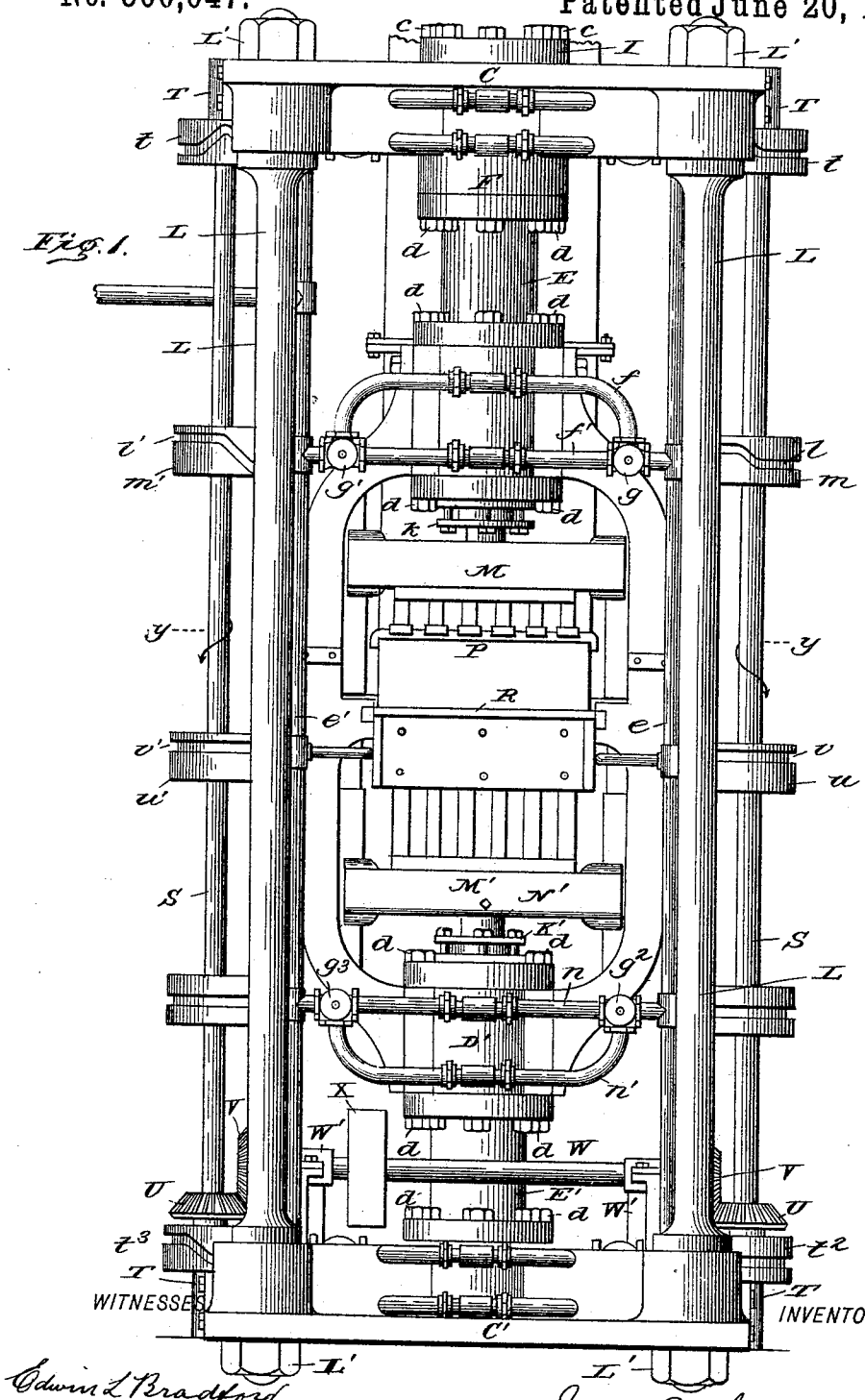
(No Model.) 5 Sheets—Sheet 1.

J. C. ANDERSON.

METHOD OF AND MACHINERY FOR OPERATING THE PRESSING PLUNGERS OF BRICK MACHINES.

No. 500,047. Patented June 20, 1893.

Fig. 1.



