4 Sheets—Sheet 1.

J. C. ANDERSON.

Brick-Machine.

No. 213,085. Patented Mar. 11, 1879.

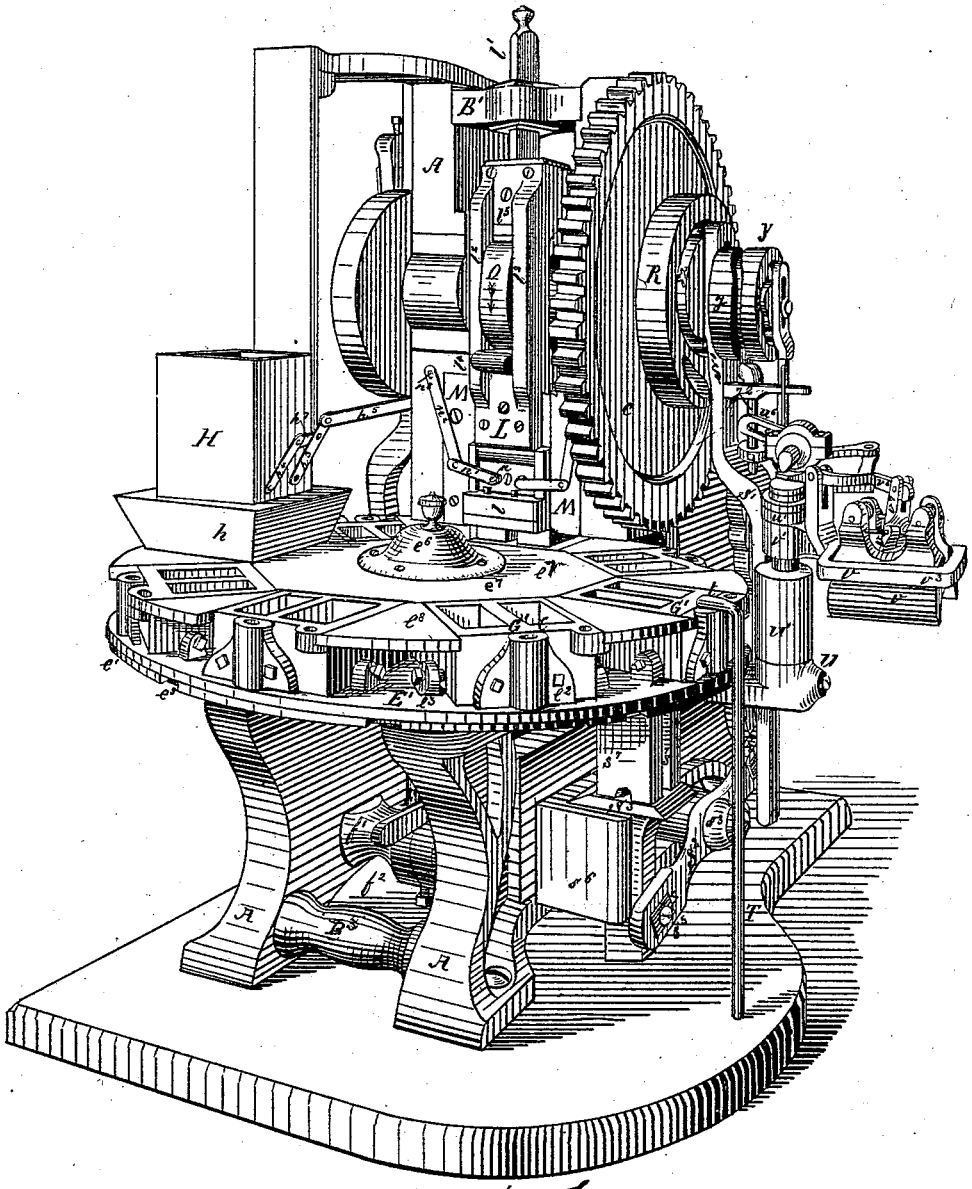

Fig. 1.

Witnesses.
Emil H. Frommann
Ernst Jebsen.

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Brick-Machine.

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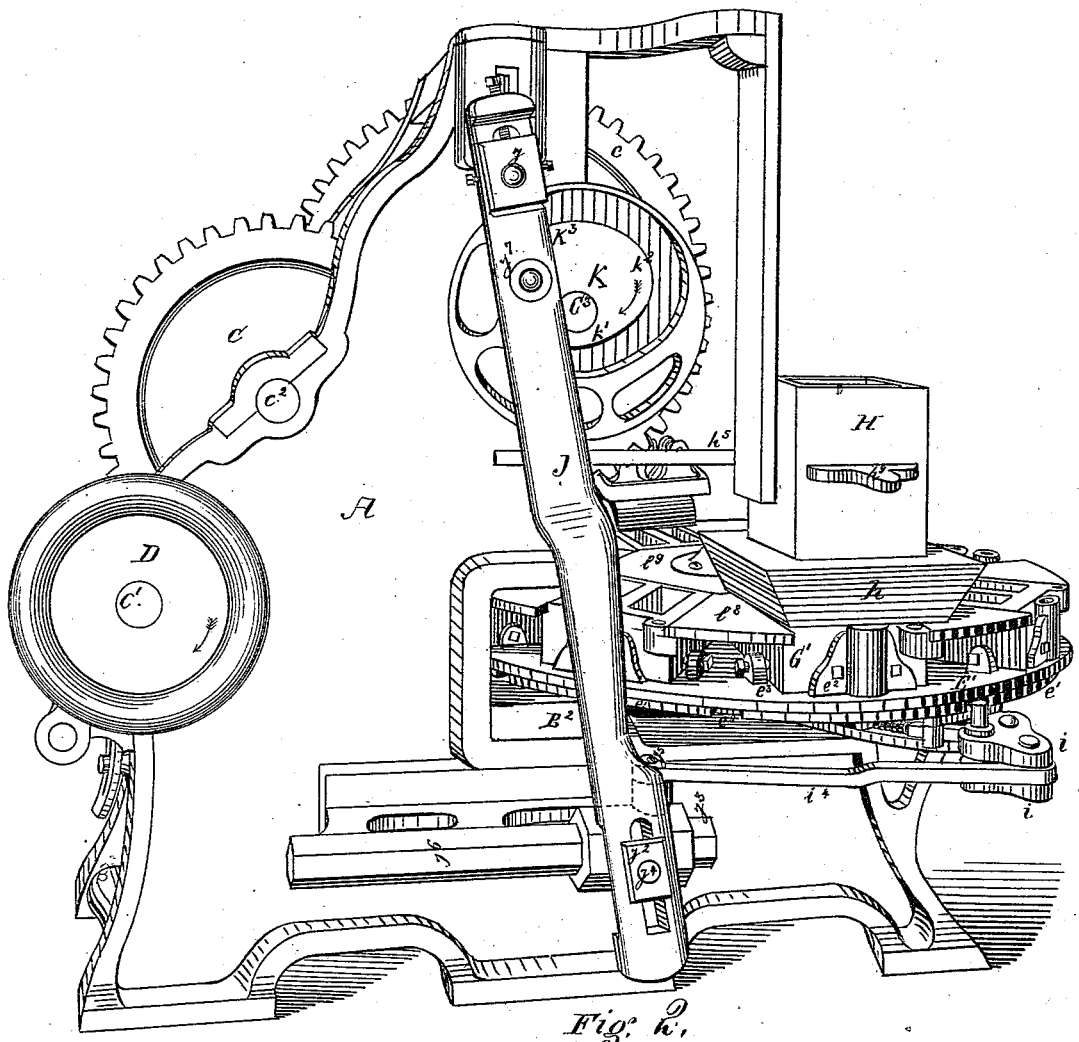

