(No Model.) 6 Sheets—Sheet 1.

B. C. WHITE.

BRICK MACHINE.

No. 488,622. Patented Dec. 27, 1892.

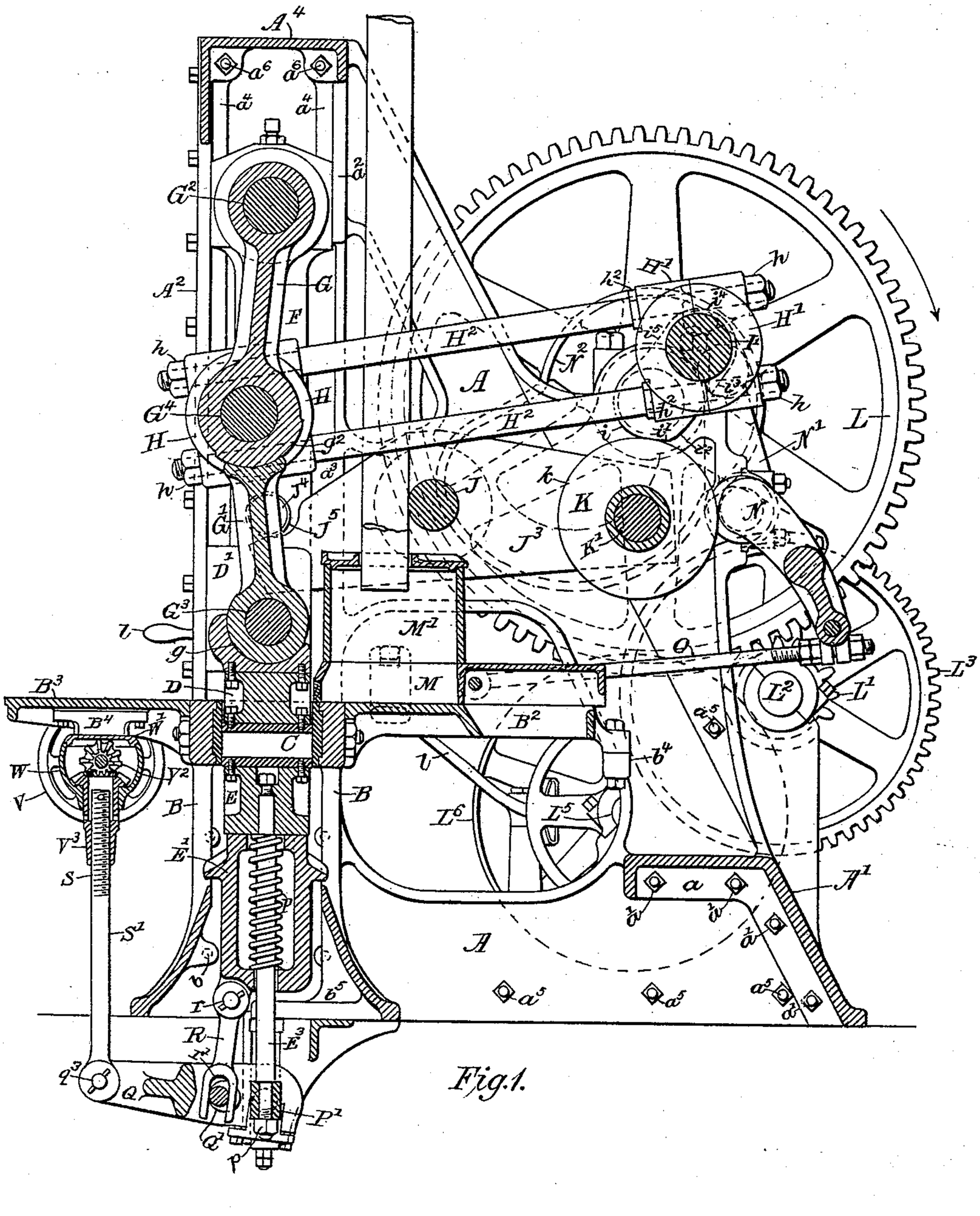

Fig. 1.

Witnesses:-
Louis M. F. Whitehead.
C. E. Tomlinson

Inventor:
Bruce Clark White.
by Dayton, Poole & Brown
his Attorneys.

(No Model.)

6 Sheets—Sheet 2.

B. C. WHITE.

BRICK MACHINE.

No. 488,622.

Patented Dec. 27, 1892.

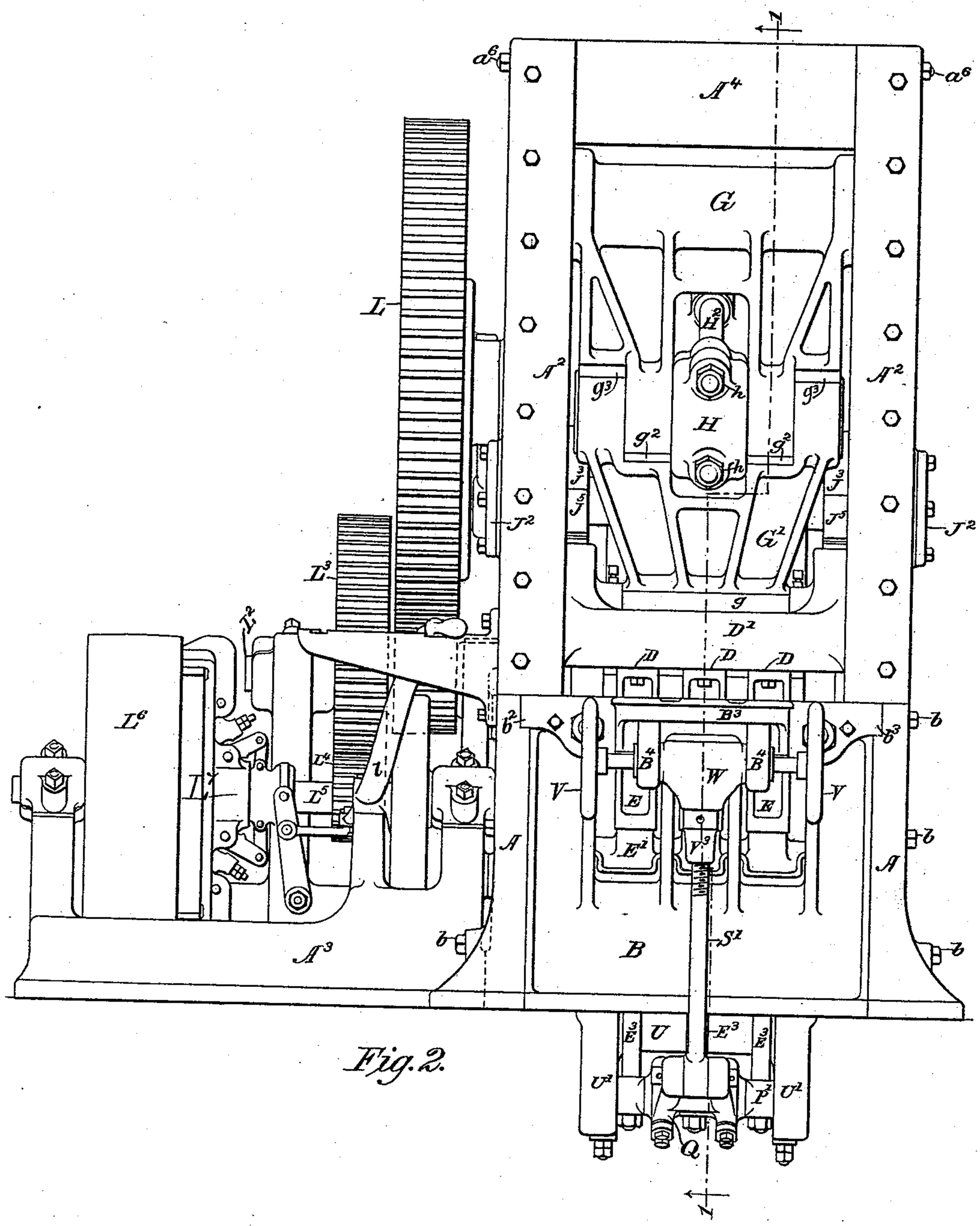

Fig. 2.

Witnesses:-
Louis M. F. Whitehead.
C. E. Tomlinson.

Inventor:
Bruce Clark White
by:- Maytone. Poole & Brown
his Attorneys.

(No Model.) 6 Sheets—Sheet 3.

B. C. WHITE.

BRICK MACHINE.

No. 488,622. Patented Dec. 27, 1892.

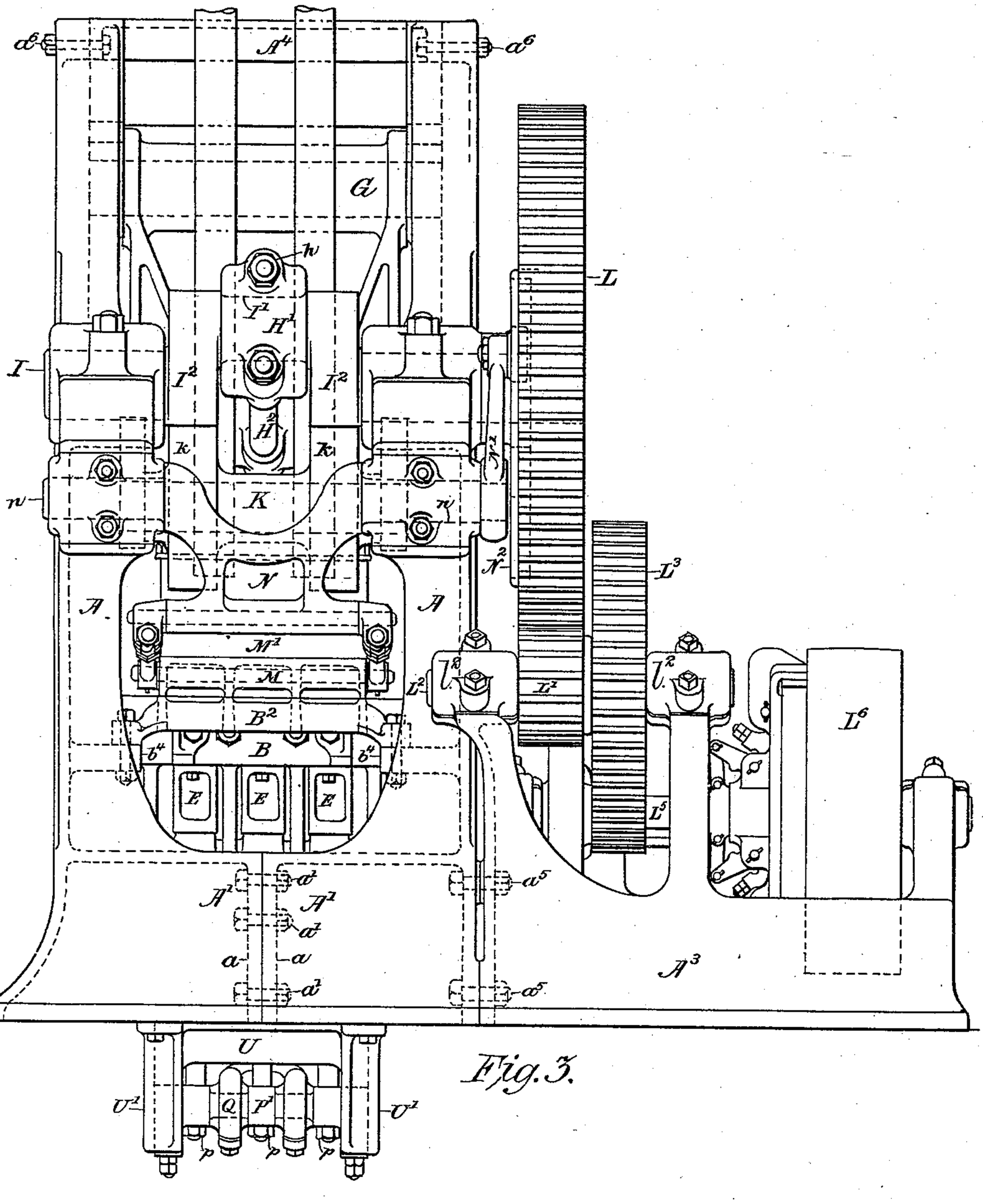

Fig. 3.