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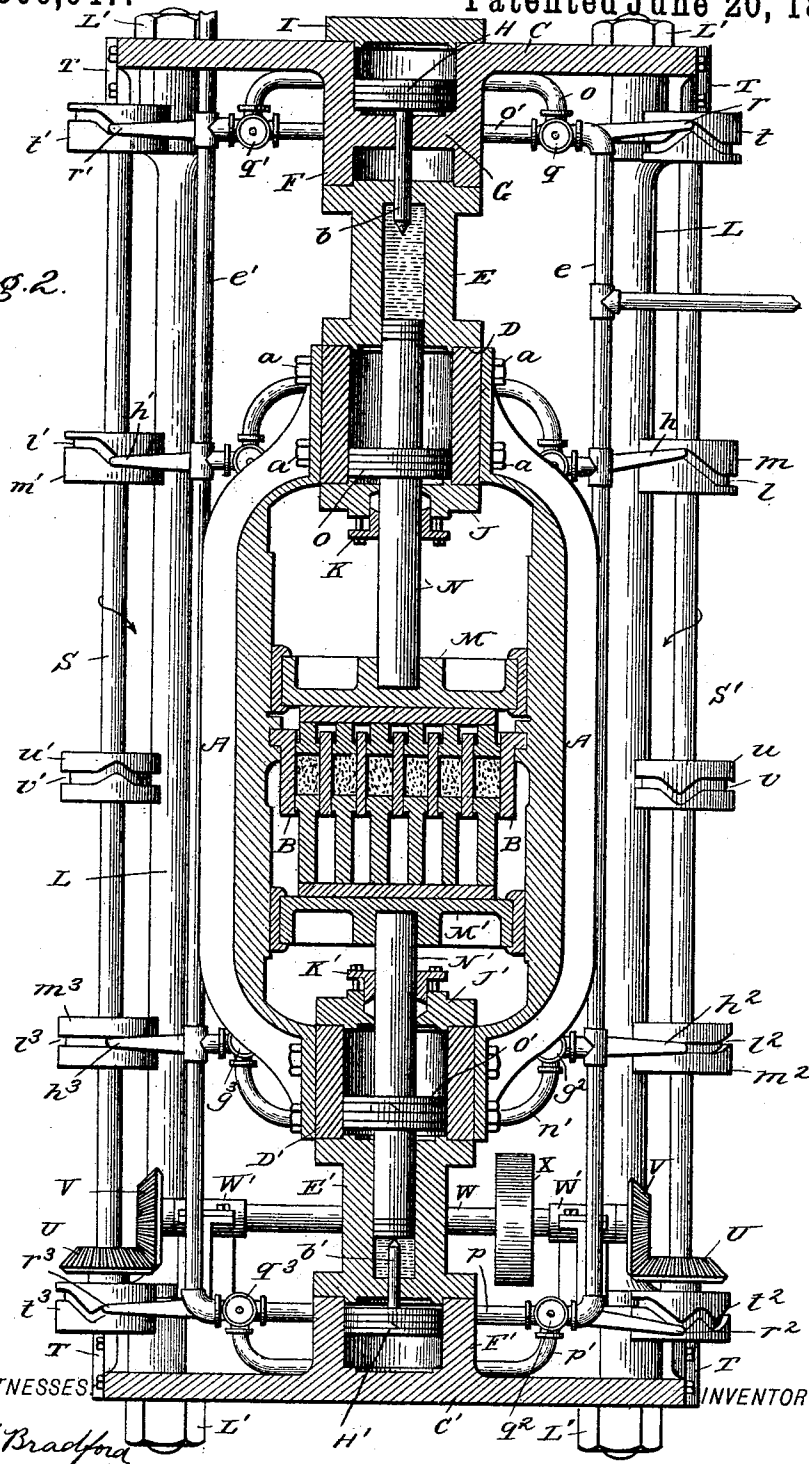
METHOD OF AND MACHINERY FOR OPERATING THE PRESSING PLUNGERS OF BRICK MACHINES.

No. 500,047. Patented June 20, 1893.

Fig. 2.



