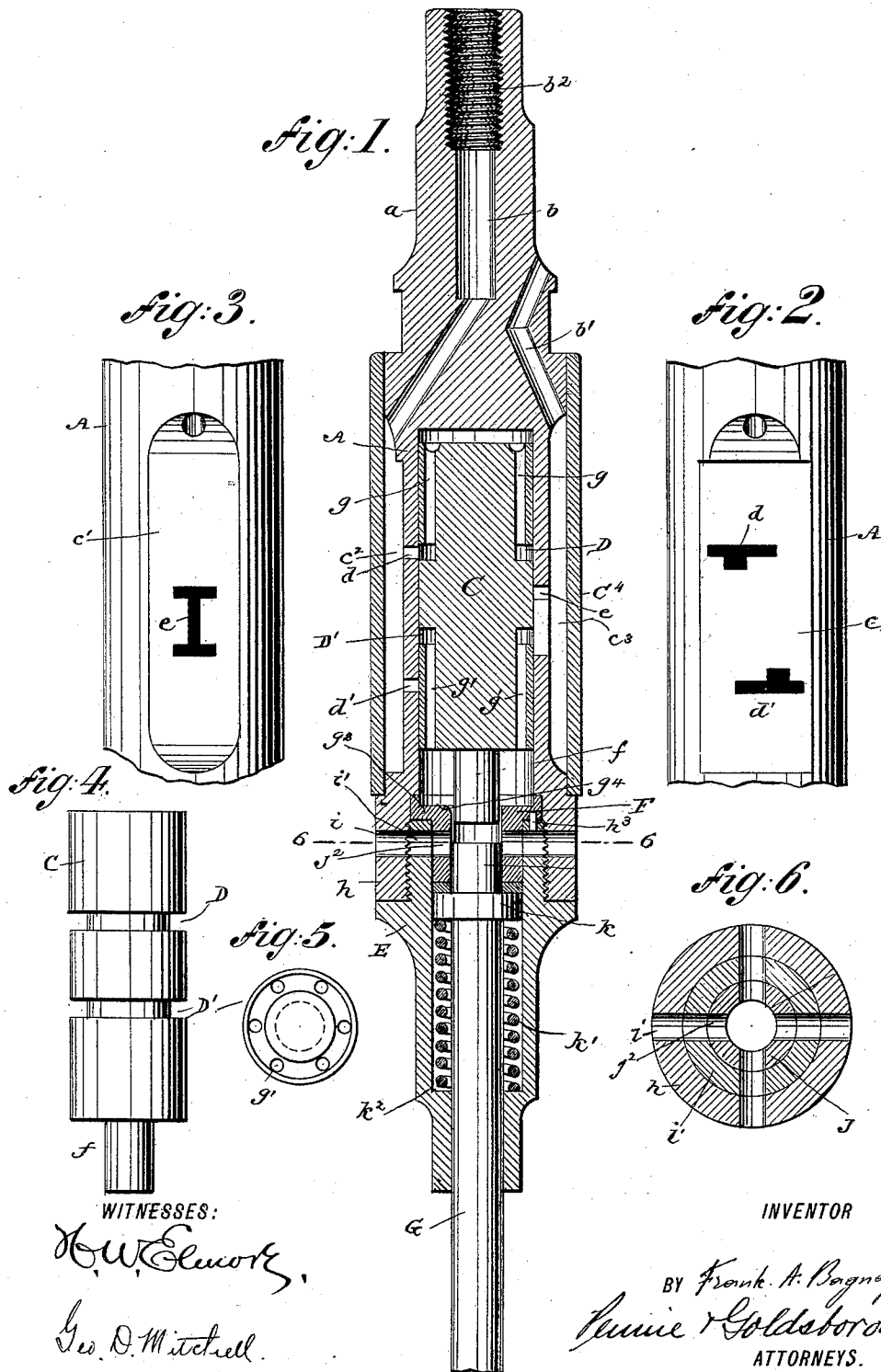


(No Model.)

F. A. BAGNASCO.
PNEUMATIC TOOL.

No. 474,154.

Patented May 3, 1892.



UNITED STATES PATENT OFFICE.

FRANK A. BAGNASCO, OF LONG ISLAND CITY, NEW YORK.

PNEUMATIC TOOL.

SPECIFICATION forming part of Letters Patent No. 474,154, dated May 3, 1892.

Application filed August 30, 1890. Serial No. 363,494. (No model.)

To all whom it may concern:

Be it known that I, FRANK A. BAGNASCO, a citizen of the United States, residing at Long Island City, in the county of Queens and State of New York, have invented certain new and useful Improvements in Pneumatic Tools; and I do hereby 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.