Witnesses:-
Louis M. F. Whitehead
C. E. Tomlinson.

Inventor:
Bruce Clark White.

by:- Dayton. Poole & Brown
His Attorneys.

(No Model.)

6 Sheets—Sheet 4.

B. C. WHITE.

BRICK MACHINE.

No. 488,622. Patented Dec. 27, 1892.

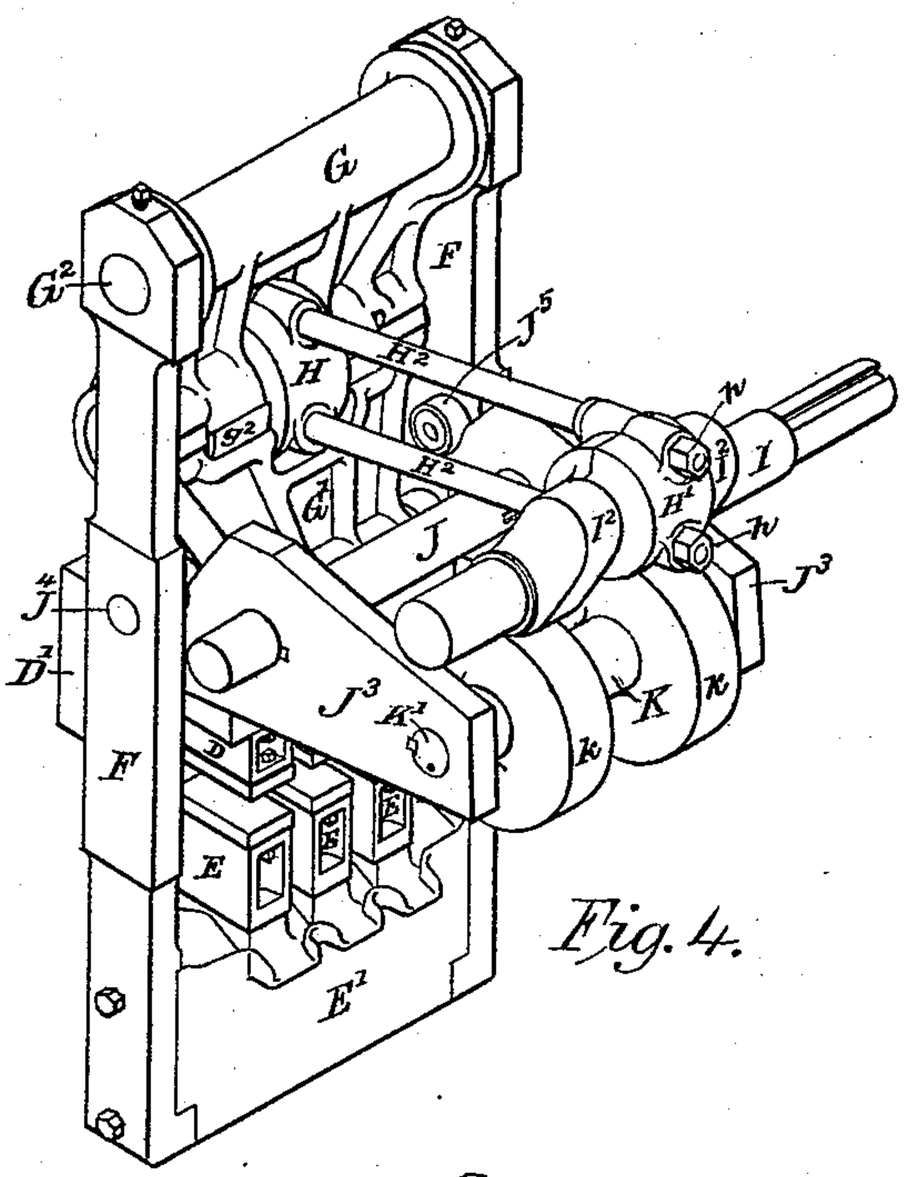

Fig. 4.

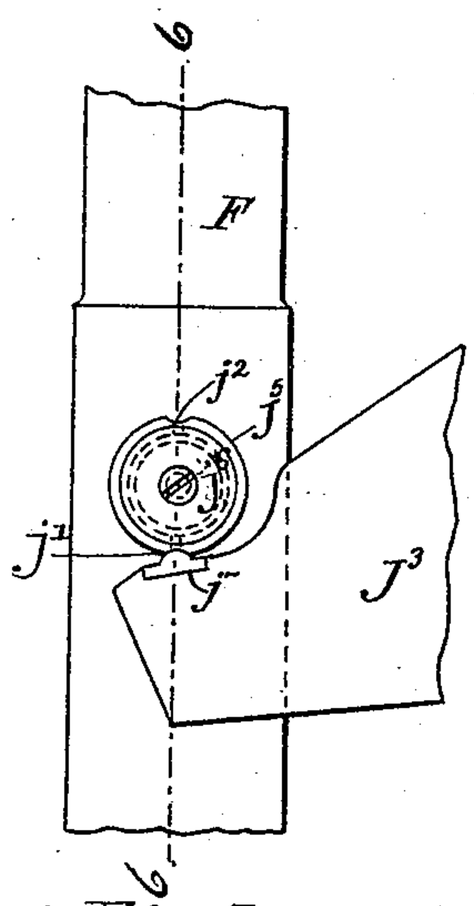

Fig. 5.

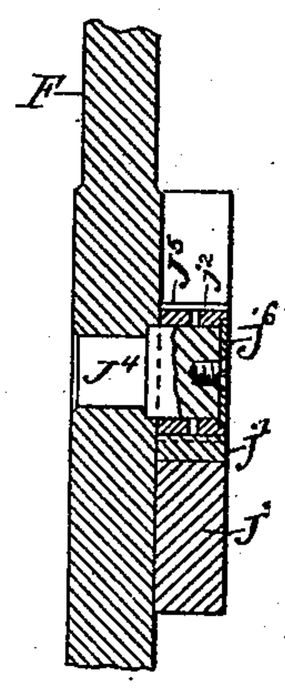

Fig. 6.

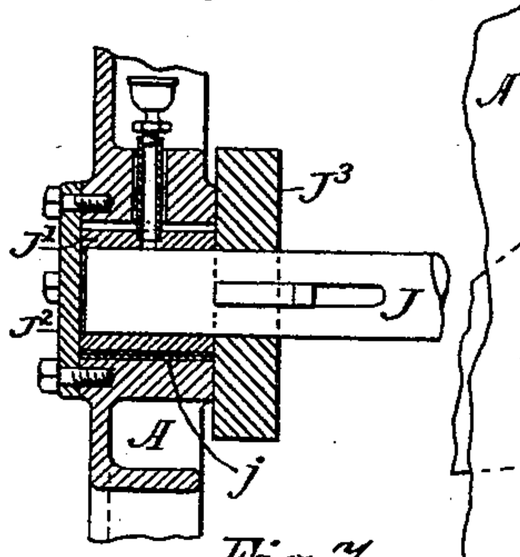

Fig. 7.

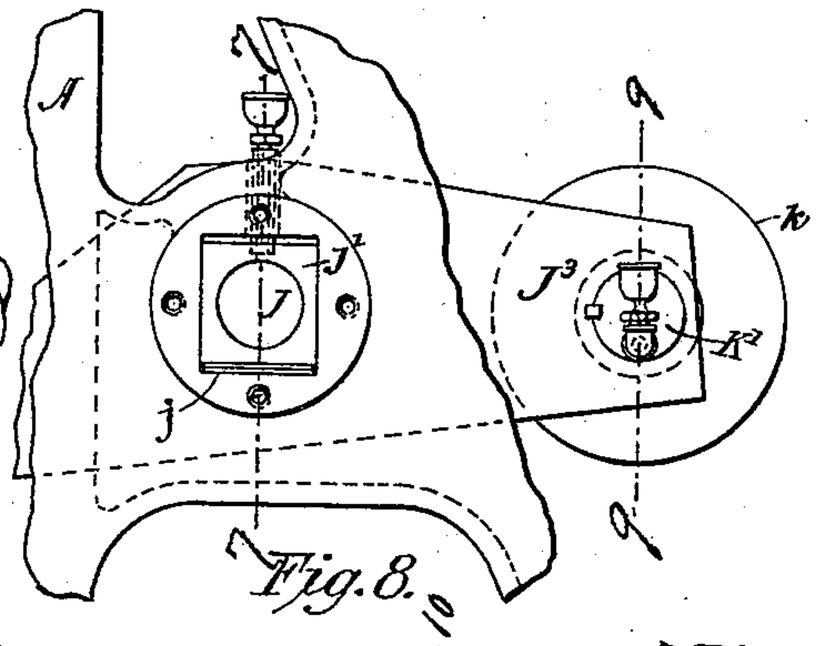

Fig. 8.

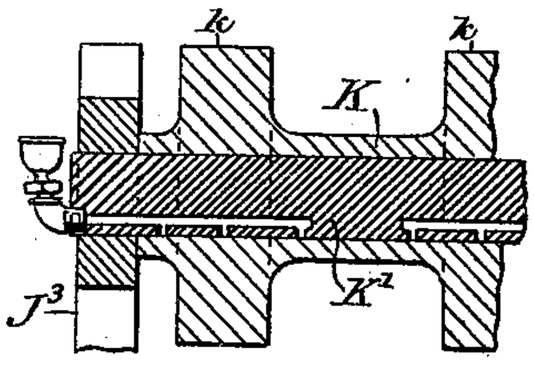

Fig. 9.

