4 Sheets--Sheet 1.

E. F. ANDREWS.
Brick-Machines.

No. 158,453. Patented Jan. 5, 1875.

FIG. 2.

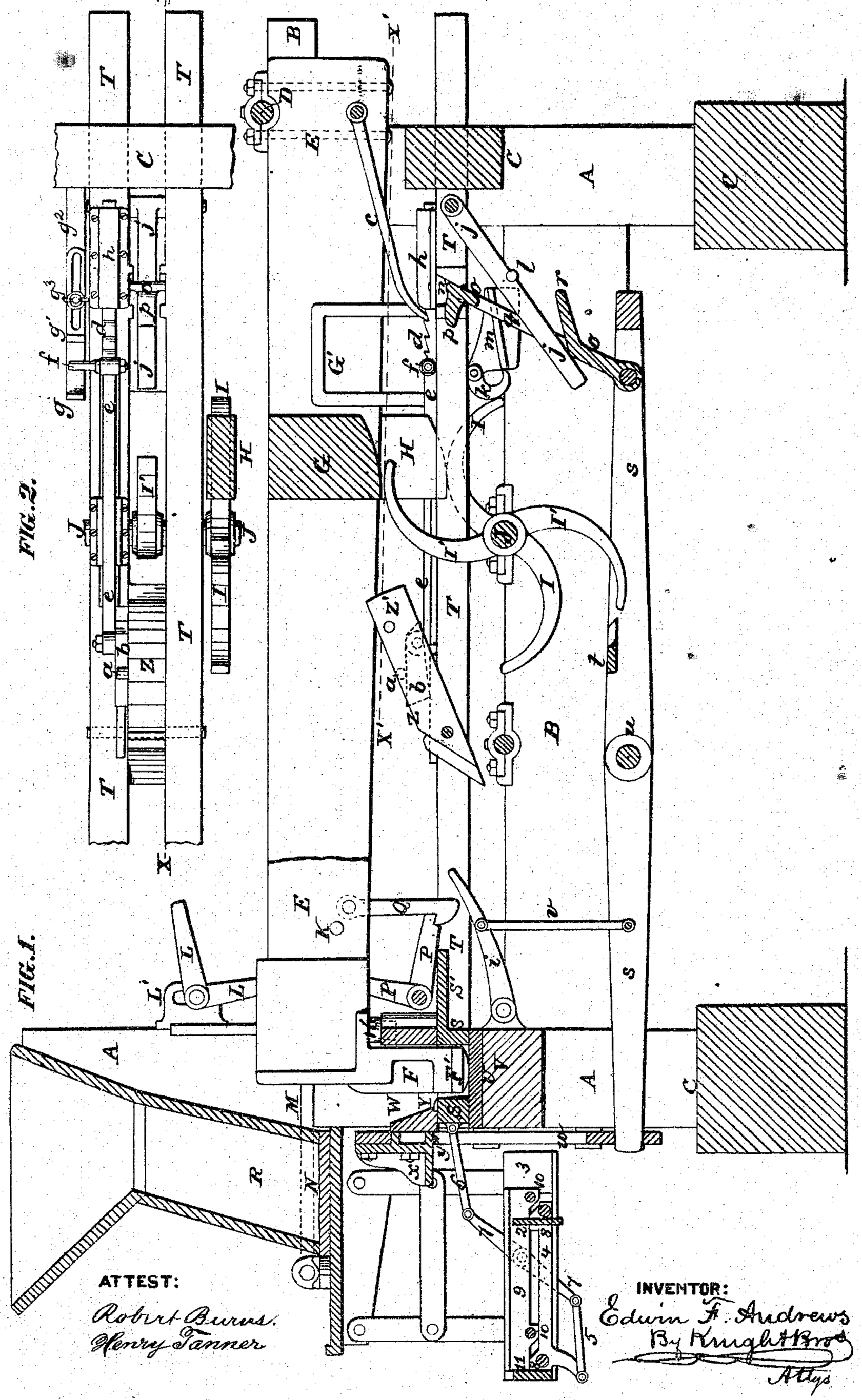

FIG. 1.

ATTEST:

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Henry Tanner

INVENTOR:

Edwin F. Andrews
By Knight Bros
Attys

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FIG. 3.