Fig. 2.

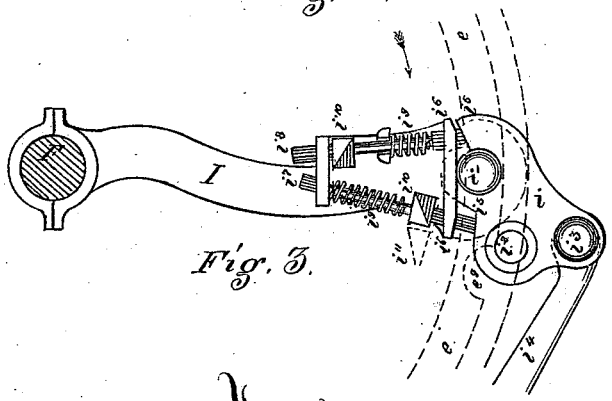

Fig. 3.

Witnesses.
Emil H. Frommann
Arnold Jebsen

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4 Sheets—Sheet 3.

J. C. ANDERSON.

Brick-Machine.

No. 213,085. Patented Mar. 11, 1879.

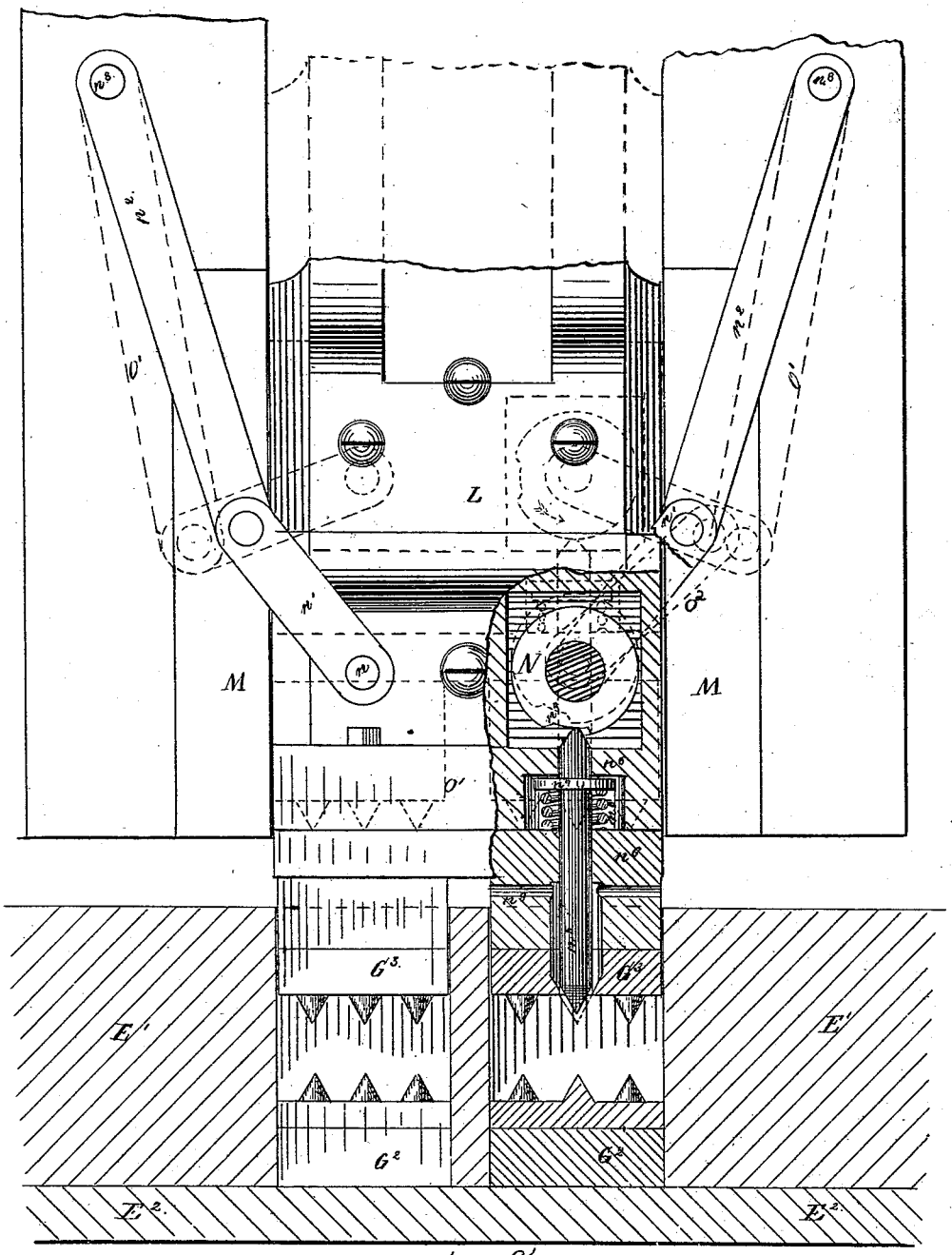

Fig. 8.

Witnesses.
Emil H. Bronnmann
Oscar Jebsen

Inventor
J. C. Anderson

4 Sheets—Sheet 4.

J. C. ANDERSON.

Brick-Machine.

