4 Sheets—Sheet 1

A. F. NAGLE.

Press for Pressing Brick and Concrete Blocks.

No. 205,569. Patented July 2, 1878.

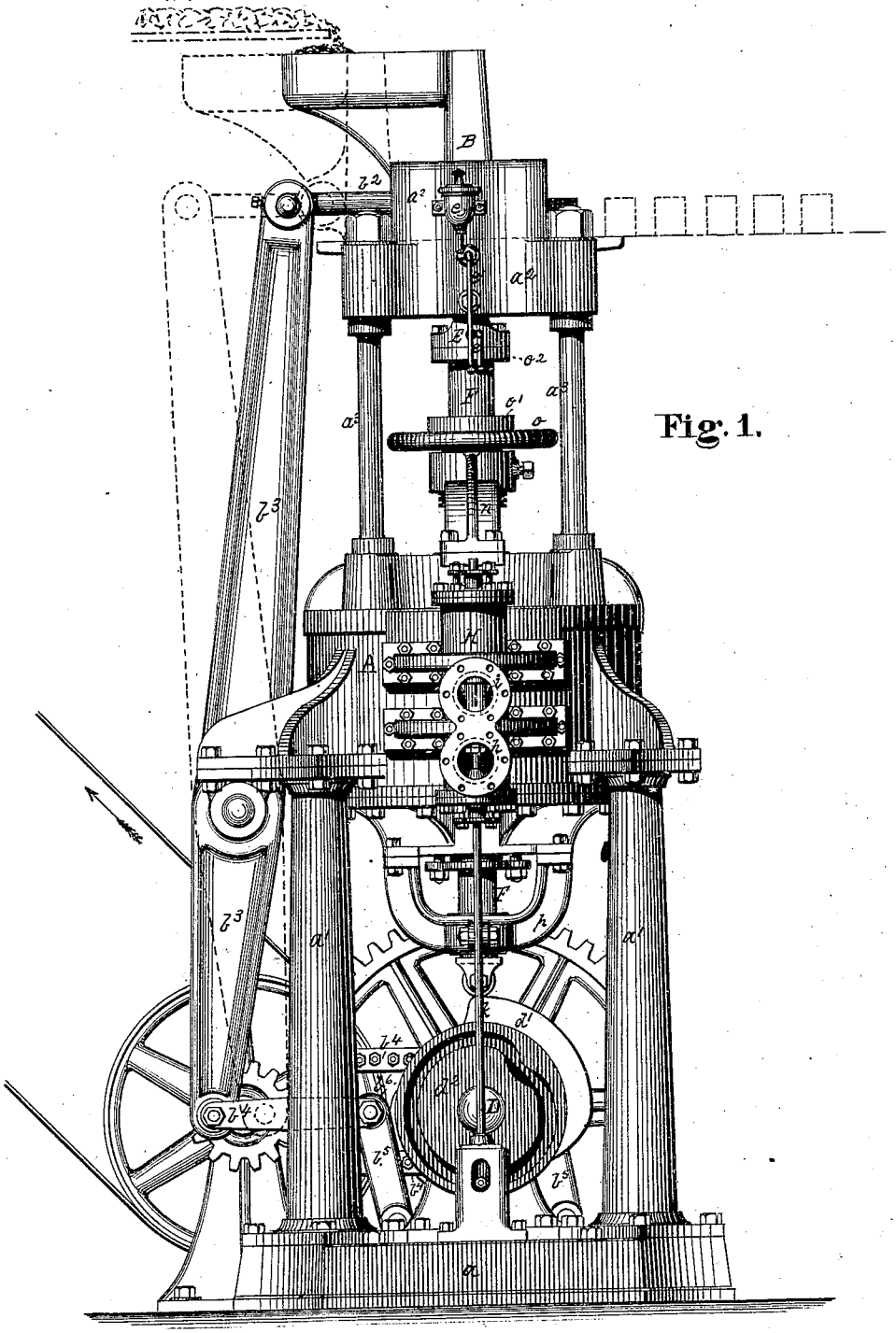

Fig. 1.

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4 Sheets—Sheet 2.

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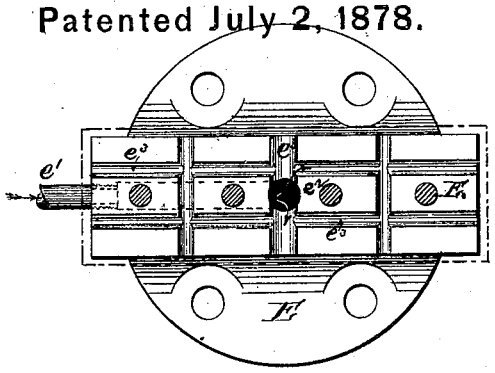

Fig. 11.