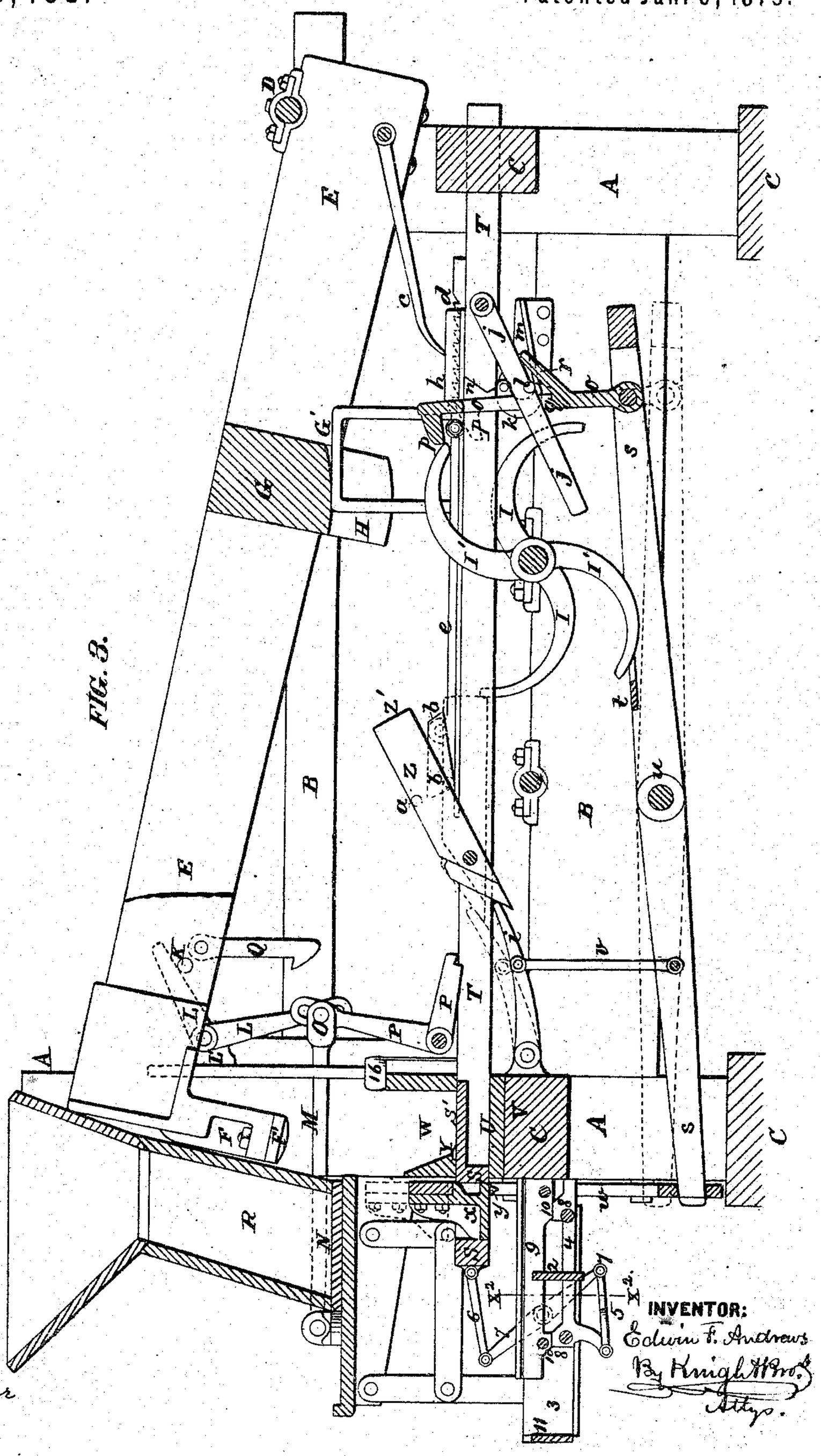

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FIG. 4.

