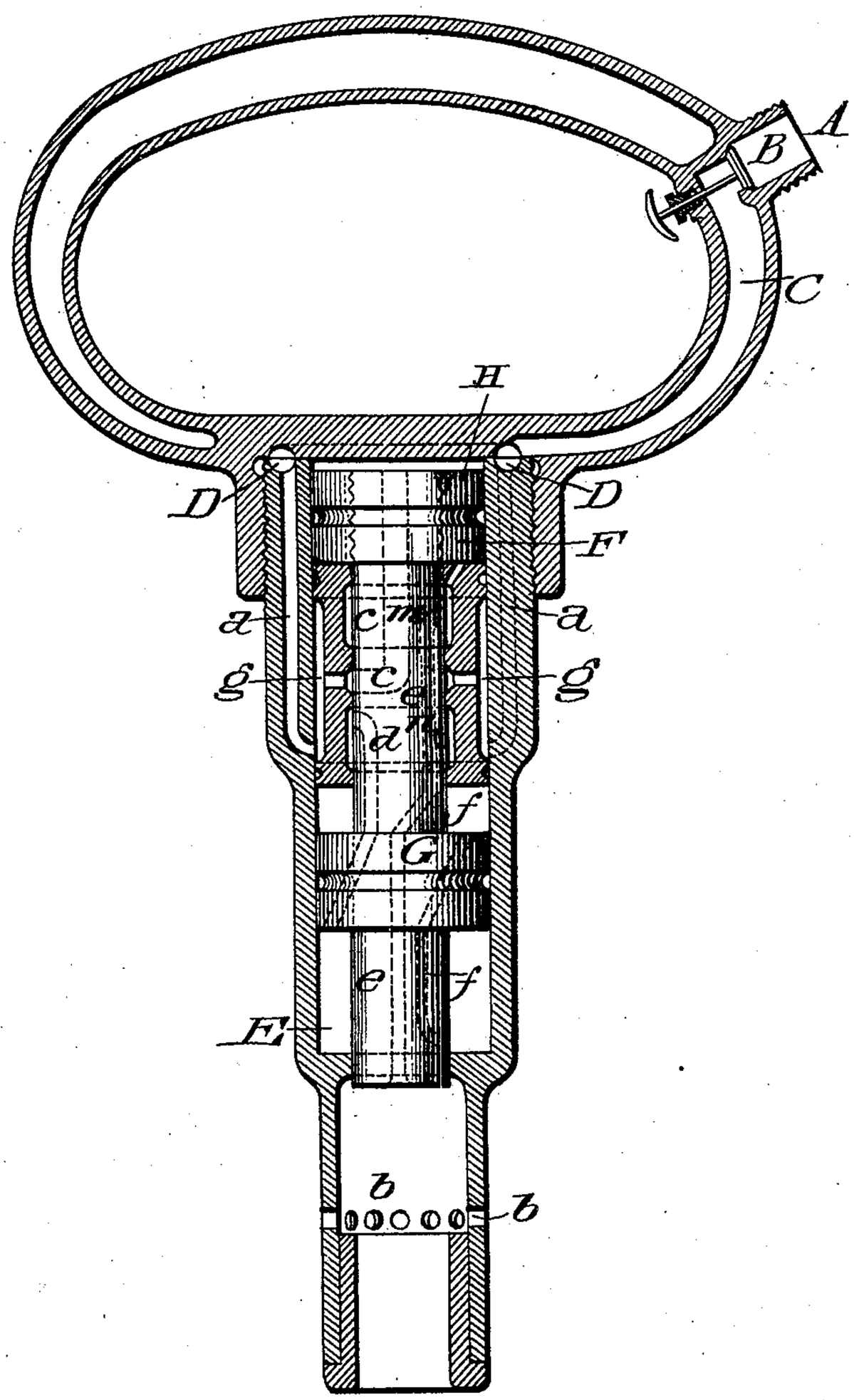
No. 705,436. Patented July 22, 1902.

# N. PECORARO.

## AIR TOOL.

(Application filed Aug. 24, 1901.)

(No Model.)

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# UNITED STATES PATENT OFFICE.

NINO PECORARO, OF SPEZIA, ITALY.

## AIR-TOOL.

SPECIFICATION forming part of Letters Patent No. 705,436, dated July 22, 1902.

Application filed August 24, 1901. Serial No. 73,181. (No model.)

