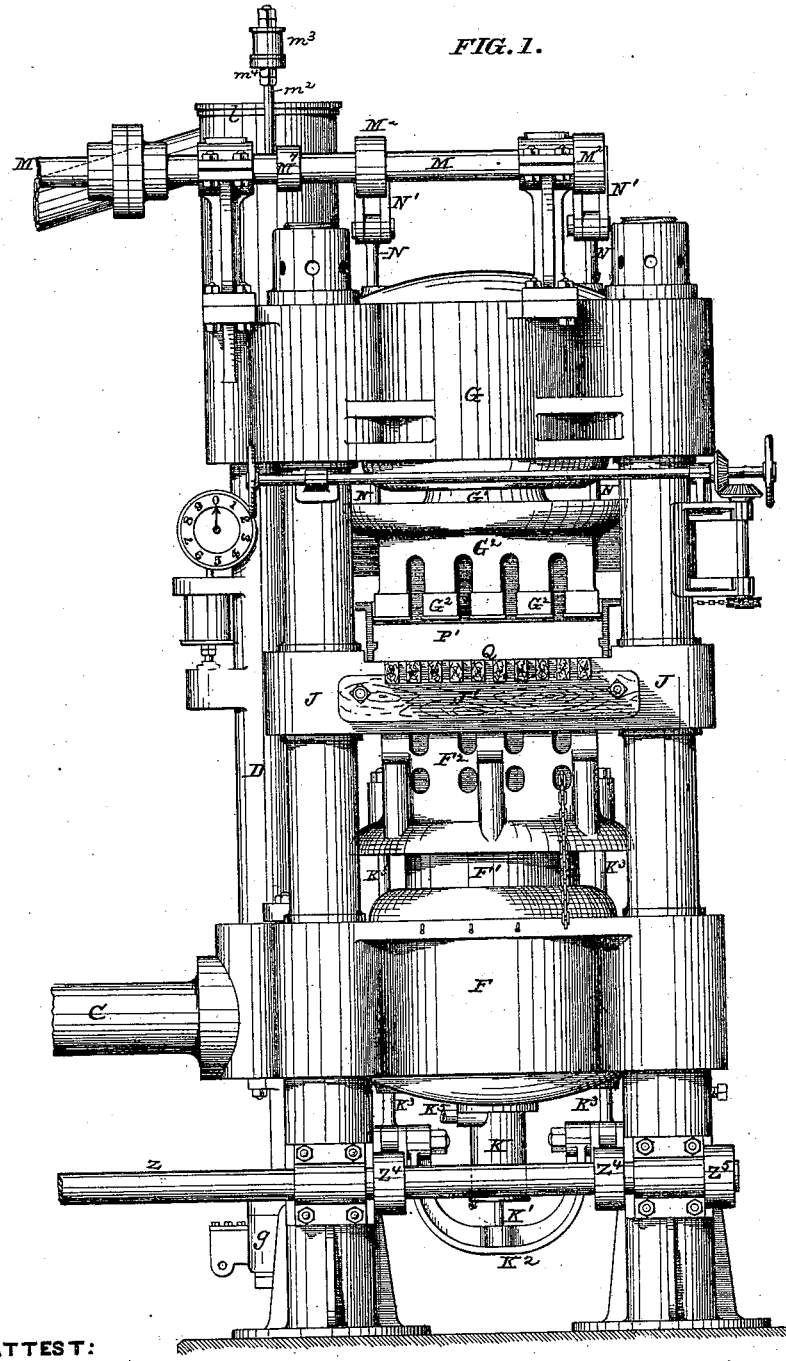
7 Sheets—Sheet 1.

E. ROGERS.

HYDRAULIC BRICK-MACHINES.

No. 195,169. Patented Sept. 11, 1877.

FIG. 1.



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Chas. Hall.

INVENTOR:

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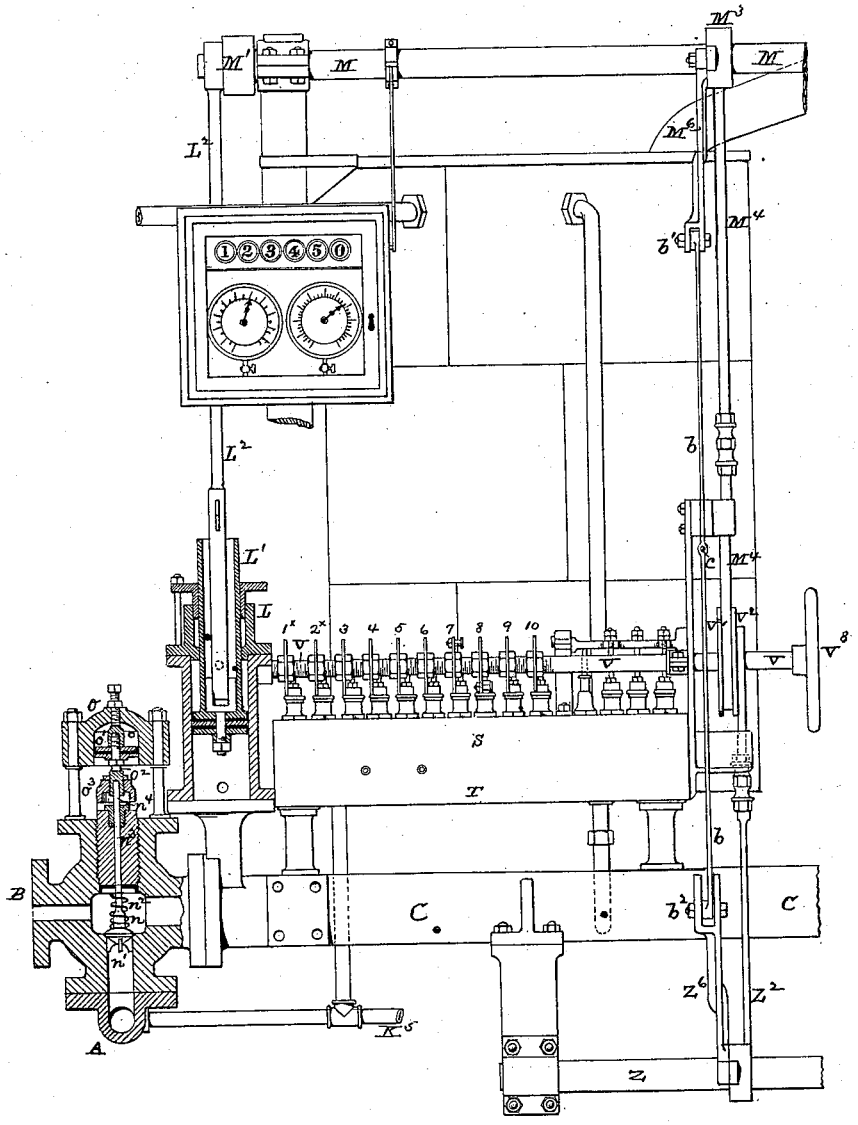
FIG. 2.



