4 Sheets—Sheet 1.

W. A. GRAHAM.

BRICK-MACHINE.

No. 191,800. Patented June 12. 1877.

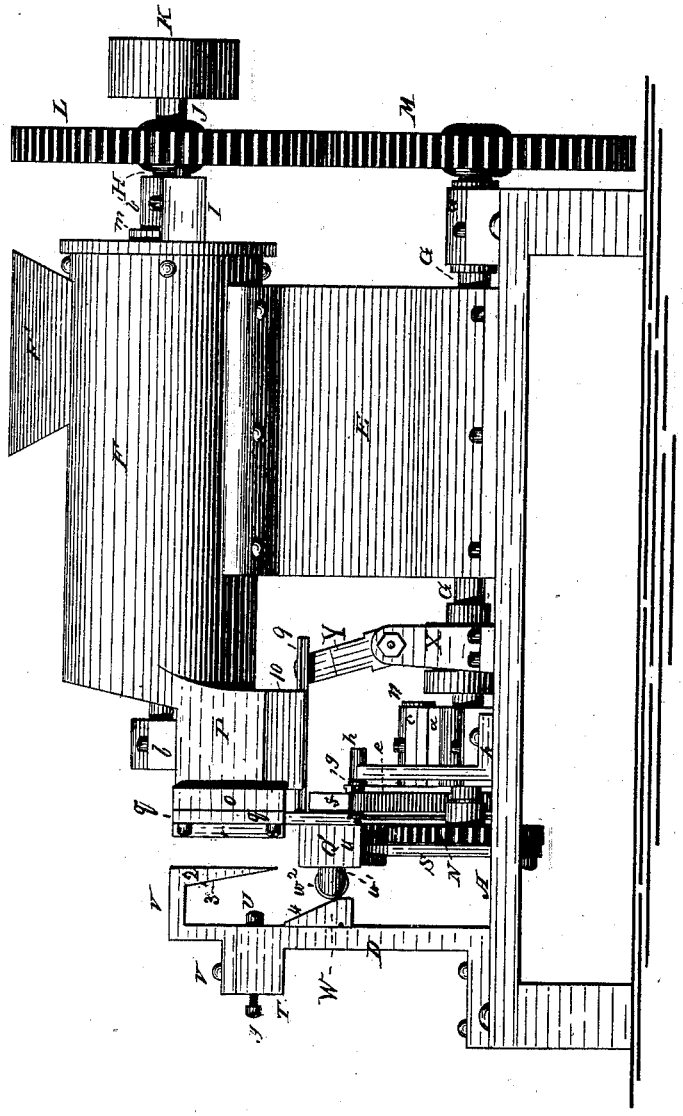

Fig. 1.

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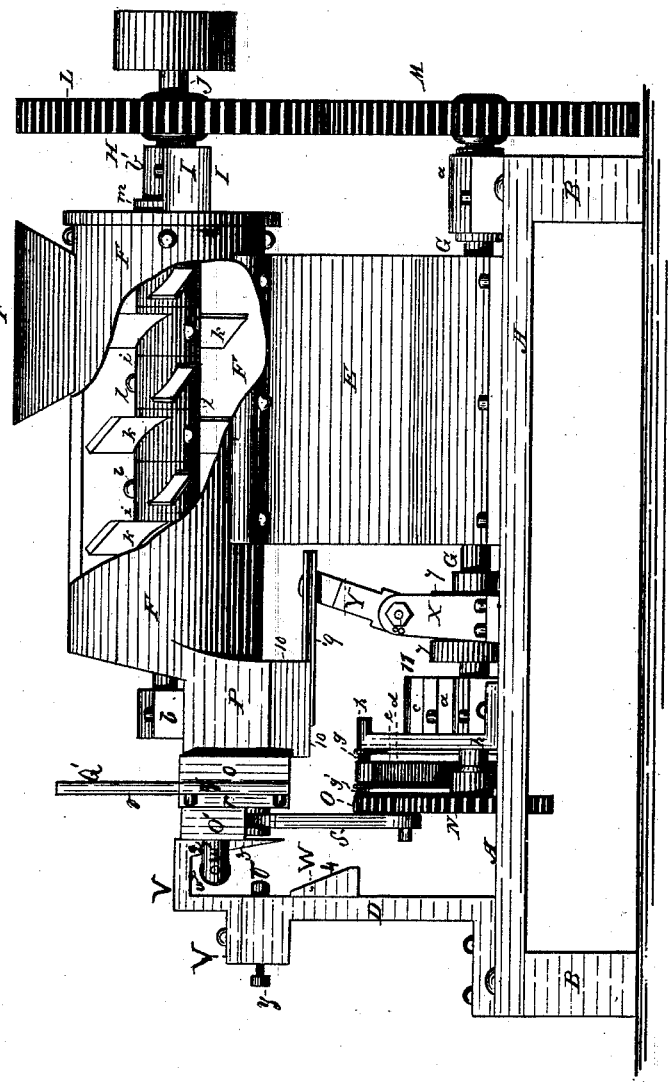

