(No Model.) 4 Sheets—Sheet 1.

B. C. WHITE.

BRICK MAKING MACHINE.

No. 455,374. Patented July 7, 1891.

Fig 1.

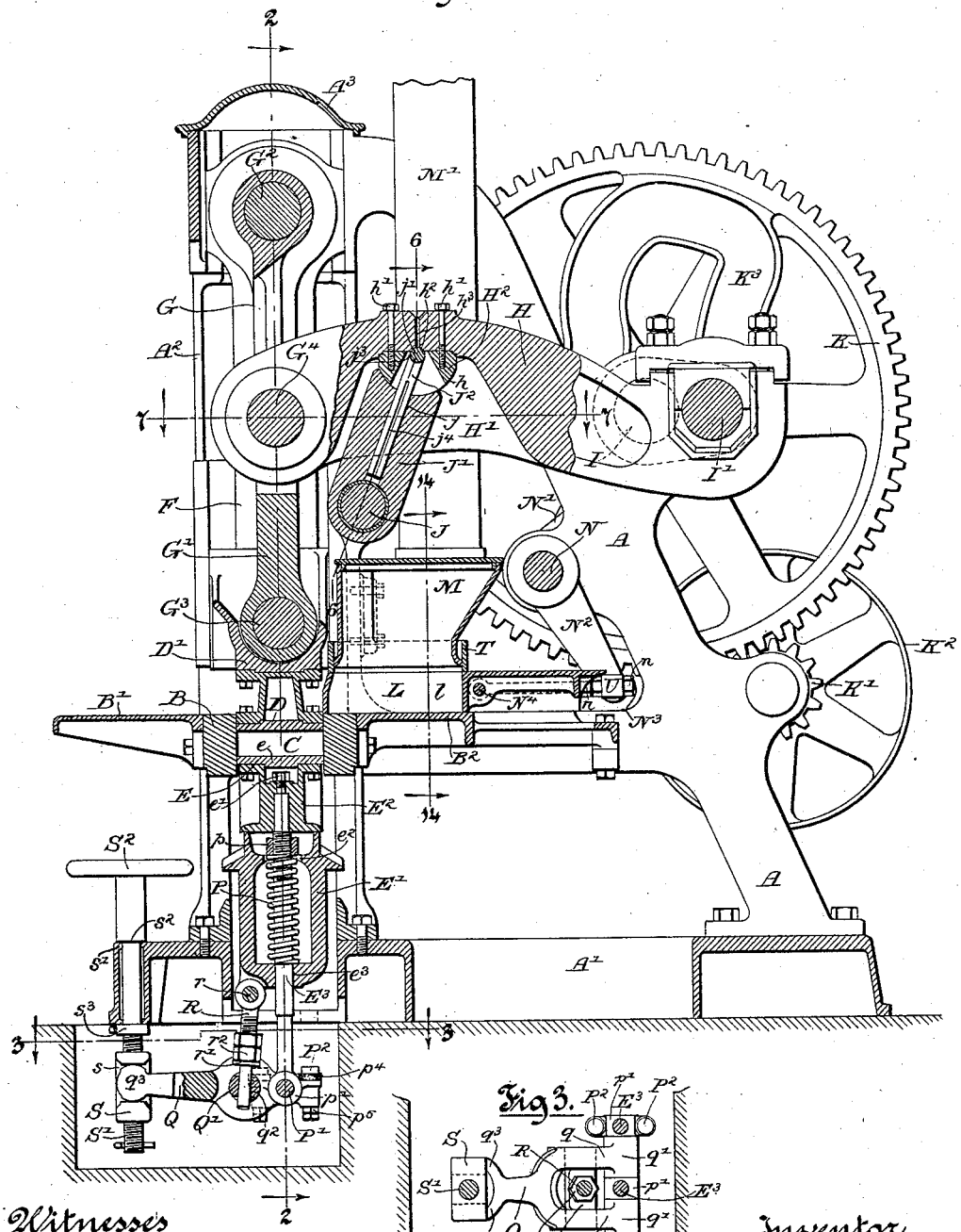

Fig 3.

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(No Model.)

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B. C. WHITE.

BRICK MAKING MACHINE.

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Fig 2.

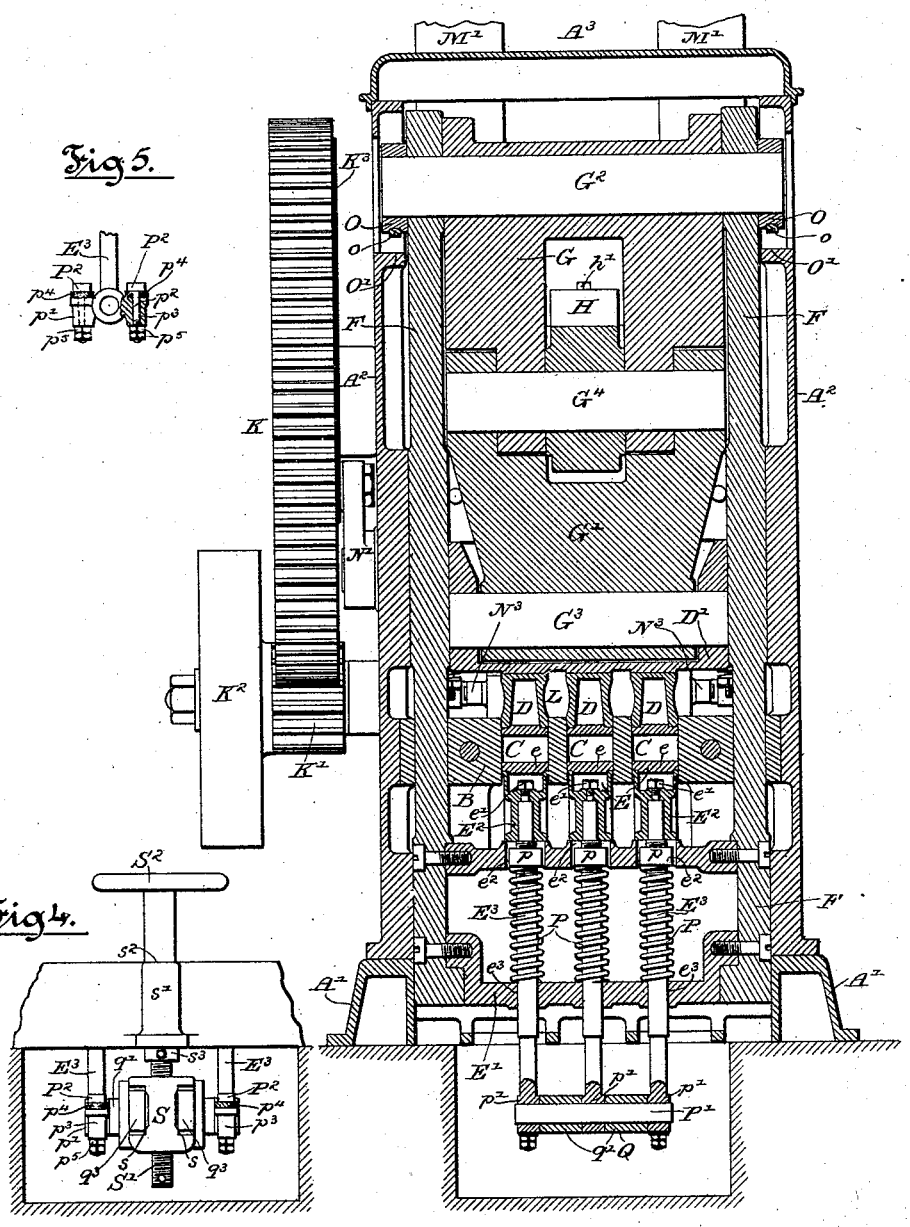

Fig 5.