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HYDRAULIC BRICK-MACHINES.

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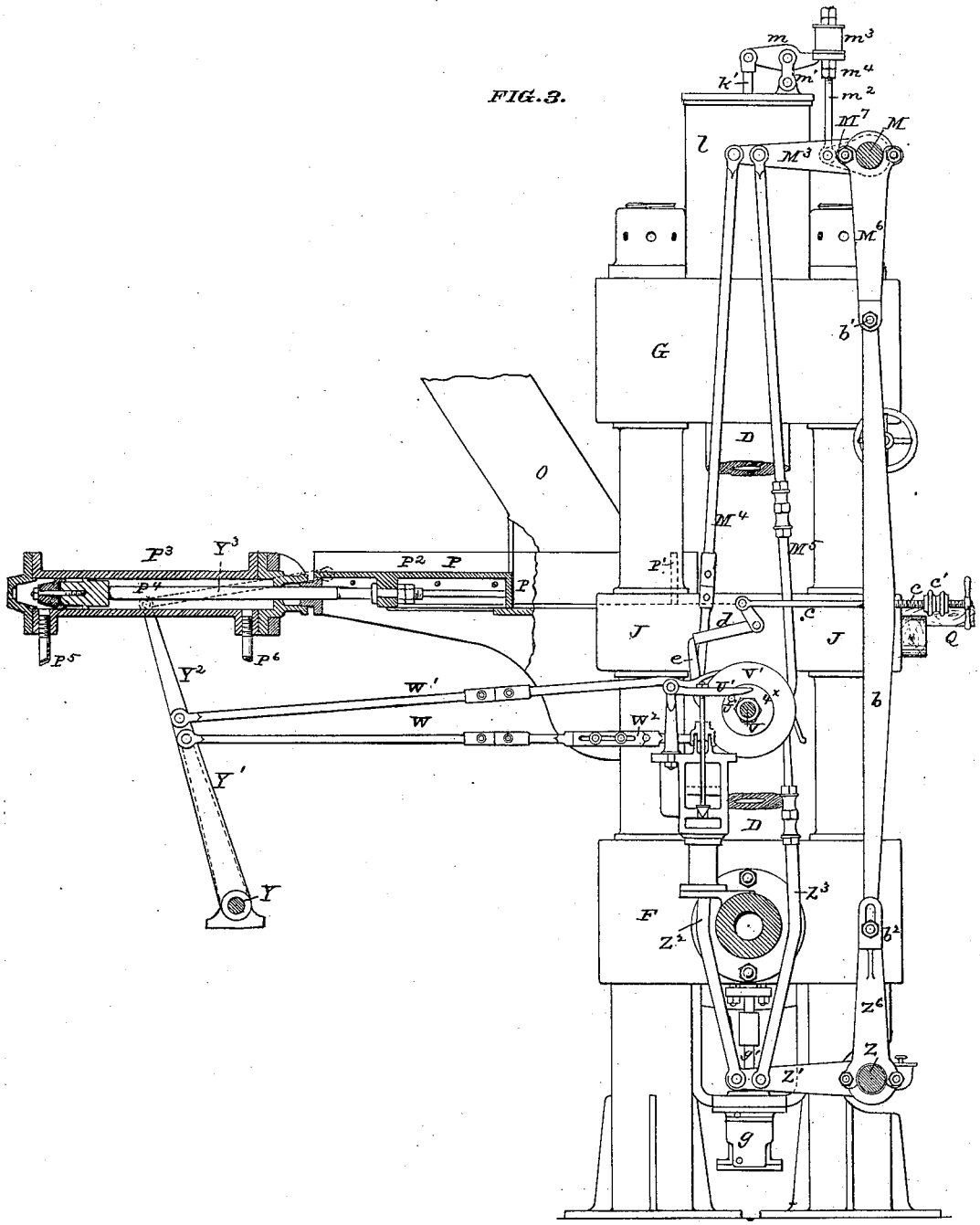
FIG. 3.



