No. 667,784. Patented Feb. 12, 1901.

J. K. LENCKE.

PNEUMATIC HAMMER.

(Application filed Apr. 2, 1900.)

(No Model.)

Fig. 1.

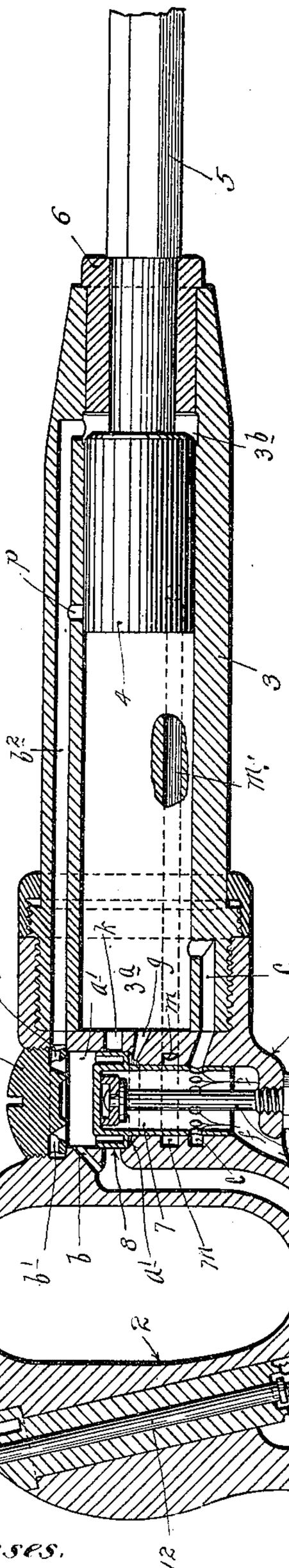
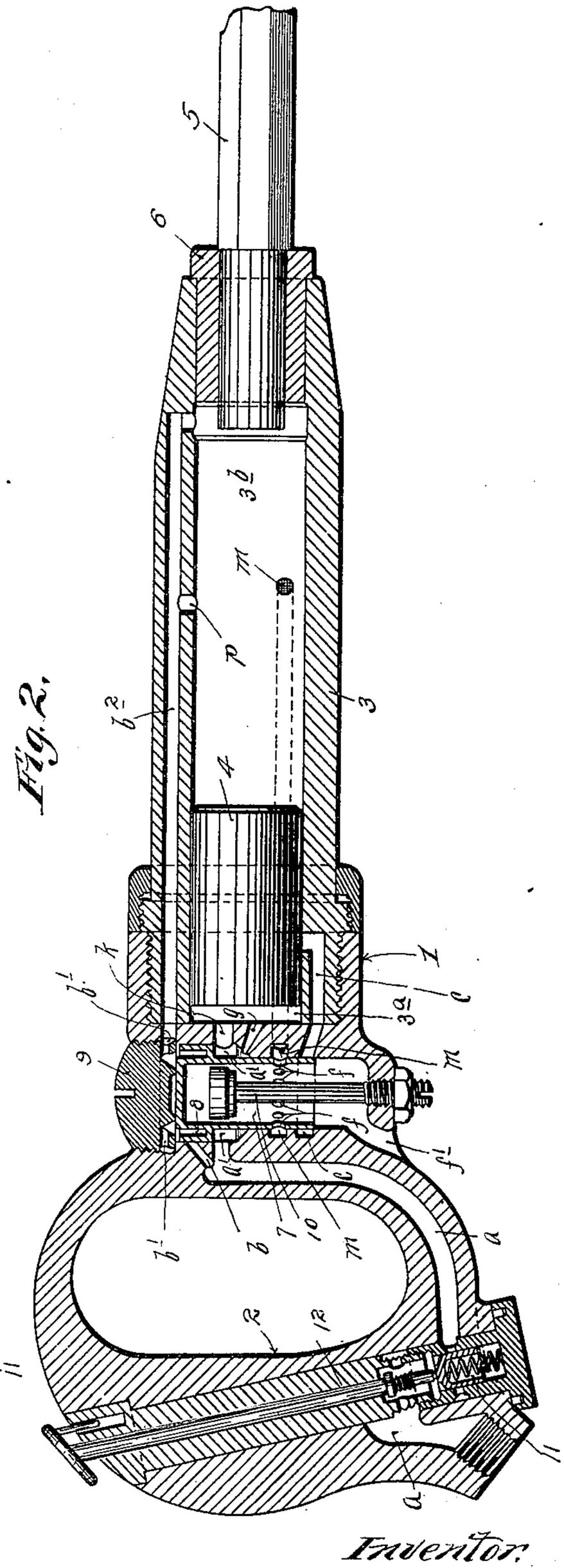


Fig. 2.