Fig. 2.

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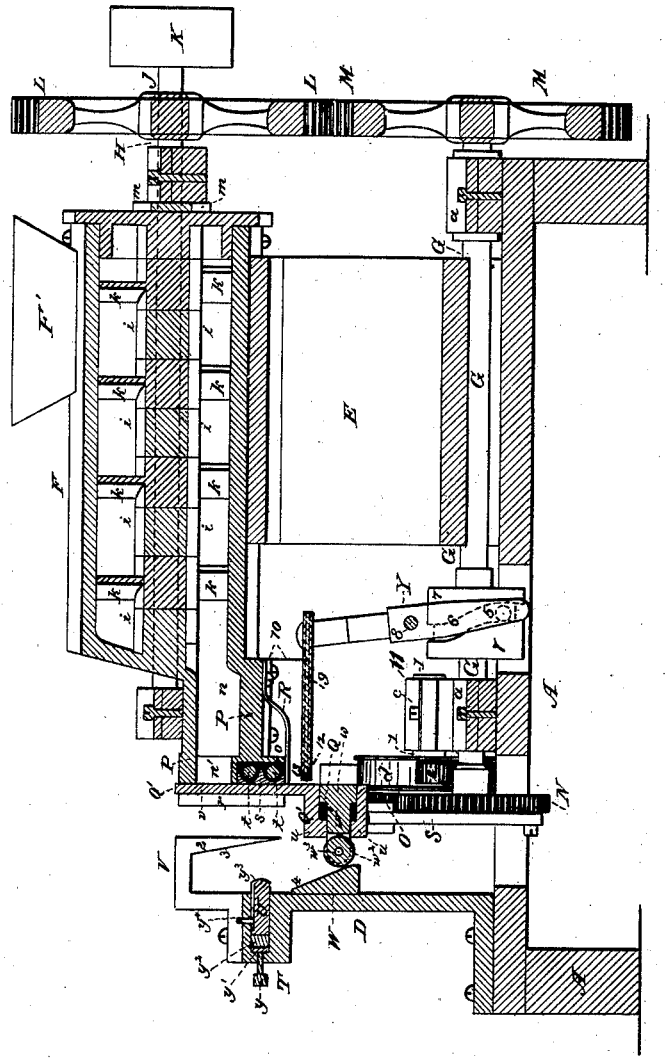

Fig. 3.

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BRICK-MACHINE.