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HYDRAULIC BRICK-MACHINES.

No. 195,169. Patented Sept. 11, 1877.

FIG. 4.

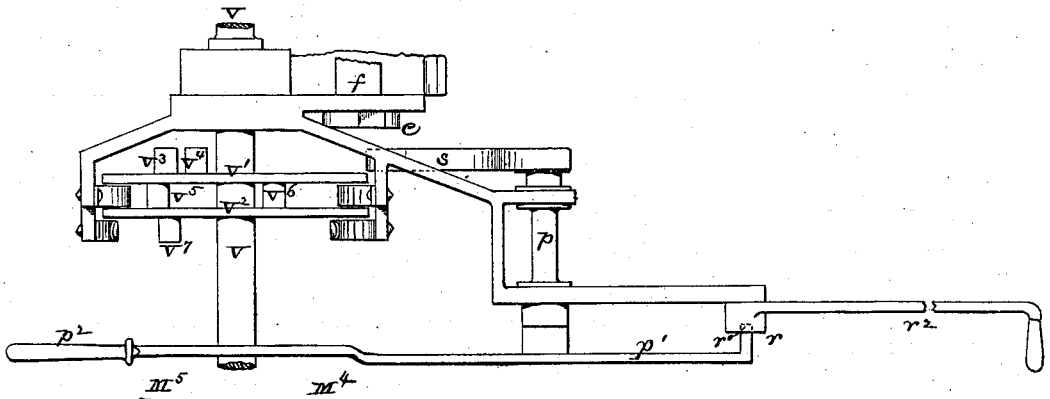

FIG. 5.

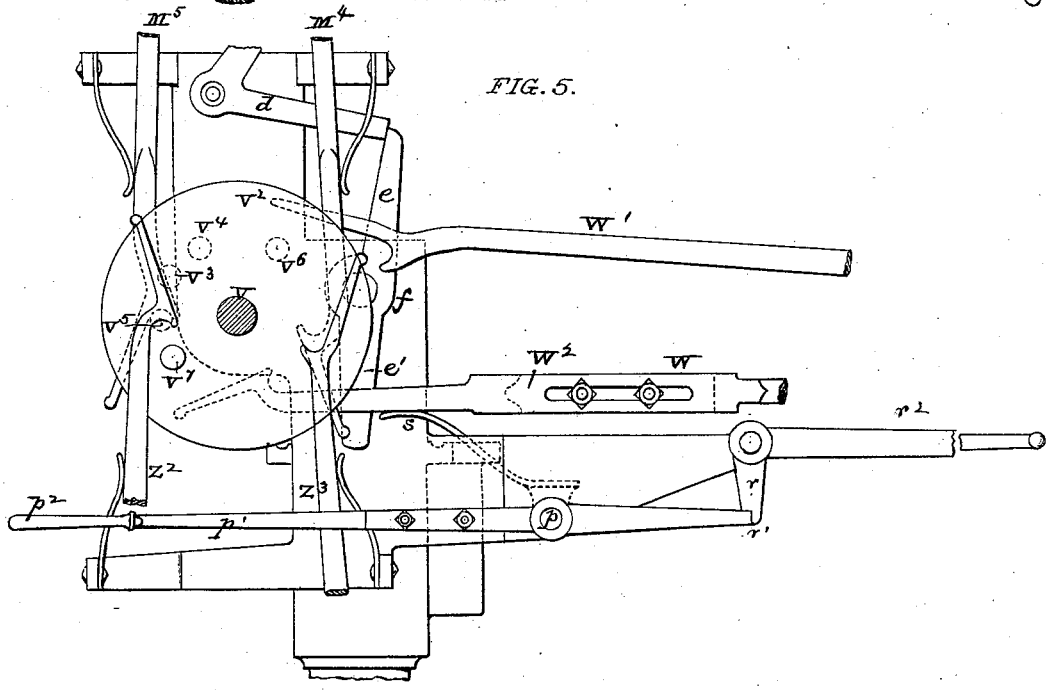

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FIG. 6.

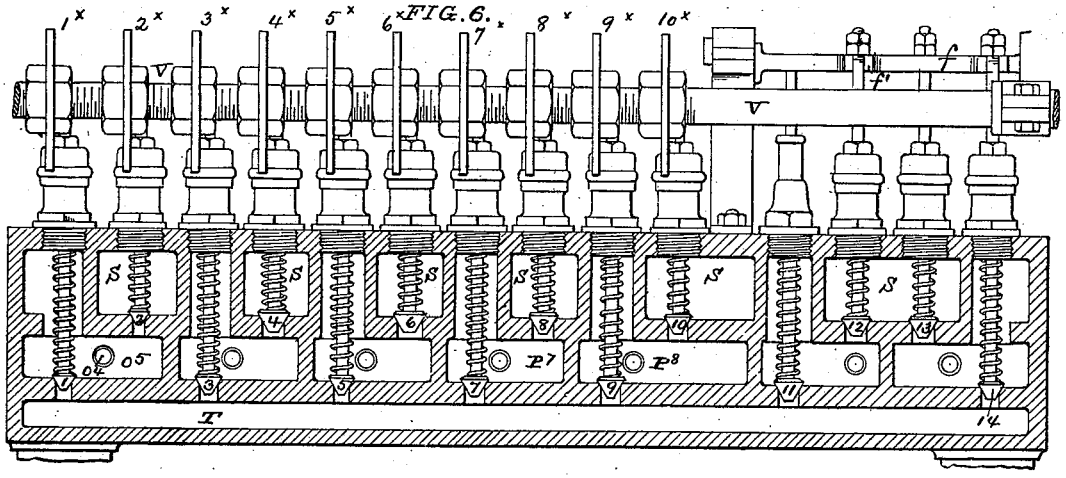

FIG. 7.