Fig 4.

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Fig 6.

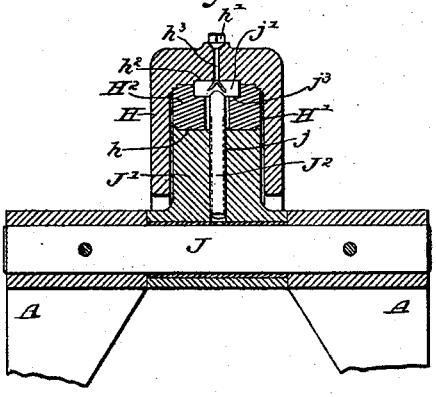


Fig 7.

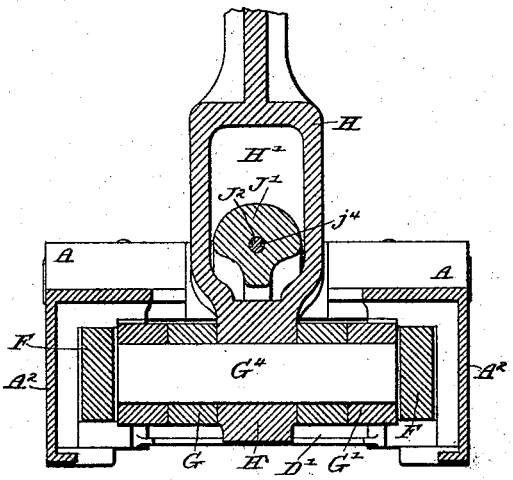


Fig 8.

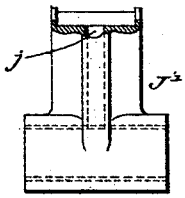


Fig 9.

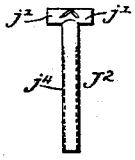


Fig 10.

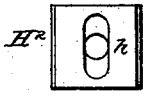


Fig 11.

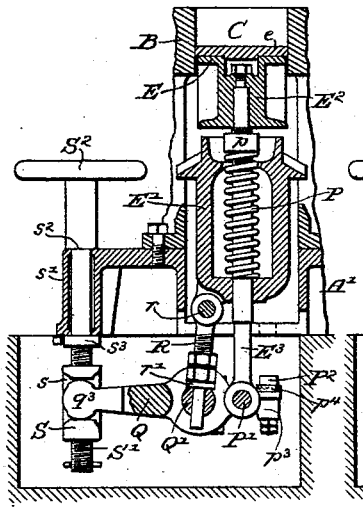


Fig 12.

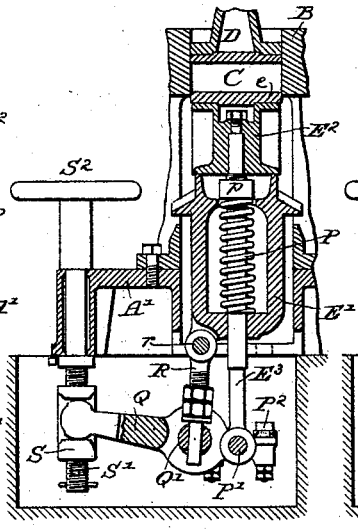
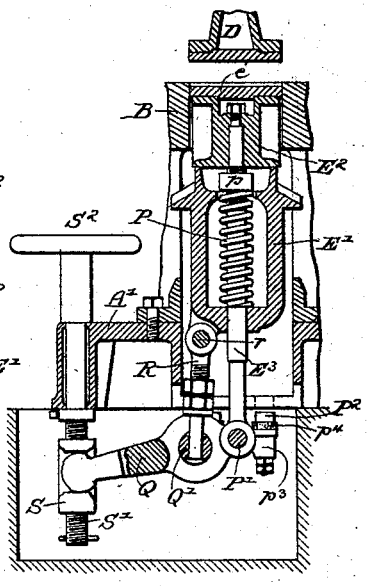


Fig 13.



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B. C. WHITE.

BRICK MAKING MACHINE.

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Fig 14.

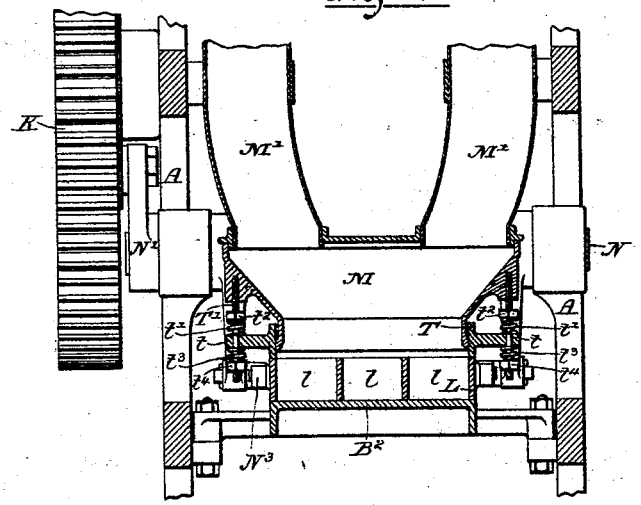


Fig 15.

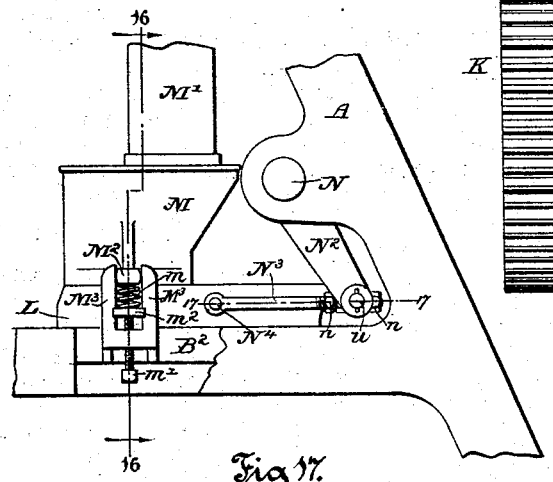


Fig 16.

