No. 867,856. PATENTED OCT. 8, 1907.

E. M. TOBIN.

PNEUMATIC TOOL.

APPLICATION FILED JULY 13, 1906.

2 SHEETS—SHEET 1.

Fig. 2

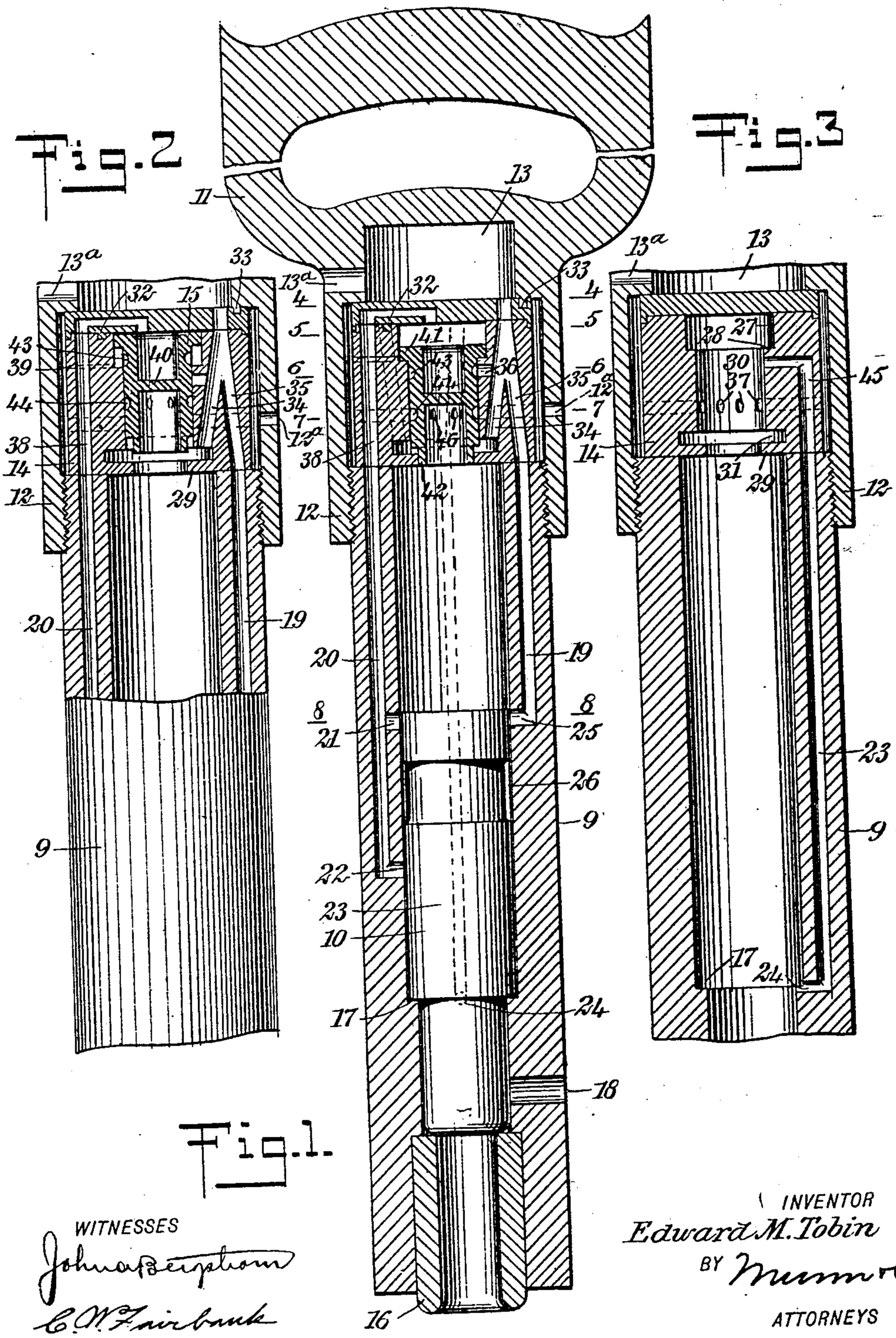

Fig. 3

Fig. 1.