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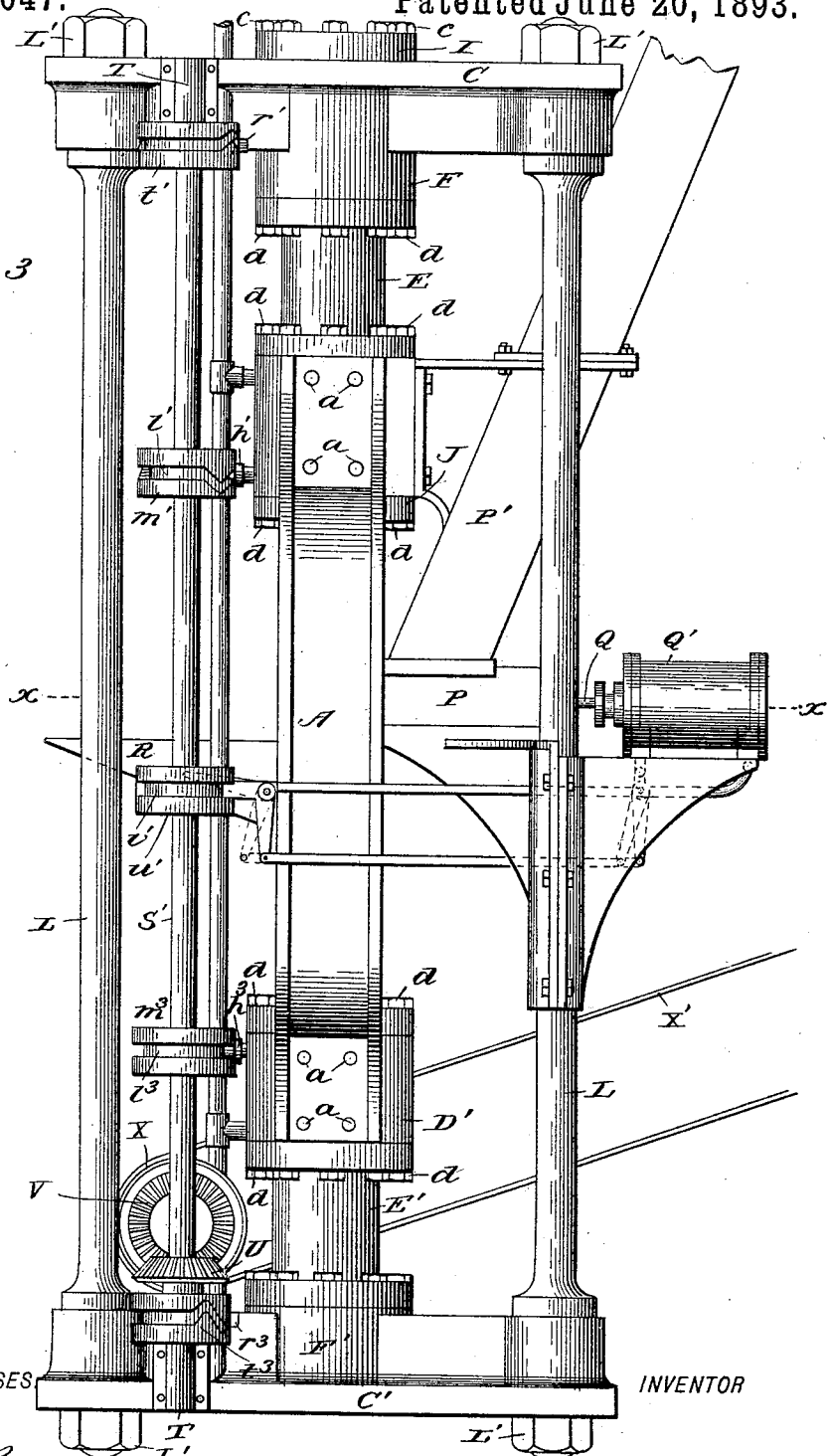
METHOD OF AND MACHINERY FOR OPERATING THE PRESSING PLUNGERS OF BRICK MACHINES.

No. 500,047. Patented June 20, 1893.

Fig. 3



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METHOD OF AND MACHINERY FOR OPERATING THE PRESSING PLUNGERS OF BRICK MACHINES.

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Fig. 5.

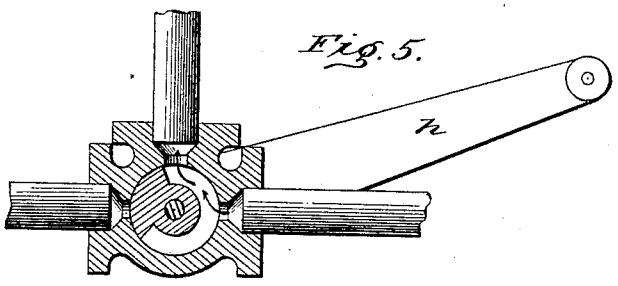
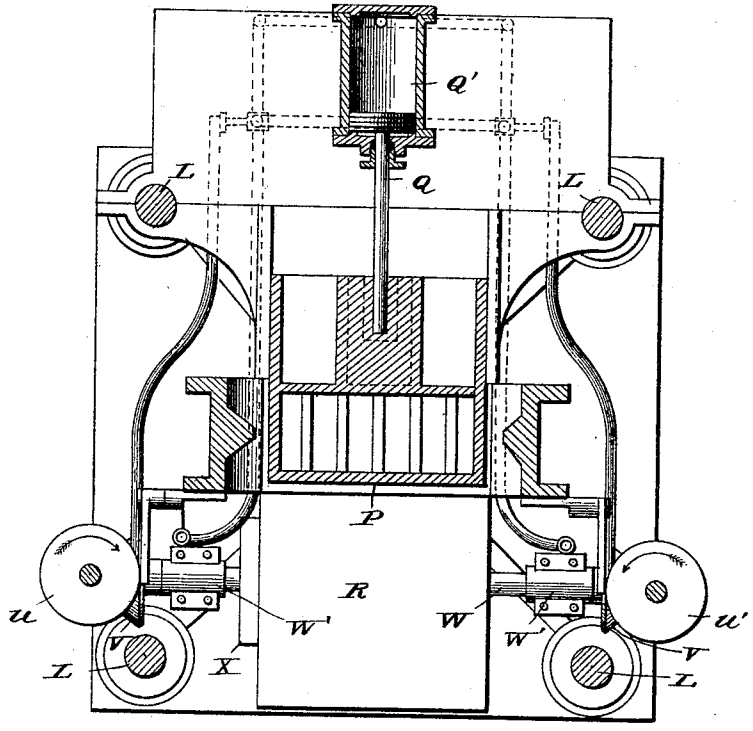