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Fig. 4

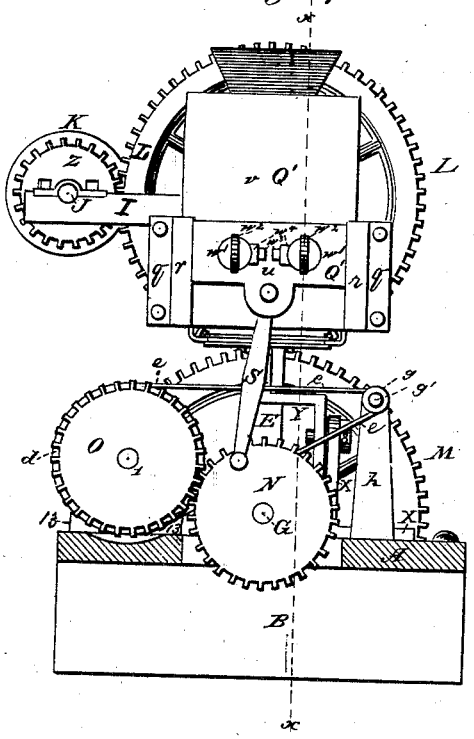
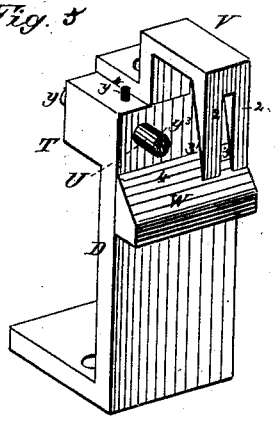


Fig. 5



Attest:
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UNITED STATES PATENT OFFICE.

WILLIAM A. GRAHAM, OF CARLISLE, PENNSYLVANIA.

IMPROVEMENT IN BRICK-MACHINES.

Specification forming part of Letters Patent No. **191,800**, dated June 12, 1877; application filed May 19, 1877.

To all whom it may concern:

Be it known that I, WILLIAM A. GRAHAM, of Carlisle, in the county of Cumberland and State of Pennsylvania, have invented a certain new and useful Brick-Machine; and I do hereby declare that the following is a full, clear, and exact description thereof, which will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification, in which—

Figure 1 represents a side elevation of my improved machine, showing the molds depressed to discharge the brick upon the endless belt that delivers them from the machine. Fig. 2 represents a similar view with the molds raised to receive a fresh charge of clay, a portion of the side of the feed-cylinder being broken away to show the feed mechanism. Fig. 3 represents a vertical longitudinal section, taken through Fig. 1, at the line *x x* shown in Fig. 4, a portion of the mechanism being shown in elevation; and Fig. 4, an end elevation with the outer standard D removed. Fig. 5 represents a detached perspective view of the end standard D.

My invention relates to a new and improved mode of compressing clay in molds, and of automatically charging and discharging the same, by means of which a superior machine-pressed brick is made, with all its sides left smooth and clean.

My invention consists, first, in using, in connection with the compressing and molding devices of a brick-machine, and which have motion during the compressing process, a bed-plate capable of having an intermittent back-and-forth movement imparted thereto, in such manner as that it shall, through the simple pressure of the clay, move with the mold during the time the pressure of the plunger is being exerted upon the clay in the mold, and then cease or stop in its movement with the mold as soon as the pressure on the clay is relaxed; and which, on being thus stopped, has motion imparted to it in the opposite direction by any suitable device, such as a spring, until it has been forced back to its original position, to receive pressure anew, and repeat the operation when the molds have been refilled, whereby the bricks are more perfectly compressed, and their sides next the traveling bed-plate left with a smooth, clean, and even surface; second, in combining with a mold, which moves during the time pressure is being applied to the clay, and which, for this purpose, is provided with a compressing-plunger, a traveling bed-plate, suitably arranged and constructed to receive the pressure of the clay while being compressed by the plunger to form the brick, and in such manner that, while the clay is being subjected in the mold to the pressure of the plunger, the pressure thus exerted will, through the clay, move the bed-plate, causing it to move with the mold, and in the same direction, throughout the compressing process, and then, on the release or relaxation of the pressure, allow it to be automatically returned to its normal position, ready for a repetition of the same operation; third, in a new combination and arrangement of devices with a mold having a back-and-forth movement, and a compressing-plunger, for the purpose of facilitating the charging of the molds; fourth, in a new combination and arrangement of devices with a mold having a back-and-forth movement, and a compressing-plunger for the purpose of facilitating the discharge of the brick from the mold when compressed; fifth, in a new and improved combination of devices with a mold having a back-and-forth movement, whereby the face of the molds and the plunger are cleaned as they return for a new charge of clay.