WITNESSES

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2 SHEETS—SHEET 2.

Fig. 4

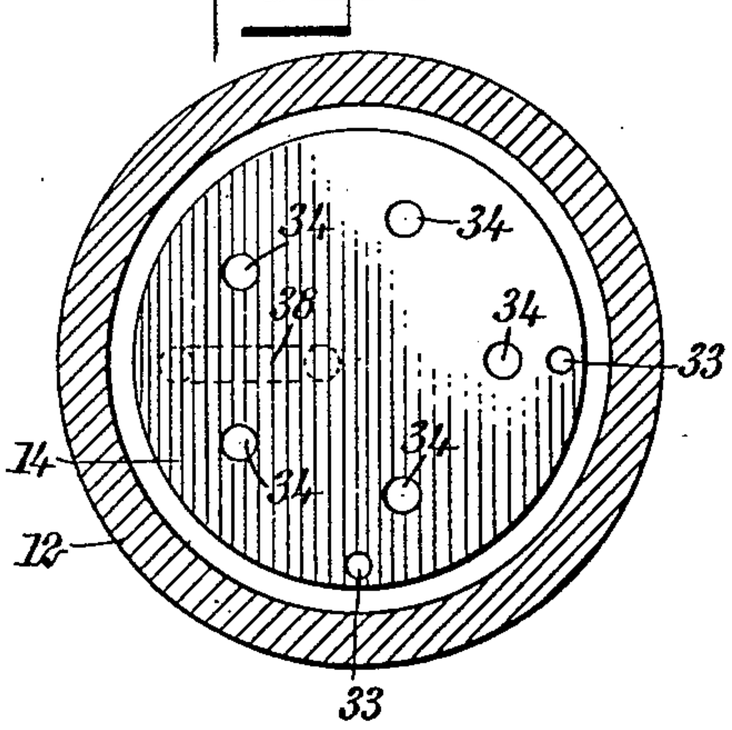


Fig. 5

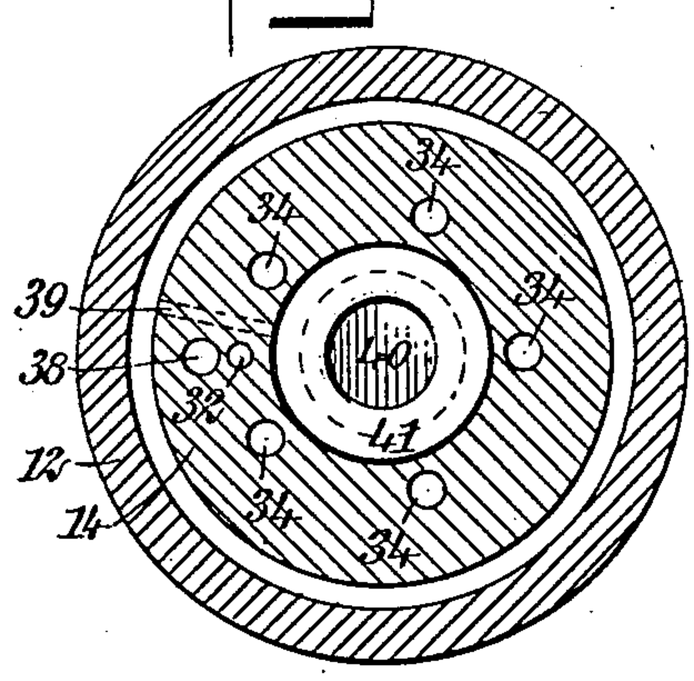


Fig. 6

