To all whom it may concern:

Be it known that I, SAMUEL OLDHAM, a citizen of the United States, residing in the city and county of Philadelphia, State of Pennsylvania, have invented a new and useful Pneumatic Sand-Rammer, of which the following is a specification.

My invention consists of a pneumatic sand-rammer, such as is usually employed in ramming molding sand for large castings or for other molding purposes.

It further consists of other novel features of construction, all as will be hereinafter fully set forth.

25 The annexed drawings and the following description set forth in detail one mechanical form embodying the invention, such detail construction being but one of various mechanical forms in which the principle of the invention may be used.

In said annexed drawings—Figure 1 represents an axial section of my improved pneumatic sand-rammer. Fig. 2 represents an axial section in another plane. Fig. 3 represents a side elevation of the valve.

Similar numerals of reference indicate corresponding parts in the figures.

Referring to the drawings, the reference numeral 1 indicates a barrel having a cylindrical bore, 2. The lower end of the barrel is formed with an annular shoulder, 3, and with a threaded bore, 4, in the upper end of which is a bevel-faced ring, 5, against which bears a packing, 6, compressed by a cap, 7, screwed into the outer end of the bore.

The flange, 8, of said cap has recesses, 9, in its upper face, and openings, 10, through it from its lower face and into the bottoms of the recesses. A bore, 11, is formed in the lower end of the barrel and has a bolt, 12, slidable in it and forced downward by a spring, 13, to engage one of the recesses and thus prevent the cap from turning. A button, 14, closes the upper end of the barrel-bore and has a valve-block, 15, bearing against its upper side, and said block and button are drawn against the upper end of the barrel by an internally threaded socket, 16, threaded at its lower end upon the upper threaded end of the barrel. The upper portion, 17, of the bore of the socket is smooth and of greater diameter than the threaded portion, to form an annular exhaust-chamber, which communicates with the atmosphere through one or more exhaust-ports.

18. The upper end of the socket has an internally threaded bore, 19, for the attachment of an air-hose or other conduit for compressed air. A piston, 20, is reciprocable in the bore of the barrel, and has a rod, 21, slidably in the packed gland, and a ramming or tamping head, 22, or other tool is secured upon the end of said rod. The valve-block has a valve-chamber, open at both ends, and the upper end of said chamber communicates directly with the inlet-bore of the socket.

The upper portion, 24, of the valve-chamber is of less diameter than the remainder of the chamber and has an annular port-channel, 25, which communicates through a port, 26, with the upper end of a duct, 27, extending downward through the valve-block and the wall of the barrel to near the lower end of the bore of the latter, where it opens into said bore through one or more ports, 28. An intermediate portion, 29, of the valve-chamber, of slightly greater diameter than the upper portion, communicates through ports, 30, in the valve-block with the annular exhaust-chamber. A lower portion, 31, of the valve-chamber is of greater diameter than the intermediate portion and communicates with the live air inlet through a duct, 32, and a port, 33, in the wall of the valve-block.

The larger-diameter chamber-portion communicates with the upper portion of the barrel-bore or cylinder by a passage consisting of a port, 34, in the valve-block, a duct, 35, through the valve block, button, and wall of the barrel, and a port 36, opening into the cylinder a short distance from the upper end of the same. A duct, 37, is formed in the wall of the barrel and communicates at its upper end with the annular exhaust-chamber and communicates at its lower end with the piston-cylinder through a relief-port, 38, at such distance down in the barrel that it will be uncovered by the piston when the latter approaches the lower end of its stroke. A duct, 39, is formed in the wall of the barrel and communicates at its upper end with the larger-diameter chamber-portion through a rectangularly bent duct, 40, in the button, and at its lower end with the piston-cylinder through a port, 41, opposite the relief-port and a port, 42, at about the middle of the length of the cylinder. A valve has play in the valve-chamber and has a large piston, 43, having a sliding fit in the larger chamber-portion to cover and uncover...
the live-air port and the port in such portion leading into the upper portion of the cylinder. The valve further consists of a reduced neck, 44, and a small piston, 45, having a sliding fit in the smaller-diameter chamber-portion to move across the annular port-channel in the same. The end of the valve has a nose, 46, of smaller diameter than the small piston.