No. 213,085 **Patented Mar. 11, 1879.**

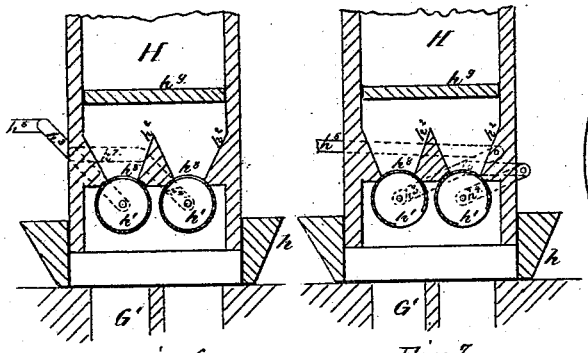

Fig. 6.

Fig. 7.

Fig. 4.

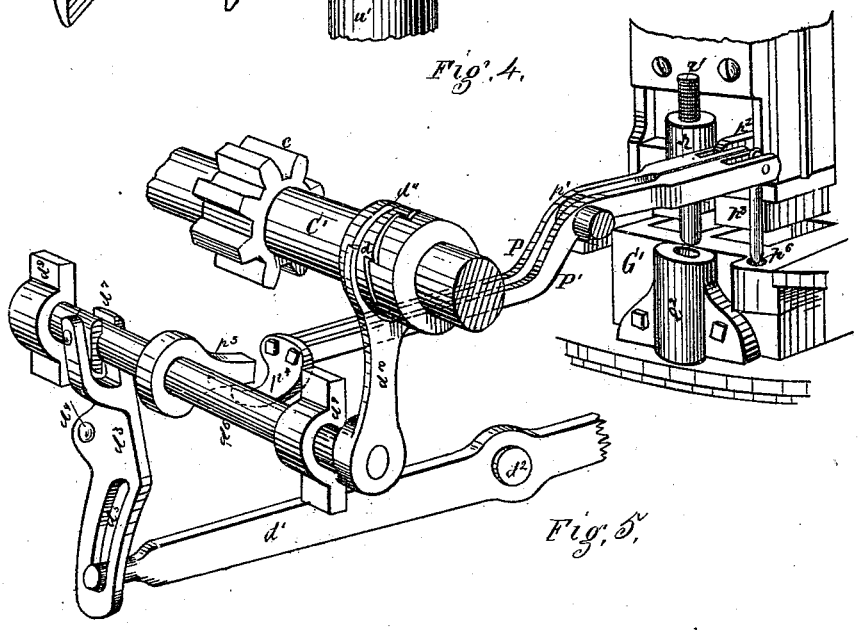

Fig. 5.

Witnesses.
Emil H. Frommann
Ernst Jebsen.

Inventor
J C Anderson

UNITED STATES PATENT OFFICE

JAMES C. ANDERSON, OF PITTSBURG, PENNSYLVANIA.

IMPROVEMENT IN BRICK-MACHINES.

Specification forming part of Letters Patent No. **213,085**, dated March 11, 1879; application filed November 25, 1878.

To all whom it may concern:

Be it known that I, JAMES C. ANDERSON, of the city of Pittsburg, Allegheny county, and State of Pennsylvania, have invented a new and useful Improvement in Brick-Machines, which improvement is fully set forth in the following specification, reference being had to the accompanying drawings.

The invention relates to a machine for molding and forming bricks and paving-blocks from homogeneous dry clay-powder.

The object of my invention is to provide a mechanism to complete the entire process in one operation of molding the clay-powder into the proper form and solidity and expelling the air from the clay and molds.

My invention consists in a system of devices of peculiar construction, arrangement, and operation, hereinafter more fully described and claimed, combining a complete machine of automatic movements, positive and accurate in their operation, and of great power in compressing the clay, whereby the clay-powder to be molded is fed to and taken up by the molds or dies in even and exact quantities, and subjected therein to intense pressure, expelling and freeing in the molding operation the air from the clay within the molds, giving to the articles molded an exceedingly solid and firm texture and fineness of finish, and by the same continuous operation bearing them from the machine and placing them on a suitable carrier to be transported into the kiln.

In the accompanying drawings, Figure 1 is a perspective view of the front and discharging side of the machine. Fig. 2 is a perspective of the reverse or charging side of the machine, showing the disk-movement in place. Fig. 3 is a detached sectional view of that part of the disk-movement operating beneath the disk. Fig. 4 is a side sectional view of the operating cam-disk for discharging the bricks from the molds, and of the operating cam-disk for bearing the bricks off from the molds. Fig. 5 shows the rear of the plunger with safety device attached and the mechanism for operating the clutch. Fig. 6 is a vertical cross-sectional view through the clay-spout, showing the cylinder-openings turned up to receive a charge of clay. Fig. 7 is the same view with the cylinder-openings turned down to discharge the clay into the molds; and Fig. 8 is a cross-section through the dies and a part of the plunger, showing the mechanism for freeing the air from the molds.

A suitable frame-work is constructed of cast-iron, with reference to the particular parts to be attached to and operated in connection therewith and the great strain required for compacting the clay-powder in the dry state. This frame-work consists mainly of two upright castings, A A, placed side by side a suitable distance apart, and secured firmly in that position by screw-bolts to the cross-castings B^1, B^2, and B^3. The shafts C^1, C^2, and C^3 have their bearings in the side castings A, which castings are formed to admit the one-half diameter of the shaft and to provide recesses to receive and give firmness to the caps. The driving-pulley D upon the shaft C^1 admits of a diameter of forty-two inches, and should have at least fourteen inches of face and two inches of rim to give belt-surface and maintain the proper momentum in driving the machine with the requisite force for the firm compacting of the clay-powder, which force is multiplied and transmitted to the main actuating-shaft C^3 by means of the pinions and gear-wheels *c* upon the shafts C^1, C^2, and C^3. A toothed clutch, *d*, is secured to the shaft C^1 by a groove and feather in position to slide into and engage with corresponding teeth on the hub of the driving-pulley, which pulley is allowed to revolve freely upon the shaft when the clutch is out of gear, and is held in position laterally by a collar on the shaft, recessed between the clutch and the hub, and a collar on the end of the shaft.