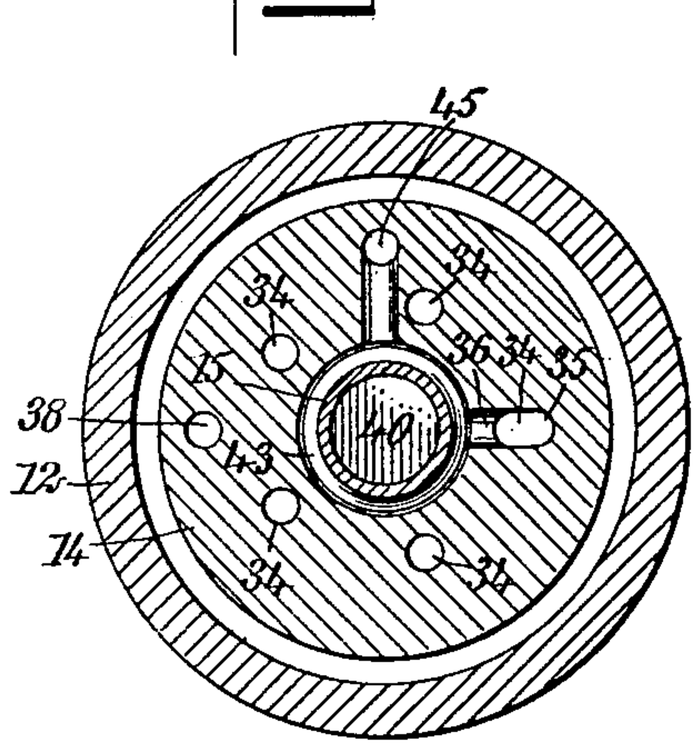


Fig. 7

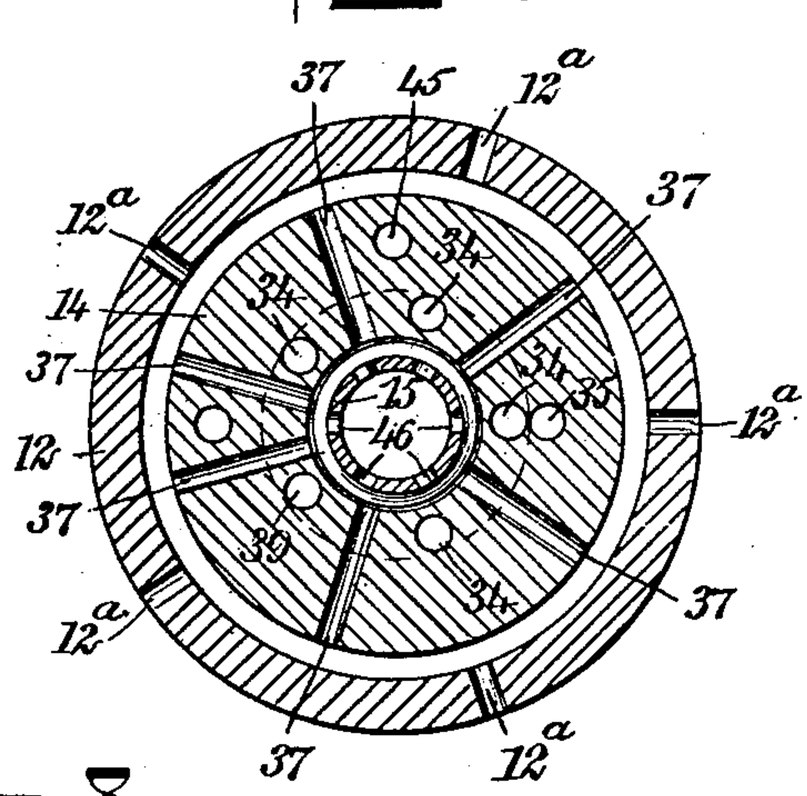
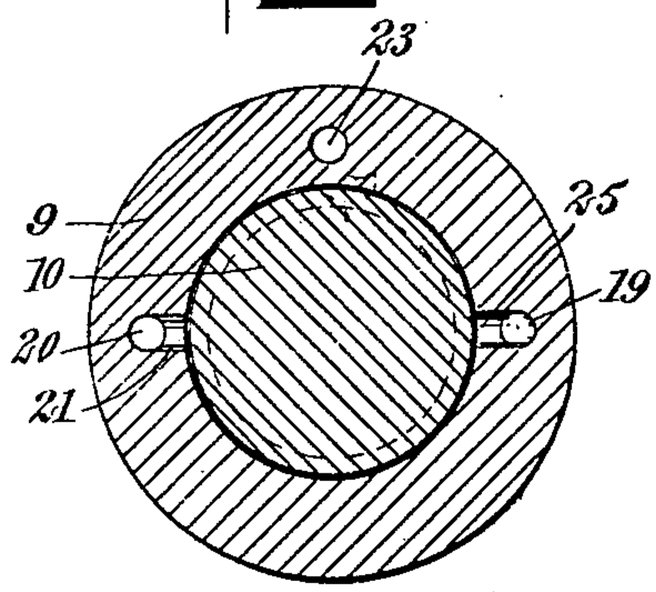


Fig. 8



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PNEUMATIC TOOL.