Fig. 4.



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METHOD OF AND MACHINERY FOR OPERATING THE PRESSING PLUNGERS OF BRICK MACHINES.

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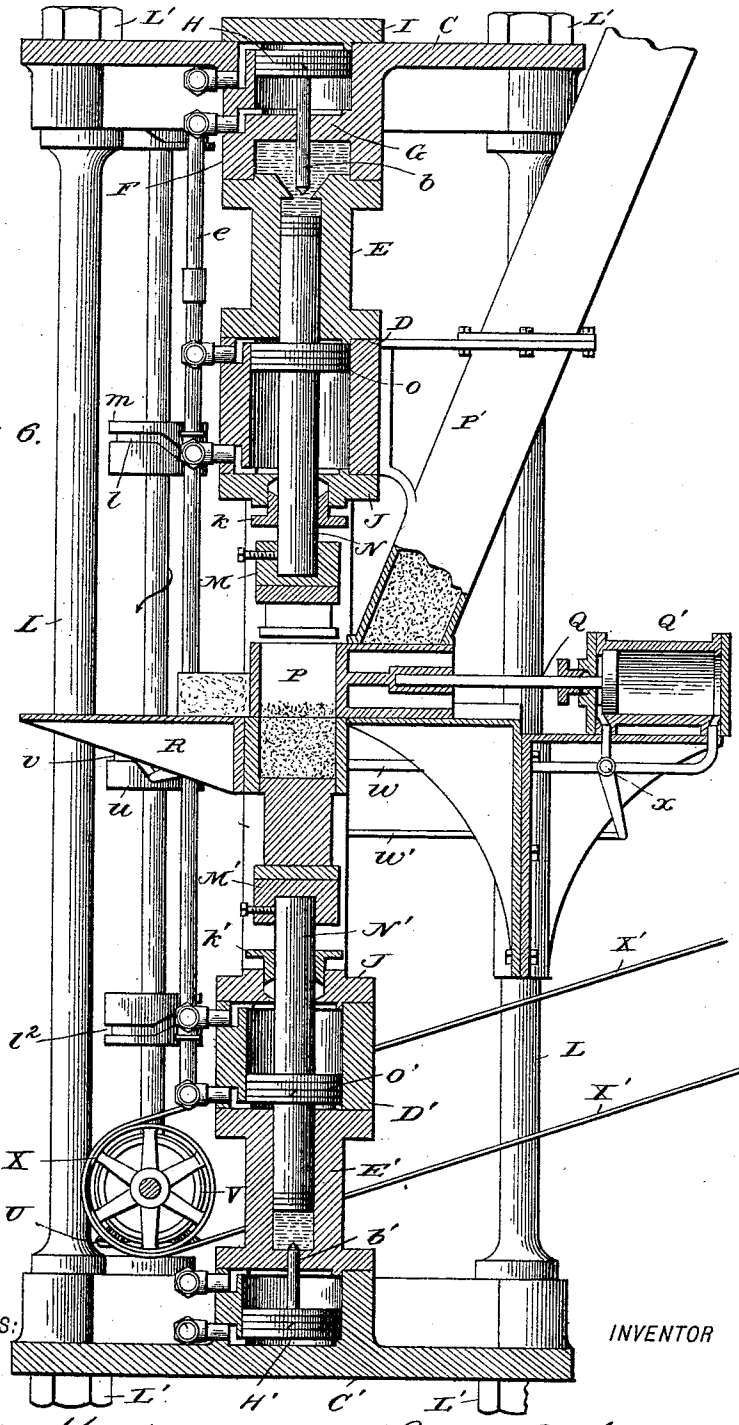
Fig. 6.



