(No Model.) 13 Sheets—Sheet 1.

# C. CHAMBERS, Jr.

## BRICK MAKING MACHINERY.

No. 275,467. Patented Apr. 10, 1883.

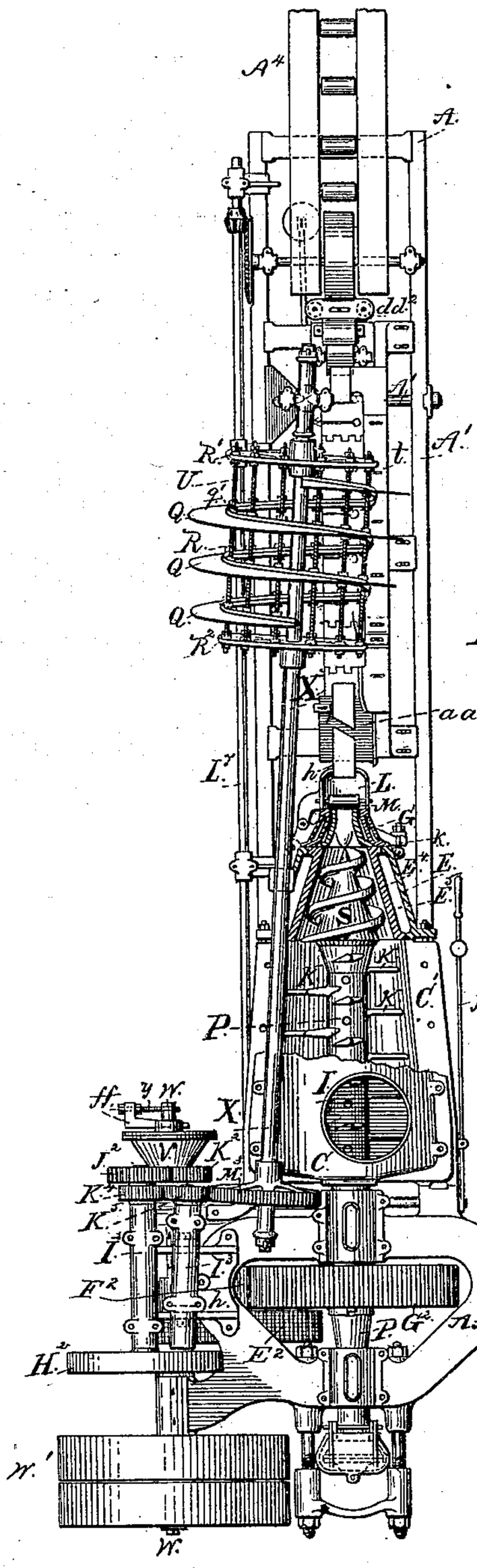



Fig. 1.

Witnesses.

John. Burkhardt.
Wm. B. Carson.

Inventor.

Cyrus Chambers Jr.
by Joshua Pusey, his atty

N. PETERS, Photo-Lithographer, Washington, D. C.

(No Model.) 13 Sheets—Sheet 2.

# C. CHAMBERS, Jr.

## BRICK MAKING MACHINERY.

No. 275,467. Patented Apr. 10, 1883.

Fig. 5½.

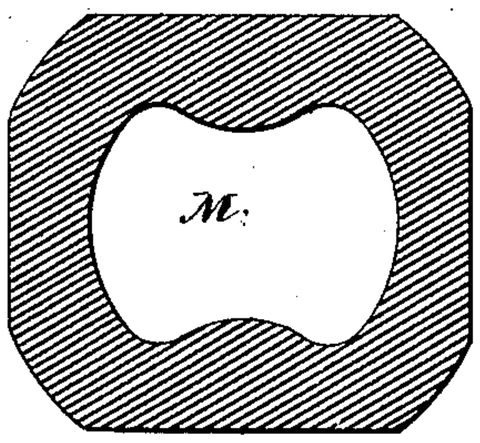
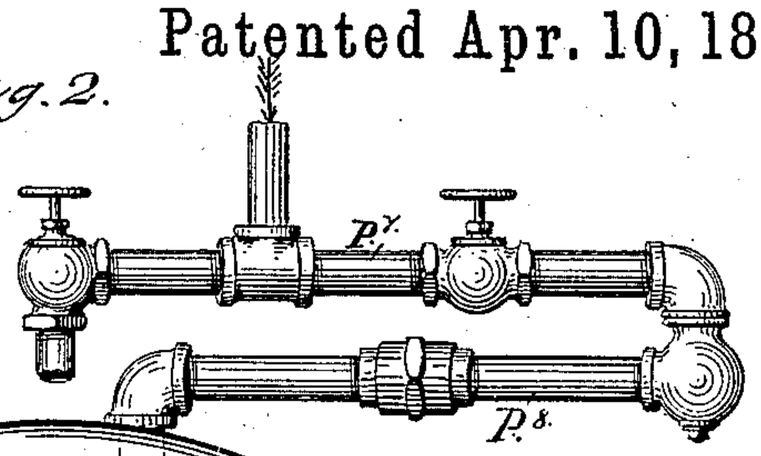



Fig. 2.



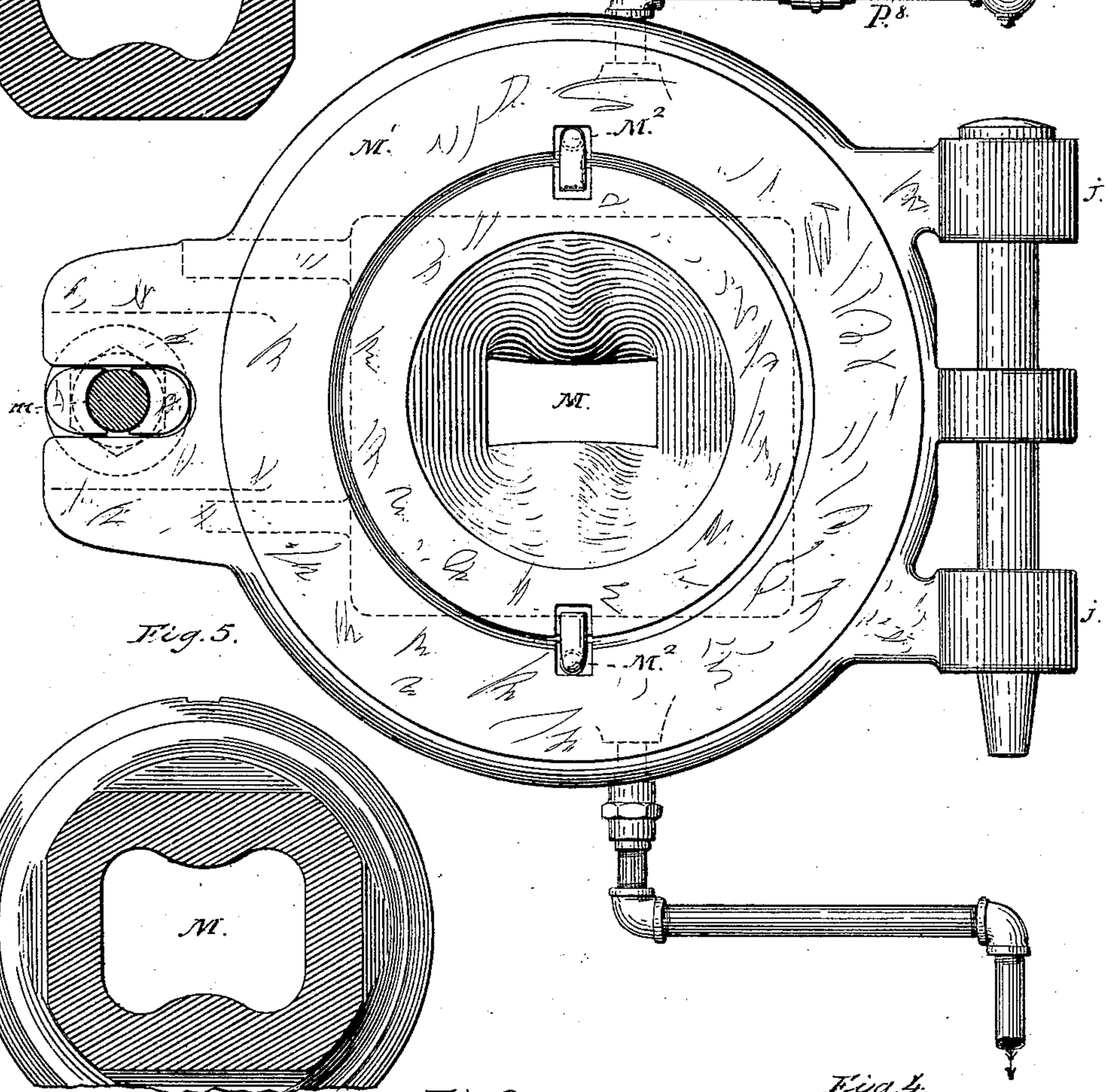
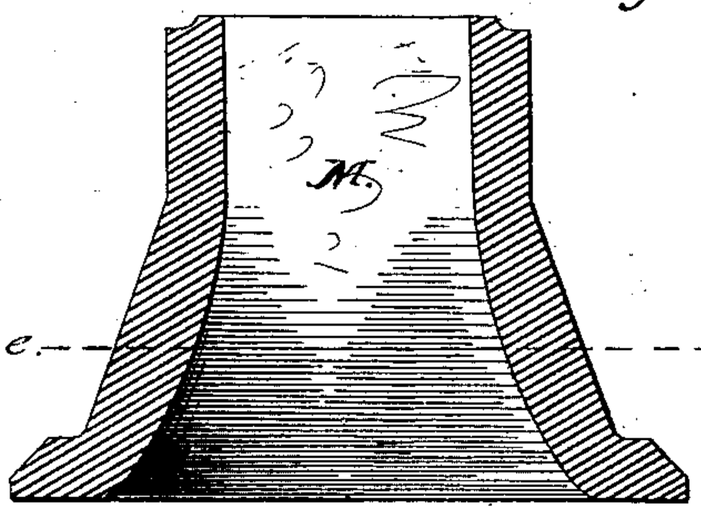