*To all whom it may concern:*

Be it known that I, NINO PECORARO, a subject of the King of Italy, residing at Spezia, Province of Genoa, Kingdom of Italy, have invented new and useful Improvements in or Relating to Air-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 refers to that class of tools which consists of an automatic hammer reciprocated in a cylinder by compressed air, steam, or another fluid and delivering a rapid succession of blows upon a tool-holder into which are inserted either bits and chisels for cutting wood, stone, metal, &c., or hammers, calking-tools, countersinks, and the like for striking rivet-heads, calking plates, countersinking holes, and performing any other work which may be accomplished by means of a tool under the influence of rapid and short strokes.

The tool is shown by way of example in the accompanying drawing, which is a sectional view thereof.

It consists of the following parts, namely: the handle, the working cylinder, the piston or ram, and the valve.

The handle is provided with a socket A, into which the pipe conveying compressed air or another motive fluid to the tool is screwed and which has at its end a valve B that the pressure of the fluid entering the tool keeps automatically shut as long as it is not relieved of said pressure by a finger of the hand grasping the handle when the tool is to be actuated. The motive fluid proceeds through passage C to the circular channel D and thence to the cylinder, screwed into another large socket, with which the handle is provided.

The ram-piston reciprocates in the cylinder, which is provided with a passage *a*, leading the motive fluid from the channel D into the interior of the working cylinder. The latter has toward its lower end an abutment or flange E, with which the ram-piston makes air-tight contact, the holes *b*, through which the motive fluid escapes after having done work, and a metal sleeve acting as a tool-holder.

The ram-piston is a cylindrical piece of steel having two shoulders F G, making air-tight contact with the internal walls of the cylinder, while the lower end of the cylinder likewise makes air-tight contact with the cylindrical wall of flange E. The lower face of the ram-piston is intended to strike upon the head of the tool proper and must therefore be properly hardened. The shoulder G is made in one piece with the ram-piston, while F is secured thereto by means of screw-threads and a locking-screw H. The following passages are provided in the interior of the piston: *c*, inlet-passage leading upward; *d*, inlet-passage leading downward; *e*, exhaust-passage with two openings *m n*, intended for exhausting the motive fluid respectively from above and from below; *f*, inlet-passage intended to actuate the distributing-valve during the return movement of the piston.

The distributing-valve is an elongated ring situated in the interval between the inside wall of the cylinder and the part of the piston extending from shoulder F to shoulder G. The valve is free to reciprocate along the piston and conaxially thereto along a stroke equal to the distance between the ports at the ends of the passages *c* and *d*. The annular ribs projecting from the body of the valve make air-tight contact with the walls of the cylinder and the piston-rod, along which they slide. The length of the valve must be such as never to allow of the ports at the end of the passages *a* being left uncovered by the incavated part of the valve extending between the outer annular ribs at each end of the valve. The valve is provided with several holes *g*, through which the motive fluid enters the channel situated between the two inner annular ribs at the middle of the valve.

The working of the tool hereinbefore described may now be easily understood and is as follows: The tool proper being inserted into the tool-holder at the end of the cylinder and the handle of the hammer being seized by clasping it with the fingers one of them is used to open the valve B, thereby admitting the motive fluid into the hammer. The same through the channels C and D reaches the cylinder-passages *a* and enters through them the annular recess left between the distribut-

ing-valve and the cylinder and corresponding to the excavated part of the valve. It then flows through the holes *g* and the passage *c*, and is thereby allowed to exert its pressure upon the upper face of the piston. The latter on its downward movement draws the distributing-valve along with it, whereby the motive fluid is allowed to reach the upper face of the ram-piston up to the moment when the head of said piston strikes on the tool proper. The speed of the ram-piston is at once reduced, while the distributing-valve owing to its momentum pursues its stroke up to the moment it strikes against the lower shoulder G of the ram-piston, when the direction of motion is at once reversed, as the holes *g* being then put into communication with the passage *d* the motive fluid is allowed to reach the lower face of the piston-ram, which begins its return stroke. In both strokes the exhaust takes place through the same distributing-valve, namely: first, in the forward stroke through passage *d*, port *n*, and passage *e;* second, in the return stroke through passage *c*, port *m*, and passage *e*. In both cases the exhaust fluid escapes from passage *e* into the surrounding atmosphere through the holes *b*. When the return stroke, which takes place at a lower speed than the forward stroke, is approaching its end, the lower part of channel *f* communicates with the chamber of the cylinder situated under the lower shoulder G of the ram-piston. As said chamber is at that moment under pressure, a part of the motive fluid flows through channel *f* into the space left between the lower shoulder G of the ram-piston and the lower face of the distributing-valve. The latter is thereby raised and brought into contact with the upper shoulder F, when it will be ready for admitting fresh motive fluid to begin a new forward stroke. The hammer thus takes up a quick alternate motion and delivers a rapid succession of blows upon the head of the tool proper.