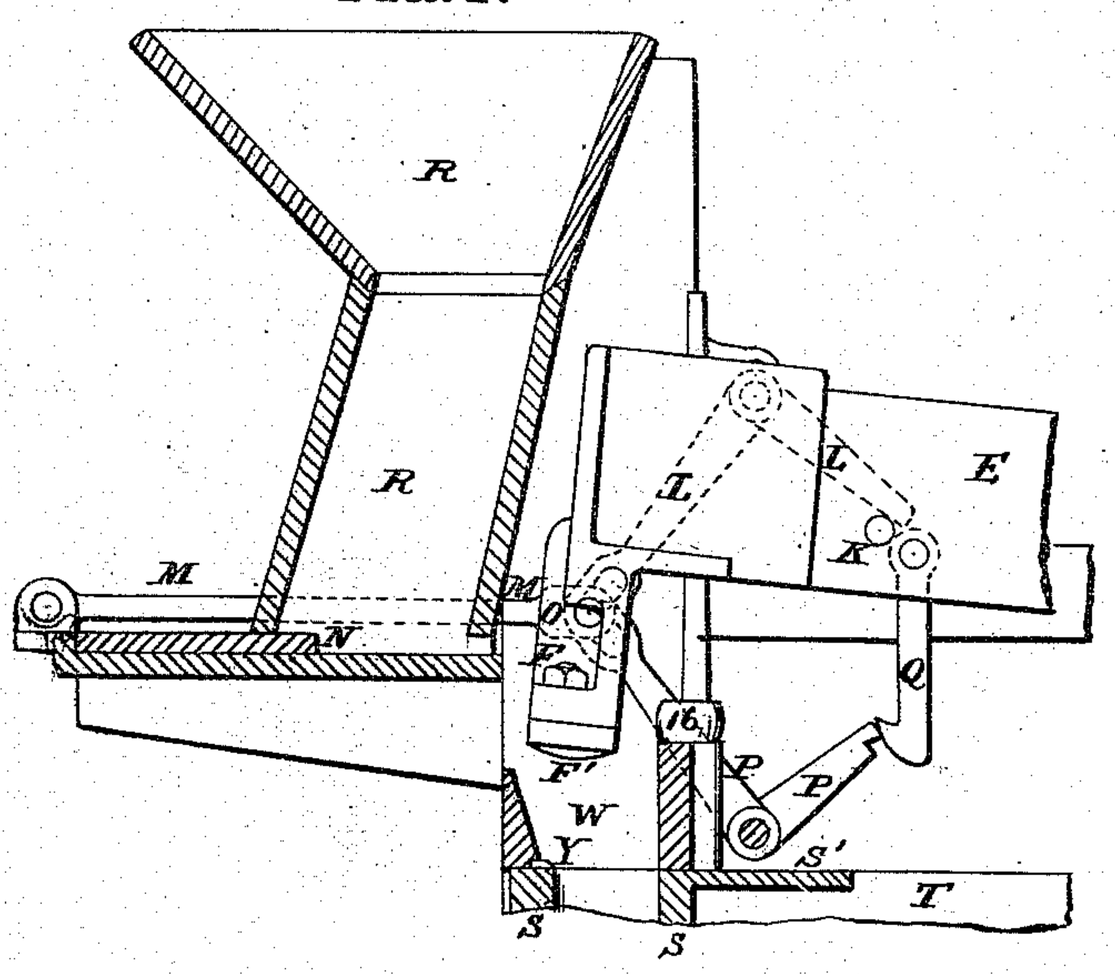

FIG. 6.

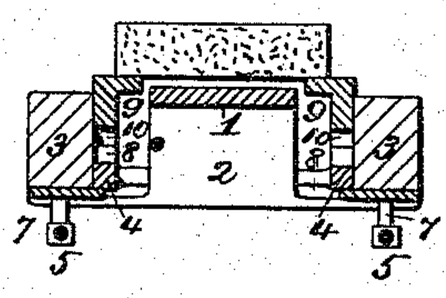

FIG. 7.

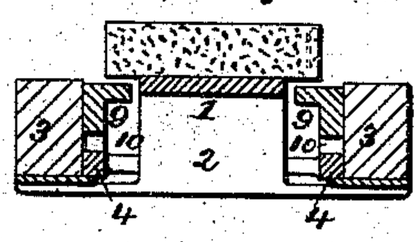

FIG. 9.

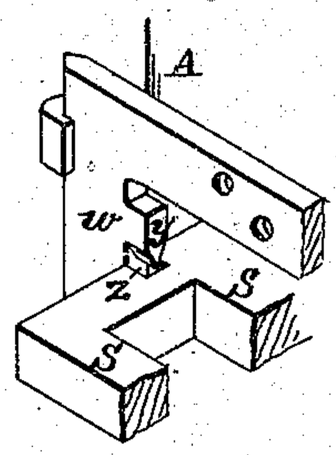

FIG. 5.

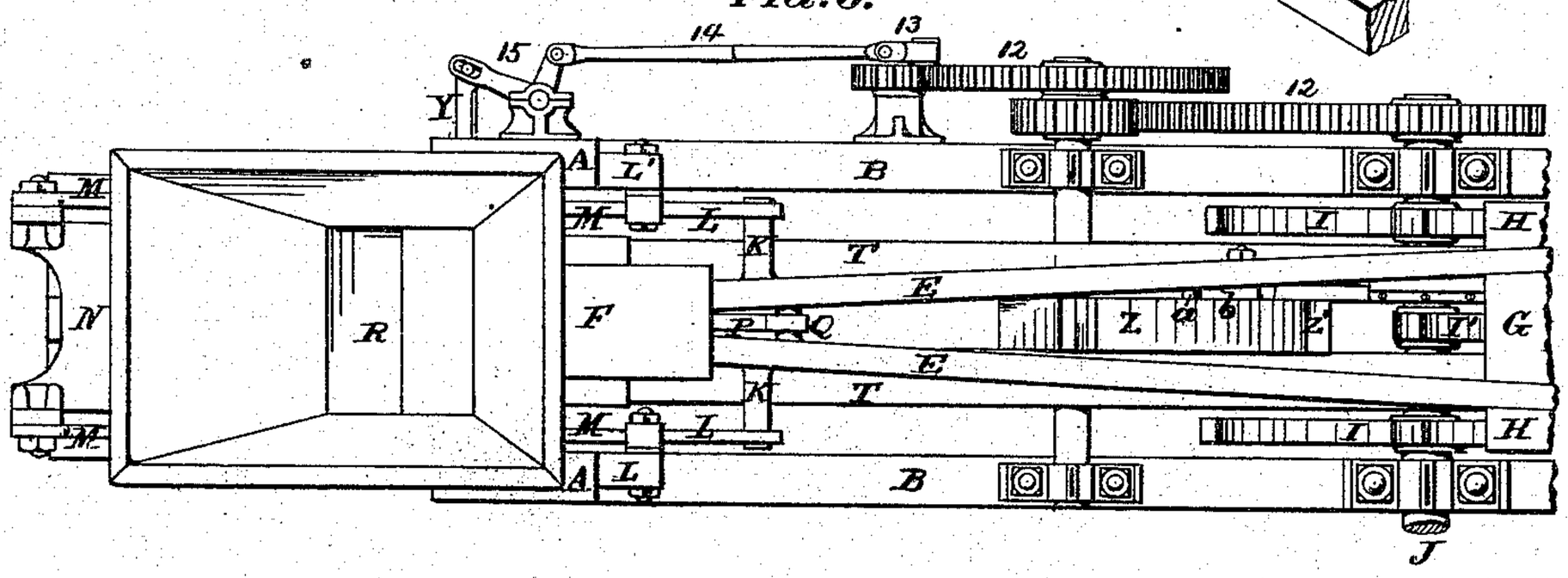

FIG. 8.

