

C. R. James,
Operating Steam Hammers.
N^o 55,772. Patented June 19, 1866.

Fig. 1.

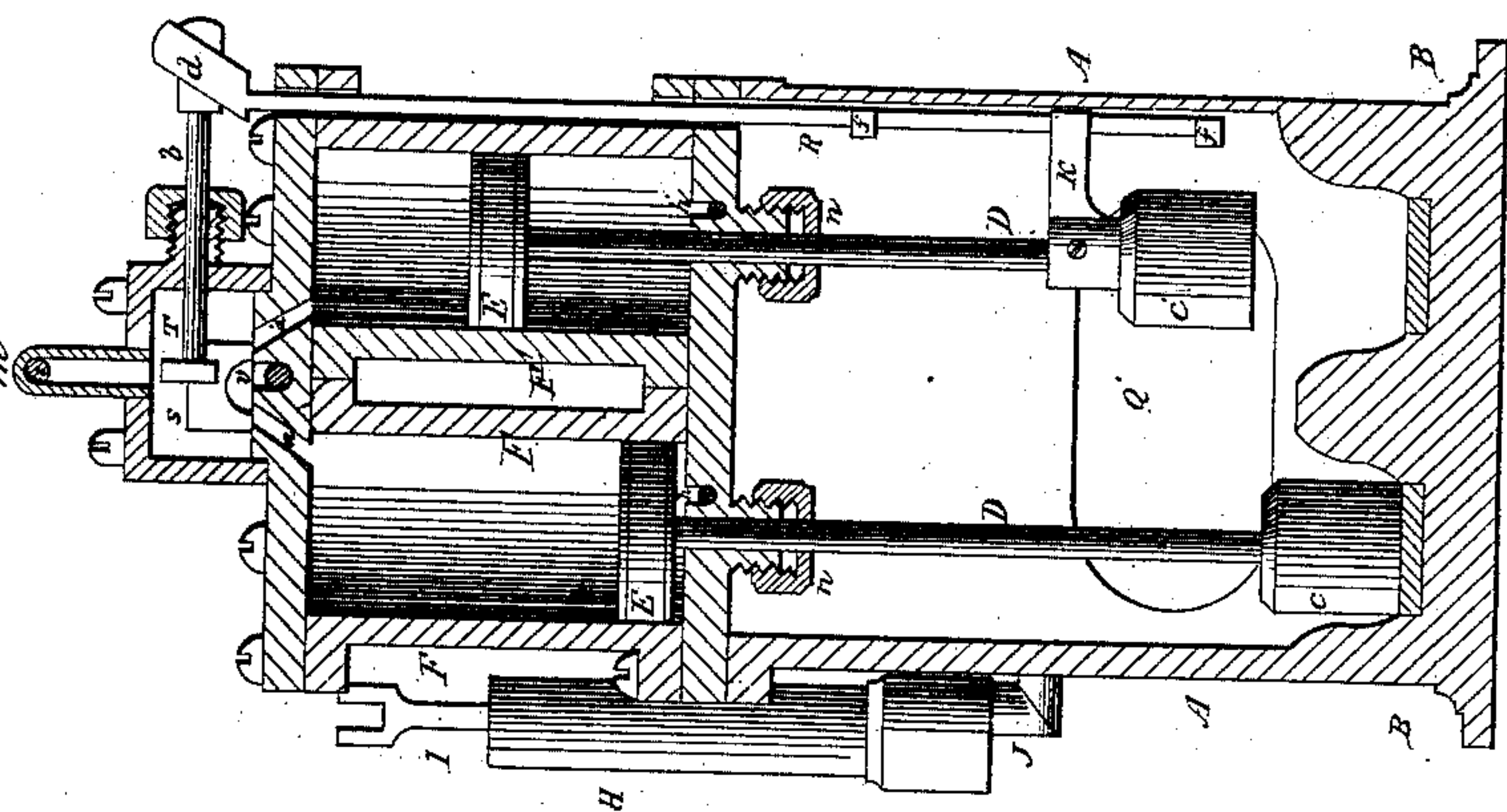
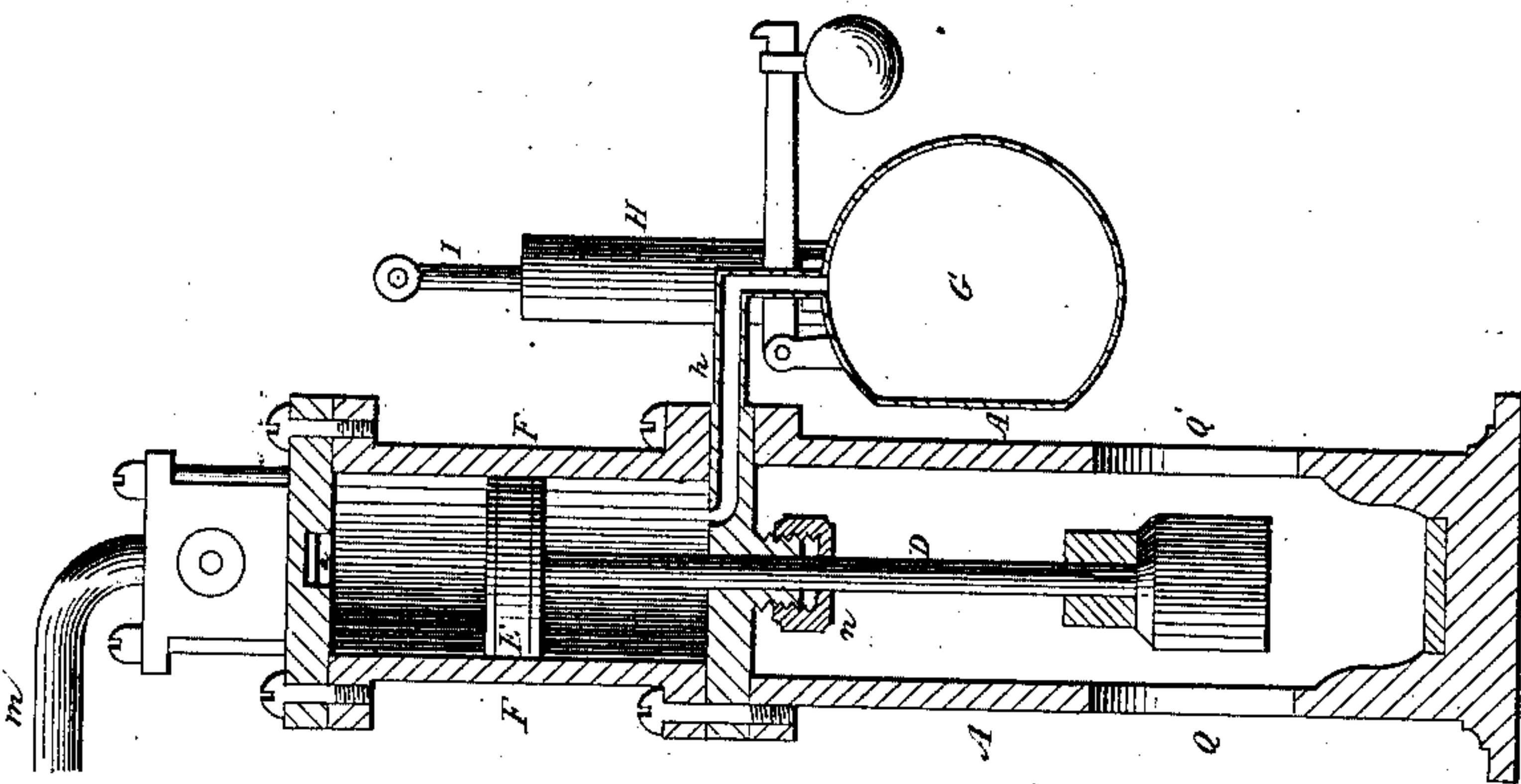