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UNITED STATES PATENT OFFICE.

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METHOD OF AND MACHINERY FOR OPERATING THE PRESSING-PLUNGERS OF BRICK-MACHINES.

SPECIFICATION forming part of Letters Patent No. 500,047, dated June 20, 1893.

Application filed August 20, 1892. Serial No. 443,660. (No model.)

To all whom it may concern:

Be it known that I, JAMES C. ANDERSON, a citizen of the United States, residing at Highland Park, in the county of Lake and State of Illinois, have invented certain new and useful improvements in methods of operating the pressing-plungers of brick-machines, and the construction and arrangement of mechanism for effecting the same; 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 relates to certain new and useful improvements in the method of and machinery for operating the pressing-plungers for brick-machines.

In the manufacture of bricks there are three processes now technically known, as the "wet" process, the "semi-dry" process, and the "dry" process. The former two involve the use of clay saturated with water to a plastic and semi-plastic state, and the latter the use of clay in a dry or practically dry powdered condition. The latter process involving, as it does, the absence of moisture in the clay encounters a difficulty which is inherent with such a body, viz: the clay being porous absorbs within the pores, from which the moisture has, been expelled, a certain amount of atmospheric air, and this action is necessarily increased when the clay is reduced to a finely comminuted condition, for air is also present within the interstices of the particles, so that great intensity of pressure is required to fix the bond of union between the dry clay particles in the last part of the operation in pressing such brick into proper form and density, and this difficulty is made apparent, when it is understood, that one of the opposite plungers must be advanced in this machine, a distance of ten inches to clear the charging boxes, and to compact the loose clay powder to that degree of density requiring the intensity of pressure above referred to, and that in exerting this final pressure this plunger need not be advanced more than one-fourth of an inch, also, that the other opposing plunger need not only be advanced a like distance with great intensity for pressing the brick and eliminating the air therefrom after which this plunger is advanced through the longer distance, requiring comparatively a slight power to discharge the bricks from the molds, it being a well known fact that all mechanical motions exert power relatively in proportion to their speed and travel. Great difficulty has therefore, been found in manufacturing bricks by the dry process; for this reason and also because the air being of such an elastic nature is compressed and confined within the body of the molded brick during the approach of the plungers, and, as a consequence of such condition, when the plungers are released and the molded brick are forced out of the mold, the compressed air within the brick, acting under its expansive property, seeks escape and in doing so fractures or cracks the brick. Many efforts have been made in the art of brick making to overcome these difficulties, and more or less success has been attained in the construction of machines operated by steam through a train of gears, cams and toggles for exerting the requisite pressure to mold the brick. The latter point has been fully overcome, practically, as described in Letters Patent No. 276,549, granted to me on the 1st day of May, 1883, in a machine of this type, which involves the principle of a pulsatory movement of the plungers, whereby the clay is partially compressed, the plungers receding slightly to allow the escape of compressed air, and then again brought into action for final and complete compression of the clay. In such mechanical motion, the power is limited as above indicated by the length of stroke or travel of the plungers and the machine is accordingly limited both in speed and power, so that it has been impracticable to properly press more than two bricks at a time during each throw of the plungers. I am not aware, however, that any one has succeeded in producing such pulsatory motion either by hydraulic pressure, or by the combined action of compressed air and a liquid.

By my present invention, I am enabled not only to operate the longer and less powerful movements of the respective plungers quickly, and the requisite short movements slowly and powerfully, but I am also, enabled to mold ten to twelve bricks at a time or correspondingly large blocks and slabs without approaching unwieldy proportions in the machine;

moreover it is highly desirable to provide a machine that will mold bricks on their face edge, or to mold large slabs and blocks thicker than a brick. The present example of machine as exhibited by the drawings, shows six bricks being molded on their edges. Such a machine would have been heretofore impracticable by any of the known methods for properly molding dry clay bricks.

The object of my present invention is a method and machine by which the disadvantages above-named, may be overcome, and a comparatively small amount of initial power may be utilized to do the work more rapidly and successfully, than it has heretofore been done; and with these ends in view, my invention consists in the method hereinafter described of utilizing a constantly, existing initial power of compressed air or steam to first act directly upon the mechanical devices employed to produce by their long and quick travel, the first part of the formation and compression of the clay within the mold, then to produce the pulsatory and final compression by said mechanical devices by transmitting the force of the initial power thereto through hydraulic mechanism interposed between the initial power and the molding devices, and, finally, again utilizing the initial power direct to lift the molded and compressed brick out of the molds.