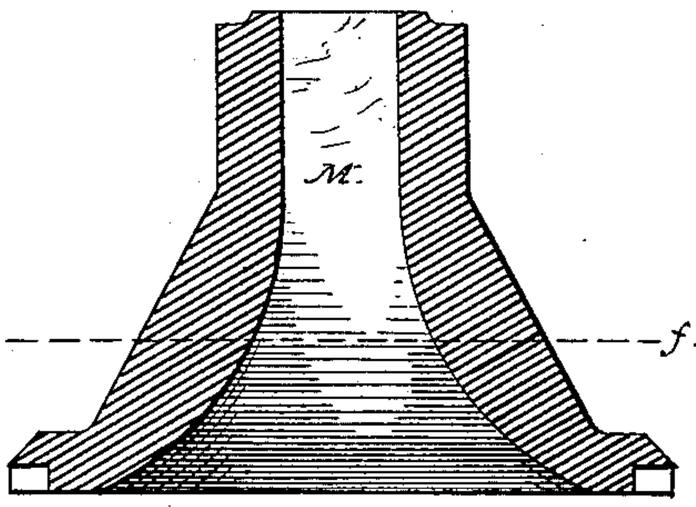

Fig. 5.




Fig. 3.

Fig. 4.




Witnesses
Wm. H. Carson
John. Burkhardt.

Inventor
Cyrus Chambers Jr.
by his Attorney
Joshua Pusey.

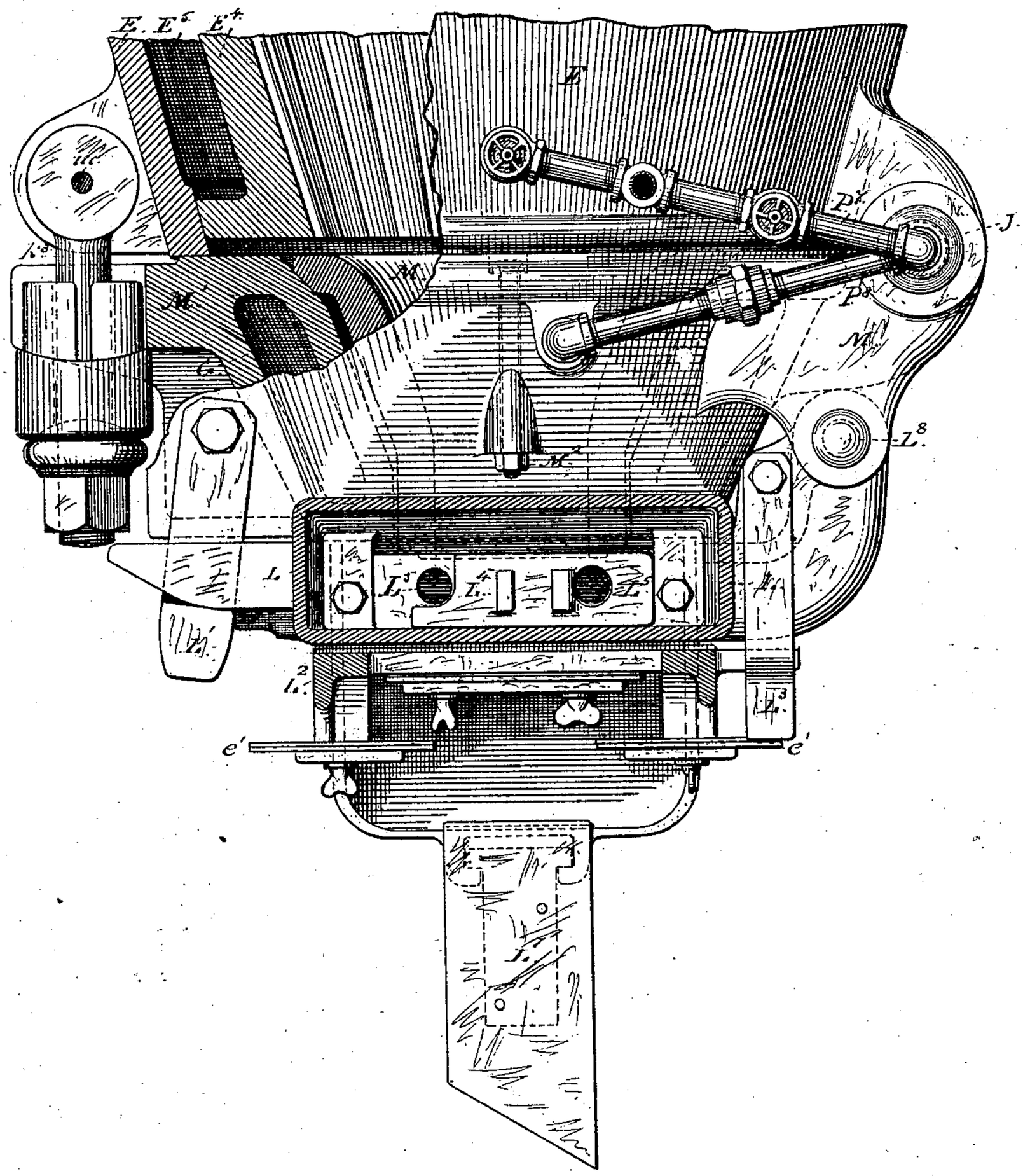
(No Model.) 13 Sheets—Sheet 3.

# C. CHAMBERS, Jr.

## BRICK MAKING MACHINERY.

No. 275,467. Patented Apr. 10, 1883.

*Fig. 6.*




*Witnesses.*

Wm. D. Carson.

John. Burkhardtt.

*Inventor*

Cyrus Chambers Jr.

by his Attorney

Joshua Pusey.

(No Model.) 13 Sheets—Sheet 4.

# C. CHAMBERS, Jr.

## BRICK MAKING MACHINERY.

No. 275,467. Patented Apr. 10, 1883.