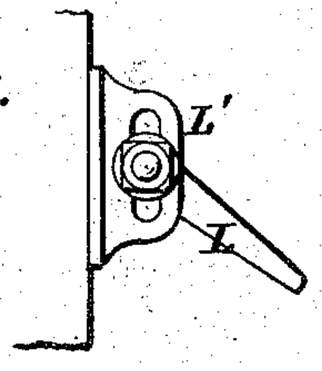

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FIG.10.

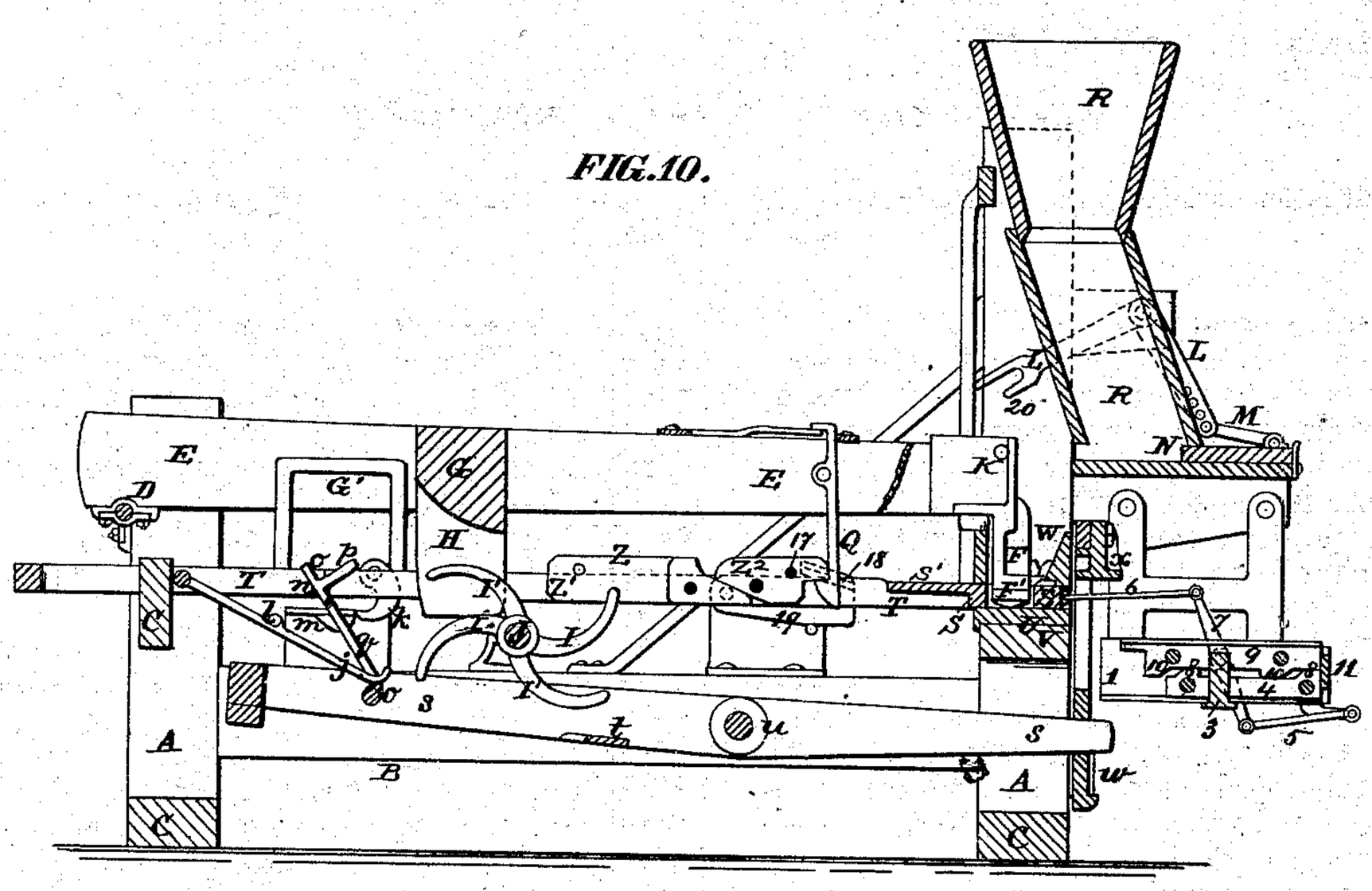


FIG.11.

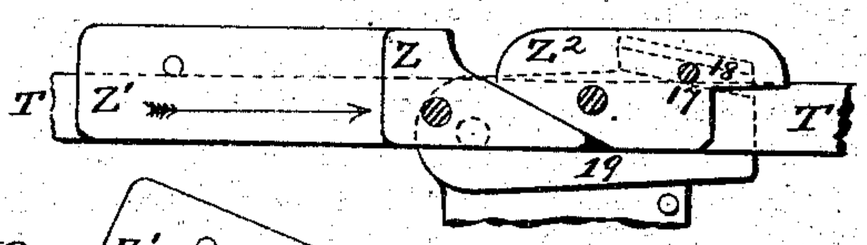


FIG.12.