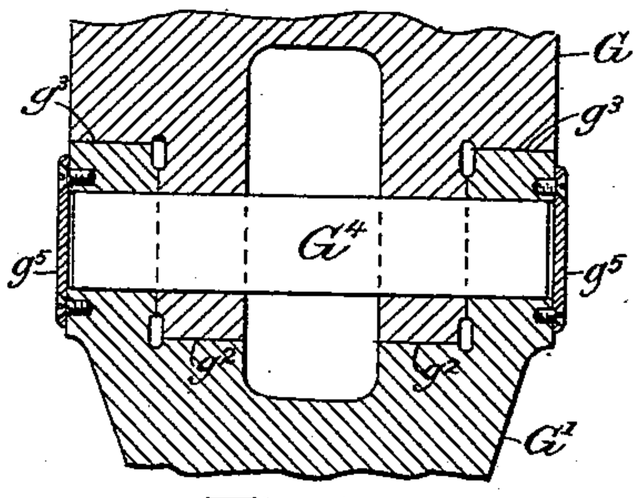

Fig. 10.

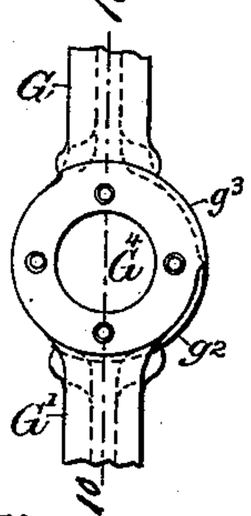

Fig. 11.

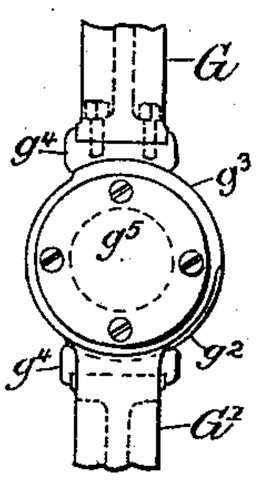

Fig. 12.

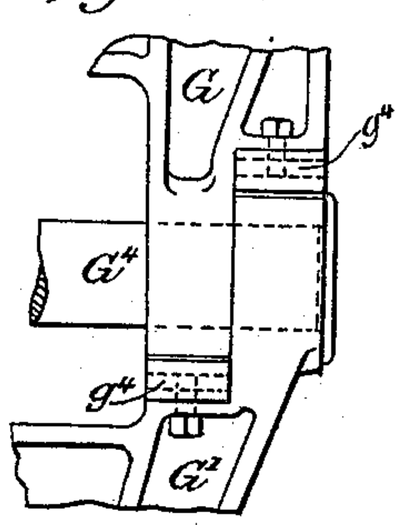

Fig. 13.

Witnesses:-
Louis H. F. Whitehead.
C. E. Tomlinson.

Inventor:-
Bruce Clark White
by:- Wayte. Poole & Brown
his Attorneys.

(No Model.)

6 Sheets—Sheet 5.

B. C. WHITE.

BRICK MACHINE.

No. 488,622. Patented Dec. 27, 1892.

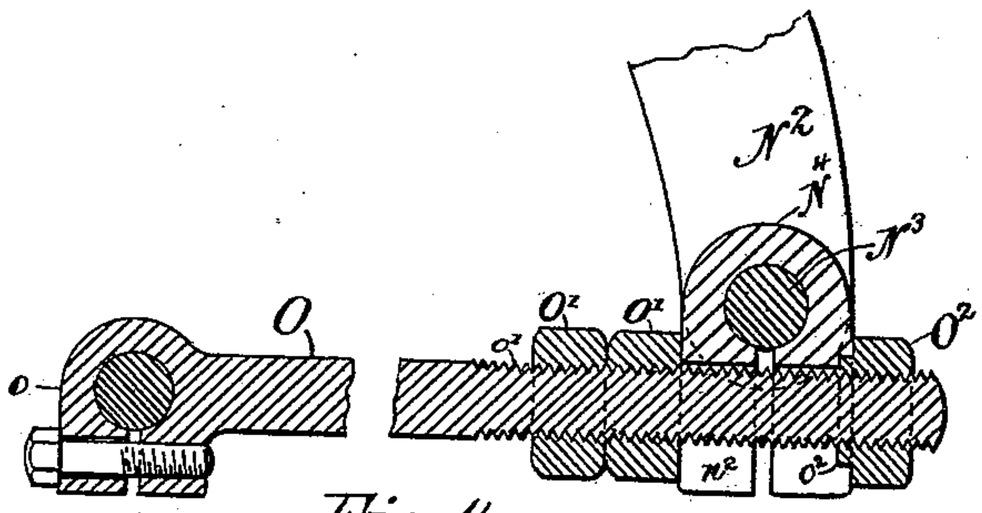

Fig. 14.

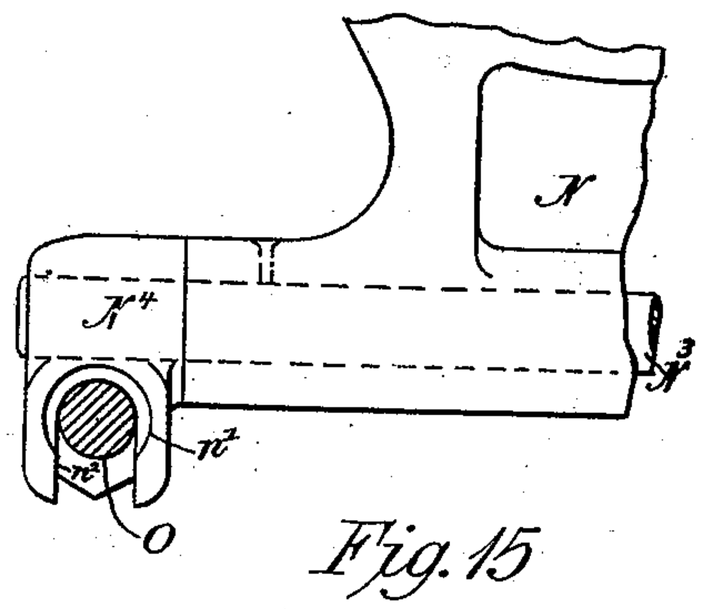

Fig. 15

Fig. 16.

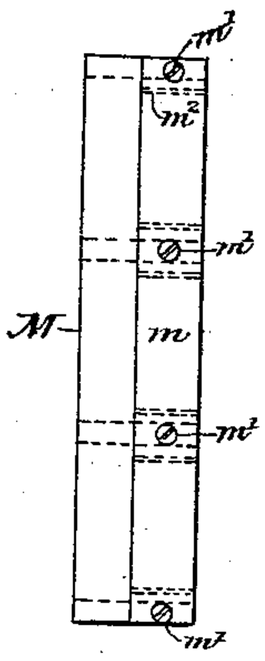

Fig. 17.

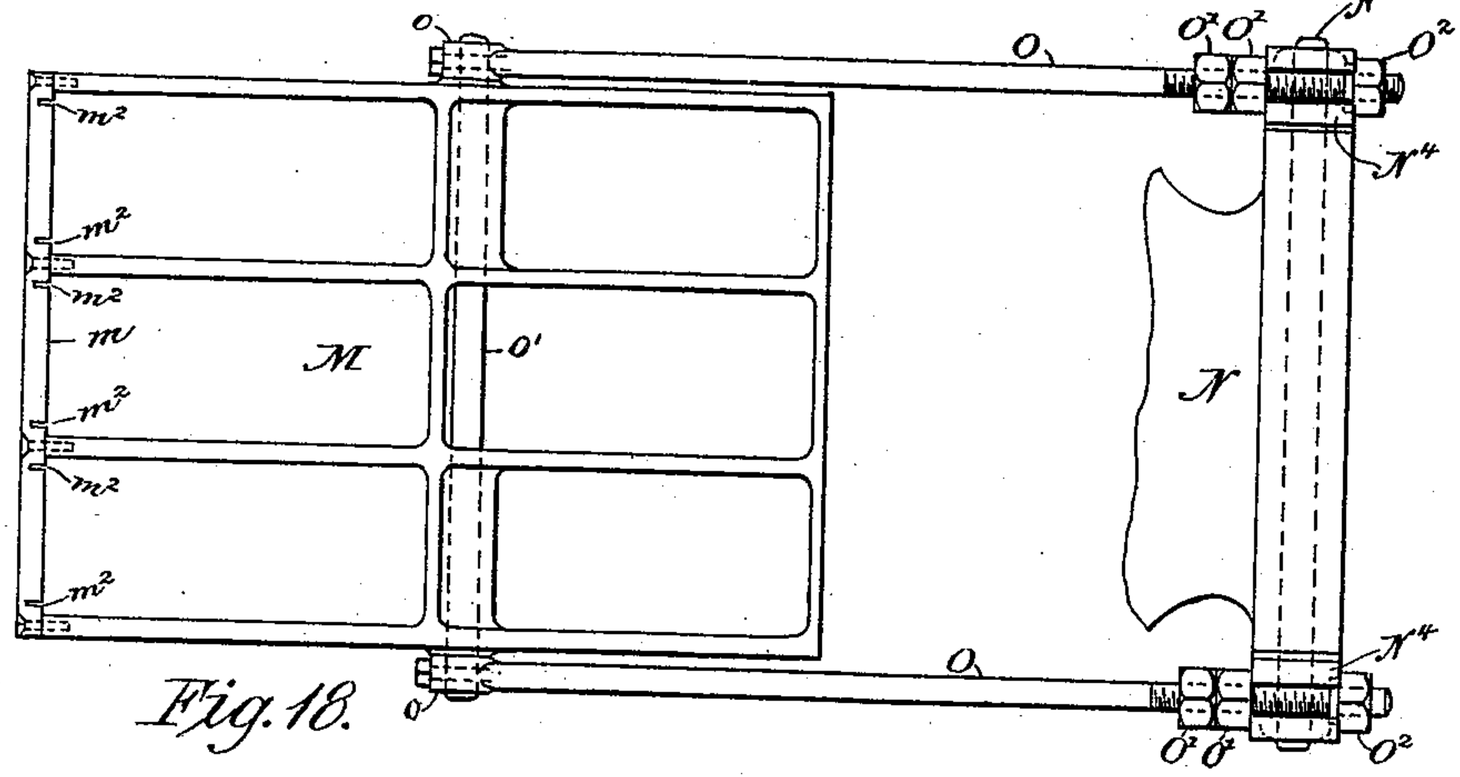

Fig. 18.

Witnesses:-
Louis H. F. Whitehead.
C. C. Tomlinson.

Inventor:-
Bruce Clark White
by:- Clayton Poole & Brown
his Attorneys.

(No Model.) 6 Sheets—Sheet 6.

B. C. WHITE.

BRICK MACHINE.

No. 488,622. Patented Dec. 27, 1892.