Fig. 2.

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Fig. 3.

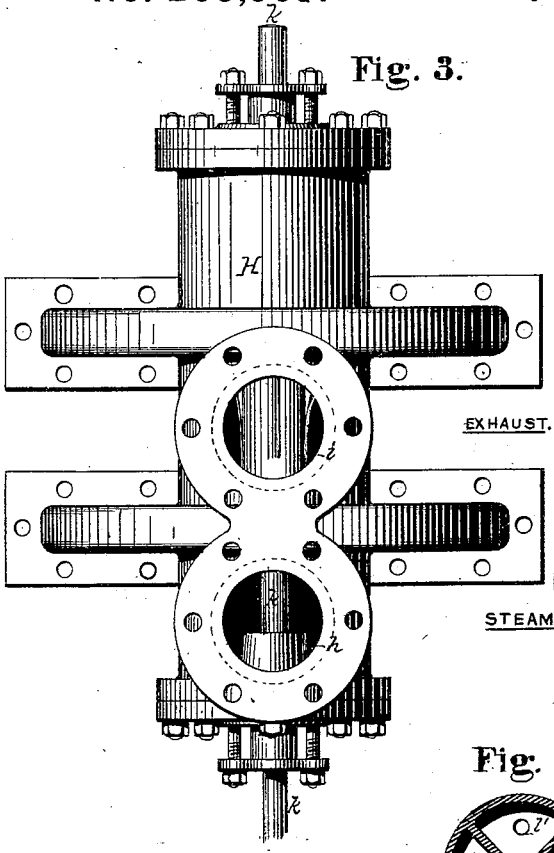

Fig. 4.

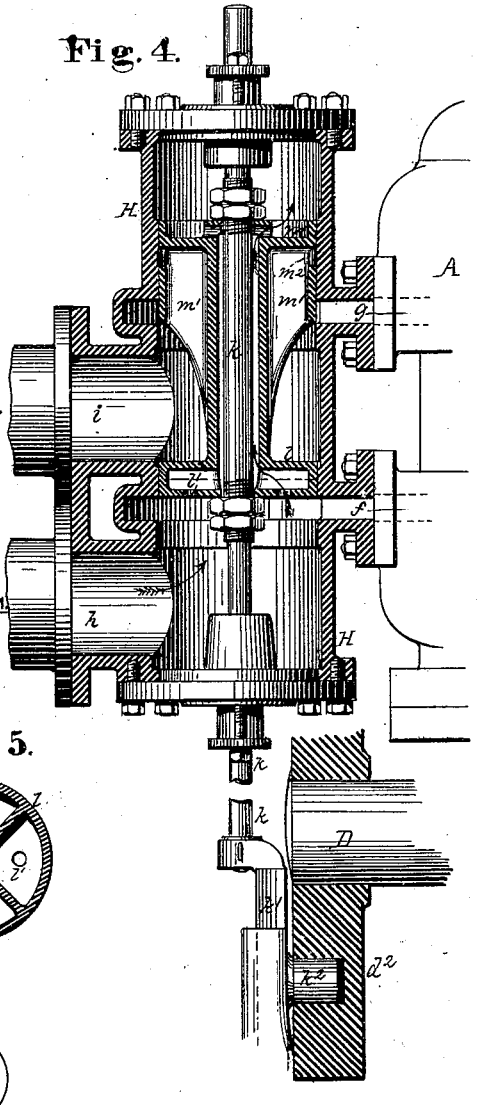

Fig. 5.

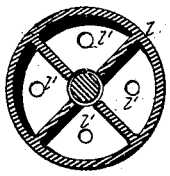

Fig. 6.

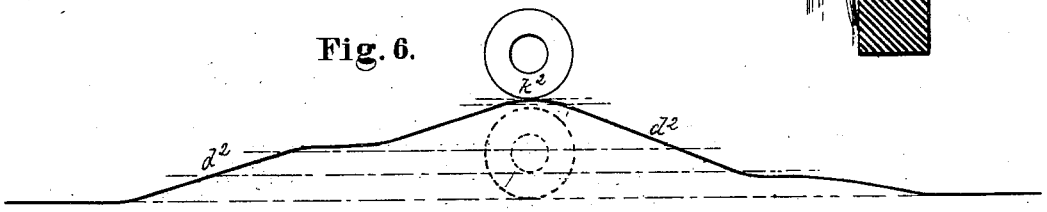

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Fig. 7.