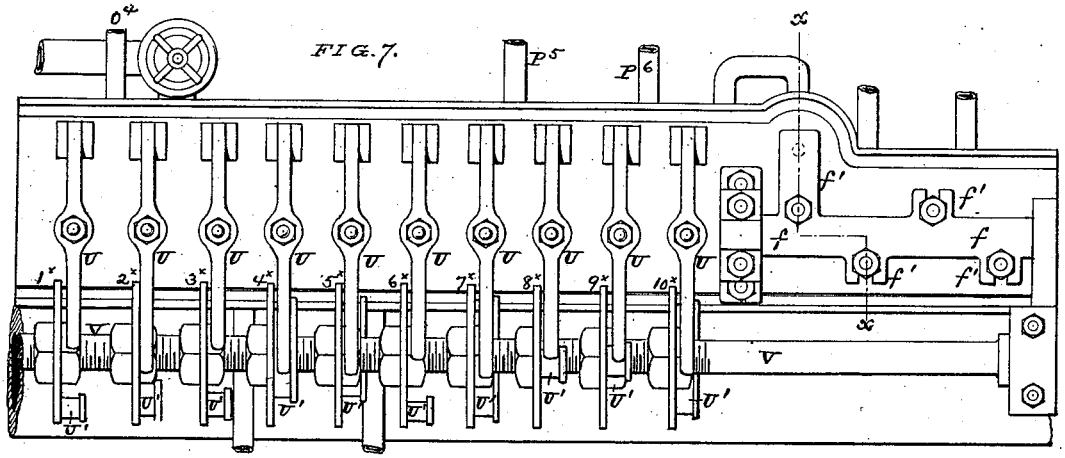

FIG. 8.

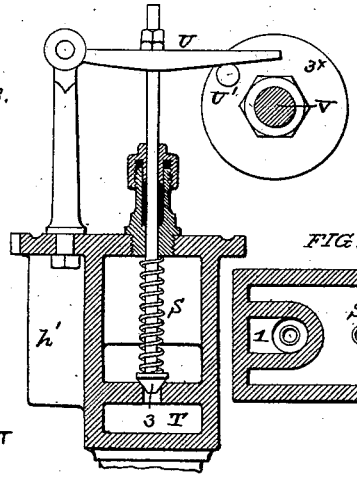

FIG. 10.

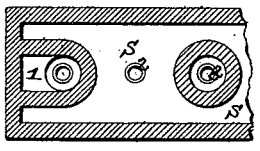

FIG. 9.

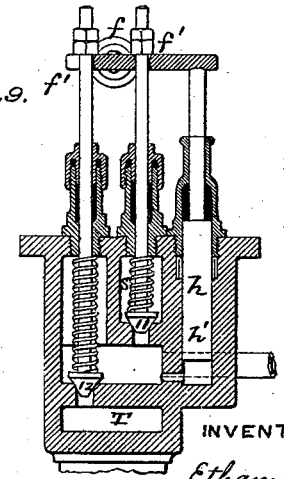

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FIG. 11.

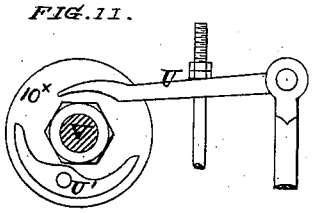

FIG. 12.

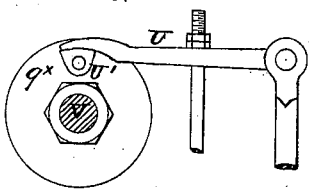

FIG. 13.

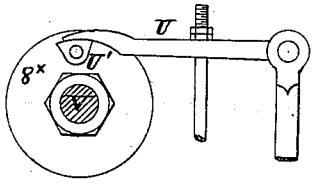

FIG. 14.

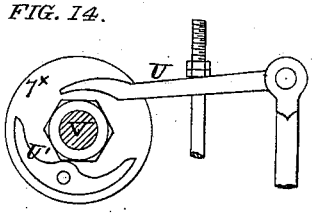

FIG. 15.

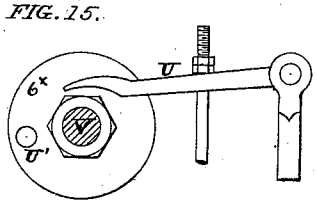

FIG. 16.

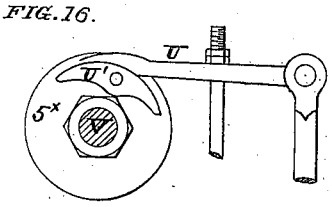

FIG. 17.

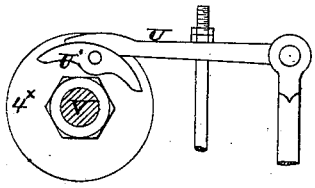

FIG. 18.

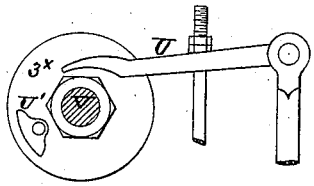

FIG. 19.