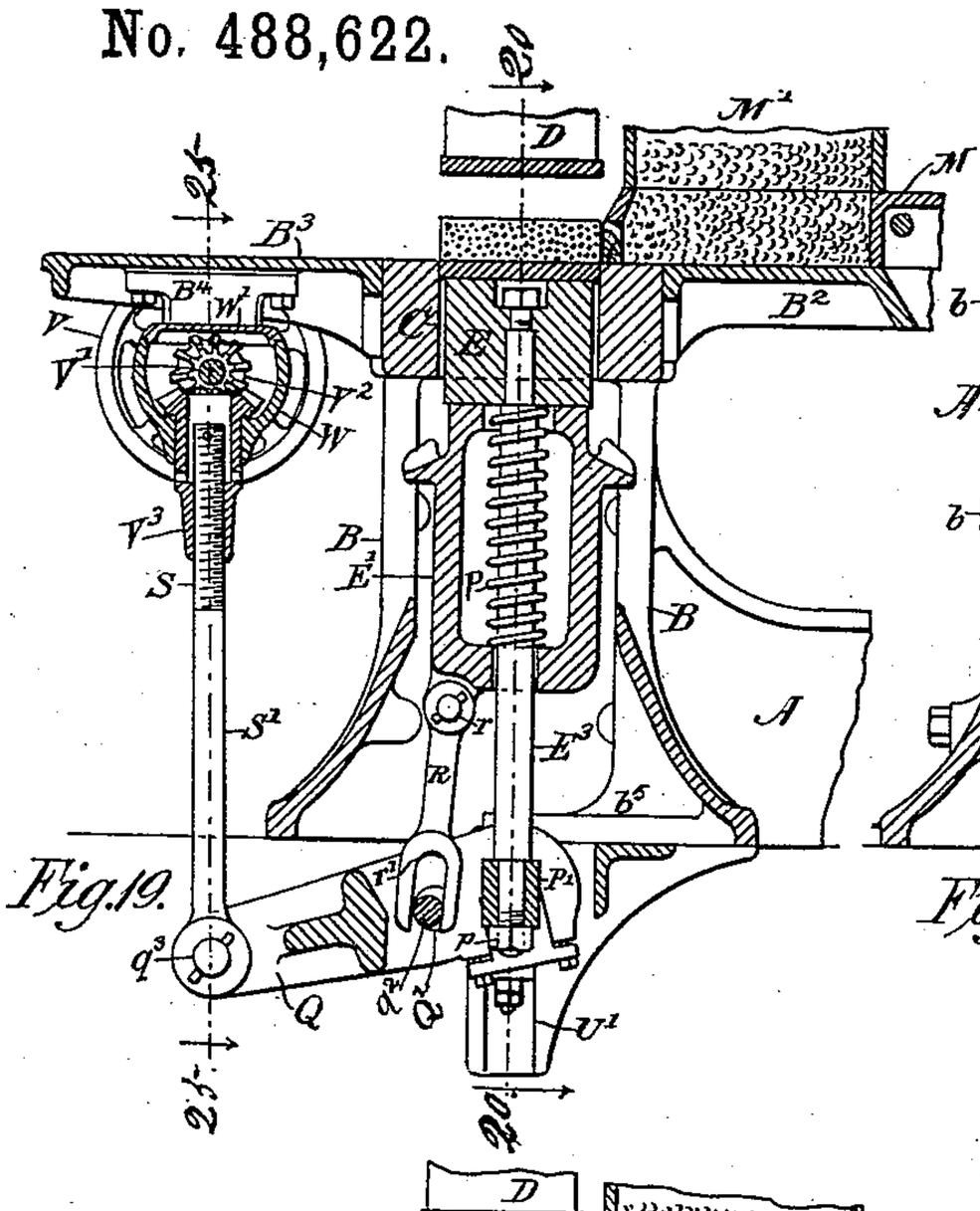

Fig. 19.

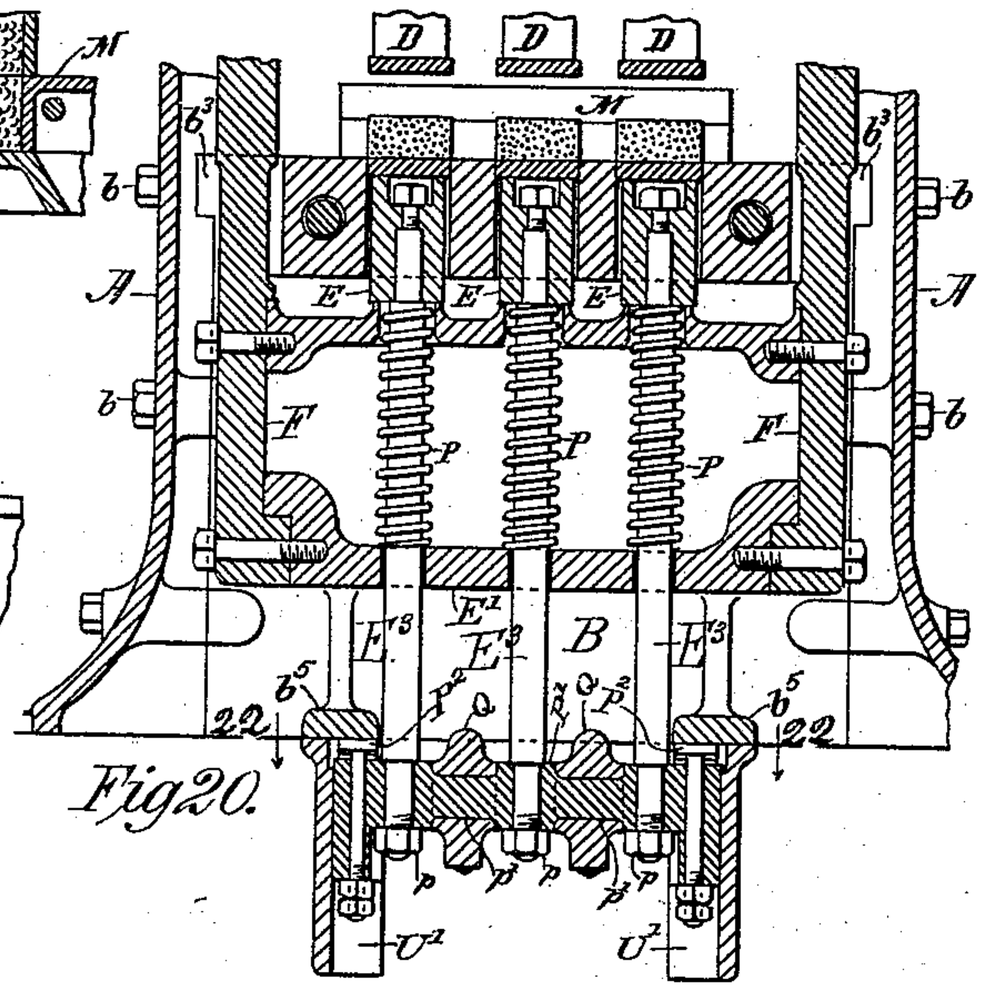

Fig 20.

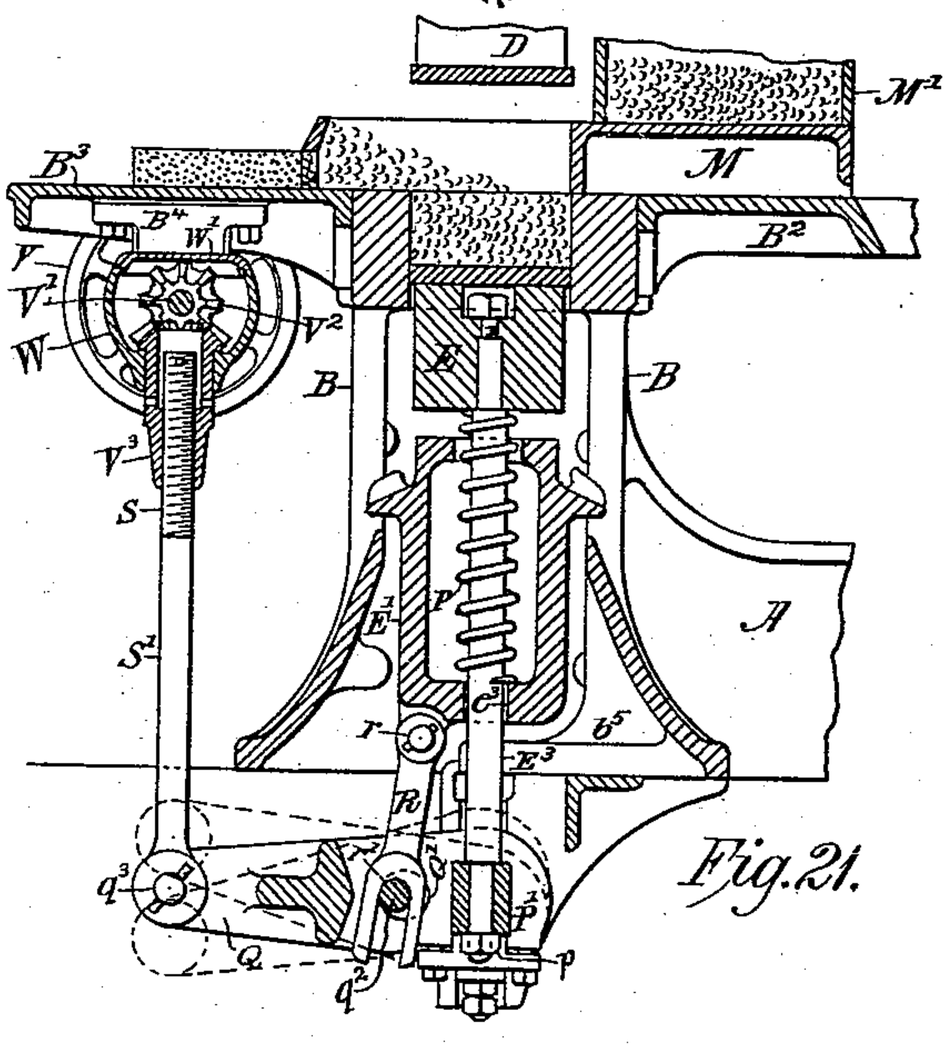

Fig. 21.

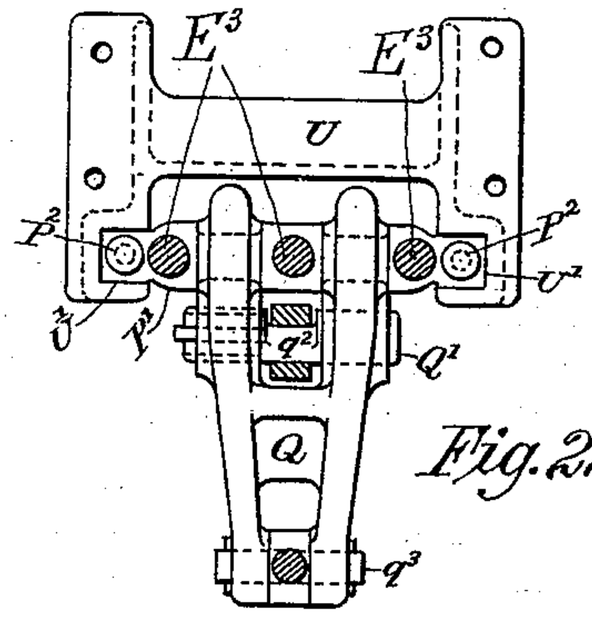

Fig. 22.