No. 867,856. Specification of Letters Patent. Patented Oct. 8, 1907.

Application filed July 13, 1906. Serial No. 325,994.

To all whom it may concern:

Be it known that I, EDWARD MICHAEL TOBIN, a citizen of the United States, and a resident of Barre, in the county of Washington and State of Vermont, have invented a new and Improved Pneumatic Tool, of which the following is a full, clear, and exact description.

This invention relates to pneumatic tools and has for its object to produce a new and improved valve mechanism so constructed that when the valve is open the full air pressure is admitted to the cylinder above the plunger through a straight and direct passage, thus avoiding the loss due to friction which occurs when the air is compelled to flow through long passages having many turns and bends therein.

A further object of my invention is to so construct the valve that the exhaust from the cylinder on the upward stroke of the plunger is direct, free and unobstructed.

Reference is to be had to the accompanying drawing which forms part of this specification, and in which similar characters of reference indicate corresponding parts in the several views, and in which

Figure 1 is a section along the axis of a device embodying my invention and showing the valve closed and the plunger about to return from its downward stroke; Fig. 2 is a fragmentary section similar to Fig. 1, but showing the valve open; Fig. 3 is a section along the axis of the tool but in a plane at right angles to that on which Figs. 1 and 2 are taken and with the valve removed; and Figs. 4, 5, 6, 7 and 8, are cross sections on the lines 4—4, 5—5, 6—6, 7—7 and 8—8 respectively of Fig. 1.

According to the form of my invention as here shown, it comprises a tubular barrel 9 carrying a plunger 10 and secured to a suitable handle 11. The handle is provided with an annular flange 12 forming a deep recess or pocket, the lower end of the flange being internally threaded to receive the upper end of the barrel, while the upper end of the recess or pocket constitutes an air chamber 13 and a chamber to receive the valve casing 14 and valve 15. The valve casing is rigidly held in place between the end of the barrel and a shoulder in the handle member, there being dowels 33 in said shoulder or in the end of the barrel fitting into openings in the valve casing whereby the passages in the adjacent parts are kept in perfect alinement at all times.

The air chamber 13 is provided with a main air supply passage 13^a, while the flange 12 has a plurality of exhaust ports 12^a through which the air delivered to the space around the valve casing may escape.

The tubular barrel 9 having the tool holder 16 at its lower end is provided with a shoulder 17 acting as a stop to limit the movement of the plunger 10, and the walls of the barrel have passages 19, 20 and 23 extending down from the upper end thereof and opening into the cylinder of the barrel through ports 21, 22, 24 and 25, as clearly shown in Figs. 1 and 3. The port 24 is located even with the shoulder 17 of the barrel so that air under pressure may be delivered beneath the plunger and force it toward the upper end of the barrel.

The plunger 10 is provided with an annular recess 26 which during a portion of the stroke serves to connect the port 25 of the passage 19 with the port 21 of the passage 20 whereby air under high pressure may be conducted to the upper side of the valve to close the same. At all other times these ports 21 and 25 are closed by the walls of the plunger. The passage 20 is also provided with a port 22 by which the air above the valve may exhaust into the space below the plunger when the latter has been forced nearly to the end of its upward stroke by the compressed air delivered through passage 23 and port 24. At the time the port 22 is uncovered, the lower end of the plunger reaches a point above the shoulder 17, and the compressed air escaping from passages 20 and 23 through ports 22 and 24 may then leave the device through exhaust port 18.