A lever, d^1, is formed of suitable length to extend from a convenient point at the front of the machine to the rear thereof to engage with and operate the clutch mechanism for throwing the clutch in or out of gear, as occasion may require. This lever has its pivotal fulcrum upon a stud, d^2, to the inner side of the frame-casting, and is provided with an anti-friction roller at the weight end of the same. A lever, d^3, having its pivotal fulcrum upon a stud, d^4, to the frame, is formed with a cam-slot, d^5, in which groove the end of the lever d^1 is inserted. The groove d^5 extends from a suitable point below the stud downwardly

to correspond with the throw of the lever d^1, and inclined outwardly to correspond with the throw of the clutch-bar d^6. The top end of the lever d^3 is forked to clasp the two sides of a collar, d^7, and is pivoted thereto by bolts d^8 through the forked jaws into suitable recesses in the collar. These recesses are elongated vertically to compensate for the diverging lines of movement of the lever d^3 and clutch-bar. The clutch-bar is held in place by boxes d^9, secured to the frame A. An arm, d^{10}, is secured rigidly to the end of the clutch-bar, and extends upwardly at right angles with the bar in such position and of such shape as to fit into the groove d^{11} on the periphery of the clutch and to encircle the one-half diameter thereof.

In the operation the clutch is placed in gear by forcing downward the end of the lever d^1, which will cause the other end of the same within the inclined groove of the lever d^3 to ascend in a true vertical line, forcing the diverging groove of the lever d^3 in the same vertical plane, which actuates the lower end of this lever outwardly, and the other end thereof in an opposite direction, and the clutch into gear with the clutch of the hub; and, in like manner, when it becomes necessary to stop the machine quickly, the end of the lever d^1 is simply drawn upward, which cuts off suddenly the driving-power and the momentum, and the machine comes to a sudden stop. Secured rigidly by screw-bolts to the sides A of the frame-work, and to the cross-casting B^2, is a stationary disk, E^2, which disk is turned up to present an even and true surface on the top, and of suitable diameter to come within the recess formed by the flange of the disk E^1. An opening is made through the center of this stationary disk to admit and support a vertical shaft, F, which shaft is also supported and held in place by a two-part clamping-box, f^1, at the bottom of the shaft, which box is securely bolted to the side castings A.

The shaft is made to extend a suitable distance above the top of the stationary disk to form a central axis, upon which the disk E^1 revolves. The main casting of the disk E^1 is formed with a central hub and a peripheral flange, e^1, and a system of lugs, e^2 and e^3, and is also provided with openings to receive the lower edge of the die-boxes G^1, and to allow the lower die-matrices, G^2, to rest upon the lower disk, E^2.

A bearing is formed for the vertical shaft F in the central hub of the disk E^1, and made adjustable to the wear by a Babbitt-metal space, the Babbitt strips being bored out to a true center to the size of the shaft, and the shaft is passed through the bearing from the top, and is secured firmly in position by a snug fit through the hub of the lower disk, E^2, and the tightening of the bolts of the clamping-box f^1 to prevent the shaft from rotating with the disk E^1. The shaft F is provided with a collar on top thereof, which collar has a bearing on the top of the central hub of the disk E^1, to prevent the disk from being forced unduly upward in the operation of pressing the bricks from the molds.

The disk E^1 is kept at an easy bearing on the disk E^2 by means of the recessed cap e^6, which is securely bolted to the top of the central hub with a bearing upon the top of the shaft-collar, and the shaft raised by means of the screw f^2 beneath the bottom of the shaft to give the disk a pivotal bearing upon the top of the shaft. An oil-cup upon the cap e^6 communicating with ducts in the top of the shaft serves to keep the journal lubricated and free from the clay-powder.

The die-boxes G^1 are made in this example suitable to mold two bricks of the ordinary size, and of a depth of seven inches to admit the thickness of the lower die-matrices of two inches and five inches of the clay-powder, and are cast in one piece of suitable thickness of walls to resist the outward pressure in the molding operation, and are secured firmly to the disk-casting by bolts through suitable lugs, and adjusted to their proper position with reference to the top die-matrices, G^3, by bolts through the lugs e^2 and e^3.

The disk E^1 is made to present an even surface on the top at the same level of the top of the die-boxes by an octagon plate, e^7, which rests within recesses formed in the top edges of the die-boxes and central hub and by plates e^8 secured at the top edges and between the die-boxes by dovetailed rabbets.

The peripheral flange e^1 is provided with notches e^9, of half-circular form, to furnish suitable holes for the disk-operating mechanism, hereinafter described.

The prepared clay-powder is supplied to the machine by a vertical spout, H, which spout is made of square shape, corresponding in size to the molds, and terminates about three inches above the top of the disk E^1. Telescoped over the end of this spout, and resting upon the disk, is a hopper, h, the use of which hopper is to form a secure joint at the junction of the spout and disk-top to prevent the escape of the clay-powder with as little friction as possible, and is therefore made to hug the disk by its own gravity, and readily yields as the disk may be raised or lowered, and also adjusts itself automatically to the wear by contact of the disk in motion.

Two cylindrical vessels, h^1, are made of sheet metal, the peripheral sides of which form the three-fourths part of a circle, leaving the one-fourth part thereof open. These cylinders are secured within and near the lower end of the spout by suitable trunnions in position over the molds when the disk E^1 is at rest. Inclined parts h^2 are formed within the spout, and fitted up snug to the sides of the cylinders, forming ports h^5, through which the clay-powder enters the cylinders and is discharged into the molds, and prevented in the operation from unduly passing through to the molds.

Fixed to the trunnion-shafts of the cylinders are crank-arms h^3 and h^4. The wrist of the

crank-arm h^3 is connected with a wrist on the oscillating arm J by a pitman-rod, h^5, and the crank-arms h^3 and h^4 are connected together by a connecting-rod, h^7. A gate, h^9, is fitted in the spout above the cylinders, to cut off the supply of clay when desired. These cylinders intervene to prevent the clay-powder from compacting unduly in the molds by the gravity of the clay in the spout, and are made to correspond in size to each of the molds, and in the operation the cylinders are oscillated a half-turn, bringing the openings in the sides of the same upward to receive a charge of clay-powder through the ports, as shown at Fig. 6 of the drawings; and on the return motion the cylinders are turned down, as shown at Fig. 7, to discharge the clay into the molds.