Fig. 2



UNITED STATES PATENT OFFICE.

CHRISTOPHER R. JAMES, OF JERSEY CITY, NEW JERSEY, ASSIGNOR TO HIMSELF AND N. W. CONDUCT, JR., OF SAME PLACE.

IMPROVEMENT IN OPERATING HAMMERS AND STAMPS.

Specification forming part of Letters Patent No. 55,772, dated June 19, 1866.

To all whom it may concern:

Be it known that I, CHRISTOPHER R. JAMES, of Jersey City, in the county of Hudson and State of New Jersey, have invented a new and Improved Mode of Operating Stamps and Hammers; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figures 1 and 2 are vertical sections, at right angles to each other, of a stamping-mill for pulverizing ores having my invention applied to operate the stamps.

Similar letters of reference indicate corresponding parts in both figures.

The atmospheric hammers and stamps now most commonly used have the hammer or stamp raised by means of rotating cams or wipers and the blow produced by means of air compressed in the upper part of a cylinder by the raising of the piston attached to the lifting-rod of the hammer or stamp and working within the said cylinder, a partial vacuum being at the same time produced in the cylinder below the piston; and in this operation the force of the blow is limited by the degree of compression of the air above or the degree of vacuum below the piston. While the use of steam to operate the hammer or stamp in the mode commonly practiced in the steam-hammer is free from this objection as to the limit of the force of the blow, it is liable, more especially in its application to stamping-mills, to the objection that, whatever pressure is used above the piston to give force to the blow, the same pressure is used below for merely lifting the hammer or stamp and the piston.