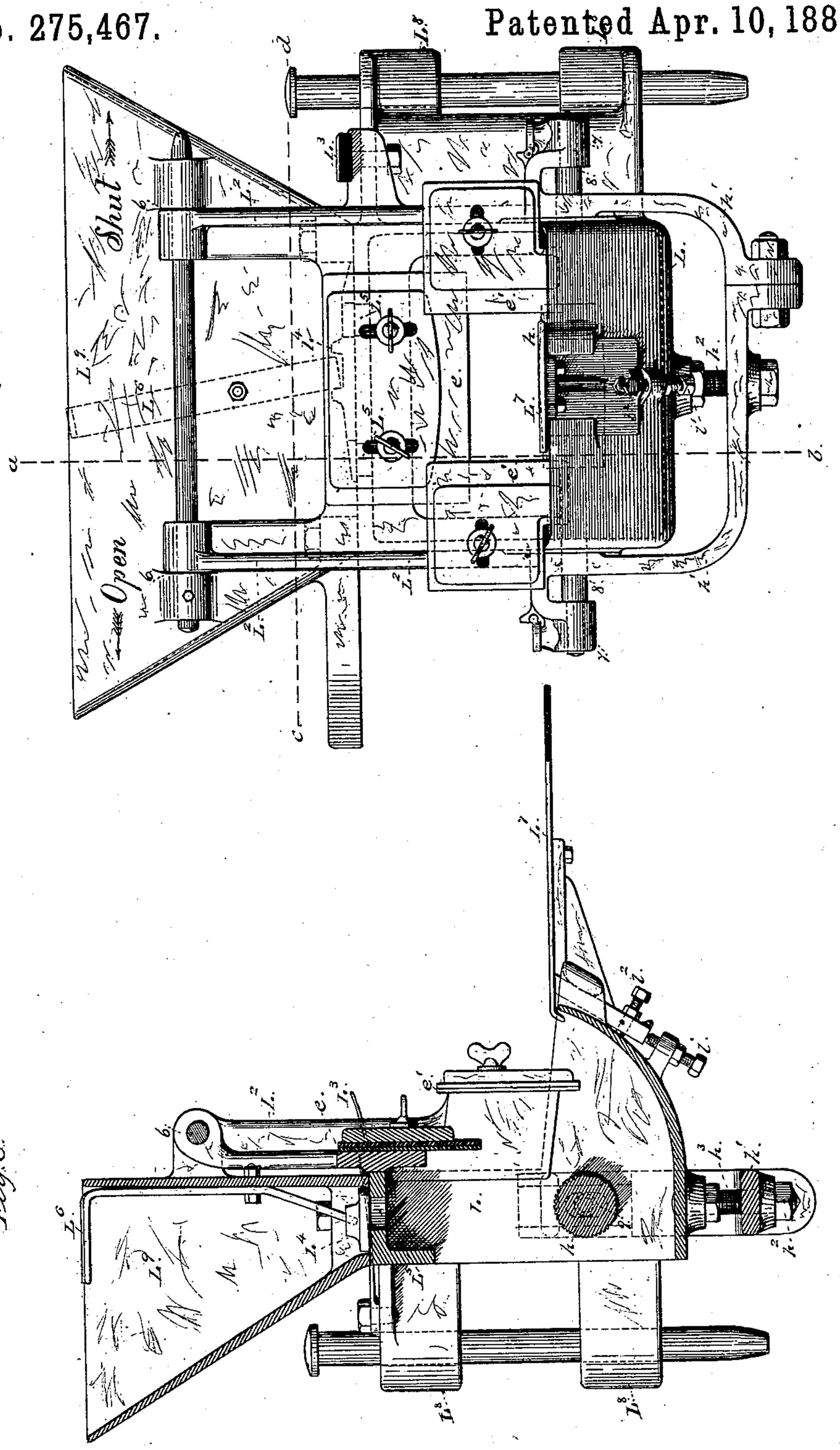



Fig. 7.

Fig. 8.

Witnesses.
Wm. H. Carson.
John Burkhardt.

Inventor
Cyrus Chambers, Jr.
by his Attorney
Joshua Pusey.

(No Model.) 13 Sheets—Sheet 5.

# C. CHAMBERS, Jr.

## BRICK MAKING MACHINERY.

No. 275,467. Patented Apr. 10, 1883.

Fig. 9.

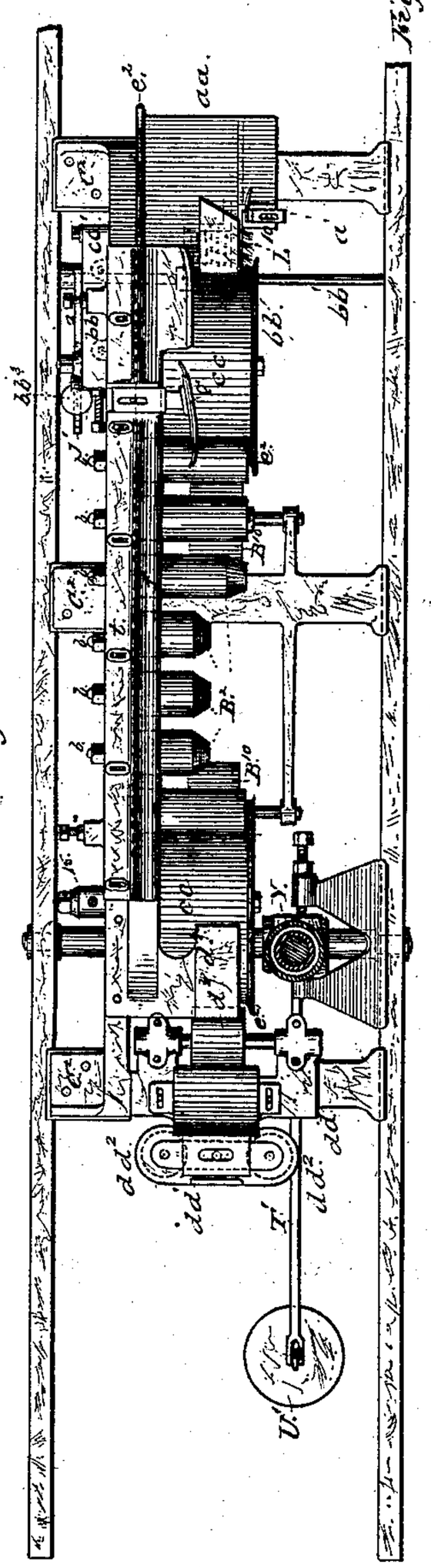


Fig. 10½.

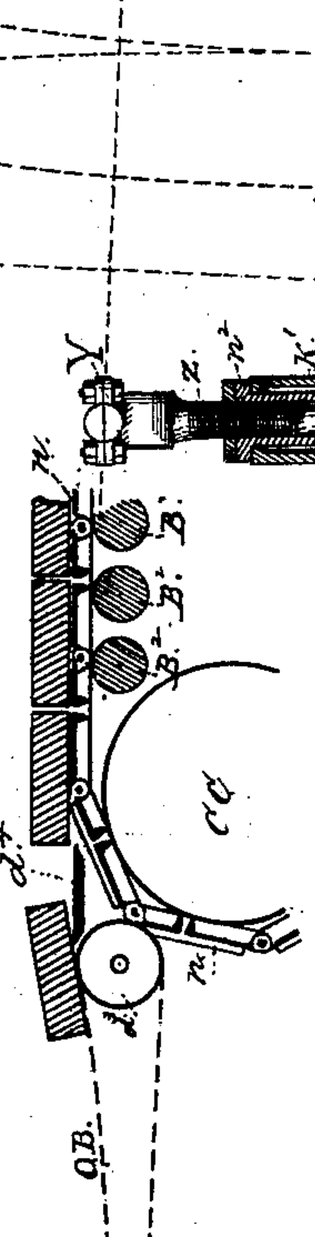


Fig. 10.



Fig. 11.

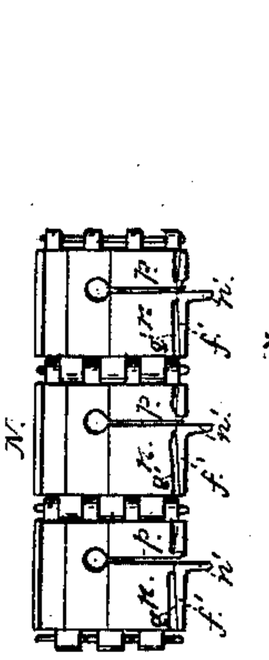
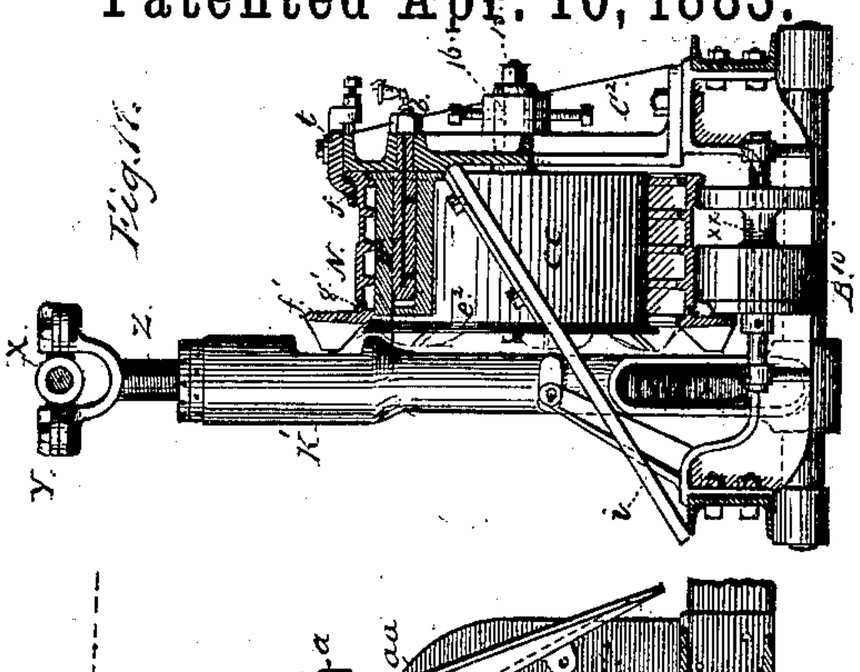


Fig. 12.