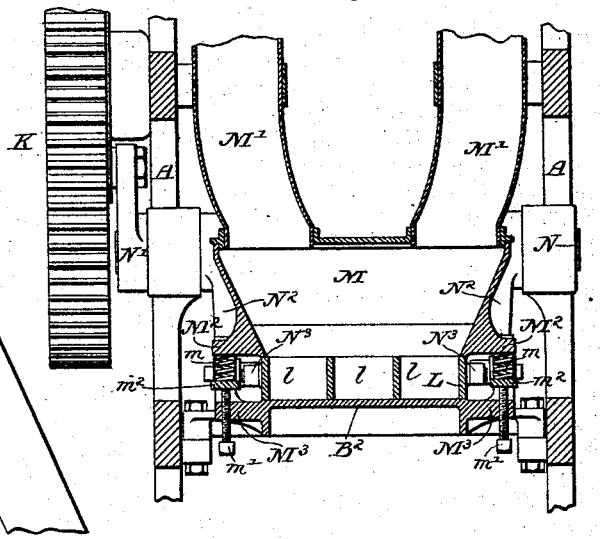


Fig 17.

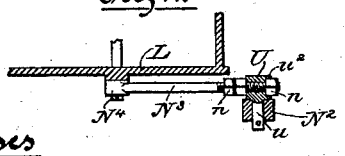
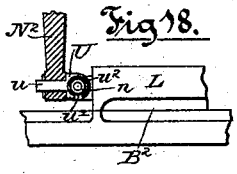


Fig 18.



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UNITED STATES PATENT OFFICE.

BRUCE CLARK WHITE, OF CHICAGO, ILLINOIS, ASSIGNOR OF TWO-THIRDS TO SAMUEL S. CHISHOLM AND JAMES A. BOYD, BOTH OF SAME PLACE.

BRICK-MAKING MACHINE.

SPECIFICATION forming part of Letters Patent No. 455,374, dated July 7, 1891.

Application filed July 25, 1890. Serial No. 359,890. (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-Making 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 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. 429,296, granted June 3, 1890, to myself and James A. Boyd.

In the accompanying drawings, illustrating my invention, Figure 1 is a central vertical section of a machine embodying my invention. Fig. 2 is a vertical cross-section thereof, taken upon line 2 2 of Fig. 1. Fig. 3 is a detail plan section taken upon line 3 3 of Fig. 1. Fig. 4 is a detail side elevation illustrating the parts shown in Fig. 3. Fig. 5 is a detail side elevation of one of the parts shown in Fig. 4. Fig. 6 is a detail section taken upon line 6 6 of Fig. 1. Fig. 7 is a plan section taken upon line 7 7 of Fig. 1. Figs. 8, 9, and 10 are detail views of parts shown in Figs. 6 and 7. Figs. 11, 12, and 13 are detail sections of the mold-table and plungers, illustrating the operation of the parts which actuate the lower plunger. Fig. 14 is a detail section taken upon line 14 14 of Fig. 1, illustrating the feeding devices for the clay. Fig. 15 is a side view of the hopper for supplying the clay to the mold, showing a somewhat different form of hopper embodying the main features of the invention. Fig. 16 is a sectional view taken upon line 16 16 of Fig. 15. Fig. 17 is a plan section taken upon line 17 17 of Fig. 15, showing the joint between one of the connecting rods and oscillating arms by which the feed-box is moved. Fig. 18 is a side elevation of the joint shown in Fig. 17.

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 attached to a massive horizontal base-casting A′. The said frame-plates A A are constructed to form two vertical guide-standards A^2 A^2 to support the bearings for the vertically-movable parts of the machine, said frame-plates being connected with each other at the top of the frame by means of a horizontal cross-girt A^3.

B is a mold-table, which is located at a convenient distance above the base-casting A′ and is arranged horizontally between and bolted at its ends to the vertical guide-standards A^2 A^2 of the frame. Within said mold-tables are located molds C C C, which in the machine shown are three in number. Horizontal extensions of said mold-table at the front and rear of the molds for the purpose of supporting the feeding devices for the clay and the finished bricks are formed by means of a horizontal plate B′ at the front of the molds and by a second horizontal plate B^2, located at the rear of the mold-table and sustained by attachment to the frame-plates A A in the manner illustrated.

D D D are a series of plungers constructed to slide in the upper parts of the molds C C C and attached to a horizontal cross-head D′, located above the mold-table B.

E E E are other plungers sliding in the bottom parts of the molds and mounted upon a cross-head E′, located beneath the mold-table.

F F are two heavy vertical bars, which are mounted to slide vertically in the guide-standards A^2 A^2 of the frame. Said bars F F are secured at their lower ends to the cross-head E′ and extend upwardly through the ends of the mold-table to points near the upper ends of the guide-standards A^2 A^2.

G G′ are toggle-arms, which are pivoted, respectively, to the upper ends of the slide-bars and the upper cross-head. The upper toggle-arm is connected with the slide-bars by means of a heavy pivot-pin G^2, and the lower toggle-arm G′ is constructed to enter a recess in the

upper surface of the cross-head D′, and is pivotally connected with the latter by means of a pivot-pin G^3, inserted through the bearing-apertures in opposite ends of said cross-head and in the lower end of said toggle-arm.

The toggle-arms G G′ are pivotally connected with each other by means of a heavy pin G^4, inserted through the overlapping forked ends of said toggle-arms.

H is a heavy beam arranged horizontally and connected with the middle joint of the toggle-arms by means of the pin G^4, which passes through the ends of said beam.

I is a heavy crank-shaft mounted in bearings in the frame-plates A A and located approximately in the same horizontal plane with the pivot-pin G^4. Said crank-shaft is located at some distance to the rear of the toggle-arms, and is provided with a heavy crank-pin I′, with which the beam H is engaged. The rotation of the crank-shaft acts upon the toggle-arms through the medium of the beam H to alternately straighten and flex the said toggle-arms.

J is a pin or shaft arranged horizontally and secured at its ends in the frame-plates A A, the middle part of said pin extending beneath the beam H. Upon said shaft is mounted a rocking arm J′, Fig. 8, preferably provided with a long cylindrical bearing at its lower end to engage the said pin J. The upper end of the arm J′ is adapted to engage a convex bearing-surface *h* formed upon the beam H, preferably at a point near that end of the beam which is engaged with the toggles G G′. Said rocking arm J′ serves as a fulcrum or point of support for the beam, so that the latter operates as it is moved by the crank to raise and lower the toggle-arms, the slide-bars, the upper and lower cross-head, and the upper and lower plungers.