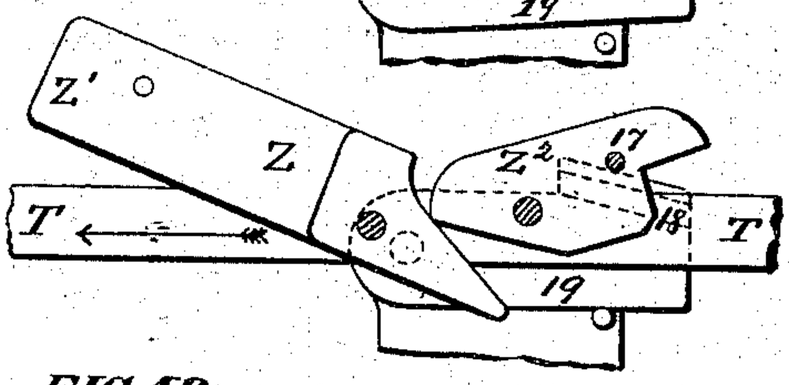
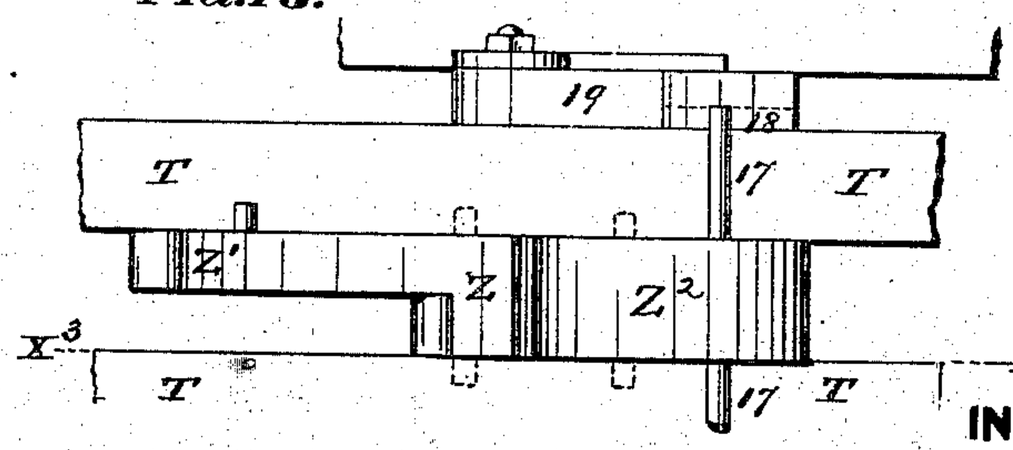


FIG.13.



ATTEST:

Robert Burns.
Henry Tanner

INVENTOR:

Edwin F. Andrews.
By Knight Bro's
Attys.

UNITED STATES PATENT OFFICE.

EDWIN F. ANDREWS, OF ST. LOUIS, ASSIGNOR OF TWO-THIRDS HIS RIGHT TO ALFRED W. ROPER, OF ST. LOUIS, AND JOSEPH D. KEEBAUGH, OF GLASGOW, MISSOURI.

IMPROVEMENT IN BRICK-MACHINES.

Specification forming part of Letters Patent No. **158,453**, dated January 5, 1875; application filed December 10, 1874.

To all whom it may concern:

Be it known that I, EDWIN F. ANDREWS, of St. Louis, St. Louis county, State of Missouri, have invented a certain new and useful Improvement in Brick-Machines, of which the following is a specification:

This improvement relates to that class of brick-machines in which the clay is compacted into the mold by strokes of a falling hammer or follower.

The first part of my improvement consists in the combination, with the said hammer, of a fixed anvil, forming the bottom of mold, and a movable mold, which carries the brick from the anvil or bottom to be discharged downward onto the table beneath.

The second part of my improvement consists in the combination, with the said sliding mold, of a reciprocating knife, which removes the superfluous clay from the top of the brick, where it is received upon a plate extending backward from the side of the mold, and on the return of the mold is pushed off this plate, and goes into the formation of the next brick.

The third part of my improvement consists in the combination, with the sliding mold, of the plunger, which is drawn down by a lever to discharge the brick from the mold onto the receiving-table. The plunger carries a wedge-formed guide, that enters a recess in the outer side of the mold to insure the accurate entrance of the plunger into the mold.

The fourth part of my improvement consists in the combination of the said mold and plunger and lever with a jointed arm on the latter and the mold-slide and operating-cam, the arm having a projection brought in the course of the rotary cam by the forward movement of the mold-slide, so that the plunger is brought down to discharge the brick from the mold when the latter has been carried to its forward position.

The fifth part of my improvement consists in the construction of the brick-receiving table. This has fixed cross-bars, which form the support of a removable board, on which the bricks are received as they leave the mold. It has also two sliding frames, the first of which is moved backward and forward by connection with the mold, and has inclined lugs in its upper side, which come beneath similar lugs on the under side of the other frame, and raise the latter as the first frame slides backward. As the upper frame is raised it lifts the bricks from the board, and as the two frames slide forward all the bricks are carried somewhat more than the breadth of a brick forward, and the lifting-lugs slide from beneath the upper frame, and it drops and allows the bricks to subside again onto the board.

The sixth part of my improvement consists in the construction of the feeder and its operating devices. In this the feeder works horizontally backward and forward in the bottom of the hopper, and deposits a quantity of clay in the mold at each backward movement. It is operated by bell-crank levers moved by the hammer-helve, the feeder being moved forward by a hooked arm depending from the helve, and drawn backward to force out the clay by the action of a pin on the side of the helve.