Witnesses:
Wm. H. Carson.
John. Burkhardt.

Inventor.
Cyrus Chambers, Jr.
by his attorney,
Joshua Pusey

(No Model.) 13 Sheets—Sheet 6.

# C. CHAMBERS, Jr.

## BRICK MAKING MACHINERY.

No. 275,467. Patented Apr. 10, 1883.

Fig. 13.

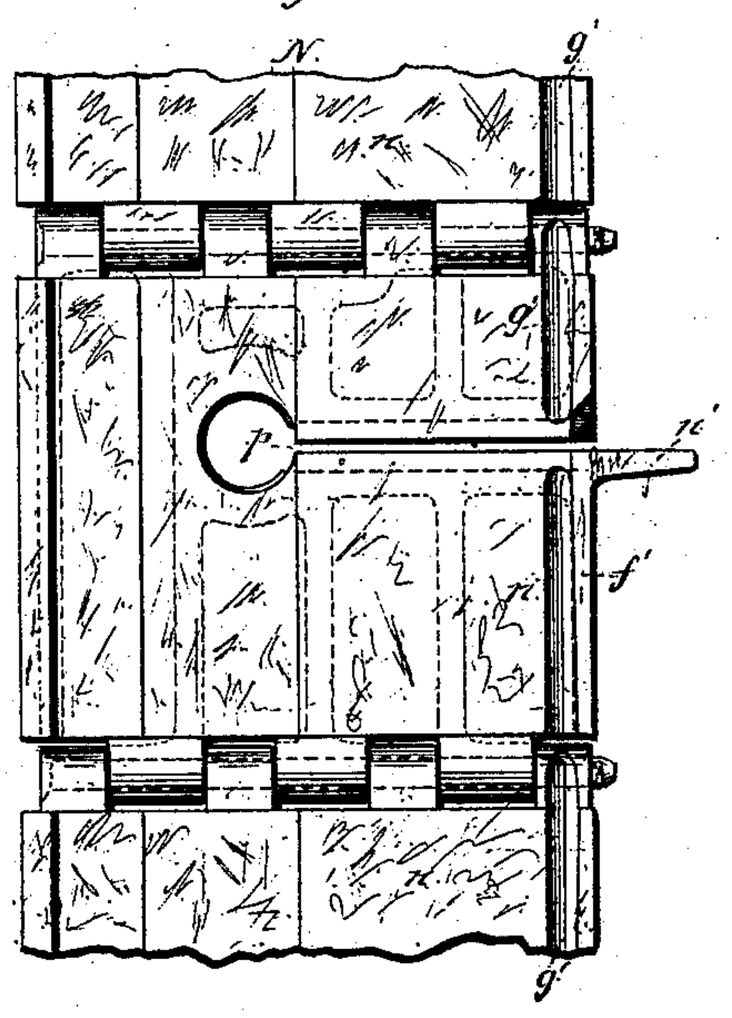



Fig. 14.

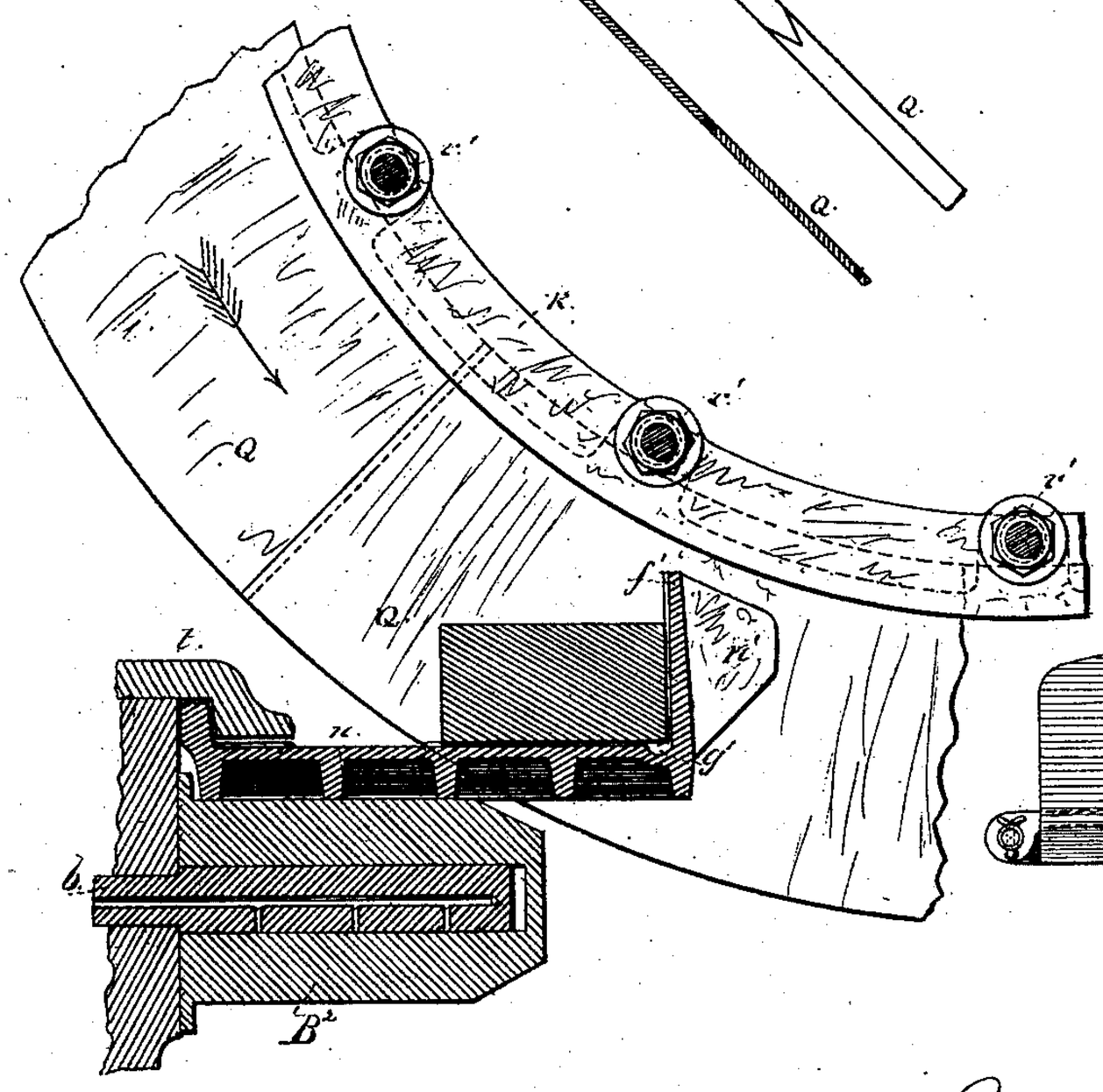
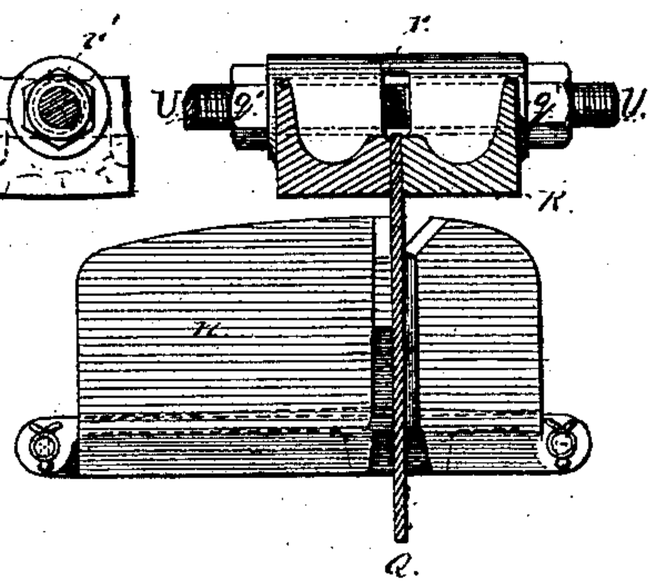



Fig. 16.




Fig. 15.




Witnesses.
Wm. H. Carson.
John. Burkhardt.

Inventor.
Cyrus Chambers Jr.
by his Attorney
Joshua Pusey.

(No Model.) 13 Sheets—Sheet 7.

# C. CHAMBERS, Jr.

## BRICK MAKING MACHINERY.

No. 275,467. Patented Apr. 10, 1883.