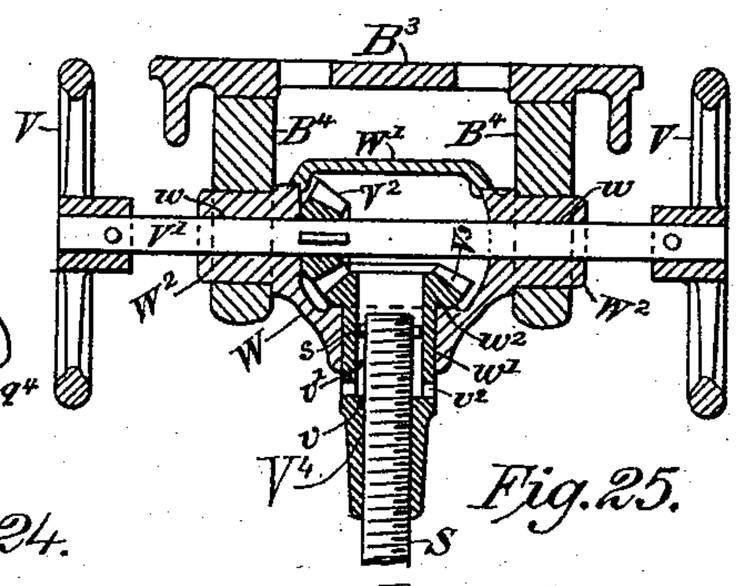

Fig. 25.

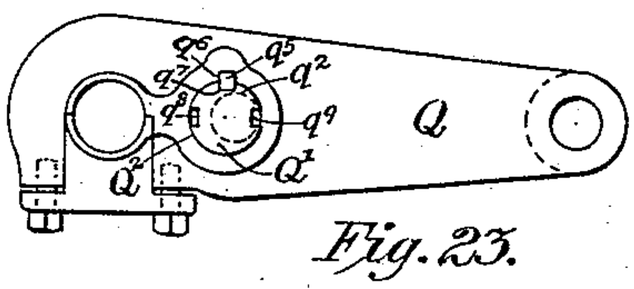

Fig. 23.

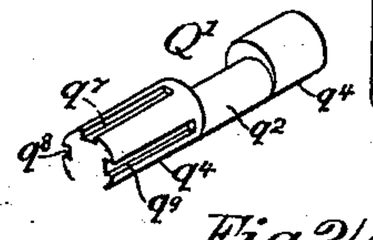

Fig. 24.

Witnesses:-
Louis M. F. Whitehead.
C. E. Tomlinson.

Inventor:-
Bruce Clark White.
by:- Dayton, Poole & Brown
His Attorneys.

UNITED STATES PATENT OFFICE.

BRUCE CLARK WHITE, OF CHICAGO, ILLINOIS.

BRICK-MACHINE.

SPECIFICATION forming part of Letters Patent No. 488,622, dated December 27, 1892.

Application filed March 11, 1892. Serial No. 424,506. (No model.)

To all whom it may concern:

Be it known that I, BRUCE CLARK WHITE, of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Brick-Machines; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

This invention relates to that class of machines for making brick in which the clay to form the bricks is compressed within a mold by means of two opposing plungers, which are moved toward each other in compressing the brick and are moved to accomplish the discharge of the finished brick from the mold, and are also moved within the mold during the act of compressing the brick in such manner as to give the brick smooth or polished edges.

This invention more particularly embraces improvements in the machine illustrated in a prior patent No. 455,374, granted to me July 7, 1891.

In the accompanying drawings illustrating my invention: Figure 1 is a central vertical section on the line 1—1 of Fig. 2, of a machine embodying the invention. Fig. 2 is a front elevation thereof. Fig. 3 is a rear elevation thereof. Fig. 4 is an isometrical or perspective view of the pressing and lifting mechanism, removed from the machine frame. Fig. 5 is a detail view, showing the forward ends of the lifting beams and connected parts. Fig. 6 is a section on line 6—6 of Fig. 5. Fig. 7 is a section on line 7—7 of Fig. 8. Fig. 8 is a detail showing the rear parts of the lifting beams. Fig. 9 is a section on line 9—9 of Fig. 8. Fig. 10 is a vertical section through the middle joint of the toggle lever on the line 10—10 of Fig. 11. Fig. 11 is a detail side elevation of the same. Figs. 12 and 13 are detail views showing a modified form of the toggle joint bearings. Figs. 14 and 15 are detail views of one of the feed box rods; Fig. 14 being a central longitudinal section of the connecting rod, and connected parts, and Fig. 15 being a side elevation of the part to which the rod is attached at its rear end, with the rod in section. Fig. 16 is a detail, longitudinal, sectional view of the feed box. Fig. 17 is an end view thereof. Fig. 18 is a bottom view of the feed box. Fig. 19 is a vertical section on line 1—1 of Fig. 2, of the adjusting device and mold table, with the lower plungers at their highest position. Fig. 20 is a vertical section of the same on line 20—20 of Fig. 19. Fig. 21 is a sectional view similar to Fig. 19, showing a changed position of the lower plungers. Fig. 22 is a plan view of the adjusting devices for the lower plungers, taken on line 22—22 of Fig. 20. Figs. 23 and 24 are detail views of parts of the same. Fig. 25 is a vertical section on line 25—25 of Fig. 19.

The main frame of the machine herein illustrated as embodying my invention consists of two heavy vertical frame plates, A, A, arranged parallel with each other at opposite sides of the machine, and having inwardly projecting parts, A′, A′, at the bottom and rear of the machine provided with internal flanges, a, a, through which pass bolts, a', a', by which the said frame-plates are secured together at this point. The frames are connected at the top of the machine by a horizontal cross-piece, A^4, to which they are secured by bolts, a^6. The frames A A are provided with internally projecting ribs, a^2, and a^3, and guide surfaces, a^4, a^4, and the front plates A^2 A^2 are bolted to said frame plates and form with the ribs a^2 and a^3 guides for the vertically movable parts.

Bolted to the outer face of one of the frames A by bolts, a^5, is a smaller auxiliary frame, A^3, (Fig. 3) forming bearings for driving and clutch devices through which power is transmitted to the machine.

B is a mold table, arranged horizontally between the lower parts of the frame plates A A to which it is secured at its ends by bolts, b. Within the said mold table are located the molds, C, of which the machine shown is provided with three. The mold table B is provided with projections, b^2, b^3, at its ends (Fig. 2) fitting into corresponding grooves in the frames A, A, in order to prevent any vertical motion of the mold table B when the machine is in action, and to make a rigid connection between the said frame plates.

B^2 is a horizontal extension of the mold table B, which is secured to the rear margin of the said mold table and extends inwardly therefrom, the top of said extension being flush with the top of the mold table. Said

extension is attached to and supported at its ends by lugs, b^4, which project inwardly from the frame-plates A A, and to which said extension is bolted (Figs. 1 and 3). Said extension B^2 forms a support for parts pertaining to the feeding mechanism.

B^3 is a forward extension secured to the front surface of the mold table with its horizontal top surface in alignment with the top of the mold table. To the under side of said extension B^3 are secured hangers, B^4, (Figs. 1, 2 and 25) by which parts of the adjusting devices for the lower plungers are supported, as will hereinafter appear.

C C C indicate the molds which are formed in the mold table; D D D upper plungers; and E E E lower plungers, adapted to fit and slide in the said molds. The upper plungers are attached to a horizontal, vertically movable, upper cross-head, D′, and the lower plungers are attached to and supported by a lower cross-head, E′, having a vertical movement and supported by attachment to two heavy vertical side bars which are bolted to the ends of said lower cross-head and extend upwardly therefrom to points near the upper ends of the frame plates. Said bars are held in place and guided at their upper ends by the ribs and guide-surfaces a^2 and a^4, and plates A^2, and at points above the mold table by said plates, and by bearing surfaces, a^3, arranged in a manner shown to engage bearing surfaces formed on the enlarged central parts of the bars, as seen in Fig. 4. The lower cross-head is shown as made without bearings in the main frame, the same being supported solely by attachment to the lower ends of the said side bars F F.

G G′ are the upper and lower members of a toggle which are pivoted, respectively, by means of pivot pins, G^2 and G^3, to the upper ends of the side bars F F and to the upper cross-head D′. Said upper cross-head is held in place and guided during its vertical movement by being extended at its ends past the front edges of the side bars F F, so as to form guide projections which are located between and in contact with the front edges of said side bars, and the inner surfaces of the plates A^2. The pivot pin G^3 is inserted at its ends in the end portions of the upper cross-head and passes through a horizontal bearing aperture in the lower toggle member G′, which latter is made of such width as to extend over the greater part of the length of the cross-head (Fig. 2), and is constructed to afford a continuous bearing for the pivot pin throughout its entire width. The lower end of said toggle member is provided with an external curved surface, g, said curved surface being cylindric and concentric with the pivot pin G^3. The upper surface of the cross-head D′ is made hollow or convexly curved to conform to the curvature of the surface g and the curved surfaces of the said toggle member of the cross-head are fitted to rest in contact with each other, so that in addition to the bearing which the lower toggle member has upon the pin G^3, it has additional bearing throughout its entire length directly upon the cross-head G′ thus preventing any upward deflection in the cross-head when heavy pressure is brought upon it.

The toggle members G G′ are pivotally connected with each other by means of a heavy pivot pin, G^4, inserted through the overlapped or inter-penetrating forked ends of said toggle members, as more fully shown in Figs. 10 and 11. The upper toggle member G is provided at its lower end with external curved surfaces, g^2, g^2, concentric with the pivot pin G^4 and adapted to bear against corresponding concave surfaces formed on the upper end of the toggle member G′, and said lower toggle member G′ has formed upon its upper end similar convex surfaces, g^3, g^3, adapted to bear against corresponding convex surfaces of the upper toggle member G. The supplementary bearing surfaces g^2 and g^3 being concentric with the pivot pin G^4 serve to take a part of the strain which would come entirely upon the pin G^4 if said bearing surfaces were absent. As shown in Figs. 12 and 13, the concave surfaces on the toggle members are formed by means of separate removable bearing blocks g^4 $g,^4$ which are provided with lateral flanges or other similar projections arranged parallel with the pivotal axis of the toggle members and adapted to engage the main parts of the toggles, so that the said blocks will be held from lateral movement when in place and at the same time may be easily removed endwise from engagement with the toggle-members for renewal or repairs. The pivot pin G^4 is adapted to turn freely within the bearing apertures of both toggle members and is prevented from moving endwise by means of caps, g^5, g^5, which are secured over the ends of said bearing apertures preferably by means of screws, as shown. The pivot pin held in place by caps, as shown, and adapted to turn freely in both toggle members, has the advantage of being entirely free to rotate in both of its bearings, so that in the continued use of the machine wear upon the pin will be equally distributed and the same will be prevented from becoming worn into eccentric form and thus throwing the parts out of adjustment. The caps g^5 g^5, arranged to cover the bearing apertures of the toggle, as shown, serve to keep out grit and dust and to retain the oil within the bearing. The said upper toggle member G is made of such width at its upper end as to fill the space between the upper ends of the side bars F F, and the pivot pin G^2 has bearing in the said toggle member throughout the entire width of the same, and is secured at its ends within the said side bars in the manner illustrated.