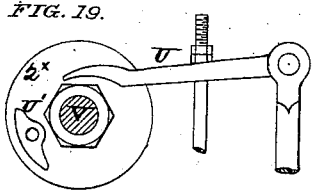

FIG. 20.

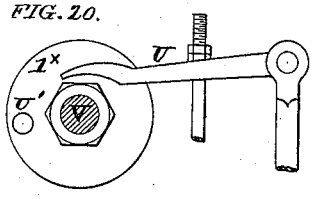

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FIG. 21.

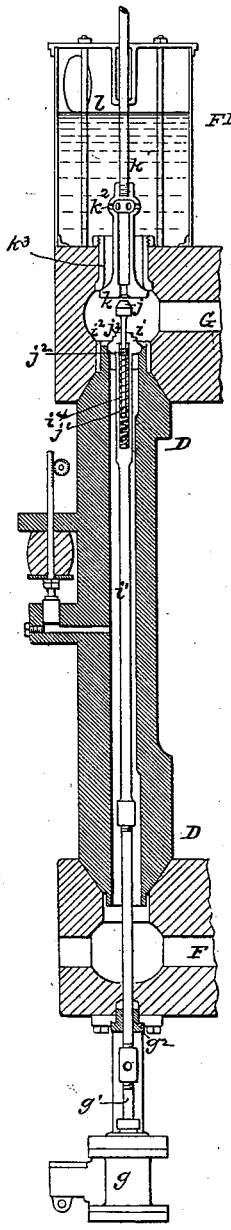

FIG. 22.

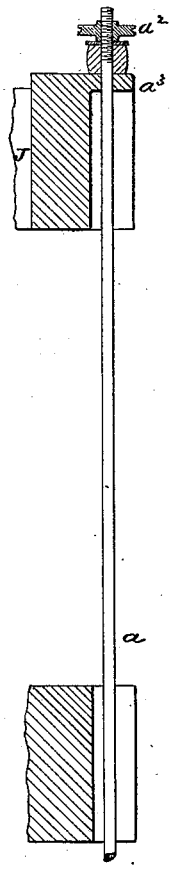

FIG. 23.

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UNITED STATES PATENT OFFICE.

ETHAN ROGERS, OF CLEVELAND, OHIO.

IMPROVEMENT IN HYDRAULIC BRICK-MACHINES.

Specification forming part of Letters Patent No. **195,169**, dated September 11, 1877; application filed June 27, 1877.

To all whom it may concern:

Be it known that I, ETHAN ROGERS, of the city of Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Hydraulic Brick-Machines, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, making part of the specification.

In this invention the main principle of operation is the same as in my Patent No. 182,481, dated September 19, 1876. A high and a low pressure pump are used—the latter to give the mold-pistons the chief part of their movement, and the former to give the final and extreme pressure upon the bricks.

My present improvement relates chiefly to the construction and arrangement of the valves and connections and the water-engines by which the various parts are operated.

The valves are a number of poppet-valves set in a valve-box common to them all, and operated by tappets or cams on disks upon a single shaft, or by connection to a rock-shaft. The former shaft, which has intermittent rotary motion in one direction, and the said rock-shaft are actuated by devices connected to the various moving parts of the machine, so that, when any of said parts have completed their movement, said part will, by means of the proper valves and connecting mechanism, put in motion the parts of the machine that should go next into operation, as will be described at length in the appropriate place.

In the drawings, Figure 1 is a front elevation, showing the mold-cylinders and adjacent parts. Fig. 2 is a similar view, showing the arrangement of valves and operating mechanism, with water-engine, by which the upper mold-piston is raised from the molded bricks. Fig. 3 is a side view of the machine, partly in section. Fig. 4 is a detail plan of the mechanism for operating the rotary-valve actuating-shaft. Fig. 5 is a detail side view of the same, showing the pawls by which said shaft is intermittingly turned to operate the valves of the various water-engines, &c. Fig. 6 is a detail longitudinal section of the valve-box and connections. Fig. 7 is a detail plan of the same. Fig. 8 is a detail cross-section of same. Fig. 9 is a detail horizontal section of same. Fig. 10 is a detail cross-section at line *x x*. Figs. 11, 12, 13, 14, 15, 16, 17, 18, 19, and 20 are detail views of the valve-lifting tappets, levers, &c., showing them in their relative positions, and showing the various forms of tappets. Fig. 21 is an axial section of the side-pipe communicating between the mold-cylinders. Fig. 22 is a detail of the adjustable rod that limits the descent of the lower mold-piston. The lower end, broken off and turned around, is shown in Fig. 23, where the slot a^1 is shown, which receives the pin of arm Z^5.

A is a pipe in communication with the low-pressure pump, and B is a pipe in communication with the high-pressure pump. It is not necessary to describe these pumps, nor the steam-engines by which they are driven, nor the safety or loaded valves by which the water is allowed to escape from the pipes A and B when the water in them has attained the maximum pressure allowed, because no novelty is claimed in the construction of said parts in this application; and said construction may be varied without affecting the operation of the parts herein claimed as new and of my invention.

The water from both pipes A and B passes along the pipe C, and that for the upper mold-cylinder G up through the vertical or side pipe D, the pipe C communicating directly with the interior of cylinder F. In the cylinders F and G work the mold pistons or plungers F^1 and G^1, respectively. These pistons carry the followers F^2 and G^2, which work in the mold J in precisely the same manner as in my aforesaid patent. The mold has recesses J′ extending vertically through it, and the followers F^2, when in their lower position, form the bottoms of recesses J′, in which the bricks are molded between the followers F^2 below and G^2 above.