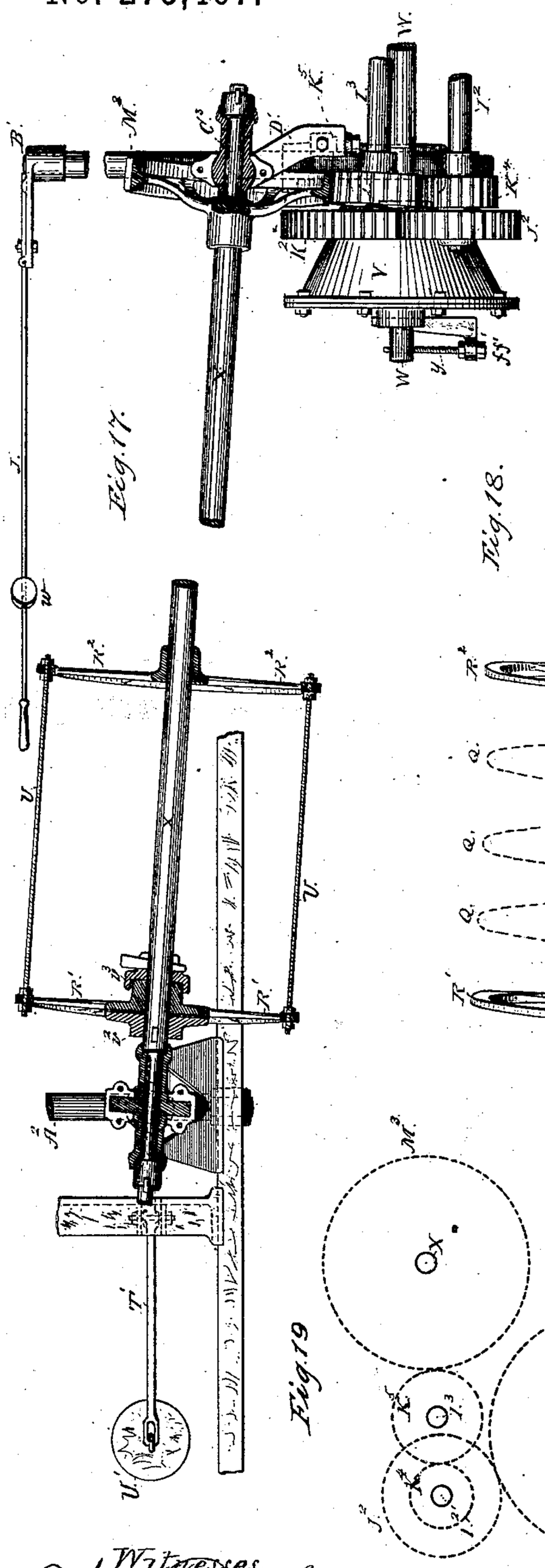


Fig. 17.

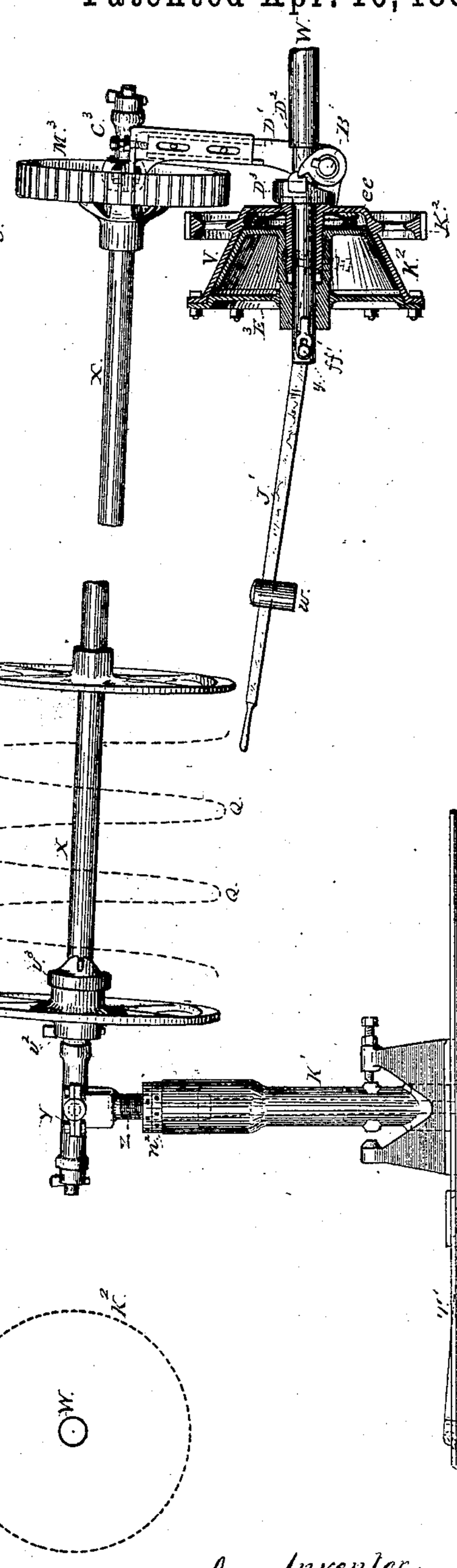


Fig. 18.



Fig. 19.

Witnesses.
Wm. L. Carson.
John. Birkhardt.

Inventor.
Cyrus Chambers. Jr.
by his Attorney
Joshua Pusey.

(No Model.) 13 Sheets—Sheet 8.

# C. CHAMBERS, Jr.

## BRICK MAKING MACHINERY.

No. 275,467. Patented Apr. 10, 1883.