I is a crank-shaft, which is mounted in the machine frame in the rear of and horizontally opposite the central joint of the toggle. The crank pin of the said crank shaft is connected with the pivot pin G^4 by means of a split box,

H, which engages the central part of said pivot pin, and a similar split box, H′, which engages the crank pin, and connecting rods, H², H², which unite said boxes with each other, and which at the same time serve as means of connecting the parts of the split boxes. The said rods are inserted at their ends through the parts of the boxes and are provided with nuts, *h*, *h*, whereby the boxes may be adjusted to compensate for wear. Between the box H′ and shoulders formed on the said connecting rods, are placed collars, *h*² (Fig. 1), which may be removed and replaced by collars of different thicknesses to adjust the lengths of the connecting rods.

The crank shaft I is so placed or located relative to the toggle members G G′ that the latter will be flexed when the crank pin is at the forward part of its throw or adjacent to the toggle, and will be straightened out when it is at the rear part of its throw, or away from the toggle.

J is a fulcrum pin, which is supported at its ends in the frame plates, and affords pivotal support for two heavy beams or lifting levers which extending from near the front of the machine where they are engaged with the side bars F F, to points below the crank shaft, said lifting levers being actuated through the medium of the crank shaft and acting to raise and lower the lower and upper plungers and the toggle and connected parts during the operation of the machine. The said fulcrum pin J is mounted in journal bearings, J′ J′ (Figs. 7 and 8) which fit into square openings in the frame plates A A, and are adapted to move or slide vertically therein for the purpose of affording vertical adjustment of the fulcrum pin. Said journal bearings J′ J′ are shown as adapted for vertical adjustment by the introduction beneath them of thin strips of metal, *j*, but other means of adjustment may be employed if desirable. Disks or plates J², J², are bolted to the frame plates to retain the bars J′ J′ in place, said plates being preferably arranged to cover the openings in the frame plates so as to exclude dust from the bearing surfaces.

The lifting levers, J³, J³, are secured to the fulcrum pin J adjacent to and inside of the frame plates A A, with their front ends inside of the side bars F F. Said lifting levers are engaged with the side bars F F by means of studs, J⁴, J⁴, (Figs. 5 and 6) which are inserted in the said bars F F and extend inwardly therefrom. To avoid frictional contact between the said studs and the ends of the lifting levers the boxes are provided with rings or sleeves, J⁵, J⁵, adapted to turn freely on the pins, said rings being held in place thereon, conveniently, by plates, *j*⁶, secured to the pins and overlapping the edges of the rings, as shown. The ends of the lifting levers are provided with narrow transverse bearing surfaces or ribs, *j*′, adapted to engage shallow grooves or notches extending across the faces of the rollers, J⁵, J⁵, the said transverse bearing surfaces or notches being rounded so that they will turn within the grooves during the movement of the parts. It will, of course, be seen that with the parts thus constructed the rollers will turn or oscillate about the pins J⁴ as the ends of the lifting levers rise and fall, the said rib or projection on the end of the lifting lever being carried forward of a vertical line passing through the center of the pin when the lever is at the center of its throw, and carried to the rear thereof at the top and bottom limits of its throw. Each of the rollers J⁵ is shown as provided with more than one of the grooves or recesses *j*², so that when one groove becomes worn the ring may be turned to bring another one of the grooves into engagement with the lifting lever. To provide for wear in the transverse projection or rib *j*′, the latter is shown as formed on a removable inserted strip, *j*⁷, which will commonly be made of hardened steel.

Near the rear ends of the lifting levers J³ J³, are mounted two rollers, *k*, *k*, which are arranged beneath the crank shaft I and at the same distance apart as the crank arms I² I² of said crank shaft, so that they are adapted to rest in contact with said crank arms; the peripheral surfaces of said rollers being made of the same width as the crank arms, the external surfaces of which constitute cams and are shaped to give the desired movement to the lifting levers. In the particular construction shown, the rollers *k k* are attached to a sleeve, K, which is mounted on a shaft, K′, secured at its ends in the lifting levers near the rear ends of the latter, as clearly seen in Figs. 4, 8 and 9. This construction has the advantage of affording a uniform pressure on the shaft K′ under the heavy strain to which the rollers are subjected, the sleeve K affording a rigid connection between said rollers and thereby transmitting a practically equal amount of pressure to all parts of the shaft. The rollers *k k*, lifting levers J³ J³, and pins J⁴ J⁴ are so arranged in relation to the crank shaft I and side bars F F that the action of the cam-shaped arms will give oscillatory movement to the said levers and thereby raise and lower the side bars and connected parts; the preponderance of weight at the front ends of the lifting levers due to the heavy parts which are supported on the same being sufficient to keep the rollers *k k* in contact with the crank arms. The general construction of these parts is well shown in Fig. 4, from which it will be seen that the side bars F, the upper and lower cross-heads and the plungers thereon, as well as the toggle, are sustained or supported solely by the said lifting levers.

The crank shaft I is journaled at its ends in suitable bearings formed in the frame plates A A, and to one end of said shaft, outside of the adjacent frame plate, is affixed a heavy gear wheel, L, which is engaged by its peripheral cogs with a gear pinion, L′, which is keyed to a gear shaft, L². The said gear shaft has affixed to it a gear wheel, L³, which in

turn engages with a gear pinion, L^4, (Figs. 2 and 3.) This pinion L^4 is keyed to a shaft, L^5, on which is mounted a belt pulley, L^6, adapted for connection with the shaft by a friction clutch, L^7, adapted for operation by a starting lever, *l*.

The shafts L^2 and L^5 referred to are mounted in suitable bearings formed in the auxiliary frame A^3, independently of the main frame; the bearings l^2 l^2 of the shaft L^2 being so located as to afford proper support for the ends of the shaft L^2, while sustaining the gear pinion L′ in alignment with the gear wheel L which is supported on the main frame. This construction has the important advantage of enabling the auxiliary frame which carries all of the driving gear, except the gear wheel L on the main crank shaft I, to be detached from the main frame without disturbing any of the shafts or removing them from their bearings. This construction of the frame and driving gear is highly advantageous in practice for the reason that the machine being a very heavy one it is exceedingly difficult to handle in transportation and set up in condition for work. By the construction described the machine is shipped and handled in two complete parts, which may be easily placed and secured together in condition for operation, so that the necessity is avoided of separating the working parts for shipment and re-assembling the same in setting up the machine for operation.

M is a feed box which rests upon the mold table and is adapted to slide alternately over the molds C C to the position shown in Fig. 21, and under the clay hopper M′ to the position shown in Figs. 1 and 19. Said feed box is constructed generally like that shown in said prior patent, said feed box consisting of a frame or casting provided at its ends adjacent to the molds with rectangular openings corresponding in number and size with the molds C C C and having at the rear of said openings a horizontal top surface which cuts off the downward passage of clay from the hopper when the feed box is at the forward part of its throw. Said feed box is like that shown in said prior patents, with the exception that its front wall comprises a separate strip *m*, secured to the ends of the partitions between the openings of the feed box by screws, *m*′ (Figs. 16, 17 and 18). Said strip is made of such strength or of such material, or is so weakened by transverse cuts, that it will break if it meets an obstacle either in its forward or rearward stroke. In the particular construction shown the strip *m* forms the lower part only of the front wall of the feed box (Fig. 16), and is provided with cuts or grooves, m^2, m^2, extending nearly through the same, so that it will easily break out between the parts when striking an obstacle. Such an obstacle usually consists of a stone, piece of iron or some other article which passes through the hopper to the feed box, and, falling from the feed box into one of the molds, extends from the top of the same in such position as to be caught between the front or rear wall of the mold and the front edge of the feed box.

The hopper M′ is movably sustained in the machine frame in the manner described in said prior patent No. 455,374, so that in case any hard object should be similarly caught between the feed box and the edge of the hopper, the latter will yield upwardly and thereby prevent breakage or injury to the parts.

Devices for actuating the feed box are constructed as follows:

N is a rock shaft having journals, *n n*, engaging bearings in the frame plates A A and extending downwardly in the form of a wide depending arm, which is connected at its lower end with the feed box for the purpose of actuating the same. Attached to one of the said journals *n n* is an arm N′, extending upwardly and provided with a roller which engages a cam, N^2, on the gear wheel L, said cam being so formed as to actuate the rock-shaft in such manner as to advance the feed box over the molds when the plungers are at their highest point and retract the feed box before the plungers reach the same in their descent. A rod, N^3, is inserted through the arm N at its lower end (Figs. 14, 15, 16 and 18) and projects at either end beyond the said arm, and two split sleeves or clamp pieces, N^4, N^4, are fitted over the projecting ends of the said rod N^3, and are provided with vertical slits extending into the apertures which receive the end of the rod.

O O are two connecting rods, arranged at either side of the feed box for uniting the same with the arm N. Said rods are connected at their forward ends with the feed box by any suitable means, as, for instance, by eyes, *o o*, on the rods engaged with the ends of the rod *o*′ which passes through the feed box, as shown. At their rear ends the connecting rods *o o* are adapted to enter transverse slots, n^2, n^2, formed in the split sleeves N^4 N^4, and the end portions of the rods are screw threaded and provided with nuts, O′, O′, and O^2 O^2, which are placed on opposite sides of the sleeves and are tightened against the same to hold the connecting rods in engagement therewith and to clamp the sleeves on the rod N^3. Two nuts, O′ O′, are placed on the rods *o o* at the forward side of the said sleeves, one of which is a jam nut, said nuts being adjustable upon the rods to change the length of the rods in adjusting the parts for operation. The nuts, O^2 O^2, are each provided on their inner surface with an inwardly projecting cylindric part, o^2, adapted to enter corresponding circular recesses, *n*′ *n*′ in the rear surfaces of the sleeves N^4 N^4 (Fig. 14). In this construction the tightening of the nut O^2 against the parts of the split sleeve brings together the ends of the sleeve at opposite sides of the slit or opening therein, and the sleeve is thereby tightened upon the end of the rod N^3 and firmly held thereon. The engagement of the inwardly projecting parts o^2

of the nuts O^2 O^2 with the recesses in the sleeves prevents the rods from dropping out of the notches N^2 N^2. By the engagement of the connecting rods *o o* with the split sleeves and the clamping of the latter on the rod N^3 in the manner described, said rods O O are held rigidly at right angles to the rod N^3 thus preventing any lateral movement of the feed box. When it is desired to disconnect the rods *o o* from the sleeves N^4 N^4 the nuts O^2 O^2 are turned back sufficiently to withdraw the projecting parts o^2 o^2 from the recesses n' n' in the said sleeves, thus permitting the rods O O to drop out of the notches n^2 n^2. The split sleeves being released from the rod N^3 by the loosening of the nuts O^2 O^2, said clamps and the rod N^3 may then be removed and the feed box M may be withdrawn from its place.