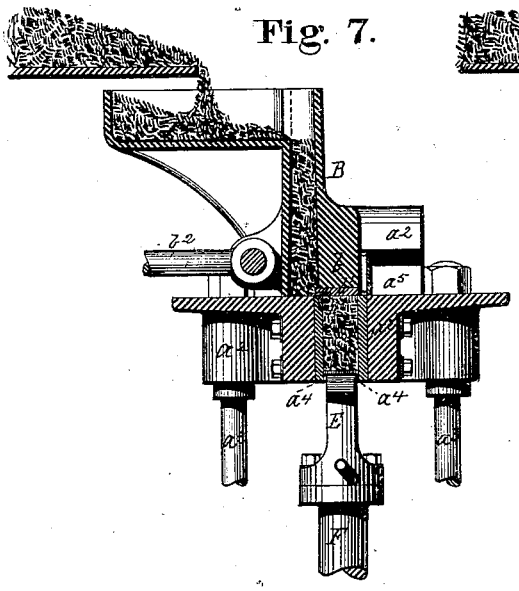


Fig. 8.

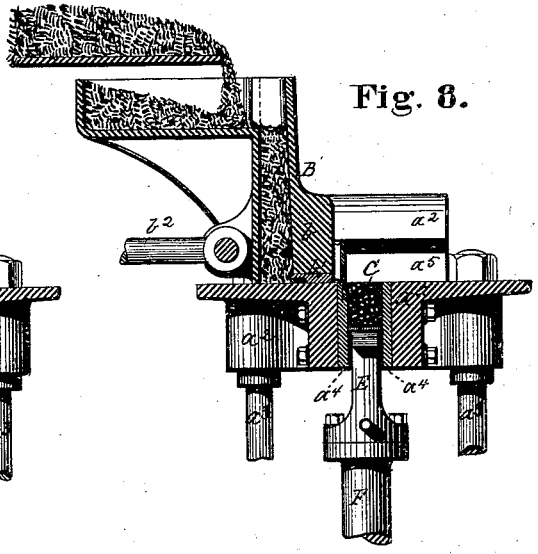


Fig. 9.

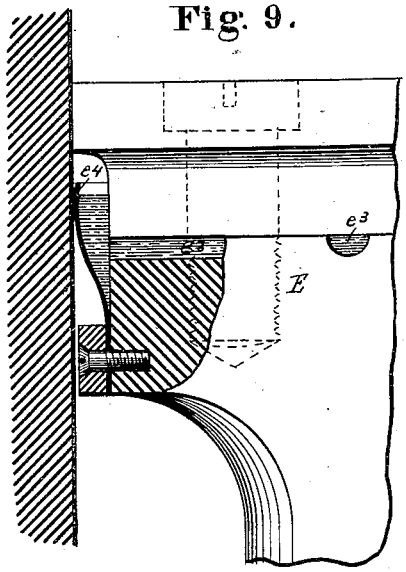
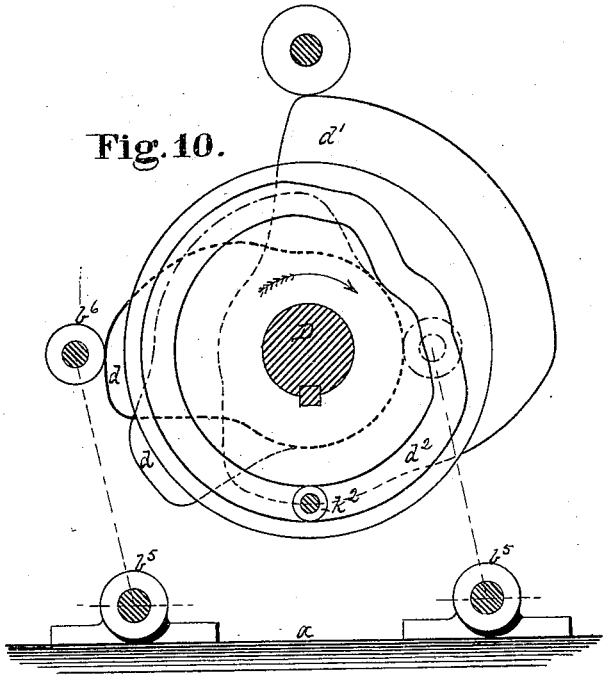


Fig. 10.