Beneath the disks E^1 and E^2 is a horizontal arm, I, having a working bearing on the vertical shaft F, and extending parallel with the disks to the outer periphery of the same. A knuckle-joint is formed on the end of the arm, with the jaw-like castings i and pivotal pin i^1. A stud, i^2, is secured to the castings and made part of the jaw, which stud is made to extend a suitable distance above the top of the castings to register with the circular openings e^9 of the disk E^1. A wrist-pin, i^3, is secured to the outer or power end of the jaw, for connecting the pitman i^4. Shoulders i^5 are formed by the jaw-castings on the two sides of the pivotal stud, and like shoulders i^6 are formed on the arm-castings, in such position with relation to each other as to allow a fixed vibrating motion from shoulder to shoulder, which vibration at the stud i^2 corresponds to the depth of the openings e^9 of the peripheral flange of the disk E^1 to allow the stud i^2 to enter the opening and clear the flange, as required in the operation. Sliding bolts i^7 and i^8 are held in place on the top of the arm-casting I by suitable keepers, and provided with spiral springs i^9, in such position as to hold the bolts outwardly, giving the ends thereof a constant bearing against the shoulders i^5 of the jaws. Each of said bolts has projections i^{10} extending upward in close proximity to the under side of the disk E^2. These projections are inclined to latch with like inclined projections in a suitable position beneath the disk to form automatical keepers to prevent the arm I from being drawn forward in the operation until the stud i^2 shall have been drawn forward into the opening e^9 of the disk-flanges, in which operation the shoulder i^5 of the jaw will force the bolt back, and the inclined projection, as a part thereof, will be thrown back to a position to pass the keeper upon the disk E^2.

Fig. 3 of the drawings shows the arm in position to allow the stud to enter the opening for the forward movement of the disk in the direction of the arrow-point, with the keeper, (represented by the dotted lines i^{11},) intervening on the same line, latched with the bolt i^7, which, on the forward motion, will be unlatched, as described, and the disk E^1 moved forward corresponding to the spaces of the molds, which will bring the arm in position to latch the bolt i^8 with the keeper i^{12}, to prevent the arm from being thrown back until the stud is released from the opening.

It will be seen that the leverage incident to the peculiar shape and attachment of the jaws to the power will insure an easy action of the knuckle-joint, and thus prevent a heavy drag against the latch.

A vertical oscillating arm, J, is suspended to a pivotal stud from a bracket to the frame A, in close proximity to the face of a grooved cam-disk, K, which disk is securely keyed to the main actuating-shaft C^3, and rotates therewith in the direction of the arrow-point, and a stud, j^7, provided with an anti-friction roller, branches from the inner side of the arm into the groove of the disk a suitable distance below the pivoted stud j to oscillate the lower end of the arm in conformity with the peculiar shape of the groove, a proper throw for rotating the disk E^1 from mold to mold, and maintaining it securely in that position a suitable time in the molding operation, the pivotal stud being made adjustable vertically both in the arm and in the bracket for changing the relative distances between these two studs for shortening and lengthening the throw at the lower end of the arm to insure the accurate adjustment of the forward movement of the disk E^1. The lower end of the arm is slotted vertically to work on a sliding box, j^2, which box furnishes a bearing for the stud j^4 to connect this end of the arm to the cross-head j^3, and the cross-head is joined to the connecting-pitman i^4 by a wrist-stud, j^5.

The cross-head has its guide-bearings upon a horizontal slide-bracket, j^6, which bracket is secured to the frame A. When the stud j^7 is in that part of the cam-disk nearest to the central shaft, the lower end of the oscillating arm J will be thrown back to its farthest point, and the horizontal arm I will also be thrown back, bringing the jaw-stud in position to close into the notch in the peripheral flange of the disk E^1, which position is shown in Figs. 2 and 3 of the drawings, and in this position the clay-cylinders are turned down, as shown in Fig. 7 of the drawings. The line of the groove in the cam-disk diverges slightly from this point sufficient to actuate the arm forward until the jaw-stud enters the notch in the disk, when the groove in the cam-disk will maintain a true circle to the shaft from this point to the point k^1, which maintains the arms J and I and jaw at rest until the point k^1 in the groove is reached, when by the diverging line of the groove to the point k^2, the arms will be carried forward to their extreme point, bringing the disk E^1 forward one space of the molds and turning upward the openings in the clay-cylinders. The groove in the cam-disk then maintains an even distance to the shaft to the point k^3, which maintains the arms, the jaw, and the disk at rest, when, by the convergence of the groove in the cam-disk back to the commencement point, the arm J will actuate

the jaw from the notch in the disk-flange, and the arm I will be carried back with the arm J to the first position to repeat the operation.

The slides M are securely bolted within recesses formed in the side castings A, and are provided with V-grooves in their edges to member with corresponding V-grooves on the cross-head of the plunger.

The plunger L is formed by a cross-head casting, l, provided with suitable rises on the edges to work into the V-grooves of the slides M, and a top guide-bar forging, l^1, made to work into a vertical guide-box formed in the top cross-casting, B^1, of the frame. These parts l and l^1 are connected securely together in a firm housing formed to the actuating-cam O by the forgings l^2, which are formed to member into suitable recesses on the top of the cross-head casting and the bottom of the guide-bar forging and firmly bolted thereto. A firm base is formed on the top of the cross-head within the opening of the bottom of the housing, in which is fitted, and held in place by suitable shoulders and bolts, a working-surface, l^4, of phosphor-bronze metal for sustaining the great pressure and drag of the cam in compacting the clay, and a like working-bearing, l^5, is formed and secured to the bottom of the guide-bar within the housing, providing a bearing upon the top of the cam for actuating the plunger upwardly. The top and bottom working-surfaces hug to both sides of the cam, which cam is made of such form as to prevent and maintain the same vertical diameter between these bearings in all positions, and therefore have a continuous bearing upon both the upper and lower surfaces, which in the operation will impart a vertical motion to the plunger incident to the peculiar points of contact through a vertical line of the cam upon the working-surfaces of the bearing.