This improved pneumatic hammer differs from those hitherto in use in as far as it allows of the stroke and number of blows delivered by the hammer being varied according to the work to be performed without throttling the air or other motive fluid, which aim is attained by the use of a distributing-valve sliding along the same axis as the ram-piston and reversing the movement only since the blow has been struck. It ensues therefrom that when the hammer has delivered a blow upon the tool proper its movement can be reversed at any point of the stroke whatever, the blows being delivered either quickly and gently or at larger intervals and heavily, according to the length of the shaft of the tool.

Having now described my invention, what I claim, and desire to protect by Letters Patent, is—

1. In a pneumatic tool, a cylinder, a piston therein, shoulders upon the extremities of said piston, a valve movable on said piston, between said shoulders and provided with ports extending therethrough, inlet-ports in said cylinder, an inlet-passage *c* in said piston leading upwardly therethrough, an inlet-passage *d* therein leading downwardly therethrough, an exhaust-passage in said piston extending to the end thereof and having the ports *m* and *n* and an inlet-passage *f* in said piston for enabling said valve to be operated.

2. In a pneumatic tool, a cylinder, a piston therein, shoulders upon the extremities of said piston, one of said shoulders being integral with said piston, and the other of said shoulders in threaded engagement therewith, a locking-screw H holding said shoulder in position, a valve movable on said piston between said shoulders and provided with ports, inlet-ports in said cylinder, an inlet-passage *c* in said piston leading upwardly, an inlet-passage *d* therein leading downwardly, an exhaust-passage in said piston extending to the end thereof and having the ports *m* and *n*, and an inlet-passage *f* in said piston for enabling said valve to be operated.

3. In a pneumatic tool, a cylinder, a piston therein, enlarged shoulders upon the extremities of said piston, an extension on the lower shoulder of the latter adapted to impact with the shank of the tool employed, an inwardly-projecting wall through which said extension passes, a valve movable on said piston between said shoulders and provided with ports extending therethrough, said valve having an annular passage between it and the bore of said cylinder, an inlet-passage *c* in said piston leading upwardly, an inlet-passage *d* therein leading in an opposite direction, an exhaust-passage in said piston extending through the extension thereof and having the ports *m* and *n* and an inlet-passage located for a portion of its length in said extension for enabling said valve to be operated.

4. In a pneumatic tool, a cylinder, a piston therein, shoulders upon the extremities of said piston, one of said shoulders being integral with said piston, and the other of said shoulders in threaded engagement therewith, a locking-screw H holding said shoulder in position, a valve movable on said piston between said shoulders and provided with ports in said cylinder, an inlet-passage *c* in said piston leading upwardly, an inlet-passage *d* therein leading downwardly, an exhaust-passage in said piston extending to the end thereof and having the ports *m* and *n*, and an inlet-passage *f* in said piston for enabling said valve to be operated, in combination with an extension on the extremity of said piston of reduced diameter and a flange projecting inwardly from said cylinder through which said extension passes.

5. In a pneumatic tool, a cylinder, a piston therein, shoulders upon the extremities of said piston, one of said shoulders being integral with said piston, and the other of said shoulders in threaded engagement therewith, a locking-screw H holding said shoulder in

position, a valve movable on said piston between said shoulders and provided with ports in said cylinder, an inlet-passage *c* in said piston leading upwardly, an inlet-passage *d* therein leading downwardly, an exhaust-passage in said piston extending to the end thereof and having the ports *m* and *n*, and an inlet-passage *f* in said piston for enabling said valve to be operated, in combination with an extension on the extremity of said piston of reduced diameter and a flange projecting inwardly from said cylinder through which said extension passes, the lower portion of said cylinder having the exhaust-ports *b* therein.

6. In a pneumatic tool, a cylinder, a piston therein, shoulders upon the extremities of said piston, the latter being of reduced diameter between said shoulders, a valve mounted on said piston between said shoulders and having a plurality of ports therethrough, the outer intermediate portion of said valve being of reduced diameter and said valve having a plurality of recesses between its inner periphery and the outer periphery of said piston, an inlet-passage *c* in said piston leading to one end thereof and another inlet-passage in said piston leading to the opposite end thereof, an exhaust-passage in said piston extending toward the extremity thereof and having the ports *m* and *n*, and an inlet-passage *f* in said piston for enabling said valve to be operated.

In witness whereof I have hereunto set my hand in presence of two witnesses.

NINO PECORARO.

Witnesses:

GIUSEPPE PALAZZI,

EUGENIO DALT TITA.