To now refer more particularly to devices illustrated for supporting and adjusting the lower plungers E E E. Said plungers are yieldingly supported above the lower cross-heads E′ by means of springs, P, P, P, placed between the lower surfaces of the plungers and opposing surfaces of the cross-head, the latter, in the instance shown, being made hollow to afford space for the said springs, which are located within the cross-heads and extend upwardly through openings in the top of the same.

The devices provided for adjusting the vertical position of the lower plungers within the molds, consist generally of vertical stems, E^3, E^3, E^3, affixed to the said plungers and depending from the latter, a cross bar, P′ to which the said stems are connected at their lower ends and a horizontally arranged lever which is engaged pivotally at one end with a vertically adjustable fulcrum on the machine frame and at its opposite end with the stems E^3 E^3 E^3, and is adapted for contact between its ends with a part upon and moving with the lower cross-head, by which the position of the plungers at the time of filling the mold is determined. As far as above described, the adjusting device is similar to that shown in the prior patent No. 455,374, granted to B. C. White July 7, 1891. As shown in said prior patent, the stems of the lower plungers are connected with the lever by means of a horizontal pivot passing through apertures in the lower ends of the stems and in said lever, and stops are provided in position to engage the lever for limiting the upward movement of the plungers. The stop on the lower cross-head was in that patent shown as formed by a depending rod, pivoted to the cross-head and provided with nuts forming an adjustable shoulder on the rod, and the rod was held in engagement with the lever by a stem extending through an aperture in a pivoted or rocking bar mounted in the lever.

In the construction herein shown, the stems E^3 E^3 E^3 are rigidly secured to the cross-bar P′ by means of nuts *p* on the lower ends of said stems, and said cross bar is provided with cylindric journals *p′ p′* which pass through bearing apertures in the forked ends of the lever Q (Figs. 22 and 23). Said forked ends of the lever are provided with bearing boxes, having removable caps to enable the lever to be engaged with the cross bar between the stems E^3, as shown in drawing Fig. 22. The ends of said cross bar P′ are extended to engage guide grooves, U′ U′ formed in a casting, U, which is secured to the base of the machine and extends downwardly therefrom. The said guide grooves U′ constitute the sole means of guiding the lower ends of the stems E^3 E^3, while the upper ends of said stems are held in place and guided by the sliding of the lower plungers within the molds, the intermediate parts of the stems being free from contact with the lower cross-head so that the lateral position of the lower plungers and stems attached thereto is independent of the lower cross-head, and the lower plungers are maintained accurately in horizontal position, and the stems thereof parallel with the sides of the mold, without regard to possible lateral variations in the position of the lower cross-head. The upward travel of the lower plunger is limited by stop bolts, P^2, P^2 (Fig. 20) inserted through the ends of the cross-bar P′ and adapted to come in contact with the bottom surfaces of inwardly projecting feet, b^5, b^5, of the mold table B. The stop upon the lower cross-head for limiting the upward movement of the lower plungers when the cross head is depressed, is in this instance formed by a forked rod, R, which is pivoted at its upper end to the lower cross-head, and engages at its forked lower end with a cylindric part, q^2, of a pin, Q′, mounted in the lever Q, which cylindric part of the pin is eccentric to the cylindric end portions, q^4, q^4, of the said pin, which enter the parts of the lever Q (Figs. 22, 23 and 24). One of the said parts of the pin Q′ is provided with three similar key-ways, q^7, q^8, q^9, in either one of which, and in a key-way, q^6, formed in the lever *q*, may be inserted a key, q^5, to hold the pin from turning. The said key-ways in the pin are located so that the eccentric part q^2 thereof may be secured at the highest or lowest limit of its throw, or at an intermediate position, as clearly seen in Figs. 23 and 24. The object of the adjustment provided by the eccentric pin Q is to increase the range of adjustment of the lower plungers over that obtained by vertical adjustment of the fulcrum of said lever. By this construction, sufficient range of adjustment may be afforded by the adjusting devices which move said fulcrum without necessitating as great range of movement in the latter. It will of course be understood that in this construction, as in that set forth in said prior patent last referred to, the swinging rod R and pin Q′ form in effect a movable pivot or bearing for said lever Q; the end of said lever which is engaged with the plunger stems being capable of movement only in a straight line vertically, and the position of the plungers when at the lower

limit of their throw, being dependent on the vertical position of the fulcrum, which engages the outer end of the lever, with relation to the said pin Q′. The adjustable fulcrum for the outer end of the lever Q is afforded by the lower end of a vertical rod, S′, which is connected with the lever Q by means of a pivot pin, q^3, and extends upwardly at the front of the machine to a point adjacent to the mold table where it is connected with adjusting devices by which the rod may be moved up or down to effect the adjustment of the lower plungers. Said adjusting devices are made as follows:

V V are hand wheels attached to the opposite ends of a shaft, V′, which extends horizontally beneath the table, B^3, so as to sustain said wheels at either side of said table. Secured to said shaft is a beveled gear-wheel, V^2, which engages a smaller wheel, V^3, arranged to turn about a vertical axis and attached to a vertical sleeve, V^4, the lower part of which is internally screw-threaded to engage the external thread S on the rod S′.

W is a hollow frame or gear casing, provided with trunnions, W^2, W^2, at either side, which engage bearing apertures in the hangers B^4 B^4, as seen in Fig. 25. Horizontal bearing apertures, *w w*, formed in the trunnions provide journal bearings for the shaft V′, and an aperture, *w′*, forms a journal bearing for the sleeve V^4. Said gear casing is provided with a bearing surface or shoulder, w^2, at the upper end of the aperture *w′*, to engage a corresponding shoulder on the sleeve V^4 (in the instance shown, formed by the lower surfaces of the gear V^3) and serving to hold the said sleeve from downward movement. The rotation of the sleeve V^4 through the medium of the hand-wheels and gear described, will obviously raise or lower the rod S, the turning of the nut or sleeve V^4 accomplishing the lifting of the rod, while its descent is produced by its own weight and that of the parts connected with it. The upward travel of the threaded rod S′ is limited by the striking of its upper end against the shaft V′, while its downward travel is limited by means of a pin, *s*, which projects from the opposite sides of the rod within a space or recess formed in the upper part of the sleeve V^4, and which is adapted to engage a shoulder, *v*, formed at the bottom of the said recess; apertures, v^2, v^2, Fig. 25, formed in the sleeve V^4 enabling the pin *s* to be driven out of the rod in case it is necessary to remove the said rod from the sleeve. The gear casing W is preferably arranged to partially surround the gear, and is provided with a removable cover, W′, which, when secured to the casting, protects the gears and adjacent parts from access of grit or clay.

The employment, in connection with the vertical shaft S′, of the horizontal shaft V′ connected by gears with the vertical shaft located beneath the projecting part of the mold-table and having hand wheels at its ends adjacent to the sides of the said projecting part of the mold table, has the advantage of making the adjusting devices accessible and convenient to the operator, who can easily reach and actuate the hand-wheels thus placed when standing at either side of the mold table and in position convenient for observing the action of the plungers and adjacent parts.

The operation of the main parts of the machine above described, except the devices employed for raising and lowering the side bars F F, is substantially the same as that of corresponding parts of the machine shown and described in said prior patent, the brick being compressed within the molds and moved vertically therein while being compressed by the upper and lower plungers operating through the medium of the cross-heads, side-bars and toggle, and rotating crank-shaft. The vertical position of the side-bars and connected parts in the machine described in that patent is controlled by a beam or pitman lever acting both as a connecting rod or pitman to straighten and flex the toggles, and as a lever to lift the said parts by its engagement with a fulcrum on the machine frame. As herein shown, however, any such lever action of the pitman is entirely absent and a device for raising the side bars is substituted consisting of the lifting beams fulcrumed in the frame plates and actuated by the cam-shaped crank arms, whereby the opposite ends of the said levers connected with the side bars, give vertical movement to the same and connected parts. In the devices shown in said prior patent, it was necessary to provide cushioned stops to sustain the side-bars and connected parts when the action of the crank-shaft allowed the said parts to descend to their lowermost position. It was also necessary to provide stops for the upper cross-head to limit its downward motion before the toggle arms had straightened, in order to produce an upward motion of the lower plungers by the further straightening of the toggle arms. It was found in that construction that the engagement of the pitman lever with its fulcrum produced a violent shock or jar to the moving parts, and that the sudden interruption of the downward motion of the heavy side-bars and their connections also caused a violent jar. By substituting the levers J^3 actuated by the cam-shaped arms, the stops or cushions for receiving and sustaining the heavy side-bars and connections, and also the stops for limiting the descent of the upper cross head, may be omitted, and all shock and jar incident to their employment obviated, as the outline of the crank arms, actuating the said parts, is such that the part *i* (Fig. 1) of the cam nearest to and concentric with the center of the crank-shaft will sustain the side-bars at their lowest position, and until the upper plungers have descended the desired distance within the mold. At *i′* the cam outline becomes tangent to the line *i*, in order to

depress the roller K and lift the side bars F F, thus lifting the lower plungers E to produce a pressure on the brick from below while the toggle arms G G′ are straightening, the crank pin I′ having nearly reached the farthest limit of its throw in a direction away from the said toggles. The tangent line i' is preferably made sufficiently long to slightly raise the upper plungers D while the pressure from below is being produced, causing an upward bodily motion of the material being pressed. The part of the cam at i^2 is also concentric, thereby sustaining the lower plungers for the time while the said toggle arms are being straightened to give the full pressure and until the crank pin I′ has passed the farthest rearward limit of its throw, has commenced its forward movement, and has slightly flexed the said toggle arms in a direction away from the crank shaft.