K is a heavy drive-wheel fixed to the shaft I outside of the frame-plate A. Said drive-wheel is provided with peripheral cogs, which engage pinion K′, mounted upon the frame, and having attached to it a belt-pulley K^2, over which is placed the driving belt for transmitting power to the machine.

L is a sliding feed-box which rests and slides upon the top of the mold-table at the rear of the molds. Said feed-box consists of a horizontal plate or casting provided at its end adjacent to the molds with rectangular openings *l l l*, corresponding in number with the molds C C C and of the suitable dimensions to contain the quantity of clay required for filling the molds. Said openings *l l l* are closed at their bottoms by the mold-table, except when the feed-box is moved forward to bring said openings over the molds.

M is a feed-hopper, located at the rear of the molds and over the sliding feed-box L, which latter has a horizontal reciprocatory motion through a distance sufficient to carry the openings *l l l* alternately over the molds and under the feed-hopper. The feed-box is provided at the rear of the openings *l l l* with a horizontal top surface, which supports the material within the hopper during the time the feed-box is being moved to carry the clay to the molds.

N is a rock-shaft, mounted at its ends in the frame-plates A A and provided with an upwardly-extending arm N′, which engages with the cam K^3 upon the wheel K. Said rock-shaft N is also provided with two depending arms N^2 N^2, which are connected by pitmen N^3 N^3 with the opposite sides of the feed-box in the manner clearly shown in the drawings, Fig. 14.

The ends of the pivot G^2, which connect the upper toggle G with the vertical bars F F, are extended outwardly beyond said bars, and upon the ends of said pivots are placed two blocks O O, having flat lower faces adapted to engage transverse horizontal stops or ledges O′ O′ on the guide-standards A^2 A^2 below said blocks O O. The lower surfaces of the blocks O O are preferably provided with cushions *o o*, of rubber. Said stops operate to limit the downward movement of the lower cross-head and to sustain the weight of the cross-heads and plungers and connected parts, except when the same are supported by the rocking arm J′ acting on the beam H.

The construction and operation of the main parts of the machine above described are substantially the same as that of the corresponding parts of the machine shown in said prior patent, No. 429,296, the compression of the brick being produced by the action of the toggle-arms operating through the medium of the slide-bars F F and the upper and lower cross-heads; while the vertical position of the cross-heads during the compression of the brick is determined by the action of the beam H and rocking arm J′, except when the said cross-heads are sustained by said stops O′ O′ upon the frame. As shown in said patent No. 429,296, two swinging arms are employed to form a fulcrum or support for the beam H, said arms being adapted to engage bearing-pins extending through the beam. As herein shown, only a single rocking arm J′ and said arm and adjacent parts of the beam are made as follows: Said beam H is made of considerable depth vertically and in its under surface is provided with a deep recess H′, extending upwardly to the top of the beam, and within which the upper end of the arm J′ is located. The convex bearing-surface *h* is located in the upper part of this recess, and said bearing-surface is preferably formed upon a bearing-block H^2, made separate from the beam and held in place by bolts *h′ h′* in the manner illustrated.

J^2 is a guide-rod, which enters and slides in a longitudinal guide-passage *j* in the arm J′. Said rod is provided at its upper end with a cross piece or head *j′*, having cylindric bearing-surfaces at its ends, which are engaged with bearing-recesses j^3 h^2, formed between the block H^2 and the beam, the said rod *j* being adapted to swing upon an axis concentric

with the bearing-surface h by the turning of the said cross-piece in the said bearing-recesses j^3 h^2. The bearing-block H^2 is provided with a central slot for the passage of the guide-rod in the manner illustrated. In the operation of the beam the latter is at one point in its movement lifted above or free from the rocking arm J′, and the object of the guide-rod J^2 is to maintain the said rocking arm in proper position to re-engage the bearing-surface h during the time the beam is lifted free from the arm. Such lifting of the beam will occur during the time that the crank-pin is in the upper part of its throw, when the beam is near the termination of its forward or outward movement, and the upper toggle G is thrown outwardly by the beam in such manner as to temporarily sustain the outer end of the beam, the upper pivot of the said toggle being at this time supported by the stops O′ O′. The several parts are preferably located so that the beam will be re-engaged with the arm J′ during the downward movement of the crank-pin and when the beam is at the extreme limit of its throw away from the toggles and the latter are straight, it following from this construction that the bodily vertical movement of the toggles and the plungers within the molds will not begin until about the time the toggles are straightened out.

To facilitate the oiling of the bearing-surface h and other adjacent parts, an oil-passage h^3 extends through the beam from the top surface thereof to the cross-head j', so that oil may be fed directly to said cross-head and will flow downwardly from the latter along the rod J^2 to the bearing-surfaces between the end of the rocking arm and the block H^2, and will also lubricate the bearing-surfaces of the said rod J^2 and the arm. The guide-passage j is preferably made to extend through said arm to the pin J, so that oil fed through said bearing-passage will reach the said pin J and lubricate the latter also. The rod J^2 is preferably provided with longitudinal grooves j^4 j^4, which serve both to convey the oil downwardly to the pin J and also as a means of admitting air to the guide-passage beneath the lower end of the said rod during the operation of the machine.

The machine shown in the drawings embraces, also, improved features of construction in means for actuating the lower plungers, as follows: The said lower plungers E E, instead of being positively or rigidly attached to the lower cross-head, are vertically movable with relation to said lower cross-head and are sustained from the cross-head by means of springs or equivalent weights engaging the cross-head and pressing upwardly against the plungers. By this construction the said lower plungers in certain positions of the cross-head are adapted to be moved vertically within the mold independently of the position of the lower cross-head. Said plungers are, however, provided with bearing surfaces or shoulders adapted for contact with the lower cross-head in the upward movement of the latter, so that the plungers will be positively lifted in compressing the brick.

In the particular construction of those parts illustrated in the drawings the plungers E consist of rectangular castings E^2, to the upper surfaces of which are secured flat plates e e, forming the working-surfaces of the plungers, and the lower surfaces of which are adapted for contact with the top surface of the lower cross-head. The plungers are further provided with depending stems or rods E^3, which are secured at their upper ends in the castings E^2, and which pass downwardly through the cross-head E′. The said stems are conveniently secured in the castings E^2 by being inserted therein at their upper ends and held by means of vertical set-screws e', which pass through the upper part of the castings and enter the upper ends of the stems. The lower cross-head E′ is shown as made hollow or of box form and as provided in its upper horizontal part with openings e^2, made considerably larger than the stems E^3, and at its lower part with guide-passages e^3, within which the said stems fit and slide.

P P P are coiled springs surrounding the stems E^3 E^3 E^3 within the hollow lower cross-heads, said springs being arranged to bear against the lower wall of the cross-head at their lower ends and against collars or nuts p p p, secured upon the stems near the upper ends of the latter. Said nuts p p p are adjustably secured upon the stems, so that they may be moved endwise thereon, said rings for this purpose being conveniently engaged with screw-threads upon the said stems in the manner illustrated.