To enable those skilled in the art to make, construct, and use my invention, I will now describe it in detail.

The machine may be mounted upon, and secured to any frame of suitable construction and material, but I prefer a good, stout cast-iron frame.

In the drawings the working parts of the machine are represented as being mounted upon a metal frame, consisting of a bed-plate, A, erected on suitable legs or supports B, and which carries two main standards, D and E.

Standard E supports the hollow cylinder F, which holds the clay for feeding the molds. For this purpose it is made concave on its up-

per side, so as to receive and conform to the contour of the cylinder, and is similarly formed at the bottom to give free passage beneath it to the shaft G, through which motion is imparted to the molding mechanism. Shaft G has its bearings *a a* mounted on and secured to the main bed-plate A.

Through the center of cylinder F runs a shaft, H, which has one of its bearings in a box, *b*, mounted on and secured to the casing P of the discharge end of the cylinder, and its other bearing in a box, *b'*, at the other end of the cylinder.

Box *b'* is mounted in a bearing-block, I, secured to one end of the cylinder. This bearing-block also carries another shaft, J, on which is mounted a pinion, Z, and the driving-pulley K. Pinion Z, on shaft J, gears with a large spur wheel, L, on shaft H, and which, in turn, meshes with the teeth of another spur-wheel, M, mounted on shaft G. On the other end of shaft G is secured another gear-wheel, N, which, in turn, drives another gear-wheel, O, mounted on a shaft, 1, which has its bearings in a box, *c*, mounted on a suitable standard, 11, which is secured to the bed-plate A. On the shaft 1 is also secured the pulley *d*, which drives the endless belt *e* that carries off the brick *f* as discharged from the mold. (See Fig. 1.) For this purpose belt *e* is made to pass around another pulley, *g*, mounted loosely on a stud-pin, *g'*, secured to the upper end of a standard, *h*, and which rises from, and is bolted to, the bed-plate A.

It is deemed advisable to provide each of the pulleys *d* and *g* with flanges on their edges, to retain the belt *e* better in place.

On shaft H, within the cylinder F, are mounted and secured a series of sleeves, *i*, on each of which are formed one or more (two preferred) cutting and pressing blades, *k*, and which are set obliquely to its axis, so as to form, as it were, a portion of an Archimedean or forcing screw. These blades serve a two-fold purpose, as they serve, in the first place, as active agents in the tempering of the clay; and, in the second place, because of their obliquity to their center of rotation, as mediums for charging the molds with the clay. Each sleeve is firmly secured to the shaft by means of a screw-bolt, *l*, and can be removed and returned or replaced at will. On the outside of the outer end of cylinder F, on the shaft H, is secured a disk, *m*, to close the shaft-opening in the head of the cylinder.

F' represents a feed-hopper to the cylinder.

The end of cylinder F next standard D is provided with a casing, P, which may either be cast in one piece with cylinder F, or made separately, and afterward secured thereto in any suitable and substantial manner. In this casing is formed a channel or throat, *n*, through which the clay is forced by the blades *k* into the brick-molds Q. The length of the mouth *n'* of the throat or opening *n* of cylinder F across the end of the casing P of the latter will be made to correspond with the number of molds Q arranged in the mold-carrier Q', it being, of course, made longer where it has three molds to fill than where there are only two, and so on.