The lower piston F^1 tends, of course, to descend by gravity when the water exhausts from cylinder F, and in addition it is constantly drawn down by a piston-rod, K^1, whose piston works in a cylinder, K. The upper end of the cylinder K is supplied with water under pressure by a pipe, K^5, connecting with the low-pressure pump-pipe A. This piston-rod K^1 is connected by a yoke, K^2, to rods K^3, which pass through the metal of cylinder F, and

are attached to the top of the piston F^1. The upper mold-piston G^1 is lifted with the bricks as they are forced from the molds by the rising of the lower piston F^1, and when the bricks are lifted out of the mold-cavities the piston G^1 is still farther raised by a water-engine, L, whose piston-rod L^1 is connected by rod L^2 to an arm, M^1, of the rock-shaft M. This rock-shaft M has arms M^2, to which are connected by links N′ the rods N, extending through metal of cylinder G, and connected to the piston G^1.

O is the hopper, into which the earth is dropped in a pulverized state, and through the lower part of which works the charger P. At the front of the charger is a flat bar, P^1, whose face is vertical, and which extends the whole width of the charger, so as to push (as it moves forward) the batch of bricks from the top of the mold onto the slat-table Q, from which they may be taken by hand.

The bar P^1 constitutes the front bar of an open frame forming, with the bottom of the hopper, an earth-vessel, in which the earth is carried forward over the mold, into whose cavities it drops, so as to fill them, and the surplus earth is swept back by the bar P^1 on its retrograde movement.

P^2 is a horizontal plate of the charger, which constitutes the temporary bottom of the hopper when the charger is in its forward position. The charger is moved forward and backward by a water-engine, P^3, whose piston-rod P^4 is attached to the charger.

P^5 and P^6 are the water-pipes leading to the ends of the cylinder of the engine P^3. These pipes communicate with valve-chambers of valves 7, 8, 9, and 10, as shown, the valves 8 and 10 being pressure-valves, and the valves 7 and 9 being exhaust-valves, the former communicating between the chambers P^7 and P^8 and the water-supply chamber S, and the latter communicating between the said chambers P^7 and P^8 and the exhaust-chamber T. All of the valves of this series (from 1 to 10, inclusive) are closed with the pressure and by springs, and are opened by connection of their stems with levers U, that are raised by tappets or cams U′ on the disks $1^\times$, $2^\times$, $3^\times$, &c. These disks are upon a shaft, V, which has intermittent rotation by the action of pawls actuated, respectively, by connection to the pistons F^1 and G^1 and the charger. The shaft V carries two disks, V^1 and V^2, and projecting from the faces of these are studs or pins V^3 V^4 V^5 V^6 V^7, upon which pawls act, so as to cause the rotation of shaft V by a series of intermittent movements.

V^3 and V^4 are two studs on disk V^1, which are acted on by pull and push pawls W and W^1, which are both connected to the end of the arm Y^1 upon a rock-shaft, Y. This rock-shaft is connected by an arm, Y^2, and rod Y^3 to the charger, so that the movement of the charger causes the rocking of the shaft, and through that means the partial rotation of the shaft V. For instance, as the charger attains its backward position, after having charged the molds, the pull-pawl W acts on the stud V^3 to turn the shaft V, so as to raise the valves 4 and 5 from their seats, to exhaust the water from the bottom of the engine L, and to allow the mold-piston G^1 to descend by the mechanism described. As the piston G^1 falls the arm M^3 descends, and the push-pawl M^5 comes in contact with the stud or pin V^5 between the disks V^1 and V^2, causing a partial rotation of the shaft V, raising valve 1, the valve 2 closing, and the water is allowed to escape from cylinder *o*, which allows valve *n* to rise, and the water can then pass from low-pressure pipe A to the cylinders F and G.

When the arm M^3 again rises the pull-pawl M^4 comes into action to give the disks V^1 and V^2 and shaft V a further partial rotation to lift valves 3 and 6 and drop valves 4 and 5, allowing pressure of water beneath piston L^1 to finish upward movement of piston G^1. Z^2 Z^3 are, respectively, push and pull pawls on the arm Z^1, extending from rock-shaft Z. The rock-shaft Z extends horizontally, and has motion imparted to it by arms Z^4 connected to the rods K^3. These pawls act upon a stud, V^6, at the proper time to give to the shaft V a partial rotation. In this the pull-pawl Z^2 acts on the pin or stud V^7 to operate the valves of the charger-engine to move the charger backward.

The push-pawl Z^3 acts on stud V^7 to operate the valves 3 4 5 6, opening the valves 4 and 5, and allowing valves 3 and 6 to close, so as to raise the piston G^1 by engine L.

V^8 is a hand-wheel, by which the shaft V may be turned when required to operate any of the valves with which it is connected.

Upon the shaft Z is an arm, Z^5, at the end of which is a pin which works in a vertical slot, a^1, in a rod, *a*, having bearing in the housing or main frame, and supported therein upon a nut, a^2, which screws on the rod at its upper end, and has bearing upon the ledge a^3 of the frame, in proximity to the mold. The purpose of this arrangement is to prevent the piston F^1 descending below the desired level, and thus to regulate the depth of the mold-cavities to receive the proper quantity of clay.