My invention also consists of the construction, combination, and arrangement of the several devices necessarily employed to carry out the method, all as will be more fully and in detail described and specifically claimed hereinafter.

In order that those skilled in the art of molding brick may fully understand my improved method, and may learn how to make and use my improved machinery, I will proceed to describe the same referring by letters to the accompanying drawings, in which—

Figure 1 is a front elevation of a machine embodying my improvements and adapted to carry out the method. Fig. 2 is a central vertical section taken at line *x*, *x*, of Fig. 3. Fig. 3 is a side elevation. Fig. 4 is a transverse or cross section taken at the line *y*, *y*, of Fig. 1. Fig. 5 is a detail sectional view showing construction of the three-way valves employed throughout the machine, and Fig. 6 is a central vertical section taken at right angles to that shown at Fig. 2.

Similar letters of reference denote like parts in the several figures of the drawings.

A is the frame within which the molds B are secured in position in the usual or any suitable manner. The frame A is located between the head plate C and bed plate C′, each end of the said frame embracing a short cylinder D, D′, and being secured thereto by suitable bolts *a*, *a*, (see Fig. 3.) Above the cylinder D and mounted thereon is what I denominate a hydraulic cylinder E, and below the cylinder D′ is located another hydraulic cylinder E′, similar to the one above. Each of said cylinders is formed with annular shoulders to fit within the cylinders D and D′ respectively, and cylindrical extensions on the head plate C and bed plate C′. The head plate C is formed with a hollow cylindrical extension fitting over the shoulder of the upper hydraulic cylinder E, and with a horizontal partition G, through which passes the stem *b*, attached to a piston head H, which moves in the box which is closed by a plate I, secured in position by bolts *c*. The bed plate C′ is formed with an upwardly extending hollow cylinder F′ fitting over the annular shoulder on the lower end of the hydraulic cylinder E′, forming a box for a piston head H′ having a stem *b*′ passing through the otherwise closed base of cylinder E′, and the cylinders D and D′ are each provided with closing heads J, J′ and stuffing boxes K, K′. The several cylinders, and heads are all secured permanently together by bolts *d* (see Figs. 1 and 3).

The head plate, bed plate, frame A, and intermediate cylinders are all braced and secured in position against strain by strong pillars or rods L and screw nuts L′ in an obvious manner.

M is the upper die head provided with a series of dies adapted to enter the molds B, and M′ is the lower die head similarly constructed. Each die head is connected respectively to a plunger N, N′ provided with piston heads O and O′ respectively, working within the cylinders D and D′. The upper plunger N extends through the piston head O and into the water space in the hydraulic cylinder E, and the lower plunger N′ extends through the piston head O′ and into the water space in the lower hydraulic cylinder E, and each plunger is preferably provided at its end which enters the water cylinder with a metal spring ring or bushing as clearly shown in Fig. 2.

P is the filling box which is caused to reciprocate over the molds and P′ is the clay feeding chute. The filling box is reciprocated by the piston Q working in the air cylinder Q′—and R is the table onto which the molded brick are delivered by the reciprocating filling box, and from which they are delivered in any ordinary manner to a traveling table or belt.

S, S′, are two rotatory shafts secured in suitable boxes T, to the head plate C and the bed plate C′ and they are each provided with a series of cam wheels. These shafts S, S′ near their lower ends have keyed thereto crown gears U, meshing with similar gears V on the ends of a horizontal shaft W, mounted upon the bed plate in boxes W′ and provided with a band pulley X which is connected by a band X′ (see Fig. 3) to any suitable power.

e is a compressed air pipe connected in any suitable manner with any suitable supply or pump, and *e*′ is another pipe through which the exhaust is effected.

From the compressed air pipe *e* extends

conducting pipes f, f', leading into the upper cylinder D at points respectively above and below the path of travel of the upper piston head O, and thence to the exhaust tube e'. Located at the points of juncture between the conduit pipes f and f' each side of the cylinder O and adjacent to the supply and exhaust pipes e, e', are arranged three-way valves or cocks g, g', (the construction of which is clearly shown at Fig. 5,) the stems of said valves being connected respectively to levers h and h' provided with short arms extending into cam grooves l and l' in the cam wheels m, m', on the rotating shafts S, S'.