The improved valve casing and valve constituting the major portion of my invention, are secured within the tool in the manner above described. The casing, cylindrical in form, is composed of two parts whereby the valve may be inserted in place and the movement thereof limited, the two parts being held in alinement by a suitable flange on one of the parts and a dowel 32. The lower and main portion of the casing has a comparatively large opening extending longitudinally therethrough in which the valve is placed, the upper end of the opening being enlarged to form an annular recess 27 and a shoulder 28. The lower end of the opening is slightly reduced in cross sectional area by an annular flange 29, while between this flange and the main portion 30 of the opening is a deep recess 31.

Air passages are provided in the casing, as follows: A plurality of passages 34 extending from the upper surface of the casing to the recess 31, a branch passage 35 from one of these extending to the lower side of the casing and communicating with the passage 19, a branch passage 36 extending from the last mentioned passage 34 and passage 35 to the main opening through the casing, a plurality of radiating passages 37 from the main opening to the outer circumference, a passage 38 extending up into the cover member from the inside, then toward the circumference and down to the lower side of the casing to connect the passage 20 with the space in the valve casing above the valve, a vent passage 39 extending radially from the shoulder 28 to the outer surface of the casing, and lastly, a passage 45 connecting the main opening with the passage 23 of the barrel.

The valve 15 is composed of a hollow cylindrical body portion fitting the main opening 30 of the casing, and having an imperforate partition 40 dividing the internal space into two non-communicating chambers, a flange 41 fitting the recess 27 of the casing and resting

on the shoulder 28, and a reduced lower end 42 fitting the flange 29 of the casing. The outer circumference of the valve is provided with two annular recesses or grooves 43, 44, one of which, 43, serves to connect the branch passage 36 of the casing with the passage 45 when the valve is closed, while the other, 44, at the same time communicates with all the radial exhaust passages 37 and communicates with the lower chamber of the valve through a plurality of passages 46. When the valve is open as shown in Fig. 2, these grooves do not communicate with any passages.

The operation of my improved pneumatic tool may be briefly described as follows: Compressed air is continuously supplied through the passage 13ª to the chamber 13 from which it may escape only through the passages 34. When the plunger is at the lower end of its stroke and the valve is closed as in Fig. 1, the compressed air can pass down but one of the passages 34 and through the branch passage 36, groove 43, and passages 45 and 23 to the port 24. The air escaping through this port raises the plunger until the lower end of the plunger reaches a point above the shoulder 17. Meanwhile the compressed air in the cylinder above the plunger is permitted to escape through the ports 46, groove 44, radial passages 37 and outlet ports 12ª, and the valve is held closed by the pressure of the air communicated to the space above the valve, which has been delivered thereto through passages 35 and 19, port 25, annular groove 26, port 21, and passages 20 and 38. At the time the lower end of the plunger passes the shoulder 17 on its upward stroke, the compressed air above the valve, as well as that being supplied through the passage 23, may now escape through the exhaust port 18, and the pressure above the valve being relieved the valve is now raised by the pressure of the air delivered to the annular recess 31 through the passages 34. The valve is kept open as shown in Fig. 2 by this pressure, while the compressed air fills the space above the plunger and forces it down against the end of any suitable tool that may be held in the tool holder 16. On the downward stroke when the annular recess 16 reaches the ports 25 and 21, the compressed air may be again delivered to the upper side of the valve, and as the upper surface of the valve is larger in area than the lower surface and the pressure of the air per square inch exerted upon both sides is the same, the valve is now closed, the supply of air to the upper side of the plunger is shut off, and the exhaust ports 46 are opened whereupon the operation may be repeated.

It will be noted that when the valve is opened as shown in Fig. 2, the passage through which the compressed air is supplied from the chamber 13 to the upper surface of the plunger is substantially straight and unobstructed, whereby the full force of the air may be exerted and the loss due to friction very materially lessened. When the valve is closed the air in escaping from the chamber passes in a substantially direct line through the ports 26, passages 37 and ports 12ª, these passages and ports being in the same plane and free from valves or other obstructions. The rapid action of the valve is facilitated by the chamber formed in the upper portion thereof, whereby a small quantity of air is stored, and by the vent passage 39 whereby air may freely enter and escape from the chamber formed beneath the flange 41 as the valve raises. The operation of the valve is very simple and its action is very rapid. There is nothing whatever about the valve or valve casing which can get out of order or become materially affected by wear or hard usage, while in case any repairs are needed the valve and valve casing may be very quickly removed from the tool and a new one inserted while the old one is being repaired. Many other advantages resulting from the use of my improved pneumatic tool above described will be readily apparent from a close inspection of the same.