Z^6 is an upwardly-extending arm of the rock-shaft Z, and M^6 is a downwardly-extending arm of the rock-shaft M. These arms are slotted at the ends to receive pins or studs b^1 b^2 at the ends of a vertical bar, *b*.

c is a screw-rod passing through the bar *b*, at or near its middle, and upon the rod screws a nut, *c′*, against which the bar *b* bears when it is moved outward a certain distance by the outward movement of arms Z^6 and M^6 as the pistons F^1 and G^1 approach each other in pressing the bricks in the molds, so that when the said pistons have reduced the bricks to the required thickness the rod *c* is drawn outward and throws up the trip *d*, which consists of a bell-crank lever, to whose shorter and upper arm the rod *c* is connected. The longer and

lower arm, when down, acts as a detent to the arm *e* of the rock-shaft *f*.

The rock-shaft *f* has side lugs *f'*, to which are connected the stems of valves 11, 12, 13, and 14, so that on the shaft moving in one direction the valves 11 and 13 are raised, and by an opposite movement valves 12 and 14 are raised.

The valves 11, 12, 13, and 14 belong to the water-engine *g*, the valves 12 and 11 governing, respectively, the supply and exhaust of the upper end of said engine-cylinder. As the detent or trip *d* is thrown up so as to release the arm *e*, the rock-shaft is rolled partially over by a plunger, *h*, in a cylinder, *h'*, beneath which piston is a constant pressure of water, so that at any time the arm *e* is released from the detent the valves 11 and 13 are raised, so as to supply water to the upper part of engine-cylinder *g* and exhaust from the lower part of said cylinder, and draws down the valve-rod to which said engine-piston is attached, (said valve, when down, closing communication between the mold-cylinders F and G, and drawing down with it the small valve which allows the escape of water from cylinder G, so that the pressure is wholly on piston F^1, which moves upward and forces the bricks from the mold-cavities, driving the piston G^1 upward with it.) The plunger *h* has bearing beneath an extension of the lug *f'*, to which the stem of valve 11 is connected.

e' is an arm, extending from the rock-shaft *f* in a direction opposite to the arm *e*, and by which the rock-shaft is turned in a direction opposite to that in which the plunger *h* acts, said arm receiving motion for this purpose by a tappet, W^2, on the pawl-arm W, and as the tappet W^2 forces the arm *e'* forward the detent *d* drops down in front of the arm *e*, and holds the rock-shaft *f* in position shown against the pressure of plunger *h* until the detent is again raised.

The piston-rod g^1 of the engine *g* forms at its upper end the stem i^1 of the valve *i*, passing through a stuffing-box, g^2, at the lower end of side pipe D. The seat i^2 of the valve *i* is in the pipe D, and is so situated that when the valve is closed communication is closed between the interior of the cylinders F and G, so that when the valve is closed the cylinder G is cut off from connection with the water-supply pipes A and B.

The upper end of the valve-stem *i* has an axial socket, i^4, in which works the stem j^1 of a valve, *j*. Said stem has at the lower end an enlargement or collar, j^2, which collar prevents it from escaping from its socket i^4, said collar, when the valve is in its upper position, coming in contact with the socket-nut j^3. The valve-stem is surrounded by a spiral spring, j^4, which tends to force it into its upper position. The valve *j* has its seat in the bottom of valve *k*, and the port of valve *j* extends up axially through valve *k* and its tubular stem k^1. The valve-stem k^1 extends upward through the outflow water-chamber *l*, and its axial chamber communicates at k^2 with the outflow water-chamber, so that when valve *j* is open there is communication between pipe D and water-chamber *l*.

The stem k^1 extends upward through the top of the water-chamber *l*, and is connected to a lever, *m*, fulcrumed on a standard, m^1, and through whose other end passes a rod, m^2, whose lower end is connected to the arm M^7 upon the rock-shaft M. The rod m^2 has at the upper end a spring, m^3, preferably of rubber, which has bearing upon the upper side of lever *m*, so that when the piston G^1 is down the valve *k* is tightly drawn up to its seat k^3. On the other hand, as the piston G^1 reaches a certain elevation an adjustable jam-nut, m^4, on the rod m^2 comes in contact with the lower side of the lever *m*, and forces down the stem k^1, so as to open the valve *k* and allow the water to have full egress from the pipe D to the chamber *l*.

The outflow-chamber *l* may communicate by a pipe with the tank from which water is supplied to the high and low pressure pumps.

n is a valve, working on a seat, n^1, between the low and high pressure pipes A and B, such valve being raised from its seat by the flow of water from the low-pressure pipe A through the valve-port.

It will be understood that, when the bricks in the molds are reduced to a certain size, their resistance to further compression overcomes the pressure of the air in the air-vessel of the low-pressure pipe A, and causes the water to cease flowing from pipe A through port of valve *n*, and the valve will descend by gravity, assisted by spring n^2, and the water will encroach on the air-space in said air-vessel, and the pressure therein accumulates to be expended on the next pressing of bricks.

When valve *n* is closed pipe B will still be in communication with cylinders F and G, and the pressing will be completed at high pressure. The valve-stem n^3 of the valve *n* extends upward through a stuffing-box, n^4, and enters cup o^3 at lower end of rod o^2 of plunger o^1 in cylinder *o*. The part of the cylinder-cavity above the plunger is connected by pipe o^4 with the valve-chamber o^5 of valves 1 and 2. Valve 1 is the exhaust-valve, and valve 2 the pressure-valve, and by the movement of these the plunger o^1 is forced down, so that the cup o^3 presses down the valve *n* upon its seat, or the pressure is taken from the plunger top, so that both the valve and plunger may be raised by the pressure of water beneath valve *n*. The valve *n* is held down by the above means when the water is being exhausted from cylinder F, so that no water can at that time enter said cylinder from the low-pressure pump.