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UNITED STATES PATENT OFFICE.

AUGUSTUS F. NAGLE, OF PROVIDENCE, R. I., ASSIGNOR TO CHARLES E. WHITIN, TRUSTEE, OF WHITINSVILLE, MASS.

IMPROVEMENT IN PRESSES FOR PRESSING BRICKS AND CONCRETE BLOCKS.

Specification forming part of Letters Patent No. **205,569**, dated July 2, 1878; application filed April 12, 1878.

To all whom it may concern:

Be it known that I, AUGUSTUS F. NAGLE, of the city and county of Providence, in the State of Rhode Island, have invented certain new and useful Improvements in Presses; and I do hereby declare that the following specification, taken in connection with the drawings furnished and forming part of the same, is a clear, true, and complete description of my invention, and of a press embodying the several features thereof.

My improvements relate to that class of presses which contain dies or molds with which a plunger co-operates for subjecting matter to heavy compression, either for the purpose of solidification, or for imparting to said matter a form corresponding to that of the die or mold.

For the accomplishment of both purposes, I have embodied the several features of my invention in a press particularly designed to mold and compress asphaltic concrete paving-blocks.

My improvements are in part applicable, however, to presses for other purposes—as, for instance, the bending or forming of sheet metal useful in the manufacture of metallic goods of various kinds; and they are equally useful in many other connections, where rapidity in execution, high pressure, and economy in operation are of especial importance.

In the manufacture of compressed concrete paving-blocks it is more important that the blocks be practically uniform in density than of the same exact dimensions. The molds in all cases arbitrarily secure uniform length and breadth to blocks formed therein; but it is obvious that, if the thickness be uniform, the density will vary in proportion as the mold is wholly or partially filled with concrete prior to compression. It is also obvious, in a press which has its plunger operated for compression by a cam or other positive mechanical device, that uniformity in density of the compressed material is only possible when the mold is filled each time with accuracy, and this is practically impossible, owing to the semi-plastic condition of the concrete.

The prime object of my invention is to secure uniform compression, regardless of the quantity of material in the mold.

To that end my invention consists, mainly, in the combination, with a suitable die or mold, of a piston-rod, a piston, a steam-cylinder, a valve for admitting steam to and exhausting it from one end of the cylinder, and a plunger which is mounted upon the piston-rod, and is forced into the mold by the pressure of steam upon the piston.

In a press embodying these elements in combination the plunger will compress with a power equal to the aggregate steam-pressure on the piston less the power requisite to overcome the weight of the parts moved, and their friction and the pressure are the same on the contents of a mold, whether it be properly filled or not.

Somewhat similar combinations have heretofore been embodied in brick-making machines; but, instead of having a plunger forced into the die or mold by steam-pressure, the latter has heretofore been relied upon for lifting a heavy drop-hammer, which is then permitted to fall into the mold, or upon the matter contained therein, and therefore the degree of compression therewith attainable is limited to the weight of the hammer and the height from which it is permitted to fall.

In cotton-presses, steam-cylinders and pistons have also been heretofore employed for operating platens; but, so far as my knowledge extends, intermediate power-multiplying mechanism has been used, such, for instance, as segmental gear-levers and rack-bars. In some cases hydraulic platens have been used, with which hydraulic pressure is attained by steam-pressure on a piston in a steam-cylinder acting through its piston-rod upon a smaller piston within a hydraulic cylinder which communicates with the chamber containing the stem of the hydraulic platen.

The employment of intermediate power-multiplying mechanism and the hydraulic features referred to, whether singly or combined, are fatal to the attainment of that rapid operation which is a matter of great importance in the service for which my press is intended. The hammering action described is impracticable with

asphaltic mixtures, which require a gradual and heavy compression.

For properly controlling the piston and plunger while under steam-pressure, my invention further consists in the combination, with the mold, the plunger, the piston, and its rod, of a steam-cylinder provided with a steam and exhaust port at one end thereof and a port or passage at the opposite end, for the escape and admission of air (or exhaust-steam, as the case may be) from and to the cylinder in front of the piston, and a valve or valves which admit and exhaust steam to and from one end of the cylinder and control the passages at the opposite end, for cushioning the piston against the initial force of the live steam.