My invention relates to an improvement in pneumatic tools, and particularly to that class adapted for use in dressing and carving stone of all kinds, for use in calking boilers, chipping iron and steel, and in fact for all classes of work in which the hammer or mallet and chisel have ordinarily been employed.

The objects of my invention are to simplify and cheapen the construction of tools of this character, to increase their durability, and to lessen the noise and vibration incident to the extremely-rapid movement of the piston.

The invention consists in the features of construction and combination of parts hereinafter fully described, and pointed out in the claims.

In the drawings, Figure 1 is a sectional elevation of a pneumatic tool embodying my invention. Fig. 2 is a detail view of the cylinder, showing the arrangement of the induction-ports. Fig. 3 is a detail view of the cylinder, showing the exhaust-port. Fig. 4 is a detail elevation of the piston. Fig. 5 is an end view of the same, and Fig. 6 is a section of the tool on the plane illustrated by the line 6 6 in Fig. 1.

Referring to the drawings, A represents the cylinder, provided at its upper end with an extension *a*, having the passage *b* threaded, as at *b*², to permit the connection of tubing for conveying compressed air to the cylinder. The cylinder A is surrounded by a jacket C⁴, which fits said cylinder so closely as to prevent the escape of air. The cylinder A is provided with a plane surface on the opposite sides *c c'*, thus forming slab-channels *c*² *c*³ between the cylinder and the jacket. The passage *b* extends downwardly and communicates with the channel *c*², while a passage *b'* communicates with the channel *c*³ and leads

through the extension *a* to the open air. The plane surface *c* is provided with induction-ports *d d'*, located at points near its ends and sides, as shown. These ports may be of any form desired. On the side *c'* of the cylinder A is located, about midway the sides and ends thereof, an exhaust-port *e*.

C' represents the piston, which is cylindrical in form and adapted to closely fit the interior of the cylinder A. The piston C' is provided at one end with a centrally-located striking or hammer portion *f*, the diameter of which is considerably smaller than that of the piston.

D D' represent annular grooves or channels, which are formed in the piston at a suitable distance. Each of the grooves or channels D D' is located an equal distance from the opposite ends of the piston. In the piston C' are provided passages *g g'*, which extend from the grooves or channels D D' through the piston to the opposite ends thereof. The lower end of the cylinder is provided with an integral annular flange *h*, which is interiorly threaded, and is provided at suitable intervals with openings *i* for a purpose which will be hereinafter fully explained.

E represents the nose, which is exteriorly threaded at its upper end to engage the interiorly-threaded flange *h*.

F represents a sleeve or thimble having a circumferential flange *g*³ at its upper end, forming a seat *g*⁴ for the piston in its downward stroke. The flange of the sleeve F rests on the upper edge of the threaded portion of the nose, and its turning is prevented by a pin *h*³, projected from said threaded portion of the nose and engaging an opening in the flange *g*³. The sleeve F is also provided with openings *j*², which register with the openings *i*², thus forming air-escape passages *j*³.

G represents the spindle for holding the bit or chisel. This spindle is located in the nose, with its lower end projecting below the latter. The spindle is provided adjacent to its upper end with a shoulder *k*, which bears against the lower end of the sleeve F, and is forced upwardly against said sleeve by means of a spiral spring *k'*, which bears against the under face of the shoulder *k* at one end and against an interior shoulder *k*² of the nose.

The upper portion of the spindle is normally located in the sleeve F to receive the blows of the striking or hammer portion *f* of the piston.