The end of the casing P next the mouth is provided at each of its sides with a flange, *o*, and to each of which is bolted a strong plate, *q*, provided with a raised flange, *r*, and which projects laterally toward the mouth *n'* of the casing. The projections thus arranged form guide-grooves, into which the sides of the mold-carrier Q' are arranged, and in which they are moved up and down as they are alternately raised to have the molds filled with clay, and drawn down to be compressed, and to discharge the brick when pressed.

The grooves thus formed between the inner face of the projections or flanges *r* and the face of the end of the casing P serve to keep the face of the molds and their carrier firmly and closely against the face of the casing P, and thus prevent the escape of the clay between the carrier and casing.

In the face of casing P, immediately below its mouth, is formed an oblong rectangular recess, into which is snugly fitted and inserted a rectangular bed-plate, *s*, of corresponding size and thickness, so as to fill the recess completely and be flush with the edges of the recess.

The recess and bed-plate *s* are made of a length equal to or nearly equal to the length of the mouth *n'* as it runs horizontally across the casing; or, in other words, it ought to be of such length as will enable it to slightly overlap at each end the outer end of each of the outside molds. It should also be of such width in a vertical direction as to slightly overlap both the upper and lower edges of the molds.

Bed-plate *s* at its rear side is provided with two or more sets of friction-rolls, *t*, according to its length and number of molds used. Each set consists of an upper and an under roll to keep the bed-plate from turning or twisting out of a true vertical plane. These rolls are so arranged as to slightly project beyond the inner face of the bed-plate, and thus bear against the face of the recess formed in the casing, and thereby support any pressure brought upon the outer face of the bed-plate.

To the under side of the casing P is secured a stout bent spring, R, the free end of which is made to bear against the lower edge of bed-plate *s*, and hold it in place, and also serves, when (and the manner of which will be hereafter explained) the bed-plate has been depressed, and the active cause of its depression removed, to again raise it to its normal position against the under side of the mouth *n'* of the casing, and which it is the more easily enabled to do by the arrangement, above referred to, of the friction-rolls *t*, which render it easy to be moved back and forth.

The mold-carrier Q', in which the molds Q are formed, consists of a strong metal frame

composed of an oblong block, *u*, in which the molds Q proper are formed, and on which, at its upper side and inner face, is also formed a rectangular plate, *v*, the side edges of which—and which extend to the lower edge of block *u*—form the guides of the molds, and travel in the grooves or guideways before referred to, and which are formed by the flanges *r* of side plates *q*.

Plate *v* also serves to cover the mouth *n'* of the cylinder F, and confine the clay therein, as the molds Q, and to which it is attached, descend for the purpose of having the brick compressed and discharged.

The molds receive motion from a connecting-rod, S, pivotally attached at its upper end to two lugs formed on the under side of block *u*, and at its lower end to a stud or crank-pin eccentrically arranged on, and secured to, the outer face or side of spur-wheel N, and through which it derives motion and communicates it to the mold-carrier.

The molds Q formed in the block *u* may be of any required form and size, and are provided with plungers *w*, which fit snugly therein. To the back of these plungers or pistons are secured stems w^1, through which pressure and motion are imparted to them for the purpose of compressing the clay within the molds.

Each stem w^1 is cleft at its outer end for the reception of a friction-roll, w^2, and which turns upon and is held in place by a small shaft or pin, w^3, (see Fig. 3,) which passes through stem w^1.

On the upper end of the standard D (before referred to as being erected upon and secured to the rear end of the main bed-plate A of the machine) is formed a socket-head, T, for the reception of the cam-stems, U, there being one for each mold, and all arranged in the same horizontal plane, to correspond with that of the molds, which are also arranged horizontally in the same plane with each other.

The positions of the cam-stems U are adjusted to the pressure required by means of the regulating-screws *y*, the inner ends of which bear against a disk or plate, y^1, made of steel or other suitable metal, arranged at the inner end of the socket, and which, in turn, bears against the inner face of a disk of vulcanized rubber, y^2, or other compressible but elastic material.