The valve or valves referred to are so operated and so constructed and arranged with reference to the cylinder-ports that when live-steam is first admitted to the cylinder at the rear of the piston the passage or port at the front end is wholly closed, thus cushioning the piston and obviating such undue shock as would otherwise be incident to its movement.

After the cushioning of the piston the front port is partially uncovered, permitting the air to escape, and thereby allowing the piston to fully advance and exert its full power through the plunger upon the material in the mold, after which the rear port is closed to steam and opened to exhaust, the front port remaining open to allow the admission of air or exhaust-steam in front of the piston, which is then, with the plunger, free to move to its normal position.

I prefer that the press be upright, in order that the return of the piston and the withdrawal of the plunger in the mold may be effected by gravity.

In the "hammer" press-brick machines, such as are hereinbefore referred to, provision has been made for cushioning the piston in its dropping movement with the hammer, and this has been attained by having a series of ports which, when operating as exhaust-ports, are successively covered by the piston in its descent. In my press the cushioning is provided for at the end of the cylinder opposite to that at which live steam is admitted and exhausted, instead of at the same end, as in the hammer-press, as well as in steam forging-hammers.

In steam-pumps a cushioning of the piston is effected in various ways alternately at the ends of the cylinder at the terminal portion of the stroke; but this feature is distinct from the important and novel one of controlling the piston during its initial and subsequent movement under pressure, by which the plunger, regardless of heavy steam-pressure, is controlled during its movement into the mold, and ultimately made to compress to the fullest extent possible with the head of steam employed.

The mold employed by me is one which has a movable top or head-block, and is therefore open at both ends, the top or upper end of the plunger serving as the bottom of the mold. During the movement of the head-block in opening the mold it is obvious that the pressure on the contents of the mold should not be continued, and therefore the steam-pressure is wholly removed from the piston and the plunger allowed to drop, thus freeing itself from the concrete block, which is thereafter ejected from the mold by a second forward movement of the plunger.

For accomplishing this end my invention further consists in the combination, with a mold, a sliding head-block, a plunger, piston-rod, piston, steam-cylinder, and valve, of a continuously-driven lifting device, which at proper intervals forces up the plunger for ejecting the contents of the mold. I prefer a cam on a continuously-driven shaft and a piston-rod which carries the plunger on its upper end and extends downward through the lower head of the cylinder for contact with the cam; but other well-known mechanical devices may be successfully employed.

In brick-making machines as heretofore constructed sliding head-blocks and open molds have been employed in connection with a plunger which is forced through the mold by actuating machinery similar to that used by me; but I know of none in which the compression is effected by steam-pressure acting through a piston and plunger, and the mold then freed from its block by means of cams or other equivalent mechanical devices acting upon the plunger after the steam-pressure is removed therefrom.

The more or less plastic character of asphaltic concrete renders it difficult to properly charge a mold; but this is greatly facilitated by another feature of my invention, which consists in the combination, with a mold, of a vertical hopper or chute which is smaller at its upper end than at the lower end, so that concrete supplied thereto passes in mass readily downward into the mold without clogging or wedging.

It is desirable that the lower end of the chute or hopper be somewhat smaller than the mold, so that the concrete will have no corner or edges to engage with in its downward movement. I prefer, also, for lessening the liability of wedging, that the corners of the chute be rounded instead of rectangular.

In order to secure a complete closure of the mold by a sliding head-block, my invention further consists in the combination, with a mold provided with a hardened cutting-edge on one side at its top, of a sliding head-block provided with a similar cutting-edge for shearing or cutting through particles of rock and asphalt when interposed between the cutting-edges during the closing movement of the head-block.

For preventing the blocks from unduly adhering to the mold, and for keeping the latter smooth and clean, my invention further consists in the combination, with the mold and

plunger, of an exterior reservoir connected with the plunger by suitable ducts or pipes, whereby oil or other lubricating matter may, while the press is at work, be supplied to the plunger, and thence distributed upon the interior surfaces of the mold during the movements of the plunger therein.

Brick-presses have heretofore been provided with chambered plungers for lubricating the mold; but, so far as my knowledge extends, lubricating matter can only be supplied to such plungers while the press is not at work.

As the top or end of the plunger serves as the bottom of the mo'd, and as it is desirable that the press be capable of making blocks of various sizes, I employ a plunger which is adjustable with reference to the mold, so that it may be permitted to fall more or less, according to the thickness of the blocks required; but such adjustable plungers have been heretofore employed in brick-presses.