The operation is as follows: Compressed air is admitted to the slab-channel *c*² through the passage *b* and completely fills said channel. In the position shown in Fig. 1 the air is admitted through the induction-port *b* and into the channel D of the piston C, passing up through the passages *g* in said piston to the upper end of the cylinder, thereby giving to the piston a downward movement. The downward movement of the piston causes the groove or channel D to pass the induction-port *d*, so that the air is prevented from entering at this point. The downward movement of the piston, however, brings the channel D' of the piston into line with the port *d'* and air is admitted to the lower end of the cylinder, passing through the channels *g'*, and inasmuch as the striking or hammer portion *f* of the piston has its lower end at all times located in the thimble F any considerable portion of air is prevented from leaking through said sleeve, and the latter acts as a stop to confine the air and give the piston its upward movement. At the limit of the downward stroke of the piston the channel D is brought into line with the exhaust-port *e*, so that when the piston is moved upwardly the air in the upper end of the cylinder is forced downwardly through the passages *g*, out through the port *e*, and to the open air through the passage *b'*. The movement of the piston by this exhaust-port is so rapid that the air in the upper end of the cylinder is not entirely removed and a sufficient portion is retained to cushion the piston. The air in the lower end of the cylinder is exhausted in a manner similar to that described. The piston in moving downwardly forces the air in the lower part of the cylinder up through the passages *g'* and out through the port *e*, as shown. The piston is not cushioned on its downward stroke for the reason that it is desirable that it should deliver a positive blow to the spindle, and this is due to the fact that a portion of the air confined will escape past the striking portion *f* and out through the passage *j*². This escape of air, however, is not sufficient to in any way interfere with the upward stroke of the piston. The blow of the striking or hammer portion *f* is delivered upon the upper end of the spindle G, as usual, and the spindle is returned to receive the successive blows of the striking or hammer portion by means of the spring *k*². The spindle carrying the chisel may be given a blow equal to the full length of the stroke of the piston, or the blow may be shortened by drawing the spindle out by hand.

It will be noticed that in the construction above described no valve is employed for controlling the movement of the air, and consequently the vibration of the tool and the noise in running are reduced to the minimum, the construction of the tool simplified and con-

siderably cheapened, and its durability increased.

It is the characteristic of my invention that the reciprocation of the piston and the admission and exhaust of the motive fluid to the piston-chamber are effected without the employment of any auxiliary valve for that purpose, the piston itself governing the inlet and exhaust ports directly. As the pneumatic tool is therefore not dependent upon the action of such a valve, the construction is greatly simplified and cheapened, and the liability of the tool to get out of repair is materially lessened by reason of the lesser number of moving parts.

Having thus described my invention, what I claim is—

1. In a pneumatic tool, the combination of a piston-chamber having inlet and exhaust ports and a valveless piston working in the chamber, said piston having grooves adapted to register with the ports in the chamber, and openings or channels extending from the grooves outward to the ends of the piston.

2. In a pneumatic tool, the combination of a piston-chamber, inlet and exhaust ports in said chamber, a valveless piston working in the chamber, annular grooves in the piston registering with the ports in the chamber, and channels or openings forming communication between the grooves and the piston-chamber at opposite ends.

3. In a pneumatic tool, the combination of a cylinder having a piston-chamber, a jacket surrounding said cylinder and forming an air-space outside of the cylinder, a valveless piston working in the chamber, inlet and exhaust ports leading from the interior chamber to the outer air-space, grooves in the said piston registering with said inlet and exhaust ports, and channels or perforations leading from the grooves outward to the piston-chamber at opposite ends of the piston.

4. In a pneumatic tool, the combination of a piston-chamber, a piston working therein, a hollow thimble whose upper end forms the lower end of the piston-chamber and in the bore of which the reduced striking end of the piston plays, and vent-openings in the walls of the thimble.

5. In a pneumatic tool, the combination of a piston-chamber, a piston working therein, a spring-seated tool-carrying spindle, a hollow thimble whose upper end forms the lower end of the piston-chamber and in the bore of which the reduced striking end of the piston plays, and vent-openings in the walls of the thimble.

6. In a pneumatic tool, the combination of a cylinder having a piston-chamber, a valveless piston working in said chamber, inlet and exhaust ports in the chamber, grooves in the piston adapted to register with the ports in the chamber, channels or perforations leading from the grooves outward to the piston-chamber at opposite ends of the piston, a hollow thimble in the lower end of the cylinder form-

ing the bottom of the piston-chamber, the piston having the hammer playing in the bore of the thimble, and vent-openings in the walls of the thimble.

5 7. In a pneumatic tool, the combination of a cylinder having a piston-chamber, a valveless piston working in said chamber, inlet and exhaust ports in the chamber, grooves in the piston adapted to register with the ports in
10 the chamber, channels or perforations leading from the grooves outward to the piston-chambers at opposite ends of the piston a hollow thimble in the lower end of the cylinder forming the bottom of the piston-chamber, the piston having a hammer playing in the bore of
15 the thimble, vent-openings in the walls of the

thimble and cylinder, a nose-piece secured to the cylinder, a tool-carrying spindle playing in said nose-piece, a shoulder or collar on the spindle, and a spring to hold the collar normally against the lower end of the thimble. 20

8. A pneumatic tool having a piston air-cushioned at the return end of the piston-chamber and vented at the opposite or striking end thereof, substantially as described. 25

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

FRANK A. BAGNASCO.

Witnesses:

FRANK H. MARSH,
FRANK E. OSBORNE.