Q is a rocking lever located adjacent and connected with the lower ends of the several stems E^3 E^3 E^3, the connecting means shown consisting of a pivot-pin P′, passing horizontally through the said lever and through bearing-apertures formed in eyes p' p' p' on the lower ends of the said stems. Said lever Q is forked or branched at its end adjacent to the plunger-stems, so as to form two arms q q, the ends of which are provided with rings or bearing-hubs q' q', which enter between the lower ends of the plunger-stems and are made of sufficient length to fill the spaces between the eyes p' p' p' at the lower ends of said stems. By this construction a continuous bearing is formed for the pivot-pin P′ and a suitably strong and rigid connection between the several plunger-stems and the said lever is afforded. Said lever Q has sliding connections at a point between its ends with a vertically-arranged rod R, which is connected at its upper end with the lower cross-head E′ and is provided with an abutting surface or shoulder adapted for engagement with the said lever. The rod R is connected with the lower part of the cross-head E′ by means of a horizontal pivot r, arranged parallel with the pivot-pin P′, so that the lower end of said

rod is free to swing toward and from said pivot-pin P′. The sliding engagement between the lower part of the rod R and the lever Q is preferably afforded by means of a swinging guide Q′, which is located between the arms q q and has bearings at its ends in said arms, so that the guide may turn upon an axis parallel with that of the pivot-pin P′. Said guide Q′ is provided with a bearing-aperture q^2, through which passes the lower end of the said rod R. The abutting surface or shoulder r' of the rod is arranged for contact with the top of the swinging guide Q′. Said shoulder is preferably made adjustable by means of a nut r^2 engaging a screw-thread upon the rod, a second or jam nut being placed above the said nut r^2 to hold the latter from shifting when properly adjusted. At its outer end or that remote from the plunger the lever Q is engaged with a vertically movable or adjustable block S, which may be moved or shifted in its vertical position to change the point of pivotal support or fulcrum of the lever Q, the adjusting device illustrated consisting of a screw-shaft S′, passing through the threaded aperture in the block S and adapted to rotate, but not to move endwise in the machine-frame, so that said screw-shaft serves both as a means of support of and for adjusting the said block S.

As herein shown, the block S is provided at its opposite sides with recesses s s, which are engaged by the forked ends or prongs q^3 q^3 of the said lever Q, as clearly seen in Fig. 4. The screw-shaft S′ is mounted in a bearing s' in the base-casting A′ of the machine and is held from vertical movement by the shoulder s^2 above the bearing and by a collar s^3 below said bearing. Said screw-shaft is provided at its upper end with a hand-wheel S^2, which is located in front of the mold-table in a position convenient to be grasped and turned by the operator for adjusting the position of the block S.

P^2 P^2 are stops attached to the lower ends of the external plunger-stems E^3 E^3 and adapted for contact with the lower surface of the base-casting A′ in such manner as to limit the upward movement of the plungers within the molds, said stops P^2 P^2 being adapted to yield in case of excessive strain, so as to prevent the breakage of the parts. For this purpose said stops are formed by means of metal blocks attached to stems p^2 p^2, which pass through tubular guides p^3 p^3, made integral with the lower ends of said stems E^3 E^3, in the manner clearly shown in the drawings, Fig. 5. Between the upper ends of said sleeves p^3 and said stops P^2 are located cushions or washers p^4, of rubber or other elastic substance, and the plates are held in place by nuts p^5, placed on the stems p^2 below the sleeves p^3. Said nuts will commonly be tightened, so as to compress the washers p^4 to a considerable extent, thereby maintaining said washers under a considerable pressure and preventing the yielding of the same except under excessive strain.

The parts above described are so arranged that the lower plungers may be sustained either by their engagement with the top of the lower cross-head, as shown in Figs. 1, 2, 12, and 13, or by means of the springs P, as shown in Fig. 11. The said springs P P P are of such strength or stiffness that they will sustain the plungers at all times except when there is a considerable downward pressure brought upon the same by the action of the upper plungers. The parts are so disposed, furthermore, that when the cross-head E′ is at the lower limit of its movement said cross-head will be free from the lower plungers, and the latter will be held up solely by the action of the springs, the expansion of which at this time will be limited by the lever Q, which is held movably at its outer end, and the upward movement of which at its inner end under the action of the springs is limited by contact of said lever with the shoulder of the rod R. The mold is filled when the lower cross-head is at the lower limit of its movement, and it follows that the position of the lower plungers within the mold at the time of filling is determined by the position of the shoulder on the rod R and of the adjustable fulcrum-block S of the lever Q. It follows that when the lower cross-head is at the lowermost limit of its movement the lower plunger will be supported in this position by the springs, and that by shifting the fulcrum-block S the position of the said lower plungers at the time of filling may be changed as desired. Such position of the lower plungers obviously determines the quantity of clay which is fed to the mold by the feed-box, and it follows that by changing the vertical position of the fulcrum-block S or that of the stop r' on the rod R at a time when the lower cross-head is at the extreme limit of its travel downwardly the lower plungers may be adjusted within the molds, so that the latter will receive the quantity of clay found desirable or necessary by reason of the quality and condition of the clay or other circumstances. When the upper plungers descend into the molds after the latter have been filled with clay, the approach of the upper plungers toward the lower plungers will cause the said lower plungers to recede, the same being sustained at this time solely by the springs. The lower plungers will not begin to move downwardly, however, until the pressure on the clay exceeds the sustaining power of the spring, and the latter may be made of such strength as to effect materially the compression of the clay before the plungers begin to descend. The plungers continue to move downwardly until they strike and rest upon the lower cross-head. The parts are desirably so arranged that the lower plungers will stop near the bottoms of the molds, as clearly shown in Fig. 12, which illustrates the position of the parts when the