For relieving the shock otherwise incident to the fall of the plunger and piston, my invention further consists in the combination, with the plunger, rod, and piston, of a head on the piston-rod beneath the plunger and a chamber to which the head is accurately fitted, so that when the plunger falls the head enters the chamber and is cushioned by the air therein.

To more particularly describe my invention, I will refer to the accompanying drawings, of which there are four sheets, and in which—

Figure 1, Sheet 1, is a side elevation of a press embodying the several features of my invention as arranged for the manufacture of concrete paving-blocks. Fig. 2, Sheet 2, represents the same press partly in central lateral vertical section and with the front main columns of the frame removed. Figs. 3 and 4, Sheet 3, represent, respectively in side elevation and central vertical section, the valve and valve-chamber and its connections. Fig. 5, Sheet 3, represents, in lateral section, the piston of the steam-valve. Fig. 6, Sheet 3, illustrates the shape of the valve-cam. Fig. 7, Sheet 4, represents, in vertical section, the sliding hopper, the head-block, and mold filled with concrete and closed ready to receive pressure. Fig. 8, Sheet 4, is a similar view, showing the mold open and the compressed block ready to be discharged. Fig. 9, Sheet 4, represents a portion of the mold and the plunger, partially in section to illustrate the manner of lubricating the mold. Fig. 10, Sheet 4, is a side view of the several cams mounted on a shaft and revolved therewith. Fig. 11, Sheet 2, represents the plunger in horizontal section, for showing the arrangement of interior lubricating-ducts.

A denotes the steam-cylinder, which is incorporated into and forms a part of the frame of the press. It is supported on four columns, a^1, mounted on a base-plate, a. The cap-plate a^2 of the press is above the cylinder, and is firmly connected thereto and supported by four heavy iron rods or bolts, a^3. The mold is centrally located in the cap-plate, and may be of any desired form. For making asphaltic concrete paving-blocks it is desirable that the mold be lined with steel plates a^4, secured by bolts, as shown in Fig. 2; but a steel-lined mold constitutes no portion of my invention.

The cap-plate on each side is provided with two heavy upright flanges, one on each side, which are channeled from front to rear, as shown at a^5, Figs. 2, 7, and 8, for the reception of laterally-projecting portions of the sliding hopper B and its head-block b. The interior of the hopper is clearly shown in Figs. 2, 7, and 8. It has interior rounded corners, is smaller at the top than at the bottom, and is somewhat smaller at its lower end than the area of the mold C, so that the more or less plastic mass of concrete will readily pass downward into and fill the mold. The head-block b is clad on its lower face with a hardened-steel plate, b^1, which is in sliding contact with the upper surface of the cap-plate a^2. The head-block plate has a shear or cutting-edge, which co-operates with a corresponding hardened edge of the steel lining of the mold, in order that small fragments of rock will not obstruct the movement of the sliding block in closing the mold, said fragments being readily disposed of by the cutting-edges. A pair is mounted on the hopper to serve as a receptacle for concrete, and from which the hopper and mold are supplied from time to time by an attendant, it being advisable that the hopper should at all times contain considerably more concrete than is requisite for filling the mold.

The hopper is connected by a link, b^2, to a vertical lever, b^3, which is pivoted to the frame near the cylinder, and is furcated at its lower end. Each leg of the lever b^3 is connected by double links b^4 to rockers b^5, pivoted to the bed-plate a. One of these rockers is located in front and the other in rear of the shaft D, and each is provided with a friction-roller, b^6. (Clearly shown in Figs. 1, 2, and 10.) One of these double links b^4 is composed of oval counterparts, with the central portions thereof removed to afford space for the shaft D, which carries the two cams d. (Shown in Figs. 2 and 10.) These cams are so shaped and so set on the shaft with reference to each other that the lever b^3 is positively vibrated and the sliding hopper moved to and fro at certain intervals, as hereinafter described. The shaft D also carries a cam, d^1, which is located beneath and in line with the center of the steam-cylinder, and is the mechanical lifting device by means of which the compressed contents of the mold are ejected. At the outer end of shaft D is a valve-cam, d^2, which is relied upon to impart certain movements to the valves of the press. The cam is cut in the side of a circular plate, and is a continuous groove of a form which is illustrated on an enlarged scale in Fig. 6, and also fully shown in Fig. 10.