Openings are formed in the cross-head above the dies, into which openings are placed a small disk, N, having a notch, n^4, in the one side, which notched disk is secured in position by trunnion-shafts n, having suitable bearings in the cross-head casting. To the outer end of the trunnion-shafts are secured rigidly the arms n^1, which arms are connected by toggle-joints to corresponding arms n^2, and these latter arms are secured by pivotal studs to the side castings A of the frame. Flanges are formed at the bottom of the cross-head, through which flanges is secured the top die-casting, and the die-matrices G^3 are securely bolted thereto. The matrices are made of steel or other suitable metal for maintaining a smooth hard surface, upon the face of which are secured wedge-shaped projections, rounded, of cone-like form, converging from about one inch at the base to a point at about the same distance from the face of the die-matrices. The central cone-projection in each of these top die-matrices is formed by a stud, n^5, of equal diameter to the face of the cone, and extends upwardly, bringing the top end thereof to bear against the edges of the notched disk N, and is held in place laterally by a bearing, n^6, within the die-casting and cross-head. A collar, n^7, is fixed to this stud rigidly to afford a shoulder for the upward pressure of the spiral spring n^8. The hole through the face of the matrix is made to fit closely to the stud at that point, but widens upwardly at the same angle to that of the cone to form an air-duct around the stud, which air-duct communicates with air-ducts n^9 through the die-casting to a point above the top of the die-boxes. To the back of the cross-head casting is a sleeve-bracket, r, in a suitable position to form a keeper for the vertical guiding-stud r'. The use of the guiding-stud is for the adjustment of the disk E^1 to a position to bring the die-boxes in the exact line with the top die-matrices, and for that purpose is made tapering at the lower end, allowing the full diameter of the same to come below the face of the die-matrices, and is forced down into the opening in the lug e^2 of the disk, which opening is made a snug fit to the full part of the stud and is steel-bushed to prevent too much wear.

In the operation of this plunger part of the machine, when the full side of the cam O is turned upward the plunger will be raised to its extreme upward throw, and the top die-matrices will be at a position above the top of the disk, as shown by the dotted lines o^1 in Fig. 8 of the drawings, and the arms n^1 and n^2 will be in the relative positions as also shown by the dotted lines, and the notched disk N will be in position with its periphery resting upon the top of the cone-stud, and in this position the molds will be full of the clay-powder, in which state the clay being deprived of its water leaves the pores open to be filled with air.

The cam being rotated forward in the direction of the arrow-point the plunger will be forced downward until the cam shall have made nearly a half-turn, when the plunger will have reached within one-fourth of an inch of its extreme downward throw, and the clay-powder within the molds will have been compressed to within a like distance to the proper thickness of the brick, when, by the action of an indent upon the full side of the cam and a corresponding rise of the top side of the same when at this point, the plunger will stop its downward motion and recede a distance of about three-sixteenths of an inch to allow the escape of the air from the molds.

It will be understood that when the die-matrices enter the molds a tamping of the fine clay-powder is forced into the joints between the die-matrices and the die-boxes, and the air within the interstices and pores of the clay-powder will offer but little resistance to the pressure in the first part of the operation, but will readily yield to the pressure, and before it reaches that degree of density by the pressure to force its way through the tamping out of the mold an exceedingly hard fin is formed of the tamping,

which effectually prevents the escape of the air from the molds. It is therefore obvious, unless means were provided for the elimination of the air from the molds, that no true bond could take place, and that the expansion incident to the great elasticity of air when released from pressure would stratify and burst the bricks, and for that reason the plunger is made to recede, by which means the tamping fin will be withdrawn from the joints, and the compressed air will have vent to force its way from the molds. The wedged cones upon the matrices also serve to compact the clay with equal solidity in the center of the brick, and thus force the air to the surface, to be expelled as described. The plunger is again actuated downward to its extreme point by a swell upon the full side of the cam and a corresponding indent on the top or lean side thereof. During this first downward operation of the plunger the notched disk N will have been rotated from the point shown by the dotted lines o^1 in the direction of the arrow-point to point o^2 of the dotted lines, with a continuous bearing upon the top of the central cone-stud n^5, and in the second operation the notch n^4 of the disk N is brought in position over the top of the cone-stud, and the stud, being thus released from pressure from the top, is actuated upward the depth of the notch by the force of the spiral spring, thus withdrawing the cone from the mold a suitable distance, to bring the tapered point thereof in position within the tapered opening of the die-matrix, and thus provide for the free escape of the air from the molds through the ducts. The plunger is then raised to its first position by the action of the full side of the cam against the the top bearing of the housing, by which operation the air is entirely freed from the mold, and a true bond is effected.

In molding the clay-powder into a solid form, and also for the purpose of freeing the top die-matrices from the bricks when so molded, and to prevent the brick from being lifted or burst by the suction-vacuum incident to the rapid withdrawal of the dies in the upward movement of the plunger, the duct remains open for a suitable time to supply air beneath the die until closed by the return action of the notched cam upon the top of the cone-stud by the upward motion of the plunger.

Levers P and P′ are placed longitudinally in the hollow of the machine in a suitable position between the back of the plunger L and clutch-bar d^6, having their pivotal fulcrum on a stud, p^1, to the frame A, the lever P being secured at one end by a pivotal pin to a lug, p^2, of the plunger, and the end of the lever P being pivoted in like manner to a vertical stud, p^3, which stud is tapered at the lower end, and is kept in its vertical position by a suitable keeper to the plunger. The lug of the plunger and top of the stud are slotted at the pivotal pin, to compensate for the diverging lines of motion of the plunger and the levers. Rounded tenons are formed to the other end of these levers, to which a jaw, p^4, provided with corresponding openings, is fitted and secured in place by thread-nuts on the ends of these tenons. The bite part of this jaw comes in suitable position at the proper time to engage with an arm, p^5, of the clutch-bar. The use of this lever mechanism is to provide an automatical safety attachment to guard against injury to the machine in case an accident should occur to any part of the mechanism, by which the mold-disk would be prevented from coming in position to receive the dies on the downward motion of the plunger, in which case serious injury must result to the machine on account of the great power of the plunger mechanism.

In the operation a rocking motion is given to the levers by the motion of the plunger, and the stud p^3 enters the hole p^6 on each downward motion of the plunger when the disk is in its proper position; but should an accident occur to prevent the disk from being in its proper place when the plunger descends, the stud p^3 will come in contact with the disk-top, which will arrest the downward motion of that end of the lever P′, while the end of the other lever, P, secured to the plunger will be carried downward with the plunger, which action will be reversed at the other end of the levers, and the bite of the jaw will be actuated against the arm of the clutch-bar to force the clutch out of gear with the clutch of the driving-pulley, and no damage can occur to the machine other than stripping the thread of the nut of the guide-stud of the plunger.