n and n' are conduit pipes similar to the pipes f, f' and connected in the same manner to the lower cylinder D' and communicate with the supply and exhaust pipes e and e', and provided with similar three-way valves or cocks g^2, g^3, operated by levers h^2, h^3, the outer ends of which are located within cam grooves l^2, l^3, in the cam wheels m^2, m^3. This construction and arrangement permit of the introduction alternately above and below the piston heads O and O', and the corresponding exhaust, in order that said piston heads may be properly reciprocated, the upper one for partially compressing the clay and the latter for lifting the brick out of the molds.

o, o', and p, p', are two sets of conduit pipes connected with the supply and exhaust pipes e and e' and with the upper and lower cylindrical extensions F, F' on the head plate C and base plate C', and they are similarly provided with three-way valves q, q' and q^2, q^3 and operating levers r, r', r^2, r^3, operated by cam wheels t, t', t^2, t^3, in order that the compressed air may be conducted alternately above and below the piston heads H and H' to reciprocate the same with their respective stems b, b'.

u, u' are cam wheels provided with cam grooves v, v' operating levers w, w' and two-way valves x in conduit and exhaust pipes leading into the two heads of the cylinder Q', and connected with the main supply and exhaust pipes e, e', so that the piston Q connected with the filling box P may be properly reciprocated over the molds and the table R.

When the machine is properly connected in all its parts and ready to operate, a supply of water or other suitable liquid is placed in the upper hydraulic cylinder E above the end of the plunger N as represented by broken lines at Fig. 2, and this is accomplished through the medium of a suitable filling tube communicating with the upper end of the cylinder and provided with a closing cap. The lower hydraulic cylinder is likewise furnished with a suitable supply of water below the end of the plunger N'. The space below the horizontal portion G of the upper extension F of the head plate is provided to receive the water supply in the upper hydraulic cylinder E when it is expelled by the upward movement of the upper plunger N, as will be more fully understood when the operation of the machine is described.

Having described the construction of my improved brick molding machine I will now describe the operation of the same, and while it may be understood by reference to all the figures of the drawings, it will be best understood by referring more particularly to Fig. 2.

Fig. 1 shows the several parts of the machine in position to begin operations the bottom plunger being down on its resting point to receive the thrust of the top plunger. The shaft W being rotated and with it the vertical shafts S, S', the filling box T is caused to reciprocate over the molds, dumping therein the charge of clay received from the charging chute P' and is then returned to its normal position under said chute P'. This movement is accomplished by alternately admitting and exhausting the compressed air supply at opposite sides of the piston head within the cylinder Q'. The parts of the machine are so timed by the construction and relation of the several cam wheels, supply and exhaust pipes, three-way valves and valve operating levers, that as soon as the filling box P has gotten out of the way, the valves g g' are opened, the compressed air passing through the conduit pipe f above the piston head O, forces the plunger N, die frame M and dies downward compacting into form and partially compressing the clay within the molds and against the lower dies held against movement. During this movement the air which was below the piston head O escapes through the upper three-way valve g into the exhaust pipe e'. This movement above described of the upper plunger is so calculated that the clay in the mold will be pressed to within half an inch of its final compressed form, and during this operation the levers h and h' are at rest by reason of the form of the grooves l and l' in the operating cam wheels m, m'. The two-way valves q', q^3 being next opened air is permitted to exhaust from below the upper piston H and from above the lower piston H'; these valves q', q^3 then close, and the valves q q^2 are opened and the stems b and b' are forced into the hydraulic cylinders E, E', and the pressure then exerted hydraulically upon the plungers N and N' causes both of them to move toward each at the same time to still further compress the bricks in the molds and to within a small limit of the necessary final compression. The stem b and plunger N now remain at rest, and with them necessarily the upper die frame and dies, and the valve q^3 is again opened which exhausts the air below piston head H' and permits said piston and the lower plunger N' with lower die frame and dies to drop down to their normal resting point, and this movement permits the air which has been compressed within the body of the bricks to escape from the bricks and molds, and immediately thereafter the valve q^2 is again opened and compressed air being admitted below the piston head H', it

with its stem b' is lifted and hydraulic pressure exerted against the end of lower plunger N′ which with the lower die frame and dies is forced up to make the last pressure upon and complete the bricks. When the bricks have thus been finally compressed, the valve q' is opened to exhaust the air from above the piston head H, and the valve q being opened to permit the compressed air to enter under said piston head, and the valves g and g' being opened to let compressed air under the piston O, and to permit the exhaust of the supply previously used above it, and the valve g^2 and g^3 being opened, compressed air is admitted under the piston head O′ and exhausted from above the same, so that the plungers N and N′ are lifted to their extreme upward limit, the former to resume its normal position and the latter to lift the molded bricks up on a level with the receiving table, under which they are forced by the filling box as it again travels over the molds to fill the same, valve g^3 having previously opened to exhaust the air from below the piston head O′ to permit the lower plunger and its connections to fall to the point of rest.