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UNITED STATES PATENT OFFICE.

JOHN K. LENCKE, OF CHICAGO, ILLINOIS.

PNEUMATIC HAMMER.

SPECIFICATION forming part of Letters Patent No. 667,784, dated February 12, 1901.

Application filed April 2, 1900. Serial No. 11,146. (No model.)

To all whom it may concern:

Be it known that I, JOHN K. LENCKE, a citizen of the United States, residing at Chicago, in the county of Cook, State of Illinois, (and whose temporary post-office address is B. O. 17th line No. 6, St. Petersburg, Russia,) have invented certain new and useful Improvements in Pneumatic Hammers; 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 has for its object to provide a pneumatic hammer of increased efficiency; and to this end it consists of the novel devices and combinations of devices hereinafter described, and defined in the claims.

A portable pneumatic hammer constructed in accordance with my invention is illustrated in the accompanying drawings, wherein like characters indicate like parts throughout both views.

Figure 1 is a vertical longitudinal section taken centrally through the improved hammer; and Fig. 2 is a similar view to Fig. 1, but illustrating different positions of the piston and distribution-valve.

To the body portion 1 of the handpiece 2 the inner end of a cylinder 3 is secured. Within this cylinder a short piston 4 reciprocates for action, as a hammer, on the inner end of a tool 5, which may be a drill, chisel, calking implement, or other tool. The shank of the tool 5, as shown, works through a bushing 6 in the outer end of said cylinder 3.

A cup-shaped distribution-valve 7, having an enlarged head 8, works in a suitable seat formed in the body 1 back of the inner end of the cylinder 3. A plug 9, which when removed permits the distribution-valve to be placed in working position, normally limits the upward movement of said valve 7, and a headed stud 10, supported from the body 1, limits the downward movement of the said valve.

A supply-duct *a*, which would usually lead from a flexible supply connection, (not shown,) extends through the handpiece 2 and opens into a cylindrical chamber *a'*, in which the enlarged head 8 of the distribution-valve 7 works.

A spring-pressed throttle-valve 11, which is adapted to be held in its open position by a thumb-actuated plunger 12, normally closes the supply-duct *a*.

Admission and exhaust ports and certain other passages will be noted in the description of the operation, which, briefly stated, is substantially as follows: When the hammer is in action, the throttle-valve 11 is held open by the thumb placed upon the plunger 12. When the distribution-valve 7 is in the position shown in Fig. 1, the admission from the supply-duct *a* to the outer end of the cylinder 3 will be through a port *b* to the chamber *a'* above the valve-head 8 and thence through perforations *b'* in the plug 9 to a long port b^2 delivering to the outer end of said cylinder. Hence under these conditions the piston 4 will be driven inward or given its return stroke. The exhaust under the inward movement of the piston will be through an exhaust-port *c*, the inner end of which at this time opens into ports *f* in the body of the distribution-valve 7 and thence through the valve 7 and out through the final exhaust. The exhaust-port *c* opens from the cylinder 3 outward of its inner end, so that a compression-chamber 3^a is formed at the inner end of said cylinder. After the inner end of the piston 4 passes and closes the exhaust-port *c* on its inward movement it is brought to a stop with a cushioned action; but its momentum produces a compression of the air caged in said chamber 3^a exceeding the pressure of the air above the distribution-valve 7. This more highly compressed air finds its only escape through a port *g*, which opens into the bottom of the chamber *a'* immediately below the head 8 of the valve 7, and acting upon the said valve-head raises the said distribution-valve 7 into the position indicated in Fig. 2. When the distribution-valve 7 is in the position indicated in Fig. 2, the admission-port *b* and the exhaust-port *c*, above noted, are closed, and the admission of the air to the inner end of the cylinder will then be direct from the chamber *a'*, below the head 8 of the admission-valve 7, and through a port *k*, thereby forcing the piston 4 outward or imparting to the same its blow-producing or hammer stroke. Under this outward movement of the piston the exhaust from the outer end of the cylinder will be through a long port *m*, the inner