I preferably adjust the length of the pitman connecting the crank pin I′ with the pin G^4 so that the toggle arms G and G′ will be straightened before the said crank pin has reached the limit of its backward throw, and so that the said toggle arms will be slightly flexed toward the said crank when it has reached the limit of backward throw, thus slightly relieving the pressure on the brick. The further motion downward and slightly forward of the said crank pin will cause the said toggles to again straighten, and produce a second and final pressure on the brick. As the crank pin I′ begins to flex the toggles forwardly the surface i^3 which is tangent to the curved surface i^2 engages the roller K, depressing it and causing the lower plungers to lift the finished brick out of the molds, first slowly and powerfully, and afterward more quickly, until as the bars F F approach their highest position, the curved part of the cam i^4 causes the upward motion to gradually cease until the lower plungers are flush with the top of the mold table. The crank pin I′ will then be a little forward of its lowest position, and the toggles G G′ will be sufficiently flexed to raise the upper plungers D to a point clear of the feed box M, as shown in Fig. 19. The said feed box is now moved forward, pushing before it the finished brick, as shown in Fig. 21. Meanwhile the part i^5 of the cam engages the roller k and by the revolution of the crank arms allows the said roller to rise, at first gradually and afterward more quickly, until the point of contact between the crank-arms and roller nearing the concentric part i of the said arms brings the roller gradually to rest at its highest point, thus lowering the side bars, at first slowly, then more quickly, and then gradually retarding their downward motion until they are at rest at their lowest point. The side bars F F reach their lowest limit of travel when the crank pin I′ is near its farthest forward limit of throw. The loose clay contained in the feed box is allowed to fall into the molds by the downward motion of the plungers E. The feed box M is now drawn back to the position shown in Fig. 1, while the crank pin I′ is commencing its rearward motion. The said feed box remains in the latter position back of the molds while the crank pin, continuing its rearward motion, straightens the toggles G G′, causing the upper plunger to enter the molds, as shown in Fig. 1. During this rearward motion of the crank pin the part i of the crank arms has retained the rollers k k and the side bars F F in the position shown in Fig. 1. The subsequent pressing of the brick then takes place as before described, and the raising of the lower plungers thereafter lifts the brick from the molds and leaves them level with the table, as seen in Figs. 19 and 20. They are then pushed forward by the feed box from the plungers to the front part of the table, from which they are removed by hand.

I claim as my invention:—

1. The combination, with a mold and plungers working therein, of means for actuating the plungers, embracing a toggle connected with the opposite plungers, and a crank shaft the crank-pin of which is connected with the middle joint of the toggle arms, and the crank-arms of which constitute cams adapted to lift and lower the said plungers and connected parts.

2. The combination with a mold and upper and lower plungers, of a toggle for actuating the same, side bars connecting the lower plunger with the toggle, a crank-shaft connected with and actuating the toggle, and lifting levers engaging the said side bars at points between their ends and the arms of said crank-shaft, which latter are provided with cam surfaces adapted to engage and actuate said lifting levers, substantially as described.

3. The combination with a mold and upper and lower plungers, of a toggle for actuating the same, side bars connecting the lower plunger with the toggle, a crank shaft connected with and actuating the toggle, and lifting levers acting on the said side bars at points between their ends and engaged with the arms of said crank shafts, which latter are provided with cam surfaces adapted to actuate said lifting levers, and studs secured in said bars and extending laterally therefrom for engagement with the lifting levers, substantially as described.

4. The combination with a mold and upper and lower plungers, of a toggle for actuating the same, side bars connecting the lower plunger with the toggle, a crank shaft connected with and actuating the toggle, lifting levers acting on the said side bars and engaging the arms of said crank shaft, which latter are provided with cam surfaces adapted to actuate the said lifting levers, and sleeves or rings on the studs provided with one or more grooves or notches, the said lifting levers being provided with transverse bearing surfaces adapted for engagement with said notches or grooves, substantially as described.

5. The combination with a mold-table and upper and lower plungers, of a toggle for actuating the same, the central joint of which consists of interpenetrating parts provided with cylindric bearing apertures uniform in diameter and with convex and concave segmental bearing surfaces concentric with the bearing apertures, and arranged in contact with each other, and a straight cylindric bearing pin inserted through said bearing apertures, the toggle members being provided with detachable bearing blocks upon which are formed the said concave bearing surfaces, said bearing blocks being provided with projections or ribs arranged parallel with the axis of the said bearing pin and engaging the main parts of the toggle members, whereby said bearing blocks may be removed endwise from engagement with the toggle members, substantially as described.

6. The combination with a mold, of upper and lower plungers sliding therein, a cross-head for supporting the lower plunger, a spring or counterbalance weight sustaining the lower plunger yieldingly on the cross-head, a cross-bar sliding in vertical guideways below the said cross-head, and a stem connecting the said lower plunger with the said cross-bar and passing through the cross-head, said cross-head being provided with apertures for the passage of the stem larger than the latter so as to admit of lateral displacement of the cross-head without disturbing the position of the lower plunger, substantially as described.

7. The combination with a mold, of upper and lower plungers sliding therein, a cross-head for supporting the lower plunger, a spring or counterbalance weight sustaining the lower plunger yieldingly on the cross-head, a cross-bar sliding in vertical guideways below the said cross-head, a stem connecting the said lower plunger with the said cross-bar, and a lever pivotally connected with said cross-bar and engaged with a fulcrum upon the machine frame, said lever being adapted for contact with a part of or upon the lower cross-head which limits the upward movement of the lower plunger at the time of filling the mold, substantially as described.

8. The combination with a mold, of upper and lower plungers sliding therein, a cross-head for supporting the lower plunger, a spring or counterbalance weight sustaining the lower plunger yieldingly on the lower cross-head, a lever connected with the lower plunger and having a fulcrum upon the machine frame, a guide rod engaging the lower cross-head and forked or slotted at its lower end, and a pin secured in said lever and adapted to engage the forked or slotted end of said guide rod to limit the outward movement of the plunger at the time of filling the mold, substantially as described.

9. The combination with a mold, of upper and lower plungers sliding therein, a cross-head supporting the lower plunger, a spring or counterbalance weight serving to sustain the lower plunger yieldingly on the lower cross-head, a lever connected with the lower plunger and having a fulcrum upon the machine frame, a guide rod engaging the lower cross-head and forked or slotted at its lower end, and a pin secured in said lever and adapted to engage the forked or slotted end of said guide rod to limit the upward movement of the plunger at the time of filling the mold, the said pin being provided with an eccentric part which engages the guide rod and being adapted to be turned in the lever for adjusting the position of its eccentric part, substantially as described.

10. The combination with a mold, of upper and lower plungers sliding therein, a cross-head for supporting the lower plunger, a spring or counterbalance weight sustaining the lower plunger yieldingly on the lower cross-head, a lever connected with the lower plunger and having a fulcrum upon the machine frame, a guide rod engaging the lower cross-head and forked or slotted at its lower end, and a pin secured in said lever and adapted to engage the forked or slotted end of said guide rod to limit the upward movement of the plunger at the time of filling the mold, the said pin being provided with an eccentric part which engages the guide rod and being adapted to turn in the lever, and means for securing the said pin in a desired position, consisting of grooves or key-ways in the said pin and the lever, and a key or spline adapted for insertion therein, substantially as described.

11. The combination with a mold, of upper and lower plungers sliding therein, a cross-head for supporting the lower plunger, a spring or counterbalance weight sustaining the lower plunger yieldingly on the lower cross-head, a cross-bar located below the lower plunger and having sliding connection with the machine frame, a stem passing through the lower cross-head and connecting the plunger with the said cross-bar, a lever fulcrumed upon the machine frame and pivotally connected with the said cross-bar, and a stop on the lower cross-head constructed for contact with the said lever to limit the upward movement of the lower plunger under the action of said spring or counterbalance weight, substantially as described.

12. The combination with a mold, of upper and lower plungers sliding therein, a cross-head for supporting the lower plunger, a spring or counterbalance weight sustaining the lower plunger yieldingly on the lower cross-head, a cross-bar located below the lower plunger and having sliding connection with the machine frame, a stem passing through the lower cross-head and connecting the plunger with the said cross-bar, a lever fulcrumed upon the machine frame and pivotally connected with the said cross-bar, and a stop on the lower cross-head constructed for contact with said lever to limit the up-

ward movement of the lower plunger under the action of said spring or counterbalance weight, said lever being provided with a journal bearing one half of which is removable, whereby the lever may engage with the cross-bar between the said stem and guides, substantially as described.

13. The combination with a mold, of upper and lower plungers sliding therein, a cross-head, a spring or counterbalance weights sustaining the lower plunger yieldingly on the lower cross-head, a lever connected with the lower plunger and adapted for contact with a part of or upon the lower cross-head, a vertically movable screw-shaft, a pivot connecting the screw shaft with the lever, a revolving nut mounted on the machine frame and engaging said screw-shaft, and means for rotating said nut, substantially as described.

14. The combination with a mold, of upper and lower plungers sliding therein, a cross-head, a spring or counterbalance weight sustaining the lower plunger yieldingly on the lower cross-head, a lever connected with the lower plunger, a vertically movable screw-shaft, a pivot connecting said screw-shaft with the lever, a revolving nut mounted on the machine frame and engaging said screw-shaft, a frame affording bearings for said nut and mounted upon pivotal supports or trunnions to afford freedom of lateral movement in the lower end of said screw-shaft, substantially as described.

15. The combination with a mold, of upper and lower plungers sliding therein, a lever for controlling the position of the lower plunger, a vertically movable screw-shaft, a pivot connecting said screw-shaft with the lever, a revolving nut mounted on the machine frame and engaging said screw-shaft, a frame affording bearings for said nut and mounted upon pivotal supports or trunnions to afford freedom of lateral movement in the lower end of said screw-shaft, a horizontal shaft mounted upon the machine frame concentrically with the said swinging frame and provided with a hand wheel or wheels, and intermeshing beveled gears upon the said nut and shaft, substantially as described.

16. The combination with a mold table and feed duct or hopper, of a reciprocating feed box, the front wall of which consists in whole or in part of a piece or strip which is materially weaker than the main parts of the feed-box and is detachably secured to the latter, substantially as described.

17. The combination with a mold and feed hopper, of a reciprocating feed-box, an oscillating arm by which the feed box is actuated, a pivot rod inserted through said arm, split sleeves placed upon the ends of the said rod at opposite sides of the arm and provided with notches, and connecting rods pivoted to the feed-box and inserted in said notches and provided with nuts on opposite sides of the said split sleeves whereby the latter may be clamped to the pivot rod and the connecting rods secured to the sleeves, substantially as described.

18. The combination with a mold and a feed hopper, of a reciprocating feed box, an oscillating arm by which the feed box is actuated, a pivot rod inserted through said arm, split sleeves placed upon the ends of the pivot rod and provided with notches, and connecting rods pivoted to the feed box and inserted in said notches and provided with nuts on opposite sides of the split sleeves, said split sleeves being provided with depressions or recesses which are engaged by the nuts to hold the rods in place when the nuts are loosened, substantially as described.

19. A frame for a brick-press, comprising two parallel side plates provided upon their inner faces with guides for the vertically movable parts of the machine, and rigidly connected with each other, said plates extending downwardly to the horizontal base or foundation on which the machine rests, and a separate frame for the driving gear of the machine secured against the outer surface of one of the side plates and also extending downwardly to the said base or foundation, substantially as described.

20. A brick machine, comprising upper and lower plungers, a toggle for actuating the same, a crank-shaft for actuating said toggle, a main frame consisting of parallel vertical side plates provided on their inner faces with bearings for the vertically movable parts of the machine, and provided with bearings for said crank-shaft, a gear wheel attached to the crank-shaft outside of one of the frame plates, a driving gear embracing a gear-pinion engaged with said gear-wheel on the crank-shaft, and a separate frame for said driving gear secured to the outer surface of the main frame, substantially as described.

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

BRUCE CLARK WHITE.

Witnesses:
C. CLARENCE POOLE,
GEORGE W. HIGGINS, Jr.