The seventh part of my improvement consists in the device for stopping the feeding of the clay when enough has been received. This is accomplished through means of the construction and arrangement of the bell-crank lever, by which the feeder is forced back, and its operating-hook, the said hook not descending low enough to engage the lever when the descent of the hammer is limited by the proper amount of clay having entered the mold.

The eighth part of my improvement consists in the device for determining the number of blows upon each brick. In this the following elements are combined: A cam to push forward the mold-slide, bringing beneath the helve of the hammer a support to hold it up; a tilting block, against which the cam acts to force the slide forward; a sliding block, which sustains the rear end of the tilting block out of the course of the cam until the proper time for the mold to slide forward; a ratchet-rod, by which the sliding block is pushed forward the distance of one tooth with each ascent of the hammer; a dog upon the helve, by which the rod is moved forward; and an adjustable stop on the main frame, by which the position of the sliding block at the commencement of the filling of the mold is governed.

The ninth part of my improvement consists in the combination of devices for drawing back the mold. This has a dropping-arm, against

which the cam acts to force back the mold-frame when the said arm is raised, which it is by the forward movement of the mold-frame, and the upward movement of the rear end of the lever, by which the plunger is operated to discharge the brick from the mold. When the drop-arm is raised it is sustained (so as to remain in contact with the cam) until the mold-frame has attained its backward position by pins upon its sides, which are engaged by catches and supported as the frame travels backward by projecting ledges of the main frame. As the mold-frame slides forward a pin projecting from the side of the ratchet-rod engages a stop on the main frame, to limit the forward movement of the said rod with the mold-frame.

In the drawings, Figure 1 is a vertical section at line X X, Fig. 2, showing position of parts while the molds are being rammed. Fig. 2 is a horizontal section at line X^1 X^1, Fig. 1. Fig. 3 is a vertical section at line X X, Fig. 2, showing position of parts when the molds are being emptied. Fig. 4 is a detail section, showing the position of the charger when the hammer is in its upward movement. Fig. 5 is a top plan. Fig. 6 is a transverse section of brick-carrying table at line X^2 X^2, Fig. 1, showing the position of parts while the table is in its forward movement. Fig. 7 is a similar view, showing the position of parts when the table is in its backward movement. Fig. 8 is a detail of the bracket-support for the bell-crank lever that operates the earth-charger. Fig. 9 is a detail perspective of mold and plunger-frame, showing the arrangement for bringing the mold accurately under the plunger. Fig. 10 is a vertical section at line X^3 X^3, Fig. 13, showing a modification of my improvement. Figs 11 and 12 are detail sections at line X^3 X^3, and Fig. 13 is a plan of the tripping-block and its operating mechanism.

The main frame may be made of wood or metal, and has uprights A, longitudinal bars B, and cross-bars C.

D is a bar or shaft, which forms the support of the rear end of the helve E of the hammer F, the hammer turning on the bar D as its point of oscillation. The helve E consists of two timbers, which meet together at the forward end, where they are attached to the hammer F, and which diverge backwardly. They are supported laterally by a cross-bar, G, and at this point upon each side are downwardly-extending bearings H H for the cams by which the hammer is raised. These cams I I are attached to the main shaft J, and as they turn lift the hammer twice for each single rotation of the shaft. As the hammer is raised pins or projections K upon the side of the helve E engage the lower arms of the bell-crank levers L L, and throw it into the position shown in Figs. 1 and 3, so as to draw back the feeder-slide N, and drop a quantity of clay into the mold, (this action taking place when the hammer is in its raised position, as shown in Fig. 3.) The lower arm of each bell-crank lever L is connected to the sliding bottom N of the hopper by a rod, M, the connection being by means of a pin, O, at the end of the rod, which passes through the slot in the arm, so as to allow the oscillating movement of the arm without binding the connection. The fulcrum-bearing of the bell-crank levers L L is made vertically adjustable in a slotted bracket, L′, as shown in detail in Fig. 8. P P are bell-crank levers, each of whose upper arms is slotted to receive the pin O. Q is a hook depending from the helve E. The said hook (when the hammer is down) engages below the lower arm of the bell-cranks P, so that as the hammer rises the arm of the bell-crank is drawn up with it, and the feeder N is pushed forward from the hopper R, to allow another supply of clay to fall into the course of the feeder, ready to be forced out of the hopper when the feeder is drawn back into the hopper by the action of the rising helve on the bell-cranks L L. The hook Q is so constructed that when there is the required amount of clay in the mold, so that the hammer is prevented from descending below a certain point, the hook fails to catch beneath the lever P, and consequently, as the feeder remains at rest, the supply of clay to the mold ceases. The hammer F has a removable face, F′, whose lower side is preferably made convex, so that it tends to force the clay into all the corners of the mold, and to form a concave bed to receive the next supply of clay. It is also found that a face of this form does not adhere tenaciously to the clay, like a flat face is liable to do. The mold consists of sides S S, secured to a movable sliding frame, T, and a fixed bottom plate, U, forming the top of what I call the anvil V. The moving part of the mold works between the plate U and the metallic throat or secondary hopper W, through which the clay falls in passing from the hopper R to the mold. The rear side of the mold has a horizontal extension, S′, in a plane with the top of the mold, which constitutes the bottom of the hopper W when the mold is in its forward position, and which receives the earth removed from the top of the brick by the knife Y. The mold-frame T consists mainly of two longitudinal bars working in proper guides or supports. The mold receives its forward movement from cams I′ I′ upon the main shaft. These cams, in their revolution, extend upward between the two bars of the frame T, and act upon the end Z^1 of the block Z, to force the mold forward whenever the rear end Z^1 of the block is in its downward position, as shown in dotted lines in Fig. 3; but when this block is tilted up at the rear end, as shown in full lines, the cams continue to revolve without coming in contact with it. The block Z is held in the position last described by a sliding block, *b*, on whose top rests a side pin or lug, *a*, of the block Z. This supplies the means for adjusting the machine to give the desired number of