The plunger E is fitted to the mold so that it may move freely and securely therein, with

close contact with the sides thereof. For lubricating the interior of the mold, thus keeping it smooth and permitting the blocks to be easily ejected, an oil-reservoir, *e*, is attached to the press at a point above the mold, and connected with the plunger by a jointed or flexible pipe, e^1, which communicates with a central vertical duct, e^2, and other horizontal ducts, e^3, within the plunger, through which oil or other lubricant is discharged, preferably into a mass of fibrous absorbent, which is kept in place around the plunger by perforated springs e^4, one of which is shown in Fig. 9. The contact of these springs with the sides of the mold secures a proper distribution of the lubricant. The sectional view of the plunger, Fig. 11, Sheet 2, shows the arrangement of the ducts.

The plunger is firmly mounted upon the end of the piston-rod F, and it is preferably arranged so that when at its lowest position it will still be within the mold, in order that it may always be guided therein, and because when so arranged the plunger and mold may be more accurately fitted to each other than would be possible if the plunger at each stroke was permitted to leave the mold. The piston-rod F is preferably extended downward through the lower or rear head of the cylinder, because its lower end can then be placed in direct communication with the ejecting-cam d^1; but, instead of having the piston-rod thus extended, it may terminate at the piston G, and the ejecting-cam so arranged to co-operate with a lever connected by a link to an upper lever, in turn connected with the piston-rod and plunger; but this latter arrangement would involve complication with no more satisfactory results.

The piston G is strong and heavy, is secured to the rod F, and properly packed with relation to the cylinder, and each head of the latter is provided with a stuffing-box for the piston-rod.

H denotes a cylindrical valve-chamber, which communicates by port *f* with the lower or rear end of the cylinder, and by port *g* with the upper or front end. The steam-pipe *h* communicates with the lower end of the valve-chamber, and the exhaust-pipe *i* communicates with the central portion thereof. The valve is of peculiar construction, and is, in fact, two valves mounted on a valve-rod, *k*, which is provided with a stuffing-box in each head of the chamber. This valve has two pistons. The lower one, *l*, controls the cylinder-port *f* for admitting and exhausting steam. It is hollow and webbed, and has apertures l', which admit steam within, and thence, by an annular space surrounding the valve-rod, it passes to the upper portion of the chamber, thus balancing the valve against steam-pressure. The upper valve-piston *m* is solid, but has a wide flange supported by radial webs m^1. The flange is cut away at m^2 beneath the upper valve-piston head, for affording a communicating passage, *via* port *g*, between the front or upper end of the cylinder and the central portion of the valve-chamber.

It is to be understood that the upper valve-piston is relied upon to properly guard the port *g*, so that the upward movement of the cylinder-piston G under steam-pressure may be properly controlled, and all undue shock obviated, by maintaining a cushion of air or exhaust-steam above the piston as long as may be necessary, and then permitting the compressed air to slowly escape while the piston and plunger are completing their upward movement.

The lower end of the rod *k* is provided with a slide, k^1, and a friction-roller, k^2, mounted on a stud projecting from the slide, so that the roller occupies the cam-groove in cam d^2 on the outer end of shaft D. Above the cylinder, and mounted thereon, is a yoke-frame, *n*, with a threaded eye which incloses the piston-rod. A hand-wheel, *o*, with a threaded neck, is fitted to the yoke, so that by turning the wheel it may be raised or lowered on the thread. The upper surface of the wheel is centrally recessed, as at o^1, forming a chamber, which is accurately fitted to receive the circular head or plate o^2 on the bottom of the plunger E, so that when the plunger falls an air-cushion is afforded in the chamber to obviate the undue shock which would otherwise be liable to occur when the plunger falls. By turning the hand-wheel up or down the drop of the plunger may be varied, thereby decreasing or increasing the cubic capacity of the mold.

A guide is afforded for the lower end of the piston-rod by a yoke, *p*, which is secured to the lower head of the cylinder.

In discharging a block from the mold an easy contact is afforded between cams *d* and the piston-rod, because of a friction-roller at the lower end of the rod.