lower plungers have reached the downward limit of their movement. It will of course be seen that as soon as the plungers begin to move downwardly the inner end of the lever Q will be thrust downwardly with the plunger-stems, so as to carry the lever away from the stop or shoulder, said lever being in contact with the shoulder only when the plungers are lifted free from the lower cross-head by the action of the springs. The upward movement of the lower cross-head for the purpose of compressing the brick begins immediately after the lower plungers have come to a bearing upon the lower cross-head. At this time the upper plungers will be prevented from further descent by the contact of the upper cross-head with the stops O′ O′, and the operation of pressing the brick will be completed by the lower plungers, which are then caused to rise by the further straightening of the toggles. The lower plungers are lifted to bring their upper surfaces flush with the top of the mold-table by the action of the beam H and arm J′, as hereinbefore described, the upward movement of the lower cross-head being arranged to cease when the lower plungers reach the top of the mold. The upper plungers will usually be lifted free of the pressed brick about the time the lower plungers reach the top of the mold, and, inasmuch as the springs are then still acting against the lower plungers, the latter might be thrown upwardly above the top of the mold were it not for the stops P^2 P^2, which strike the bottom of the base-casting A′, and thus limit the upward movement of the plunger-stems or plungers at this time. The movements of the beam H and of the toggles must be so adjusted as to bring the lower plungers flush with the top of the mold-table, or nearly so; but if during the adjustment of the parts or by accident the parts were so adjusted as to lift the lower plungers too far, and thus carry them above the mold-table, the contact of the stops P^2 P^2 with the base-casting would result in the breakage of the machine were it not for the presence of the spring washers or cushions p^4 p^4, above referred to, which spring washers or cushions are adapted to yield under the circumstances mentioned, and thus avoid the breaking of the machine. The position of the several parts when the lower plungers have nearly reached the upward limit of their movement is shown in Fig. 13, from which it will be seen that the stops P^2 P^2 are about to come in contact with the bottom surface of the base-casting A′, and the lower plungers are at the same distance from the top of the mold-table as the said stops are from the bottom of the base-casting. At this time, the lower cross-head having nearly reached the upward limit of its movement, the rod R has been drawn upwardly, so as to carry the shoulder r' a considerable distance from the opposing part of the lever Q. When springs are applied between the lower plungers and the lower cross-heads to sustain said plungers level with the top of the table and stops are employed to hold the plungers from rising above the table, as above described, it is obviously not essential that the lower cross-head should remain immovable at the upward limit of its movement, but said lower cross-head may immediately begin to descend. It follows that by the use of the springs arranged and operating as described any special construction in the actuating device of the machine for giving the necessary dwell to the lower plungers at this time may be omitted. By the use of springs for sustaining the lower plungers in the manner described, therefore, the rocking arm J and beam H or other device which is without provision for giving a dwell to the lower cross-head at the upward limit of its movement may be employed for actuating said lower cross-head.

One important feature of my invention is embraced in the springs for sustaining the lower plungers in connection with the lever pivoted to the lower plungers and to an adjustable support upon the frame and adapted to engage the lower cross-head in a stop on the same, so that the upward movement of the lower plungers at the time of filling the molds may be limited or controlled for changing the capacity of the molds without adjustment of the cross-head or other main parts of the machine. This same general result is obtained by the construction set forth in said prior patent, No. 429,296, wherein a weight or equivalent spring is shown as employed to lift the lower plungers, and is broadly therein claimed in connection with a stop for limiting the upward movement of the plungers. The device shown in this application has the advantage of being much more simple and durable in construction, while it is at the same time capable of being more easily and quickly adjusted. It is to be understood, however, that as far as the operation of the lever Q is concerned a counterbalance-weight may be employed in place of the spring P to provide a means of lifting the lower plungers relatively to the lower cross-head in the same general manner set forth in said prior patent, No. 429,296; but I prefer, however, to employ the spring or springs for this purpose for obvious reasons of economy and simplicity of construction.

I have herein shown the block S as sustained upon and moved by a screw-shaft; but it is entirely obvious that as far as the operation of the main parts of the machine is concerned said block may be adjustably sustained upon the frame in any one of many different ways, which will readily suggest themselves to a mechanic.

The machine herein shown embodies improvements in the construction of the hopper M, through the medium of which the clay is fed to the feed-box L as follows: T is a ring which surrounds and slides upon the lower end or mouth of the hopper M, and which is adapted to rest upon the top surface of the feed-box. In similar machines as heretofore

made the hopper has been rigidly attached to the machine-frame and arranged to bear directly upon the top of the feed-box; but this construction is found to have the disadvantage that the clay, which is liable to adhere to the top surface of the feed-box, is pressed down or compacted against said surface by the rubbing on the clay of the unyielding lower surface of the hopper, so that the feed-box is liable to become covered in a short time with a very firm and compact layer of clay, which by contact with the lower surface of the hopper prevents the proper operation of the parts. By the employment of the ring T, which is adapted to slide freely vertically on the hopper, I avoid the objections stated, it being found in practice that if the surface or edge of the hopper in contact with the feed-box is adapted to yield freely upward, so as to prevent any compacting of the clay in a hard mass or layer on the top surface of the feed-box, any clay which may adhere to the said top surface of the feed-box will be scraped therefrom in passing beneath the said yielding ring.

The ring T may rest by gravity only against the feed-box; but it may be found desirable that said ring should operate with a pressure greater or less than that afforded by its weight, and I have therefore shown in the drawings springs applied to said ring and so arranged that they may act either to make the ring press against the feed-box with a pressure less than that which would be due to its weight alone or with a pressure greater than that which would be afforded by its weight. In the particular arrangement of the said parts shown in the drawings, T′ T′ are vertical rods secured at their upper ends to the wall of the hopper above the ring T and passing through lugs $t\ t$ on said ring. The said walls of the hopper being outwardly inclined in the machine shown, Fig. 14, the rods T′ T′ are secured at their upper ends in the projections cast upon the said walls in the manner illustrated. Coiled springs $t'\ t'$ surround the rods T′ T′ above the lugs $t\ t$ and bear against said lugs and against the adjustable collars or nuts $t^2\ t^2$ upon the rods, and other coiled springs $t^3\ t^3$ are placed around the said rods below the said lugs t and bear at their upper ends against said lugs and at their lower ends against the adjustable collars or nuts $t^4\ t^4$ on the lower parts of said rods. In a construction of this kind by adjusting the nuts t^2 or t^4 the ring T may be made to bear downwardly upon the feed-box with the pressure found to be most desirable in the operation of the parts.

The results obtained by the use of the vertically-movable or upwardly-yielding ring T may be obtained by making the entire hopper vertically movable, it being obvious that the part of the feed ducts or spouts which is adjacent to the feed-box may be made to yield upwardly and to act with a desired pressure by making more or less of the said ducts or spouts movable, as may be found convenient or desirable. If, for instance, the lower part of the hopper only is movable, it is necessary to make a sliding or telescopic joint between the said movable or yielding part and the body of the hopper; but if the entire hopper is movable the latter may be moved with reference to the supply-chutes M′, which latter, being usually made of canvas, require no special provision for allowing such upward movement of the hopper. It will of course be understood that when the entire hopper is made vertically yielding or movable the same may either rest with its entire weight upon the feed-box or, if found necessary or desirable, a part of its weight may be carried by supporting-springs in the same manner as hereinbefore described in connection with the ring T. When the entire hopper is vertically movable, it will not usually be necessary to employ springs to press the hopper downwardly, inasmuch as the weight of the hopper will be so great as to render such springs unnecessary.