blows of the hammer on each brick, (in the mold,) for at each blow of the hammer the block *b* moves ahead a certain distance until it slides from beneath the pin *a*, and the rear end of the bearing-block Z falls, so that the block assumes a horizontal position, and the frame T, with the mold S, is pushed forward. The block *b* is moved forward by the following means: Upon the side of one of the bars of the helve E is pivoted a dog, *c*, which engages with the ratchet-teeth *d* of the rod *e*, whose forward end is pivoted to the block *b*. At each lift of the hammer the dog moves the ratchet-bar forward one tooth, and at each descent of the hammer the dog moves back to the next tooth on the ratchet-bar. When the mold-frame T moves forward it carries with it the block *b*, until a pin, *f*, upon the side of the ratchet-rod engages against a stop, *g*, upon the main frame, and this stop detains the block *b* until the pin *a* passes beneath it to its forward end. As the mold-frame T moves forward the covered guide *h* of the ratchet-rod is carried beneath its end, to sustain the dog during the latter part of the forward movement of the frame and the first part of its return movement, and as the mold-frame reaches its backward position the dog is again in contact with the ratchet-teeth, ready to again push forward the block *b*. As the frame T is moving backward the pin *f* engages an adjustable lug, g^1, upon a slotted plate, g^2, made adjustable on a stud-bolt, g^3, fixed in the main frame, and by the adjustment of the lug g^1 the position of the block *b* (at the commencement of the mold-filling) is regulated, for, when the pin *f* strikes the said lug, the ratchet-rod is drawn out more or less from beneath the covered guide *h*, (according to the position of the lug,) and of course the farther the ratchet-rod is drawn out from the hood *h*, the less distance remains for it to be forced out (or forward) by the dog *c* before the forward movement of the mold again takes place. As the frame T reaches its forward position the front end of the block Z engages beneath an arm, *i*, and by the action of this arm the rear end of the block is thrown up, so that the pin *a* passes the front point of the block *b*, as shown in Fig. 3, ready, on the backward movement of the frame, to travel along the top of this block, to hold up the rear end of the block Z out of the course of the cam I′.

It will be seen that the rear end of the block Z falls when the sliding block *b* reaches a certain position, and that the block moves a certain distance with each stroke of the hammer, and as the starting-point of the block *b* is governed by the position of its adjustable detaining-hook g^1, it follows that, by the adjustment of that hook, the number of blows on each brick is regulated.

When the mold is in its forward position the stand G′, which extends upward from the frame T, is, by the forward movement of this frame, brought beneath the cross-bar G, as shown in Fig. 3, so as to sustain the hammer until the mold again reaches the position for the reception of clay, as shown in Fig. 1.

The mold-frame T is carried back by the same cams I′ I′ that carry it forward. These cams, in carrying the mold-frame back, act on a pivoted bearing-block, *j*, which is thrown up by the mechanism for forcing the brick from the mold, as will be described hereafter. When the front end of the block *j* is thrown up into the course of the cams I′ I′ it is sustained in that position by pivoted claws *k k*, which engage pins *l l* on the sides of the block, and as the cam I′ acts on the front end of the block to force it backward, the block is still sustained by resting on ribs *m m* upon the bars B B of the frame. As the mold-frame attains its backward position the pins or lugs *l l* reach the ends of the ribs or ledges *m m*, and the front end of the block drops, so as to be out of the course of the cams I′ I′. In the inner sides of the bars of the mold-frame T are grooves *n n*, in which are the edges of the lifting bar or yoke *o* of the lever *s*, by which the plunger is brought down to force the brick from the mold. This lifting bar or yoke is pivoted at its lower end to the said lever, and has a lug or cross-bar, *p*, which, as the mold moves forward, is carried by the mold-frame forward, so that the lug or bar is brought into the course of the cams I′ I′, and by them raised so as to raise the rear end of the lever *s*. The bar or yoke *o* is slotted at *q* for the traverse of the block *j*, and has a backward-projecting lug, *r*, by which the said block is raised to bring it into the course of the cams I′ I′ for the purpose of moving back the molds, as heretofore described. The rear end of the lever *s* is forced down by the action of one of the cams I′ on the cross-bar *t*, connecting its two parts at a point to the rear of the fulcrum *u*. In front of the fulcrum is an upwardly-extending link, *v*, whose upper end is connected to the arm *i*, so as to draw down said arm, as shown in full lines in Fig. 3, to so far tilt up the rear end Z^1 of the block Z as to clear the pin *a* from the forward point of the block *b*. The forward end of the lever *s* engages with the vertically-sliding frame *w*, to which the plunger *x* is attached. The plunger is made to neatly fit the mold, and descends into and forces the brick downward from the same when the mold is in its forward position. Upon the sides of the frame are wedge-shaped lugs *y*, which enter grooves *z* on the sides of the mold, to insure the plunger entering accurately into the mold. As the bricks descend they are received upon a removable board, 1, lying on the cross-bar 2 of the table 3. This table may be attached to the main frame of the machine, or may have a separate support. 4 is a frame sliding horizontally in a longitudinal direction in the table by connection with the mold through the connecting-rods 5 and 6 and lever 7. 8 8 are lugs on the top of the frame 4, inclined on their rear sides, and on these lugs lies a frame, 9, on whose bottom