The object of my invention is to dispense with the rotating shaft and cams used in the atmospheric stamp and hammer, and thus to make a more simple machine, and at the same time to obviate the above-mentioned defect of the use of steam, as in the steam-hammer; and to this end it consists, principally, in the attachment of the stamp or hammer to a piston working in a cylinder the lower end of which is in constant communication with a reservoir of compressed air of a sufficient pressure to raise the piston, and the upper end of which communicates, through a suitably-operated valve,

with a steam-boiler in which there is a pressure of steam sufficiently in excess of the pressure of air in the reservoir to act on the upper side of the hammer with a force sufficient to produce as heavy a blow as may be desired.

My invention is represented in the drawings as embodied in a stamping-mill with two stamps for pulverizing ores.

A is a frame which supports the other parts of the machine. The stamps are situated within this frame, and in the bottom of the said frame are troughs or mortars B, into which the ore to be operated upon is introduced through the openings Q. The stamps C C' are secured to the lower ends of the vertical piston-rods D D', which pass through stuffing-boxes *n* in the bottom of the cylinders F F', which are arranged at the top of the frame A, and the said rods are provided at their upper ends with pistons E E', which are fitted to work tightly in the said cylinders. The lower ends of the cylinders are in constant communication, through pipes *h h'*, with the compressed-air reservoir, in which air is compressed by a pump, H I, to a suitable pressure for raising the pistons and stamps—say ten pounds per square inch—the said pump being only set in operation to fill the reservoir or make up for any loss of pressure by leakage or accident. On the top of the cylinders is a valve-chest, T, communicating by a pipe, *m*, with a steam-boiler in which there is a pressure of steam of, say from fifty to seventy-five pounds per inch, or sufficient, by its pressure on the upper sides of the pistons in excess of the pressure of air below, to produce as forcible blows of the stamps as may be desired.

In the valve-chest T there is a slide-valve, S, arranged to work over two pistons, *a a'*, each of which communicates with the upper end of one of the cylinders, and an intermediate port, *v*, communicating with the atmosphere, the said ports being so arranged and the valve so constructed that the latter will open the port *a* or *a'* of one cylinder to the steam in the valve-chest and boiler, while the port *a'* or *a* of the other cylinder is in communication, through the port *v*, with the atmosphere.

The valve S may be operated in various ways to admit steam to the upper end of one cylinder, and thereby produce the descent of its

piston and stamp, and at the same time permit the exhaust of the steam from the upper end of the other cylinder, and permit its piston and stamp to be raised by the pressure of the air below the piston. The said valve is represented as being operated by a tappet-arm, K, Fig. 1, on the right-hand piston and stamp-rod D', the said arm operating between two tappets, *f f'*, on a vertical rod, R, which slides freely in suitable guides on one of the cylinders on the frame, and the upper end of which is flattened, as shown at *d* in Fig. 1, to work in a slot at the end of the valve-stem *h*, and has its edges set at a suitable inclination to operate like wedges against the ends of the said slot as the piston E' completes its stroke upward and downward, and thereby produce a longitudinal movement of the said stem and the valve.

When the piston E' is at the upper end of its stroke the tappet-arm is in contact with the upper tappet, *f'*, the rod R is depressed, and the port *a'* is opened to the steam and the port *a* open to the atmosphere, and the steam is free to enter the cylinder F', to produce by its action on the piston E' the blow of the stamp C', while the piston E is subject only to the action of the compressed air, by which it and its respective stamp C are raised. As the piston E' completes its downward stroke the tappet-arm K, operating on the tappet *f*, reverses the position of the valve and admits steam to the upper end of the cylinder F, and opens the upper end of the cyl-

inder F' to the atmosphere, thus allowing the steam to act upon the piston E and produce the blow of the stamp C, and allowing the piston E' and stamp C' to be raised by the compressed air. In this way it will be seen that the stamps will be made to operate alternately with a very rapid and forcible action.

The invention may be applied to a hammer in the same way as described with reference to the stamping-mill.

What I claim as new, and desire to secure by Letters Patent, is—

1. Operating a stamp or hammer by means of a piston working in a cylinder, the upper end of which is opened at proper intervals to a steam-boiler and to the atmosphere alternately, and the lower end of which is in constant communication with a reservoir of compressed air, substantially as herein specified.

2. In combination with two stamps or hammers so operated by pistons working in separate cylinders, a valve and passages so operated as to bring each cylinder alternately into communication with the boiler, and so produce the alternate action of the pistons and their attached hammers, substantially as herein specified.

C. R. JAMES.

Witnesses:

HENRY T. BROWN,
J. W. COOMBS.