*Fig. 20.*

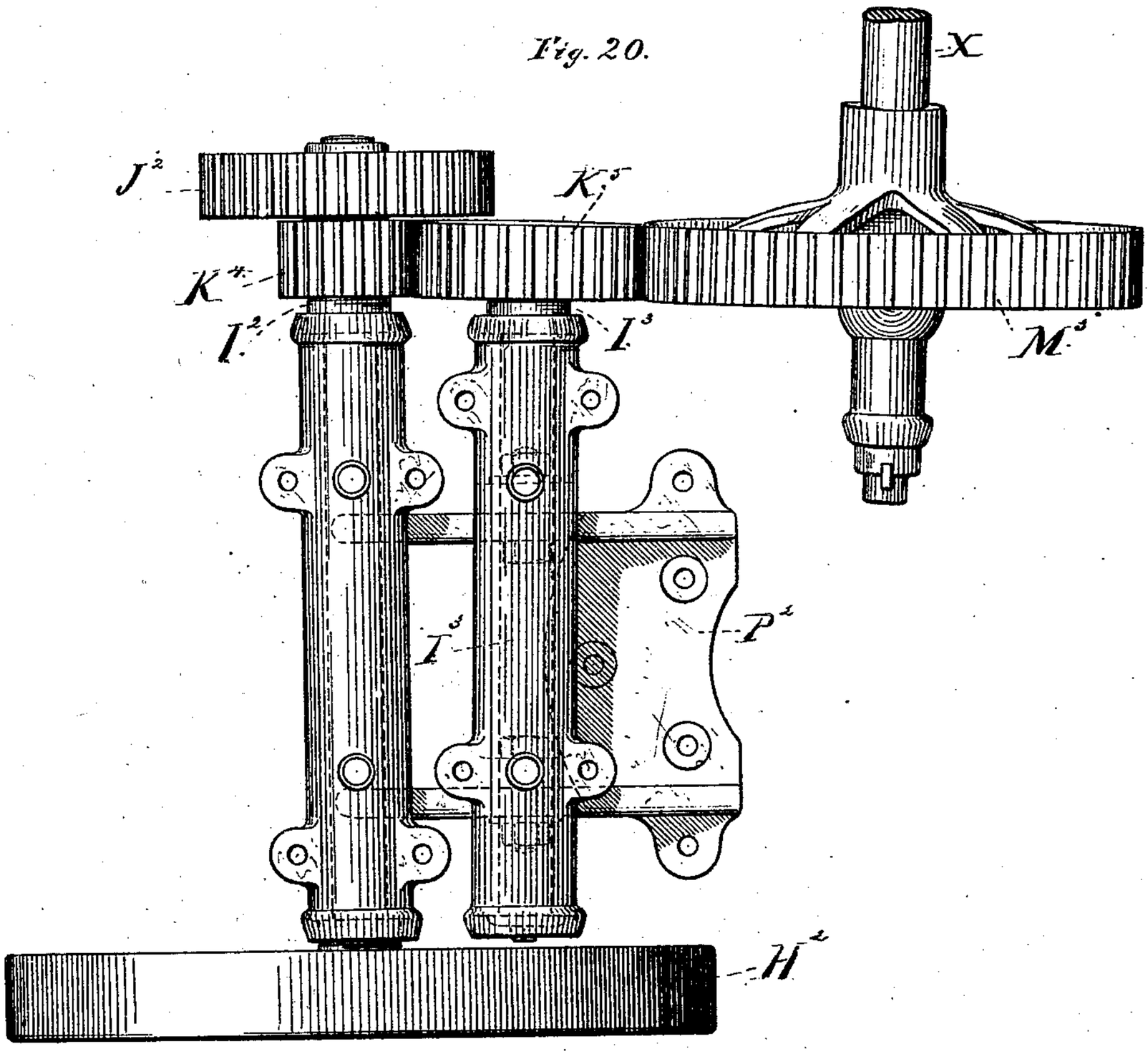
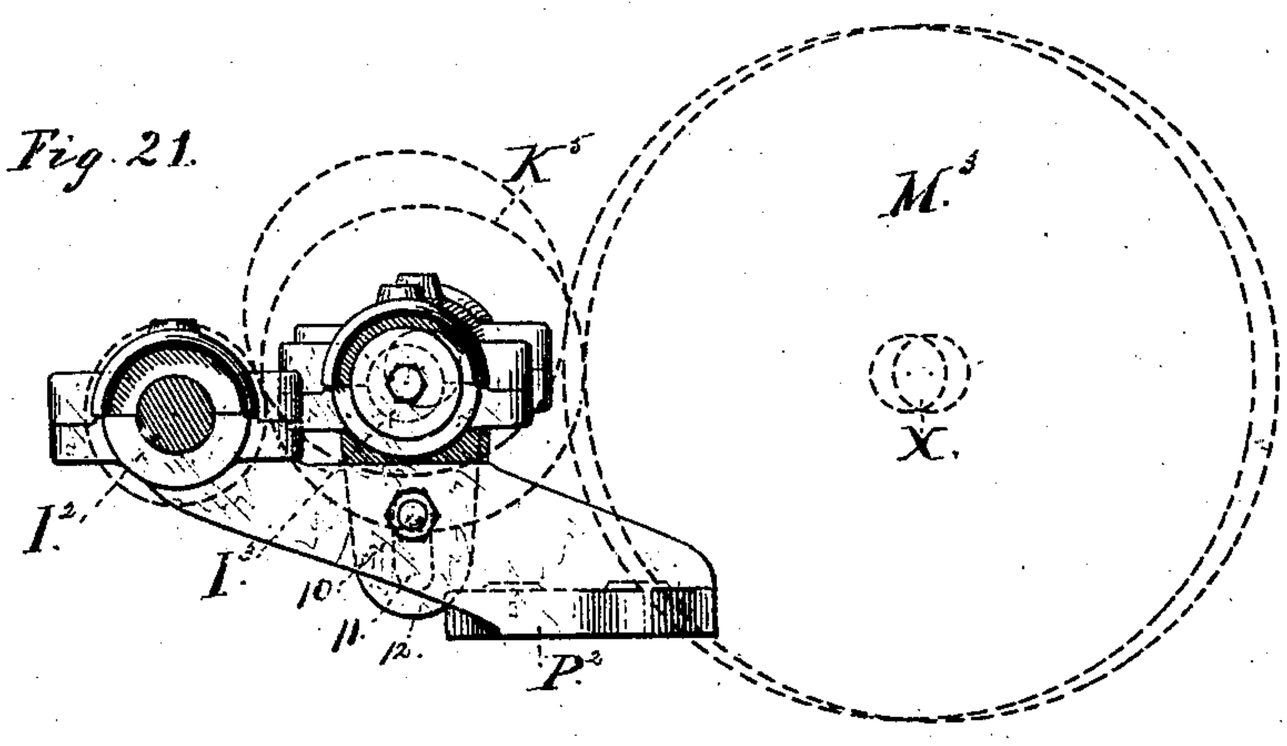



*Fig. 21.*




Witnesses.
Wm. H. Carson.
John. Burkhardt.

Inventor.
Cyrus Chambers, Jr.,
by his Attorney
Joshua Pusey.

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# C. CHAMBERS, Jr.

## BRICK MAKING MACHINERY.

No. 275,467. Patented Apr. 10, 1883.

Fig. 22.

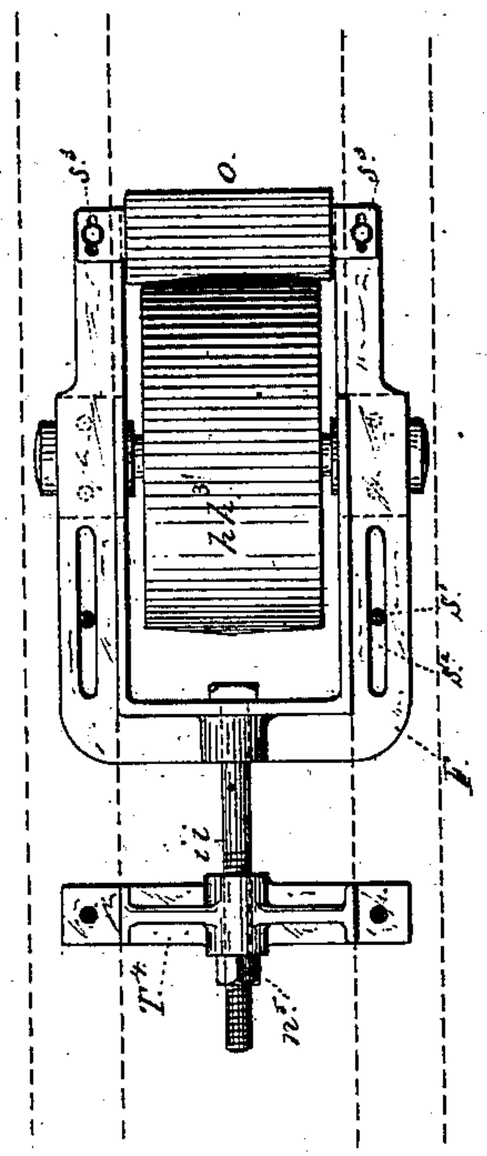
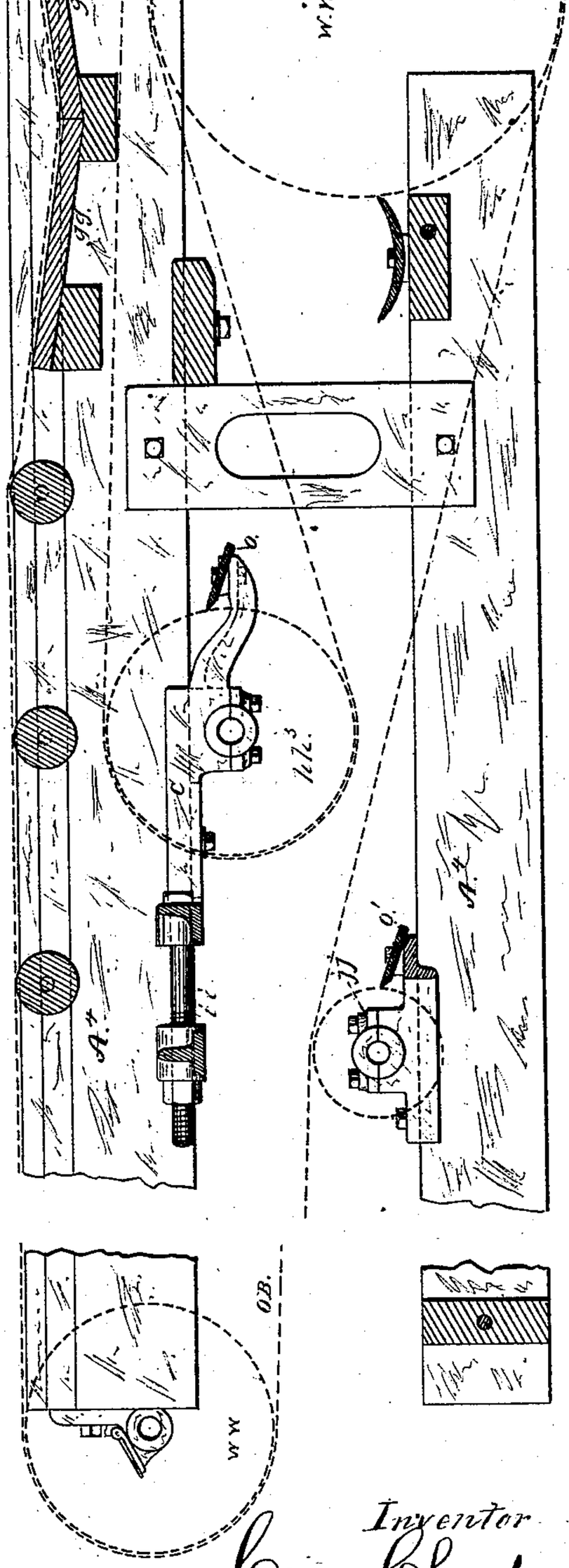



Fig. 23.




Witnesses
Wm. D. Carson.
John. Burkhardt.