are lugs 10, having inclines on their sides to slide up the inclines of the lugs 8 8 as the frame 4 is moved backward, so that as the frame 4 attains its backward position the lugs 10 ride upon the lugs 8 and lift the frame 9 so high that the bricks are raised by its bars clear from the board 1; then, as the frame 4 is carried forward by the retreat of the mold, the bricks are carried forward upon the frame 9 until it strikes the end bar 11 of the table, when the lugs 8 8, by the continued forward movement of the frame 4, slide from beneath the lugs 10, and the bricks are allowed to subside upon the board 1, but each advanced somewhat more than the breadth of one brick forward. The different vertical positions of the frame 9 are illustrated in Figs. 1, 3, 6, and 7. The knife Y has endwise reciprocation over the front bar of the mold when the mold is in its backward position, and receives motion by a train of gearing, 12, crank 13, pitman 14, and bell-crank 15. 16 is a rubber pad to receive the blow of the hammer in case the feeder may fail to supply any clay to the mold.

It is evident that a number of these machines may be associated together in a battery, and that many of the transverse bars and shafts might extend through the whole battery, and even in this latter case any of the hammers might be held up with a block or other means, and of course all the parts contingent on the action of the hammer would cease to move until the hammer was again put in motion. Two hammers may, if desired, be attached side by side to a single helve, and in that case, of course, there would two molds also be used.

Figs. 10, 11, 12, and 13 illustrate a modification of my improvement. In this the mold-slide T is moved forward and backward in the same manner before described, but the means for tilting the block Z differs somewhat.

The hook Q engages beneath a tilting block, Z^2, and, by raising the front end of the same when the hammer ascends, throws up the rear end Z^1 of the block Z out of the course of the cams I′.

As the mold fills up to the proper level the hook Q does not descend low enough to engage the end of the block Z^2, and consequently the block Z remains in its horizontal position, and receives the impact of the cam I′, to move the mold forward, as before set forth.

As the mold-frame moves forward pins 17 on the sides of the block Z^2 traverse inclined grooves 18 in the pivoted blocks 19, attached to the inner sides of the main frame, raising up the fore ends of the blocks 19, and as the mold attains its forward position the pins 17 leave the grooves 18 and the fore ends of the blocks descend, so that as the mold returns the pins 17 travel up the inclined upper sides of the blocks 19; and by this means the front end of the block Z^2 is raised, and its rear end depressed, so that the rear end Z^1 of the block Z is thrown up out of the course of the cams I′. These motions are illustrated by arrows in Figs. 11 and 12.

It will be seen that by this modification the mold is arranged to move forward as soon as the requisite amount of clay is in the mold, whereas with the construction before described only the feeding of clay to the molds ceases at this time, and each brick receives a certain number of blows.

In the modification the plan of feeding the clay to the mold also differs somewhat. The feeder is similar, but it has but a single bell-crank lever, L, upon each side, and the upper arm of this lever is forked at 20, so that the pins K enter the fork and cause the forward and backward movement of the feeder by the upward and downward movement of the hammer without any device in addition to pins K and bell-cranks L.

I claim as my invention—

1. The combination of trip-hammer E F I, fixed mold-bottom U, and sliding portion S, substantially as set forth.

2. The sliding bottomless portion S, having extension S′, to receive the clay, and combined with the reciprocating knife Y, all as set forth.

3. The combination of the sliding portion S with discharging-plunger *x*, having a guide, *y*, entering the groove *z* in the mold, all substantially as and for the purpose set forth.

4. The combination of the plunger or ram *x*, lever *s*, jointed arm or cam-yoke *o*, cam I′, and sliding frame T, forcing the yoke into the course of the cam as the bottomless mold arrives at its discharging position, as described.

5. The combination of the reciprocating frames 4 and 9, having inclined lugs 8 and 10, and associated with rest 1 between the bars of the frame 3, all substantially as and for the purpose set forth.

6. The combination of the feeder N, bell-cranks L and P, hammer-helve E, lugs or pins K, and hook Q, substantially as and for the purpose set forth.

7. The combination of the pin K, bell-crank L, feeder N, mold S U, hammer F, helve E, hook Q, and bell-crank P, to cause the filling of the mold until the same is filled to a certain height, when the filling is stopped, all substantially as set forth.

8. The combination of cams I′, mold-slide T, tilting bearing-block Z, sliding block *b*, pin or lug *a*, ratchet-rod *e*, dog *c*, helve E, and fixed and adjustable stops *g* and g^1, all substantially as set forth.

9. The combination of pivoted block or arm *j*, cam I′, sliding frame T, cam-yoke *o*, lever *s*, pins *l*, hooks *k*, and ledges *m*, all substantially as and for the purpose set forth.

In testimony of said invention I have hereunto set my hand.

Witnesses: EDWIN F. ANDREWS.
SAML. KNIGHT,
ROBERT BURNS.