By reference to the cylinder F on the head plate C it will be seen that the space below the horizontal partition G serves as a receptacle for the water or other fluid contained in the upper hydraulic cylinder E, when said water is expelled by the upward movement of the upper plunger N.

I do not wish to be confined to the exact details of construction as shown, for they may be varied in very many particulars without departing from the spirit of my invention, and particularly is this so in the construction, number and arrangement of valves for controlling the inlet and exhaust of air, the gist of my invention in this particular resting in the idea of so arranging and timing the several parts that the direct action of compressed air is employed for the long and quick movements of the plungers and the partial compression and removal of the bricks, while the short and more powerful movements of the plungers are accomplished with the same initial power exerted through the interposition of hydraulic pistons; and it will be noted in this connection that I avoid the use of all such devices as hydraulic pumps and so forth.

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

1. The within described method of operating the pressing plungers of a brick machine which consists in employing an initial pressure of compressed air or steam for impelling the respective plungers through the longer travel, said steam or air acting direct upon said plungers, then employing a secondary more intense pressure hydraulically, actuated by compressed air or steam, substantially as described.

2. The method of producing an alternate advancing and receding movement of the plunger of a brick machine, which consists, first, in employing an initial pressure of compressed air or steam, for causing the first advancing movement, second, relieving said pressure and causing a reverse movement actuated by steam or compressed air, and, third, renewing the advance movement by hydraulic power actuated by compressed air or steam, substantially as described.

3. The method of producing an alternate advancing and receding motion of the opposing plungers, which consists, first, in advancing one of said plungers through the longer throw by compressed air acting directly against the piston of the plunger, then, second, advancing the same plunger with greater pressure hydraulically, said hydraulic pressure acting against said plunger direct through the medium initially of compressed air, then, third, advancing the other opposing plunger through the shorter throw with the greater hydraulic power actuating against the piston, and by means of an initial power consisting of compressed air, and finally advancing said plunger through the longer throw by means of compressed air only, acting directly against said plunger, substantially as hereinbefore described.

4. In a machine for molding and compressing brick the combination with a mold adapted to receive dies from opposite directions, a series of dies, each series suitably connected with a plunger passing through a piston head operated by compressed air or equivalent power, and extending into a hydraulic cylinder, a piston arranged above the upper plunger, and with a stem extending into the water cylinder, a piston below the lower plunger, and with a stem extending into the lower water cylinder, a main compressed air supply pipe, a main exhaust pipe and suitable means for supplying and exhausting the compressed air to cause the several parts to act in the order and manner hereinbefore set forth.

5. In a machine for molding and compressing brick, the combination with the mold supporting frame and mold, of the lower die located and supported within the mold, of an upper die and plunger, substantially as described, the piston cylinder D, hydraulic cylinder E, piston cylinder F, piston H—b, and means substantially as described for successively operating the pistons O and H, as and for the purposes set forth.

6. In combination with the mold and supporting frame, and an upper plunger and dies the lower plunger N′ provided with dies, the air cylinder B′, piston head O′, water cylinder E′, cylinder extension F′, piston H′—b', and means substantially as described for successively operating the plunger N′ as and for the purposes set forth.

7. In combination with the mold frame A, mold B, upper and lower plungers N and N′ with dies attached and provided with piston heads O, O′, the water cylinders E, E′, cylindrical extensions F, F′, hydraulic pistons h b

and H′ b' head plate C, base plate C′, all secured in relation by the bolts or columns L, the supply pipe e, exhaust pipe e' intermediate supply and exhaust pipes leading to the cylinders F, F′, D, D′, two-way supply and exhaust valves q, q', $g\,g'$, g^2, g^3, q^2, q^3, operating levers r, r', $h\,h'$, h^2, h^3, r^2, r^3, and rotating cam wheels t, t', m, m', m^2, m^3, and t^2, t^3, secured to rotary shafts, and means for operating said shafts, substantially as and for the purposes set forth.

8. In combination with the molds D and table R, the filling box P, piston Q, cylinder Q′, supply and exhaust pipes e, e', and mechanism intermediate between the supply and exhaust pipes and the cylinder Q′, whereby the piston Q is reciprocated, substantially as and for the purposes hereinbefore set forth.

In testimony whereof I affix my signature in presence of two witnesses.

J. C. ANDERSON.

Witnesses:
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HOBART C. TAYLOR.