The operation of my press is as follows: It will be assumed that the plunger is at its lowest position, the interior of the hopper in line with the mold, and the shaft D in motion. An attendant secures the proper supply of concrete to the mold. The revolution of shaft D and cams *d*, operating through lever b^3, moves the hopper rearward, placing the head-block *b* over the mold, thus closing it, and shearing off the mass of concrete. The concrete in the hopper then rests upon the cap-plate a^2. As soon as the mold is closed (see Fig. 7) and the hopper and head-block at rest, the valve-cam d^2 lifts the valve-rod and admits steam through port *f* into the cylinder beneath the piston, which is thereby moved upward against the confined air and exhaust-steam in the upper end of the cylinder; but after this first movement of the piston the upper port *g* is slightly uncovered by the valve, which allows the compressed air to escape and permits the piston to move freely upward under full steam-pressure, and to compress the contents of the mold to a degree equal to the aggregate steam-pressure on the piston minus the weight lifted and the friction of the parts. The continued rotation of the cam d^2 next moves the valve

downward, uncovering both cylinder-ports *f* and *g*, which permits the exhaust-steam to escape from below the piston and air and exhaust-steam to enter above the piston, whereupon the piston and plunger fall without shock, because they are cushioned by the air beneath the plate o^2 when entered into the chamber above the cylinder. As soon as steam-pressure is removed from the piston the cams *d* move the hopper rearward and uncover the mold, after which the block is ejected by the cam d^1. The hopper then moves forward, sliding the block from the plunger to the surface of the cap-plate, from which it may be delivered to an endless belt, as indicated in dotted lines in Fig. 1.

It will be seen that, in case the mold be entirely empty, the movement of the piston will be properly controlled, so that it will ascend gradually to its full height without shock, and also that, in case the mold has much or little concrete therein, the blocks will be of practically the same density because subjected to the same degree of compression. During the exhausting of the steam from the lower end of the cylinder it will be seen that, the upper port *g* being open, the exhaust-steam may freely enter the upper end of the cylinder, to serve as a cushion during the succeeding movement of the piston.

Steam may be applied to the press from a boiler exclusively provided therefor, or from the boiler which affords the motive power for driving the shaft. The action of the steam being prompt and efficient for inducing the desired pressure, it is practicable to operate the shaft at a speed which will deliver, say, ten to twenty blocks a minute, if the concrete be of a character which will enable the molds to be rapidly filled, this latter operation being the one which practically controls the speed at which the press may be successfully operated.

I do not limit myself to the precise construction shown, for I am well aware that other well-known mechanical devices may be employed for moving the hopper, actuating the valve, and discharging the block, without departing from the spirit of my invention or materially affecting its practical value. Nor do I limit myself to a valve or valves of the precise construction shown, for, while I now employ what is practically two valves on one rod, I am well aware that each port of the cylinder may be guarded by a separate valve of a different construction and separately actuated; and I am also aware that the lower end of the cylinder may be provided with two ports—one for steam and the other for exhaust—and that these may be guarded by separately-actuated valves. I have, however, produced the desired results by simple and effective means, and have avoided as far as possible unnecessary complication.

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

1. The combination, with a die or mold, of a piston-rod, a piston, a steam-cylinder, a valve for admitting and exhausting steam to and from one end of the cylinder, and a plunger which is mounted upon the piston-rod, and is forced into the mold by the pressure of steam upon the piston, substantially as described.

2. The combination, with a mold, a plunger, a piston, and a piston-rod carrying the plunger, of a steam-cylinder for the piston, provided with a steam and exhaust port at one end and a passage or port at its opposite end, and a valve or valves which admit and exhaust steam to and from one end of the cylinder and control the passage at the opposite end, for cushioning the piston against the initial force of the live steam, substantially as described.

3. The combination, with a mold, a movable head-block which opens the mold, a plunger, a piston and its rod, and a steam-cylinder and its valve, of a mechanical lifting device for forcing the plunger through the mold, substantially as described, whereby the compressed contents of the mold are ejected therefrom, as set forth.

4. The combination, with a mold, of a hopper which is smaller at the top than at the bottom, substantially as described, whereby concrete may freely pass downward to the mold, as set forth.

5. The combination, with a mold having a hardened cutting-edge at its top, of a sliding head-block provided with a hardened cutting-edge, substantially as described, whereby particles of rock and concrete will not obstruct the movement of the block in closing the mold, as set forth.

6. The combination, with the mold and a plunger provided with ducts, of an exterior reservoir connected with the plunger, substantially as described, whereby lubricating matter is supplied to the plunger while at work, and thence distributed upon the surface of the mold, as set forth.

7. The combination, with the plunger, piston-rod, and piston, of a head on the rod below the plunger and a recess or chamber to which the head is accurately fitted, substantially as described, whereby the fall of the plunger-rod and piston is relieved from shock by the cushioning of air in the chamber, as set forth.

AUGUSTUS F. NAGLE.

Witnesses:
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GEORGE FULLER.