Upon these elastic disks y^2 the inner ends of the cam-stems U bear. Stem U is held in place by a screw, y^4, which takes into a groove cut longitudinally in its periphery, but not entirely through all its length, as shown in Fig. 3.

The outer end of this cam-stem is provided with a cam-face, y^3, on its upper side, and is similarly formed on its under side, as represented in the drawing, or it may be simply beveled off. The upper face y^3 constitutes the the cam through which pressure is imparted to the molds on the descent of the latter, and the under side is rounded or beveled off so as not to continue the pressure any longer than is absolutely required for the purpose, as too long a descent of the molds under pressure would unnecessarily increase the size of the machine and length of stroke of the mold-carrier Q' and bed-plate *s*.

On the upper end of the standard D, immediately above the cam-stems U, is secured a strong frame, V, bent or formed somewhat like a goose-neck. The free end 2 of this frame is made to project inwardly toward the cylinder F and downwardly toward the molds, and that in such manner that its outer side shall lie in the same vertical plane as the outside face of the mold-block *u*, and is so arranged with respect to the latter that it shall simply allow block *u*, in its up and down movement, to freely pass between it and the face of the casing P.

This downwardly-projecting arm or end 2 of the frame V is beveled on its inner side to form a wedge-shaped cam-face, 3, as shown in Fig. 3, and, being comparatively thin at its extreme end, passes freely between a friction-roll, w^4, attached to stem w^1, and the outer face of the mold-block Q', and hence, it being stationary, when the mold-block Q' is raised by its cam-face 3, (and which is made of proper size for the purpose,) draws back the plunger against the inner face of the mold, and thus prepares the latter to receive a fresh charge of clay.

That the cam 3 may work smoothly, the screw-pin w^3, upon which the friction-roll w^2 is mounted in the slot of the plunger *w*, also carries another friction-roll, w^4, but on the outside of the stem w^1, and it is against this friction-roll that the cam-face 3 of arm 2 bears, and thereby moves the plunger *w* back.

The goose-neck-shaped frame V is made of such width in the line of the molds as will allow a cam-arm, 2, to be formed thereon, or otherwise secured thereto, for each mold and plunger, or one for each pair of molds and plungers. Where but one arm, 2, is used for a pair of plungers, the arm should be made wide enough to bear simultaneously against the friction-rolls w^4 of each, and for which purpose it is preferred that the outer end of each of their screw-pins, upon which they are mounted, should be turned toward each other. Again, the lower end of cam-arm 2 should not descend sufficiently far as, on the rise of the molds after the discharge of the brick, to commence drawing the plungers *w* back before their faces have been properly scraped and cleaned, and to the devices for which I will shortly refer.

Upon the standard D, immediately below the cam-pins U, is formed or secured block W, the upper and outer portion of which is beveled off to form a cam-face, 4, against which the friction-rolls w^2, that are mounted in the slots of the plunger-stem w^1, are brought to bear, on the descent of the mold-block, for the purpose of discharging the brick from the molds.

The cam-face W is so formed and arranged that the rolls w^2 do not come in contact there-

with until the upper edge of the molds Q proper have entirely passed the lower edge of the casing P, and so that the final discharge of the brick therefrom shall occur when the molds are in proper position to deposit it upon the off-bearing belt *e*.

On the bed-plate A, between the standards B and *h*, is erected another standard, X, to the upper end of which is pivoted a lever, Y, the lower end of which carries a cam-pin, 5, on which is mounted a friction-roll which plays into a cam-groove, 6, cut or otherwise formed in the periphery of a pulley, 7, mounted on and driven by shaft G.

The friction-roll I prefer to make slightly conical, and the groove 6 of corresponding shape.