extremity of which is at this time open to the valve-ports *f*, and thence through the interior of said valve to the atmosphere through the final exhaust-passage *f'*. The exhaust-port *m* opens from the cylinder 3 inward of the outer end thereof, so as to form a compression-chamber 3^b at the outer end of the cylinder. When the outer end of the piston passes and closes the exhaust-port *m* on its outward stroke, the air caged in the chamber 3^b will under the momentum of the piston be forced backward through the port b^2 and perforations *b'*, and acting upon the head 8 of the distribution-valve 7 will force the said valve back into the position shown in Fig. 1, thereby closing the admission-port *k* and exhaust-port *m* and again opening the admission-port *b* and exhaust-port *c*, with a repetition of the action first described. It will of course be understood that the piston 4 will strike the inner end of the tool 5 and deliver the proper blow thereto while under very high speed. Inasmuch as the piston acts to control the distribution-valve at or near the limits of its reciprocation it follows that the cylinder may be long, while the piston may be short. This permits a hard blow to be struck by a short and comparatively light piston.

The admission-port *b* has a much smaller cross-section than the admission-port *k*, from which it follows that the air will be admitted to the inner end of the cylinder much more rapidly than it will to the outer end of the cylinder, with the result that the outward or blow-producing stroke of the piston will be much more rapid than the return movement thereof. This feature is of great importance in the practical operation of the hammer. With a given number of strokes per second it enables a harder blow to be delivered to the tool with a correspondingly-diminished recoil at the handpiece. As a result of this action a larger and more powerful hammer may be held in the hand and controlled by the operator.

If in starting the engine the distribution-valve 7 should be in the position indicated in Fig. 2, air will pass from the supply-chamber *a'* through the admission-port *k* into the inner end of the cylinder and the piston will be forced outward until it has engaged the tool and forced the same outward far enough to permit the inner end of the piston to pass and open the port *p*. The air from the cylinder 3 will then be admitted through the port *p*, port b^2, and perforations *b'* against the upper enlarged end of the distribution-valve and will force the said distribution-valve downward or back into the position indicated in Fig. 1. In this manner the proper relations of the piston and the distribution-valve are established and the hammer is started into action.

The hammer above specifically described is capable of many modifications within the scope of my invention and may be driven by air or any other elastic fluid under pressure.

What I claim, and desire to secure by Letters Patent of the United States, is as follows:

1. A direct-acting engine having a distribution-valve independent of and out of contact with the piston and having within its cylinder a compression-chamber with a passage leading to said distribution-valve, whereby the movements of said distribution-valve are controlled by pneumatic pressure generated by the momentum of the piston, substantially as described.

2. The combination with the cylinder 3 and piston 4, of the distribution-valve 7, 8, seated without said cylinder 3, ports leading to and from said distribution-valve and to the said cylinder, said cylinder having the compression-chamber 3^a opening through a port *g* beneath the projecting ledge 8 of said distribution-valve, substantially as described.

3. The combination with the cylinder 3 fitted with the tool 5 and piston 4 and having in its ends the compression-chambers 3^a and 3^b, of the handpiece 2 secured to said cylinder, equipped with a throttle-valve and provided with the valve-seat, *a'*, the distribution-valve 7, 8, seated in said valve-seat, and suitable admission and exhaust ports involving a supply-duct *a*, *b*, leading from said throttle-valve to said seat *a'*, the ports *k*, *g*, opening from said seat *a'* to said compression-chamber 3^a, and the ports *c*, b^2 leading from said distribution-valve to the opposite ends of the cylinder.

In testimony that I claim the foregoing as my invention I have signed my name in presence of two subscribing witnesses.

JOHN K. LENCKE.

Witnesses:
M. BREITFUSS,
E. LOURIE.