Inventor
Cyrus Chambers, Jr
by his Attorney,
Joshua Pusey.

(No Model.) 13 Sheets—Sheet 10.

# C. CHAMBERS, Jr.

## BRICK MAKING MACHINERY.

No. 275,467. Patented Apr. 10, 1883.

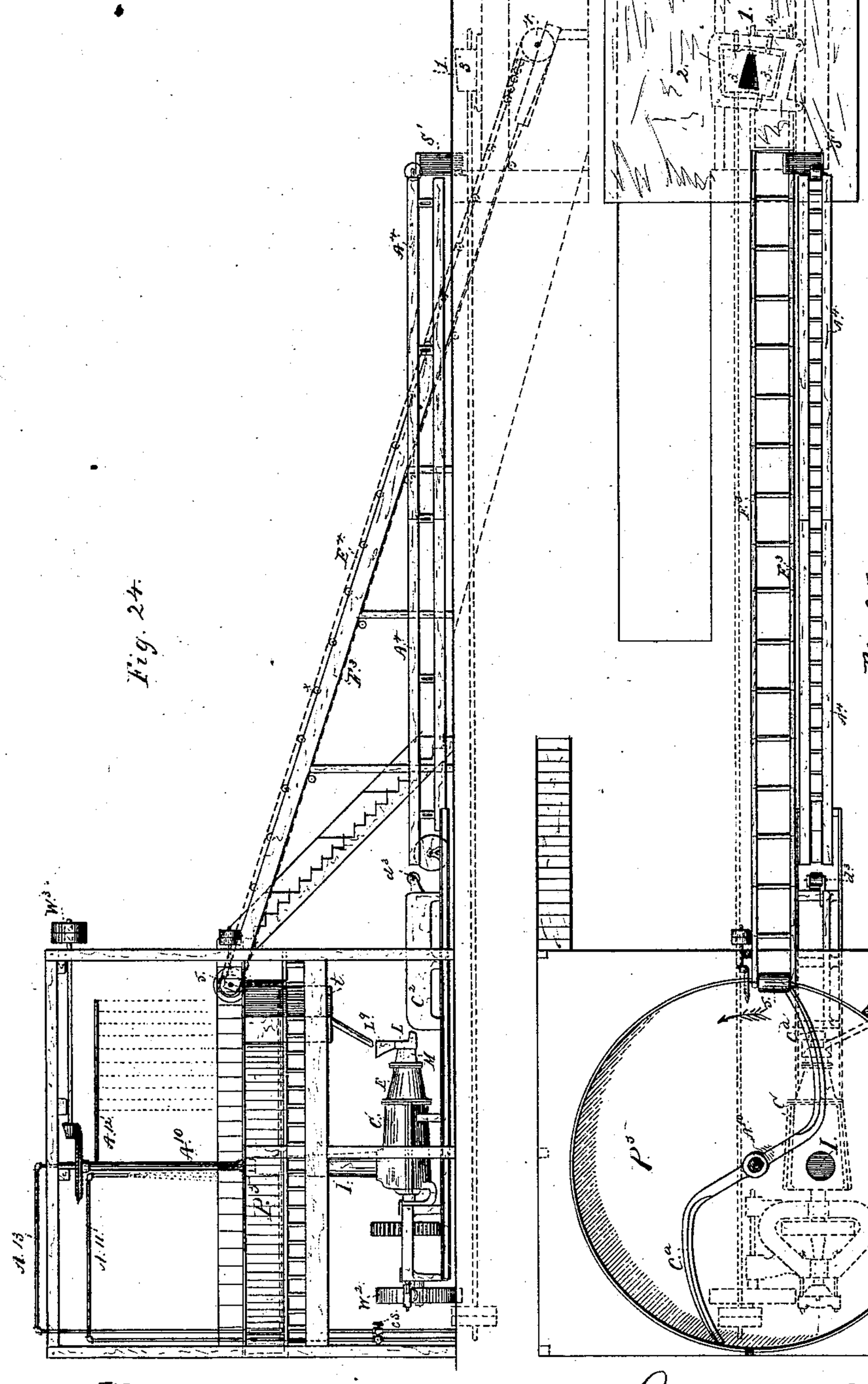


Fig. 24.



Fig. 25.

Witnesses.
Wm. D. Carson.
John Burkhardt.

Inventor
Cyrus Chambers, Jr.
by his Attorney
Joshua Pusey.

(No Model.) 13 Sheets—Sheet 11.

# C. CHAMBERS, Jr.

## BRICK MAKING MACHINERY.

No. 275,467. Patented Apr. 10, 1883.

Fig. 26.

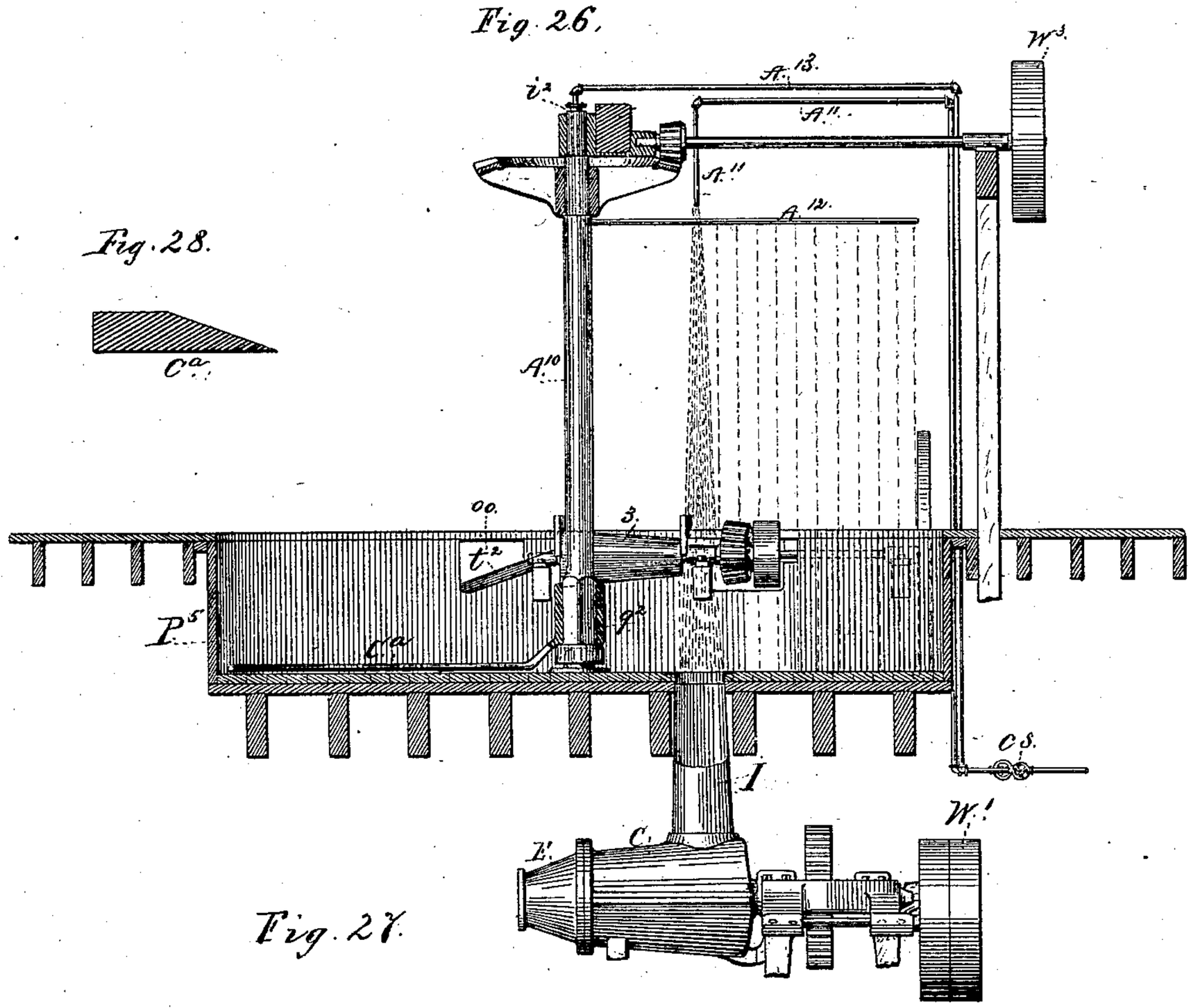
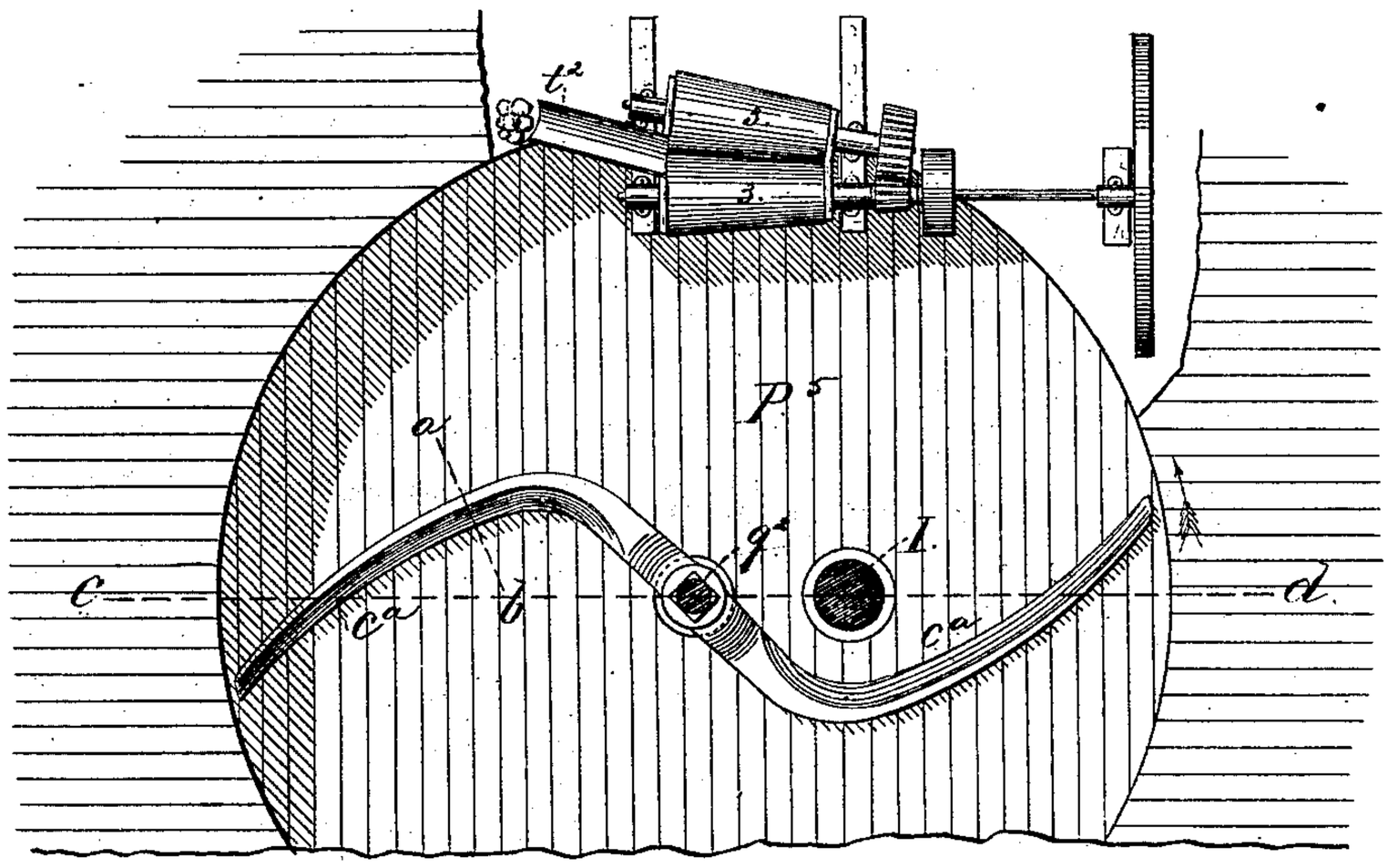