In Fig. 15 of the accompanying drawings I have shown a construction of the kind above last referred to, wherein the hopper M is provided at its opposite sides with outwardly-projecting horizontal arms $M^2\ M^2$, which engage with two vertically-arranged slotted guide-arms $M^3\ M^3$ on the rear part B^2 of the mold-table. Springs $m\ m$ are placed between the arms $M^2\ M^2$ and the lower ends of the slots in the guide-arms $M^3\ M^3$, so that said springs act upwardly in a manner to take part of the weight of the hopper from the feed-box. To provide means for adjusting the tension of said springs, set-screws $m'\ m'$ are inserted through the arms $M^3\ M^3$, so as to bear upwardly against followers $m^2\ m^2$, placed in the guide-slots of said arms beneath said springs $m\ m$ in the manner illustrated in Figs. 15 and 16.

It will of course be understood that equivalent counterbalance-weights may be employed in place of the springs for lifting the ring T or the entire hopper when the latter is made vertically movable.

As commonly heretofore constructed, the mold-table of a brick-machine having a reciprocatory feed-box of the kind herein shown has been provided with guides for the feed-box, constructed to hold the latter from displacement sidewise in its reciprocatory movement, and as novel construction in these parts the top of the mold-table on which the feed-box moves is made perfectly flat or horizontal, and the feed-box is held in position solely by the pitmen or connecting-rods $N^3\ N^3$, which unite the oscillating arms $N^2\ N^2$ with the opposite sides of the feed-box, said rods being connected with the oscillating arms and the feed-box by pivotal connections constructed to rigidly hold the connecting-rods parallel to the feed-box, and means being provided for adjusting the length of the connecting-rods, so that the sides of the feed-box

may be adjusted accurately parallel to the sides of the mold-table, and the feed-box thereby caused to move in a straight line without the use of any guides on the mold-table, which have been found objectionable by reason of the liability of clay to accumulate thereon and lift the box from its seat.

The particular device herein shown for attaching the connecting-bars N^3 N^3 with the arms N^2 N^2 embodies certain features of novelty, which are herein claimed, and are made as follows, Figs. 17 and 18: U U are blocks swiveled to the arms N^2 N^2 by means of stems u u upon the blocks, which pass through bearing-apertures in said arms and are arranged parallel with the shaft N, so that the blocks may swing in vertical planes. Said blocks are provided with notches u', into which the end portions of the rods N^3 N^3 are inserted, said rods being provided with nuts n n on opposite sides of the blocks U U. By shifting said nuts upon the rods the length of the same may be varied for the purpose of adjusting the feed-box so that it will move accurately parallel with the sides of the mold-table. In order to avoid the possibility of the connecting-rods being accidentally disconnected from the blocks U, each of said blocks is provided in its outer face with a recess u^2, Fig. 17, into which the nut n enters, so that the said rod cannot be lifted out of the notch u' until the nut has been turned back clear of the face of the block. The connecting-rods N^3 N^3 are preferably connected with the feed-box by means of the pivot-rod N^4, passing through the said walls or flanges of the feed-box and projecting outside of the same a sufficient distance to engage the transverse bearing-apertures formed in the ends of said connecting-rods in the manner illustrated.

When the feed-box is connected with the arms N^2 N^2 in the manner described, said feed-box may be readily and quickly disconnected from the arms by loosening the nuts n n on the connecting-rods, lifting the latter free from the swiveled blocks U U, and then slipping the forward ends of said connecting-rods from the pivot-rod N^4.

I claim as my invention—

1. The combination, with a mold and upper and lower plungers working therein, of means for actuating the plungers, embracing toggle-arms connected with the opposite plungers, a crank-shaft, a beam connected with the crank-shaft and with the middle joint of the toggle-arms, and a shifting fulcrum for the beam, consisting of a pivotally-supported arm upon the frame adapted to engage at its upper end with a curved bearing-surface on the beam, whereby the part of the beam engaged with said arm is caused to move in the arc of a circle during the forward movement of the beam, the lower plunger being yieldingly connected with the actuating devices, whereby the lower plunger may be allowed to dwell at the upper limit of its movement independently of the said actuating devices, substantially as described.

2. The combination, with a mold and plungers working therein, of means for actuating the plungers, embracing toggle-arms connected with the opposite plungers, a crank-shaft, a beam connected with the said crank-shaft and with the middle joint of the toggle-arms, a shifting fulcrum for the beam, comprising a pivotally-supported arm upon the frame adapted to engage at its upper end with a bearing-surface on the beam, and a sliding connection between the said beam and the arm for holding the arm in position to re-engage said bearing-surface of the beam, substantially as described.

3. The combination, with a mold and plungers working therein, of means for actuating the plungers, embracing toggle-arms connected with the opposite plungers, a crank-shaft, a beam connected with the said crank-shaft and with the middle joint of the toggle-arms, and a pivotally-supported arm upon the frame acting as a fulcrum for the beam, said beam being provided with an upwardly-extending recess and having in the upper part of said recess a bearing-surface to engage the upper end of said arm, substantially as described.

4. The combination, with a mold and plungers working therein, of means for actuating plungers, embracing toggle-arms connected with the opposite plungers, a crank-shaft, a beam connected with the said crank-shaft and with the middle joint of the toggle-arms, said beam being provided with an upwardly-extending recess, a pivotally-supported arm upon the frame forming a shifting fulcrum for the beam, and a removable bearing-block upon the beam having a convex bearing-surface for engagement with the upper end of the said arm, substantially as described.

5. The combination, with a mold, of upper and lower plungers sliding therein, means for actuating the lower plunger, having yielding connection therewith, and means for limiting the upward movement of the said lower plunger relative to the parts which actuate the same, comprising a lever pivotally connected with the lower plunger and an adjustable fulcrum for the said lever, said lever being adapted for contact with one of the parts which is moved to give movement to the said lower plunger, so as to limit the upward movement of the plunger at the time of filling the mold, substantially as described.

6. The combination, with a mold, of upper and lower plungers sliding therein, and means for actuating the lower plunger, comprising a cross-head engaged with and supporting the lower plunger and having sliding connection therewith, a spring or counterbalance-weight serving to sustain the lower plunger yieldingly on the lower cross-head, and a lever pivotally connected with the lower plunger and with the machine-frame, said lever being adapted for contact with a part of or upon

the lower cross-head, so as to limit the upward movement of the lower plunger at the time of filling the mold, substantially as described.

7. The combination, with a mold, of upper and lower plungers sliding therein, and means for actuating the lower plunger, comprising a cross-head engaged with and supporting the lower plunger and having sliding connection therewith, a spring or counterbalance-weight serving to sustain the lower plunger yieldingly on the lower cross-head, a lever pivotally connected with the lower plunger, and an adjustable fulcrum for the lever, said lever being adapted for contact with or a part of the lower cross-head, so as to limit the upward movement of the plunger at the time of filling the mold, substantially as described.