The upper end of lever Y is bent inwardly at a point some distance above its pivotal pin 8, and extends for a distance in a horizontal direction, near to or at the center of the machine, and is then bent upward in a vertical direction, and made to take into a slot cut into a slide-plate, 9, which moves on two supporting-guides formed by the plates 10, that are secured to the under side of the casing P, one on each side. The lower edge of each plate 10 is bent or turned squarely inward to form the guides, and which, as thus bent, take into grooves 11, formed on the outer sides or edges of plate 9, and are represented by dotted lines in the drawing.

This plate 9 forms the scraper or mold-cleaner, and, for this purpose, through the lever Y, receives an intermittent back-and-forth movement toward and from the face of the molds, through the cam-groove 6 of pulley 7, in the following manner—that is to say, the cam-groove 6 is so shaped and fashioned as, through lever Y, to hold the scraper-plate 9 back in the position shown in Fig. 2—*i. e.*, away from the face of the molds during the entire descent of the latter, and until the discharge of the brick upon the off-carrying belt *e* has taken or is about to take place. At this point, by the peculiar shape of the groove, it is suddenly thrust forward against the inner face of the molds, and there held until the latter, in their ascent to receive a new charge of clay, have fairly passed the scraper and been thereby scraped and cleaned, or, if desired, until they have reached their full upward stroke, when it is withdrawn and there held as before, until the molds have again descended and discharged the brick just pressed, and so on. In this connection it is to be remarked that not only the face of the molds, but of the plungers *w* also, have been scraped and cleaned, they not being withdrawn by the cam-arms 2 within the molds until after they have passed the scraper and been properly cleaned. To this end a groove, 12, is cut entirely across the whole inner end or edge of the scraper, and a piece or strip of leather, 13, or other suitable material for the purpose, secured therein, and which, when worn, may be removed and replaced with another.

The cylinder F, if desired, may be made of such length and provided with enough blades, *k*, to temper the clay of itself before feeding it to the molds; or it may be simply made of such length and capacity as to feed previously-tempered clay to the machine.

The operation is as follows: Clay being placed into and continuously supplied to the cylinder F, the screw-blades *k* feed and force it into the molds Q each time the latter are raised and brought opposite to the mouth *n'* of the cylinder. During the latter part of the ascent of the molds they are mostly, if not quite, filled, and, to some extent, compressed, and, therefore, in the continued motion of the machine, ready to descend with the drag of the connecting-bar S, as soon as it has passed its upper dead-center. For this purpose, however, and previous to the completion of the upward stroke of the molds, the cam-arms 2 will have withdrawn the plungers *w* back, as before described, to make room within the molds for the clay which forms the charge for a brick.

The molds then commence their descent, and continue without further action being had thereon until their upper edges have fairly passed the lower edge of the mouth *n'* and are squarely opposite the bed-plate *s*.

At this point the friction-rolls w^2 then come in contact with the cam-faces y^3 of cam-pins U, and which, by regulating-screw *y*, have been first properly adjusted for the purpose, as the molds descend force the plungers *w* inwardly against the clay in the mold, and thereby compress the clay firmly against the bed-plates, and temporarily bind the clay to the latter.

The clay in the molds being thus firmly pressed against the bed-plate *s* causes the latter to move with the molds, and which is the more readily effected because of the friction-rolls *t*, until the pressure on the clay has been relaxed by the passage of the plunger-stem w^1 and its friction-roll w^2 beyond the sphere of action of the cam-pins U by the descent of the molds.

At this stage of the process—that is to say, as soon as the clay has been released from pressure—the bed-plate *s* is forced back to its normal position by the reaction of the spring R, which, by the forced descent of the bed-plate, had thereby been placed under tension. By this means the bed-plate is prepared to receive the pressure of the next batch of bricks.

The molds continue to descend without further action being had upon the plungers *w* until their upper edges are entirely clear of the lower edge of the casing P, at which point the plunger-stems w^1, through their friction-rolls w^2, are brought in contact with the cam W on the face of standard D, and by it are forced inwardly until they discharge the brick upon the off-bearing belt *e*, and which, being

in constant motion, are then carried off to the point of delivery.