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

1. A pneumatic tool having a valve casing provided with an axial opening, means connected to said valve casing and having an annular flange inclosing said valve casing, said valve casing and inclosing means having radial passages lying in the same plane, and a valve within the axial opening of said casing, said valve having an open-ended body portion in engagement with the inner walls of said axial opening, and a partition intermediate the ends thereof, said valve being provided with a plurality of radial passages below the partition and adapted to lie in the same transverse plane with the above mentioned radial passages and permit the escape of exhaust air from the interior of the valve to the atmosphere when the valve is in one position, and lie in a different plane and prevent this escape from in the opposite position.

2. A pneumatic tool, comprising a cylindrical barrel, a hammer located therein, a valve casing adjacent one end of said barrel and having an axial opening in communication with the interior of said barrel, an annular recess adjacent one end of said opening, a passage whereby compressed air may be delivered to said recess, and a second passage whereby compressed air may be delivered to said opening independently of the recess, the walls of the casing and of the barrel having a passage, one end thereof terminating within the axial opening of the casing adjacent the outlet of the last mentioned passage and the other end of said passage terminating within the barrel adjacent the lower end of the hammer, and a valve within the axial opening of the valve casing and having an annular groove in its outer surface in communication with both of the last mentioned passages when the valve is in its closed position.

3. A valve casing having an axial opening, an annular recess adjacent each end thereqf, a plurality of radial passages leading from said axial opening to the outside atmosphere from points intermediate the annular recesses, a passage for supplying compressed air to one of said recesses, a passage for supplying compressed air to said axial opening, and a passage adjacent said last mentioned passage, and a valve within said axial opening, said valve having an open-ended body portion in engagement with the wall of said axial opening, and a partition intermediate its ends, said valve being provided with a plurality of radial openings adapted to communicate with the axial opening of the casing, and an annular groove communicating with said axial opening intermediate the ends of the latter.

4. A tubular valve having both ends thereof open, an imperforate partition intermediate the ends thereof, and an annular flange upon the perimeter of said valve adjacent one end thereof, the wall of said valve being provided with a plurality of openings intermediate the partition and one end of the valve, and a circumferential groove in the perimeter of the valve intermediate the partition and the opposite end.

5. A valve for the purpose set forth, having a hollow cylindrical body portion, the ends of said body portion being open, an imperforate partition within said body portion and at right angles to the axis thereof, and an annular flange surrounding the body portion adjacent one end thereof, the outer cylindrical surface of the body portion being provided with a groove intermediate the annular flange and the partition, and the cylindrical wall of said body portion being provided with a plurality of axial openings intermediate the partition and the opposite end.

6. A valve having a cylindrical body portion of substan-

tially uniform diameter throughout its length, and an annular flange encircling the perimeter thereof adjacent one end of the valve and constituting a seat, said valve having the ends thereof open and separated by an imperforate partition, the perimeter of said valve adjacent the annular flange being provided with a groove, and the wall adjacent the opposite end thereof being provided with a series of perforations.

7. In a pneumatic hammer, the combination with the barrel thereof having a series of ports therein, a tubular valve having an annular flange encircling the perimeter thereof adjacent one end and constituting a seat, said valve being separated into two open-ended compartments by a transverse diaphragm intermediate the ends thereof, one of said compartments being in open communication with the barrel of the hammer and the other of said compartments together with the annular flange, serving as means whereby the valve may be closed, the wall of said valve being provided with a plurality of axial openings whereby the air may escape from the barrel and the first mentioned compartment when air is delivered to the last mentioned compartment.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

EDWARD MICHAEL TOBIN.

Witnesses:

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HUGH H. CARPENTER.