The push-out mechanism is actuated by a grooved cam-disk, R, which disk is securely keyed to the shaft C^3 and rotates therewith in the direction of the arrow-point. A vertical arm, S, is slotted over the shaft in position with a bearing against the face of the cam-disk. The slot s is made of suitable width and length to provide a vertical sliding bearing upon the two sides of the shaft corresponding to the vertical movement of the arm. A stud, s^1, is secured firmly to the arm, and branches inwardly into the groove s^2 of the disk, and is provided with an anti-friction roller to work in the groove. The arm S^1 is also provided with suitable guide-bearings near the lower end thereof by brackets to the frame A, a rock-arm, S^2, having its central pivotal stud to a bracket, s^3, of the frame A. The ends of this rock-arm are slotted and provided with longitudinal sliding boxes s^4 and s^5. The box s^4, at the one end of the rock-arm, works upon a stud secured firmly to the vertical arm S^1, and a box, s^5, at the other end thereof, works upon a stud secured firmly to the push-out plunger-casting S^3. The plunger-casting is formed of suitable shape to provide interlocking vertical slide-bearings with corresponding parts of the bracket s^6, which bracket is secured to and made part of the frame A. The push-out casting comes in position beneath the molds on the discharging side of the ma-

chine. An opening is made in the lower disk, E^2, beneath the lower die-matrices, when at rest, of a suitable size to allow a marginal rest to the die-matrices on the disk. Square columns s^7 are formed as a part of the plunger-casting of a suitable size to pass up through the opening in the disk E^2, and of a suitable length to carry up the lower die-matrices in the upward movement of the operation to a suitable position to raise the bricks molded about one inch above the top of the disk E^1, and on the downward movement to a position to clear the bottom of the disk E^1 in its forward movement. In the operation of the push-out mechanism, when the stud of the vertical arm S^1 is in that part of the groove of the cam-disk nearest to the central shaft, as shown in Fig. 4 of the drawings, the arm S^1 will be raised to its extreme upward point, and the plunger-casting will be on its extreme downward throw, and will be maintained at rest in that position by the equal distance of the groove to the shaft until the point in the groove reaches the stud of the arm, as shown in Fig. 1 of the drawings, when by the divergence of the groove to the point s^8, the arm S^1 will be actuated downward the full throw, and, by means of the rock-arm and intermediate mechanism, the push-out plunger will be actuated upward, forcing the bricks up out of the molds and to a suitable distance above the top of the disk E^1, to be clutched by clamping-jaws of the off-bearing mechanism and borne from the machine. The groove then describes a true circle to the point s^9, which will maintain the plunger at rest a corresponding time to allow a suitable time to the off-bearing mechanism, where, by the convergence of the groove, the arm and plunger will be brought to their first position, and the lower die-matrices will descend from beneath the bricks molded by their own gravity to a bearing on the lower disk, E^2, to be carried around by the disk E^1 to repeat the operation.

A vertical iron bar, T, is secured firmly beneath the machine, and provided with a suitable jaw-like keeper, t, and the top thereof is made to overlap the top edges of the disk E^1 in close proximity thereto, to prevent undue strain upon the vertical shaft F and the disk E^1 in forcing the bricks from the molds.

Secured rigidly to the under side of the stationary disk E^2 is a bracket-casting, U, for supporting the off-bearing mechanism, upon which bracket are formed bearing-boxes u^1 for a vertical shaft, u^2, and a bearing-box, u^3, for the horizontal shaft u^4. Secured to the top of the vertical shaft is a crank-arm, u^5. An arm-casting, V, is formed of such shape as to afford a frame-work, to which the clasping-jaws v are hinged, and is secured to the vertical shaft u^2 rigidly by the sleeve v^1 in such position as to bring the clasping-jaws v immediately over the die-boxes at the proper time to receive the bricks between the jaws from the push-out part of the machine and bear them off from the machine in conformity to the carrier. An intermittent swinging motion is imparted to the vertical shaft by the operating mechanism. Gum facings are affixed to the jaws for holding the bricks firmly without marring their edges in bearing them off from the machine.

The spiral springs v^2 are placed between the top armatures of the jaws, and are made of suitable strength for clasping and holding the bricks within the jaws by the outward pressure of the springs, reversed to an inward pressure upon the bricks by the pivotal center of the jaws to the frame v^3 of the arm V. Rods v^4 are placed through the jaw-armatures to form pivotal bearings for the ends of a toggle-bar, v^5, which toggle-bar is connected to the lever v^6 by a link, v^7, to the central pivotal pin of the toggle-joint and the end of the lever v^6, which lever has its pivotal fulcrum upon the arm-casting V at v^8, and the power end of the lever v^9 comes in position beneath a cam-like jaw upon the end of the shaft u^4.

A disk, Y, is secured in position on the end of the shaft C^3 with a bearing against the vertical arm S^1, which disk is provided with a cam-like groove, y^1, in the edge and a like cam-groove, y^1, in the face thereof. A vertical shaft, y^2, having suitable guide-bearings y^4 to the arm S^1, is placed in position below the center of the cam-disk Y. To the top of the shaft y^4 is a crank-arm and wrist-pin, which wrist-pin is provided with an anti-friction roller to enter and work into the groove y on the edge of the disk Y.

An armature, y^3, which armature is provided with a wrist-pin at its outer end, is connected to the crank-arm u^5 by a connecting-rod, u^7.

A vertical arm, Z, is secured in position with a bearing against the face of the disk Y by a stud, z, through an elongated groove at the top of the arm, which stud is tapped into the end of the actuating-shaft C^3, and is provided with a suitable collar to rest against the outer side of the arm, by which means the shaft is allowed a vertical motion, and is secured in place at the lower end by a guide-opening provided for that purpose in the bearing y^4 in front of the vertical shaft y^2.

A stud, z^2, is secured to the arm Z and branches into the groove y^1 in the face of the disk, which stud is provided with an anti-friction roller for working into the groove. An armature, z^3, branches from the arm Z, and is provided with a wrist projection to work into a suitable opening in the arm u^6 of the shaft u^4.

In the operation of this off-bearing mechanism, when the crank-pin is in that part of the groove in the edge of the disk the farthest from the face side of the same, the crank-arm of the shaft y^2 will be inclined inwardly at the outer end, and the armature y^3 will be back its full throw, and by the connecting-rod to the arm of the vertical shaft u^2 the armature-casting V, with the clasping-jaws, will also be

back their full throw, as shown in position in Fig. 1 of the drawings, in which position the stud z^2 of the arm Z will be at the point y^5 of the groove y^1 in the face of the disk. When, by the rotation of the disk, the crank-stud of the shaft y^2 shall have reached that part of the groove nearest to the face of the disk, the armature y^3 will have been actuated forward its full throw by the divergence of the groove, the edge of the disk and the jaws will be brought in position over the molds, and will remain there a suitable time at rest.