In practice, when air or other pressure fluid is admitted at the air-inlet in the top of the socket, being controlled by a suitable valve or other means, not necessary to illustrate, if the parts are in the position illustrated in Fig. 1, the live-air will pass from said inlet through the ports and duct to the lower, large valve-chamber portion, whence it will pass into the cylinder, back of the piston, through the passage 35, driving the piston down. During the reciprocations of the piston, the latter traps sufficient air behind it to cause it to rebound to uncover the port 36, and when first starting the tool, gravity will allow the piston to drop and uncover the port. While the piston is traveling downward, the air below or in front of the piston passes through the lower distributing port, upward through the duct and into the annular port-channel in the upper portion of the valve-chamber, passing beneath the upper valve-piston and around the stem to the exhaust chamber, whence it escapes to the atmosphere. When the piston in its descent passes the relief-port and uncovers the same, the pressure below the valve will be relieved, as the pressure back of the piston is reduced, the air below the large valve-piston also escaping through the port 40, duct 39 and port 41 opposite the relief-port, and the live air acting constantly upon the small valve-piston will force the same downward, closing the live-air inlet to the upper end of the piston-cylinder. When the valve is shifted downward, the small valve-piston uncovers the annular port-channel in the small upper valve-chamber portion, and the live air will pass through said channel and the duct leading to the lower end of the piston-cylinder, driving the piston upward. The air back of the piston will pass out through the relief-port and its duct into the exhaust chamber, and out into the atmosphere, until the piston passes and covers such relief-port, when the air above the piston will become compressed. This piston-compressed air will cushion the up-stroke of the piston, and as soon as the lower end of the piston uncovers the lower port 32 of the air-distributing duct 39, the live-air will enter said duct and, acting against the larger area of the lower end of the valve, will force the valve upward against the live-air constantly acting against the smaller area of the upper end of the valve. When the valve is shifted upward, the piston will again be driven down, and the operation repeated. The reciprocations of the piston will be cushioned at both ends of the stroke in the cushion-chambers at both ends of the cylinder, which is desirable in a sand-rammer, as the ramming head is not required to deliver a heavy driving blow, as in a hammer or riveter, but rather a quick succession of tapping blows. The quick reversal of the stroke of the piston is insured by the cushioning of its strokes at both ends, so that the piston may be reversed and started while the valve is reversed.

The tool is simple of construction and requires a minimum of parts and a minimum of ports and ducts to be drilled. Any form of ramming head may be employed, according to the work to be done, the head being preferably detachably secured to the piston-rod.

Other modes of applying the principle of my invention may be employed for the mode herein explained. Change may therefore be made as regards the mechanism thus disclosed, provided the principles of construction set forth, respectively, in the following claims are employed.

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

1. In a tool of the character stated, a cylinder having ports at a distance from its ends to form cushion-chambers, a plain cylindrical piston reciprocable in said cylinder, a valve-chamber at the upper end of said cylinder having a small-diameter portion having its end open to constant live-air pressure and a closed large-diameter portion, and a valve fitted to slide in said chambers and controlling the air-supply to both ends of the cylinder, said cylinder and valve-chamber having a duct extending from the bottom of the large-diameter chamber-portion to a point in the cylinder adapted to be uncovered by the lower end of the piston when approaching the end of its up-stroke to connect the live-air supply in the lower end of the cylinder with the large-diameter valve-chamber portion to raise the valve therein.

2. In a tool of the character stated, a cylinder having a relief port in its upper portion and permanently open to the atmosphere, a plain cylindrical piston reciprocable in said cylinder, and a valve controlling the air-supply to both ends of said cylinder and having a small-area piston exposed to constant live-air pressure and an opposite large-area piston, said relief port being adapted to be uncovered by the upper end of the piston when the latter approaches the lower portion of its down-stroke to connect the large-area valve-piston to the atmosphere, said large-area pis-
tion having communication with the cylinder through a port arranged in the latter to be uncovered by the piston when approaching the end of its up-stroke to admit the live-air supply in the lower end of the cylinder to said large-area valve-piston to raise the same.

3. In a tool of the character stated, a cylinder having a relief port in its upper portion and permanently open to the atmosphere, a piston reciprocable in said cylinder, a valve-chamber formed with a large-diameter portion communicating with the live-air supply and with the upper portion of the cylinder and also connected at its bottom with the cylinder through a port opposite the relief port and through a port arranged to be uncovered by the piston when approaching the end of its up-stroke, said valve chamber also formed with an intermediate portion having communication with the atmosphere and an upper small-diameter portion constantly open at its upper end to the live-air supply and having a port communicating with the lower portion of the cylinder, and a valve having a small-diameter upper piston fitted to slide in the upper chamber-portion to control said latter port, and having its upper face constantly exposed to the live-air supply and a large-diameter lower piston connected to said upper piston by a reduced neck and fitted to slide in the large-diameter chamber-portion to control the live-air port and the port communicating with the upper portion of the cylinder.

SAMUEL OLDHAM.

Witnesses:

WM. SECHER,

C. D. McVAY.