8. The combination, with a mold, of upper and lower plungers sliding therein, and means for actuating the lower plunger, comprising a cross-head engaged with and supporting the lower plunger and having sliding connection therewith, a spring or counterbalance-weight serving to sustain the lower plunger yieldingly on the lower cross-head, a lever pivotally connected with the lower plunger and with the machine-frame, and a guide-rod engaging the lower cross-head and the said lever and provided with a stop or shoulder to limit the approach of the lever toward the cross-head and acting to limit the upward 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, and means for actuating the lower plungers, comprising a cross-head engaged with and supporting the lower plunger and having sliding connection therewith, a spring or counterbalance-weight serving to sustain the lower plunger yieldingly on the lower cross-head, a lever pivotally connected with the lower plunger and with the machine-frame, and a guide-rod pivoted to the cross-head and having sliding engagement with the lever and provided with an adjustable stop or shoulder to engage the said lever, substantially as described.

10. The combination, with a mold, of upper and lower plungers sliding therein, and means for actuating the lower plunger, comprising a cross-head having sliding connection therewith, a spring or counterbalance-weight serving to sustain the lower plunger yieldingly on the lower cross-head, a lever pivotally connected with the lower plunger, a vertically-movable block forming a fulcrum for the lever, and a screw-shaft on the machine-frame engaged with said block for moving the same, substantially as described.

11. The combination, with a mold, of upper and lower plungers sliding therein, and means for actuating the lower plungers, comprising a cross-head having sliding connection therewith, a spring or counterbalance-weight serving to sustain the lower plunger yieldingly on the lower cross-head, a lever pivotally connected with the lower plunger, a vertically-movable block forming a fulcrum for said lever, a vertical screw-shaft engaging the said block, and a guide-rod pivoted to the lower cross-head and having sliding engagement with the said lever, said rod being provided with a stop or shoulder for limiting the movement of the lever toward the cross-head, substantially as described.

12. The combination, with a mold, of upper and lower plungers sliding therein, and means for actuating the lower plungers, comprising a cross-head, a vertical stem on the plunger having sliding engagement with the cross-head, a spring surrounding the said stem and bearing against the said cross-head, an adjustable nut or collar on the said stem bearing against the upper end of the spring, and a lever pivotally connected with the plunger and with the machine-frame, said lever being adapted for contact with a part of or upon the lower cross-head, substantially as described.

13. The combination, with a mold, of upper and lower plungers sliding therein, and means for actuating the lower plungers, comprising a cross-head engaged with the lower plunger and having sliding connection therewith, a spring or counterbalance-weight serving to sustain the lower plunger yieldingly on the lower cross-head, and means for limiting the upward movement of the lower plunger under the action of said spring or counterbalance-weight at the time of filling the mold, embracing a cushioned stop connected with the lower plunger and acting against a part of the machine-frame to prevent the lower plunger from rising above the mold-table, substantially as described.

14. The combination, with a mold, of upper and lower plungers sliding therein, and means for actuating the lower plunger, comprising a cross-head engaged with and supporting the lower plunger and having sliding connection therewith, a spring or counterbalance-weight serving to sustain the lower plunger yieldingly on the lower cross-head, and a lever pivotally connected with the lower plunger and with the machine-frame and adapted for contact with a part of or upon the said cross-head, so as to limit the upward movement of the lower plunger at the time of filling the mold, and a cushioned stop connected with the lower plunger and adapted for contact with a part of the machine-frame to prevent the lower plunger from rising above the mold-table, substantially as described.

15. The combination, with a mold, of upper and lower plungers sliding therein, a lower cross-head engaged with and supporting the lower plunger, a stem upon the lower plunger passing downwardly through the lower cross-head, a spring serving to sustain the lower plunger yieldingly on the lower cross-head, said stem being provided at its lower end with laterally-extending arms or brackets, stops for engagement with the frame mounted

in said brackets and having sliding connection therewith, and cushions and spring-washers inserted between the stops and the brackets, substantially as described.

16. The combination, with the mold and feed-box, of means for supplying the clay to the feed-box, embracing a passage or tubular inclosure having its part which is in contact with the feed-box movable freely toward and from the feed-box, whereby gravity tends to hold said movable part in contact with the feed-box, substantially as described.

17. The combination, with a mold and reciprocating feed-box, of a hopper resting in contact with the feed-box, the part of said feed duct or hopper which is in immediate contact with the feed-box being movable freely toward and from the feed-box, whereby gravity tends to hold the said hopper in contact with the feed-box, substantially as described.

18. The combination, with a mold and reciprocating feed-box, of a feed duct or hopper resting in contact with the feed-box, that part of the said feed duct or hopper which is in immediate contact with the feed-box being adapted to yield or move toward and from the feed-box, and a spring or springs applied to control the pressure of said movable part against the feed-box, substantially as described.

19. The combination, with a mold and reciprocating feed-box, of a feed duct or hopper resting in contact with the feed-box, that part of the said feed duct or hopper which is in immediate contact with the feed-box being adapted to yield or move toward and from the feed-box, a spring or springs applied to control the pressure of said movable part against the feed-box, and means for adjusting the tension of said spring or springs.

20. The combination, with a mold and reciprocating feed-box, of a stationary hopper and a movable ring surrounding the discharge-opening of the hopper and bearing against the feed-box, substantially as described.

21. The combination, with a mold and reciprocating feed-box, of a stationary hopper and a movable ring surrounding the discharge-opening of the hopper and bearing against the feed-box, and springs applied to control the pressure of the said ring against the feed-box, substantially as described.

22. The combination, with a mold and reciprocating feed-box, of a stationary feed-hopper, a sliding ring surrounding the exit-opening of the hopper, vertical guide-rods engaging the ring, springs surrounding the said guide-rods above and below and adapted to act both upwardly and downwardly on the ring, and adjustable collars or nuts on said guide-rods for adjusting the tension of the springs, substantially as described.

23. The combination, with a mold and stationary feed-hopper, of a reciprocating feed-box, a mold-table provided with a flat guide-surface sustaining the feed-box, oscillating arms for actuating the feed-box, and connecting-rods uniting the feed-box to the said arms, said connecting-rods being joined to the oscillating arms and to the feed-box by pivotal connections constructed to rigidly hold the connecting-rods parallel with the feed-box, and means for separately adjusting the lengths of said connecting-rods, substantially as described.

24. The combination, with a mold and stationary feed-hopper, of a reciprocating feed-box, oscillating arms by which the feed-box is actuated, blocks swiveled upon said oscillating arms 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 blocks, whereby the length of the rods may be adjusted, substantially as described.

25. The combination, with a mold and a stationary feed-hopper, of a reciprocating feed-box, oscillating arms by which the feed-box is actuated, blocks swiveled upon said oscillating arms 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 blocks, which latter are provided with depressions or recesses into which said nuts enter to hold the rods from disengagement with the blocks, 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,
TAYLOR E. BROWN.