By the operation of the groove in a straight line when the clasping-jaws are thus brought in position over the molds, groove y^1, in the face of the disk, will have reached the stud at the point y^6, and by the divergence of the groove at this point the arm Z and armature z^3 will be actuated downward, and the arm of the shaft u^4 in a like manner, bringing the jaw of the cam upon the outer end of the shaft to bear downward upon the end v^9 of the lever v^6, which forces this end of the lever down, thus raising the other end of the lever and the toggle-bar at the joint, and drawing inwardly the armatures v^4 of the clasping-jaws, and opening the jaws a suitable distance to receive the bricks from the push-out part. This operation being timed with reference to that of the push-out part, when this groove reaches the stud at the point y^7 by the convergence of the groove to the inner circle the arm Z will be raised, freeing the pressure of the jaw-cam from the lever, and, by the force of the springs outwardly upon the armature of the clasping-jaws, the toggle-bar will be drawn down and the clasping-jaws will clutch the bricks, when, by the downward motion of the push-out part, the lower die-matrices will be withdrawn from beneath the brick, leaving them suspended between the clasping-jaws, and when the die-matrices have receded a suitable distance below the bricks to clear the cone projections of the matrices, by the convergence of the groove y upon the end of the disk the clasping-jaws are swung around to their first position, when, by the divergence of the groove y^1 on the face of the disk, the arm Z is again forced down, and the clasping-jaws open as before, to allow the bricks to slide from the jaws by their own gravity upon the carrier.

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

1. In a brick-machine, the two-part upright frame-castings A A and cross-castings B^1, B^2, and B^3, formed to combine and to provide shouldered bearings for the shafts C^1, C^2, and C^3, and guide-bearings for the vertical plunger L, and a rest for the horizontal disk E^1 beneath the plunger, for resisting the plunger-pressure within the same castings, in combination with the shafts C^1, C^2, and C^3, plunger L, and disk E^1, substantially as described and shown.

2. In a brick-machine, the combination of the castings A A and B^1, B^2, and B^3, shafts C^1, C^2, and C^3, lever-gearings c, plunger L, stationary disk E^2, and intermittent mold-disk E^1, substantially as described and shown.

3. The clutch-bar d^6, cam-slotted lever d^3, and lever d^1, for operating the clutch d, substantially as described and shown.

4. The disk E^1, provided with peripheral flange e^1, lugs e^2 and e^3, recessed cap e^6, plates e^7 and e^8, and adjustable die-boxes G^1, in combination with the die-matrices G^2 and G^3, guiding-stud r', and the plunger L, substantially as described, and for the purposes set forth.

5. In a brick-machine, the adjustable hopper h and oscillating cylindrical vessels h^1, in combination with a spout, H, for supplying clay equally to the molds, substantially as described.

6. The spout H, provided with the ports h^8, cylindrical vessels h^1, arms h^3 and h^4, connecting-rods h^5 and h^7, and adjustable hopper h, substantially as described, and for the purposes set forth.

7. The arm I, jaws i, pivotal pin i^1, stud i^2, notch e^9, wrist-pin e^3, pitman i^4, shoulders i^5 and i^6, sliding bolts i^7 and i^8, springs i^9, keepers i^{11} and i^{12}, for operating the mold-disk, substantially as described.

8. The cam-disk K, oscillating arm J, cross-head j^3, slide j^6, pitman i^4, arm I, sliding bolts i^7 and i^8, notch e^9, keepers i^{11} and i^{12}, and knuckle-jointed jaw and stud i^2, for imparting an intermittent rotary motion to the mold-disk and preventing momentum shock, substantially as described.

9. The arm I, knuckle-jointed jaw and stud i^2, and connecting-pitman i^4, substantially as described, and for the purposes set forth.

10. The combination of the oscillating arm J, connecting-pitman h^5, arms h^3 and h^4, and connecting-rod h^7, for oscillating the cylinders h^1, substantially as described, and for the purposes set forth.

11. The plunger L, formed by the cross-head casting l, top guide-bar l^1, housing-links l^2, and bearings l^4 and l^5, in combination with the cam O and die-matrices G^3, substantially as described and shown, and for the purposes set forth.

12. The within-described plunger-and-die movement of first compacting the clay-powder within the molds, then receding to open the tamping fin to allow the compressed air within the molds to escape, and again renewing the pressure, compacting the clay in solid form, substantially as described.

13. The die-matrices G^2 and G^3, provided with wedge-shaped projections, in combination with the die-boxes G^1, substantially as described, and for the purposes set forth.

14. The notched disk v, toggle-arms n^1 n^2, cone-stud n^5, spring n^8, and air-duct n^9, substantially as described, as and for the purposes set forth.

15. The air-ducts n^9, in combination with a mechanism, substantially as described, for the

elimination of the air in the molding operation, and for supplying air to prevent a suction-vacuum on the return motion, substantially as described.

16. In a brick-machine, the stud n^5, made to penetrate the molds for opening and closing ducts for freeing the air in the molding operation, and preventing a suction-vacuum on the return motion, substantially as described and shown.

17. The notched disk n, toggle-arms n^1 n^2, and the stud n^8, in combination with the plunger L and frame A and cone-stud n^5, substantially as described, and for the purposes set forth.

18. The levers P and P′, lug p^2, stud p^3, jaw p^4, arm p^5, and opening p^6 of the disk-top E^1, in combination with the plunger L and the clutch-bar, substantially as described, and for the purposes set forth.

19. In a brick-machine, the vertical arm S^1, rock-arm S^2, sliding boxes s^4 and s^5, push-out plunger S^3, in combination with the cam-disk R, substantially as described and shown, and for the purposes set forth.

20. The bracket U, shafts u^2 and u^4, crank-arm u^5, arm V, clasping-jaws v, springs v^2, toggle-bar v^5, link v^7, and lever v^6, substantially as described, and for the purposes set forth.

21. The shaft y^2, guide-bearing y^4, armature y^3, arm u^5, connecting-rod u^7, arm Z, and arm u^6, in combination with the grooved disk Y, for operating the off-bearing mechanism, substantially as described and shown.

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Witnesses:
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