the right-hand end of the cylinder, moving the hammer to the left, the exhaust taking place through the ports 15 16 21 and passage 20, as before.

The throttling of the inlet and exhaust passage has already been explained, it being understood that a slight rotation of the collar 27 will effect this, the valve 24, when in the positions shown in Figs. 4 and 6, being first pushed inwardly by the fingers or thumb until its stem is clear of said collar, whereupon the latter can be rotated until the hole therein is out of alignment with the stem $26^{\times}$, and that when said passages are throttled no movement of the hammer can take place.

The tool seen in Fig. 6 operates as has already been described, the location and relation of the inlet and exhaust ports and passages to the hammer being the same.

It will be noticed that I have shown the nose-piece made separable from the casing and also the opposite end portion, which contains the compressed-air inlet and the exhaust and throttle-valve; but it is obvious that slight variations may be made in the manner of assembling the above parts, and I therefore reserve the right to make such changes in my device as will come within the scope of my invention.

It will be further noticed that by making the hammer or piston 6 portless and valveless I attain the greatest strength and durability possible, and by thus reducing the number of parts to a minimum all liability of derangement or accident to the same is removed.

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

1. In a pneumatic tool, a cylinder, a portless, valveless hammer therein, the latter being provided with a centrally located groove, an inlet passage, always in communication with said central groove, passages alternately in communication with the latter and the ends of the cylinder, and adapted to serve alternately as inlet and exhaust passages for the motive fluid, and means for conducting the exhaust to the exterior of the cylinder, substantially as described.

2. In a pneumatic tool, a cylinder, a hammer therein, having the annular grooves 7, 8 and 9, and the enlarged portions 10, 11, 12 and 13, the passage 3 and inlet port 4 always in communication with said central groove 8, passages in communication with the latter, and the ends of said cylinder adapted to serve alternately as inlet and exhaust conduits, exhaust ports adapted to register with said grooves 7 and 9, and an exhaust passage common to both of said exhaust ports, substantially as described.

3. In a pneumatic tool, inlet and exhaust passages, a recess extending across and at an angle thereto, a throttle valve in said recess, a rotatable collar mounted on said tool in the plane of said throttle valve, and means for conducting compressed air to below said valve, substantially as described.

4. In a pneumatic tool, inlet and exhaust passages, a throttle valve controlling the same, said valve consisting of the pistons 25 and $25^{\times}$, a neck connecting the same, a stem projecting above said piston 25, a port for conducting compressed air below said valve, and a rotatable collar having a hole therein, substantially as described.

5. In a pneumatic tool, a cylinder, a hammer therein, having a centrally located annular groove, always in communication with the inlet passage for the motive fluid, passages having, each, an end in communication with the ends of the cylinder, the other ends of said passages being alternately in communication with said groove, and serving alternately as inlet and exhaust conduits for the motive fluid, means for conducting said exhaust to the exterior of the cylinder, and means for throttling said inlet and exhaust passages, substantially as described.

6. In a pneumatic tool, a cylinder, a hammer therein having a central annular groove, passages in said cylinder which communicate

with said groove, and the ends of said cylinder, and serve alternately as inlet and exhaust conduits for the motive fluids, an inlet passage for the motive fluid also communicating with said groove, and a suitable exhaust passage leading to the exterior of said cylinder in proximity to said inlet passage, and suitable exhaust passages for said motive fluid, substantially as described.

7. In a pneumatic tool, a casing having a threaded end, the separable portion having the inlet and exhaust ports, a throttle valve, a rotatable collar mounted on said tool in the plane of said throttle valve, a recess therefor, and a port leading to the lower portion of said recess under said throttle, substantially as described.

8. In a pneumatic tool, a cylinder, a non-rotating hammer therein having the annular grooves 7, 8 and 9, the inlet port 4, suitable passages leading therefrom to each end of the cylinder which serve alternately as inlet and exhaust conduits for the motive fluid, exhaust ports 21 and 22, and a passage leading therefrom to the exterior of the cylinder, substantially as described.

9. In a pneumatic tool, a cylinder, a solid hammer therein having the annular grooves 7, 8 and 9, the inlet passages communicating with the port 4, suitable passages leading therefrom to each end of the cylinder, exhaust ports 21 and 22, a passage leading therefrom to the exterior of the cylinder, a throttle valve controlling said inlet and exhaust passages, a port for conducting the motive fluid to the bottom of the throttle, and a collar rotatably mounted on said tool in proximity to said throttle valve, substantially as described.

10. A pneumatic tool, having its ends made separable therefrom, one end adapted to receive a tool or chisel, and the other end having the inlet and exhaust passages for the motive fluid, a throttle therefor provided with a stem, a port for leading live motive fluid under said throttle and a rotatable collar having a hole therein, adapted to register with said stem, substantially as described.

11. In a pneumatic tool, a cylinder, a portless, valveless hammer therein, the latter being provided with a groove intermediate its ends, an inlet passage in communication with said groove, passages alternately in communication with the latter and the ends of the cylinder, and adapted to serve alternately as inlet and exhaust passages for the motive fluid, and means for conducting the exhaust to the exterior of the cylinder, substantially as described.

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