The point of discharge from the molds is so arranged that the upper edge of the molds will, when that occurs, lie in a plane somewhat below the plane of the scraper 9. Now, the movement of this scraper is so timed that it commences to move toward the molds as the latter are nearing the point at which they discharge the brick, and reaches and bears against the upper edge of the face of the molds, as the latter commence their ascent for a new charge of clay. The scraper then remains stationary and in close contact therewith, scraping and cleaning their face and the faces of the plungers until the molds have entirely passed it. As soon as the molds have passed the scraper the lower end of each of the cam-arms 2 enters between the outer wall of the molds and the corresponding friction-rolls w^4, mounted on the side of the plunger-stem w^1, and thereby, as the molds ascend, draw the plungers back to the rear end of the molds, and thus prepare the latter to receive a new charge of clay. These operations are repeated each time a brick is made.

With regard to the pressure exerted upon the clay in the mold by the action of the cam-pin U upon the stems w^1 of the plunger w, I wish to add that, as it is possible more clay may be forced into the molds at one time than another, and consequently if too full, and the cam-pins U adjusted for a less amount, then, unless some yielding device were employed to compensate for the additional matter, some part must give way or the machine stop. To provide against such a casualty the compressible and elastic disk y^2 is inserted between the inner end of cam-pin U and the disk y^1, upon which the adjusting-screw y bears; or a stout spring may be used for the purpose, but the other is deemed preferable.

This device allows the cam-pins to yield slightly and avoid injurious consequences.

It will be apparent that the movable bed-plate s can be equally efficiently used with a mold-carrier having a vibrating instead of a reciprocating motion, or with a mold-carrier having continuous motion in one direction, such as a wheel provided with molds and plungers, but little if any change being required, further than to cause it to move back and forth in the arc of a circle, instead of in a straight line as applied to the machine represented in the drawings.

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

1. A bed-plate, s, having an intermittent back-and-forth movement, in combination with the pressing and molding devices of a brick-machine, for the purposes set forth.

2. A bed-plate, s, having an intermittent back-and-forth movement, in combination with a traveling mold provided with a plunger or piston, substantially as and for the purpose set forth.

3. The combination of a bed-plate, s, having an intermittent back-and-forth movement, in the manner substantially as described, with a traveling mold provided with a plunger, w, and an actuating cam, U, for the purpose set forth.

4. A bed-plate, s, provided with friction-rolls t, and having a back-and-forth movement, in combination with the compressing devices of a brick-machine, substantially as and for the purpose set forth.

5. The combination of a bed-plate, s, having a back-and-forth movement, and a spring, R, with the compressing devices of a brick-machine, substantially as described.

6. The combination of a bed-plate, s, provided with friction-rolls t, and having a back-and-forth movement, and a spring, R, with the compressing devices of a brick-machine, for the purposes set forth.

7. The combination of the cam-arm 2, constructed and arranged substantially as described, with a reciprocating or vibrating mold, Q, and its plunger w, for the purpose set forth.

8. The combination of the cam W, as arranged, with a reciprocating or vibrating mold, Q, and its plunger w, substantially as and for the purpose set forth.

9. The combination of the cam-arm 2 and cam W, as arranged, with a moving mold and its plunger, substantially as and for the purposes set forth.

10. The combination of the scraper 9, constructed, arranged, and operated substantially as described, with a traveling-mold provided with plungers, for the purposes set forth.

11. The combination of the elastic disk y^2, adjusting-screw y, disk y^1, and a movable cam-pin, U, with the compressing plunger or piston of a brick-mold, substantially as and for the purpose set forth.

In testimony that I claim the foregoing as my own I affix my signature in presence of two witnesses.

WM. A. GRAHAM.

Witnesses:
D. G. STUART,
E. K. WILSON.