The amount of water thrown by the high-pressure pump is so small that no provision is required to cut off this supply.

The form of the tappets U varies upon the different disks $1^{\times}$, $2^{\times}$, $3^{\times}$, &c., so that each valve is kept open the required time, some of them being held open during more than one-

fourth of rotation of shaft V, and others for a smaller amount of time. The disks $1^{\times}$, $2^{\times}$, &c., may be made adjustable on the shaft V in any suitable manner, so as to adjust them to cause the valves to operate at the proper time. As shown, the shaft V has a screw-thread cut thereon, and the disks are fixed in position by jam-nuts.

The pull-pawl W is sustained, so as to hold it in the working position, by a spring, *s*, upon which it slides, and this spring is supported on a rock-shaft, *p*, that can be turned by a lever, p^1, having at one end a handle, p^2, and at the other end being arranged to enter the notch r^1 of the detent *r*. As the handle p^2 of the lever p^1 is raised, its other end engages in the notch r^1 and, at the same time, the spring *s* raises the pawl-rod W, so that it is in position to engage the pins on the disk V^1. When the handle r^2 of the detent is raised the handle p^2 of the lever *p* drops and the spring *s* descends, and allows the pawl-rod W to descend so that it will not engage the stud V^3 on disk V^1, and the machine stops because the pawl-rod W has failed to turn the shaft V and open the valves 3 and 4. The consequence is that the machine stops with the mold-cavities charged with clay, the charger drawn back, and the piston G^1 in its upper position.

The operation of the machine, as far as the manipulation of the clay and the formation of the bricks are concerned, is similar to that described in my former Patent, No. 182,481, before mentioned; but the mechanical devices for the production of the movements are different, and these new devices are alone claimed in the present application.

The said operation of the machine is as follows: Suppose the piston G^1 to be in its upper position and the charger in its backward position, then, if the machine is in running condition, the first movement is the exhaustion of the water from beneath the piston of engine L, which allows the mold-piston G^1 to descend upon the clay in the molds. Then the water-escape from cylinders F G is stopped by the closing of valve *k*, the valve *j* having been previously closed, and the pressure of the water comes on both mold-pistons F^1 and G^1, and the clay is compressed until the mold-followers are the thickness of a brick asunder; then the trip *d* releases the rock-shaft *f* of valves 11 12 13 14, the valve *i* is closed by engine *g*, and valve *i* in closing opens small escape-valve *j*; then the water escapes from cylinder G, and both the mold-pistons are raised by water-pressure beneath the mold-piston F^1, and the bricks are raised from the molds; then the mold-piston G^1 is lifted from the bricks and carried to its highest position by the engine L; then the charger P is moved forward by engine P^3, and pushes the bricks from the top of the mold as it carries forward a fresh supply of clay; then piston F^1 falls and the clay from the charger drops into the molds; then the charger returns to its rear position as at the commencement.

Each movement inaugurates the movement following.

I claim—

1. The combination of piston or plunger F^1, rods K^3, yoke K^2, rod K^1, and plunger K, substantially as and for the purpose set forth.

2. The combination of piston F^1, rods K^3, arms Z^4 and Z^5, and adjustable rod *a*, substantially as set forth.

3. The combination of piston or plunger G^1, rods N, arms M^2, shaft M, arm M^7, rod m^2, lever *m*, valve-rod k^1, and valve *k*, substantially as set forth.

4. The combination of pistons F^1 and G^1, shafts M and Z, arms M^6 and Z^6, bar *b*, rod *c*, trip or detent *d*, trip-lever *e*, rock-shaft *f*, and valves 11 12 13 14, engine *g*, valve *i*, and valve-rod i^1, substantially as set forth.

5. The combination of piston F^1, shaft Z, arm Z^1, and pawls Z^2 Z^3, studs V^6 V^7, disk V^2, shaft V, valves 3 4 5 6 7 8 9 10, charger-engine P^3, and engine L of the plunger or piston G^1, substantially as and for the purposes set forth.

6. The combination of the charger P, rod Y^3, arms Y^1 Y^2, pawls W W^1, studs V^3 V^4, disk V^1, shaft V, valves 4 and 5, engine L, arm M^1, shaft M, arms M^2, rods N, and piston G^1, substantially as set forth.

7. The combination of piston G^1, rods N, arms M^2 and M^3, shaft M, pawls M^4 and M^5, studs V^5 and V^6, disks V^1 and V^2, and valve-shaft V, substantially as set forth.

8. The combination of valves 1 to 10, inclusive, with lifting-levers U, valve-shaft V, with tappet-disks $1^{\times}$ to $10^{\times}$, inclusive, stud-disks V^1 V^2, and pawls M^4 M^5 W^1 W^2 Z^2 Z^3, substantially as and for the purpose set forth.

9. The combination of valve *n*, stem n^3, rod o^2, plunger o^1, cylinder *o*, and valves 1 2, operated by tappet-disks $1^{\times}$ $2^{\times}$ on valve shaft V, substantially as set forth.

ETHAN ROGERS.

Witnesses:

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