Fig. 28.




Fig. 27.




Witnesses.
Wm. D. Carson.
John. Burkhardt.

Inventor.
Cyrus Chambers, Jr.,
by his Attorney
Joshua Pusey.

(No Model.) 13 Sheets—Sheet 12.

# C. CHAMBERS, Jr.

## BRICK MAKING MACHINERY.

No. 275,467. Patented Apr. 10, 1883.

Fig. 29.

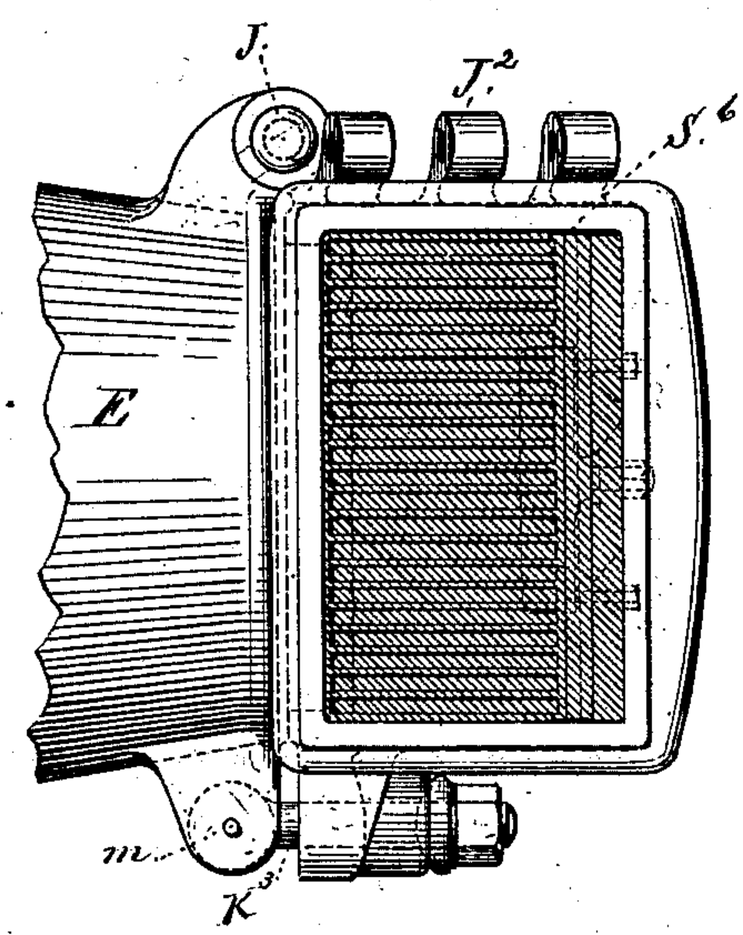



Fig. 32.

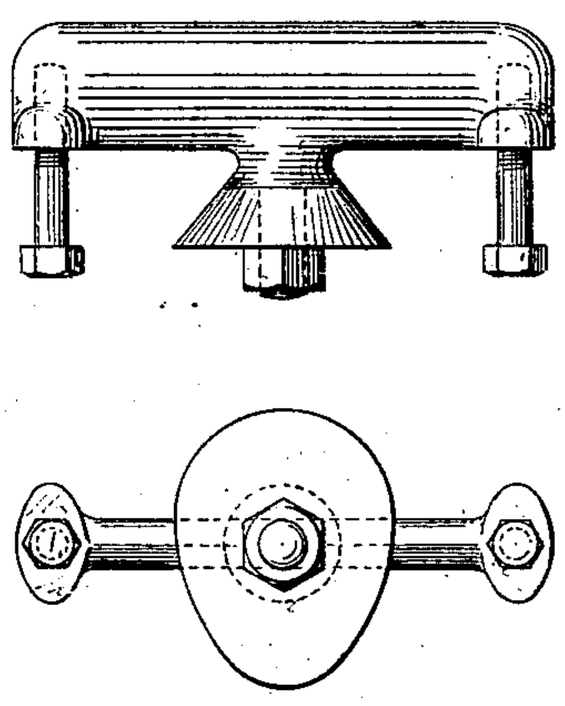


Fig. 30.

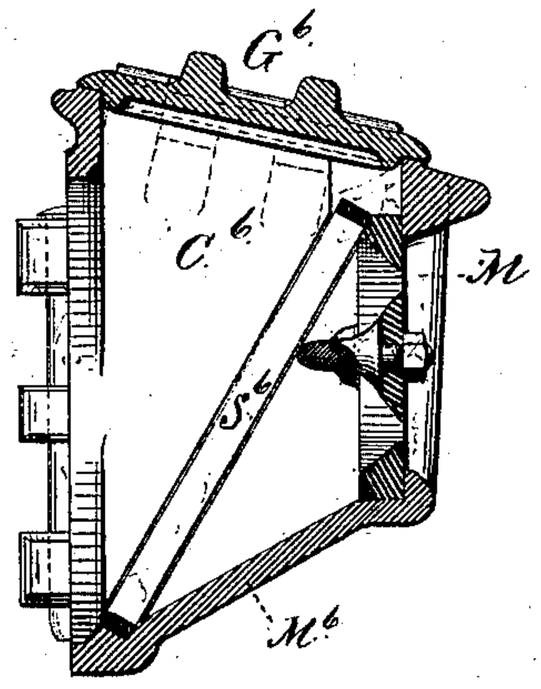
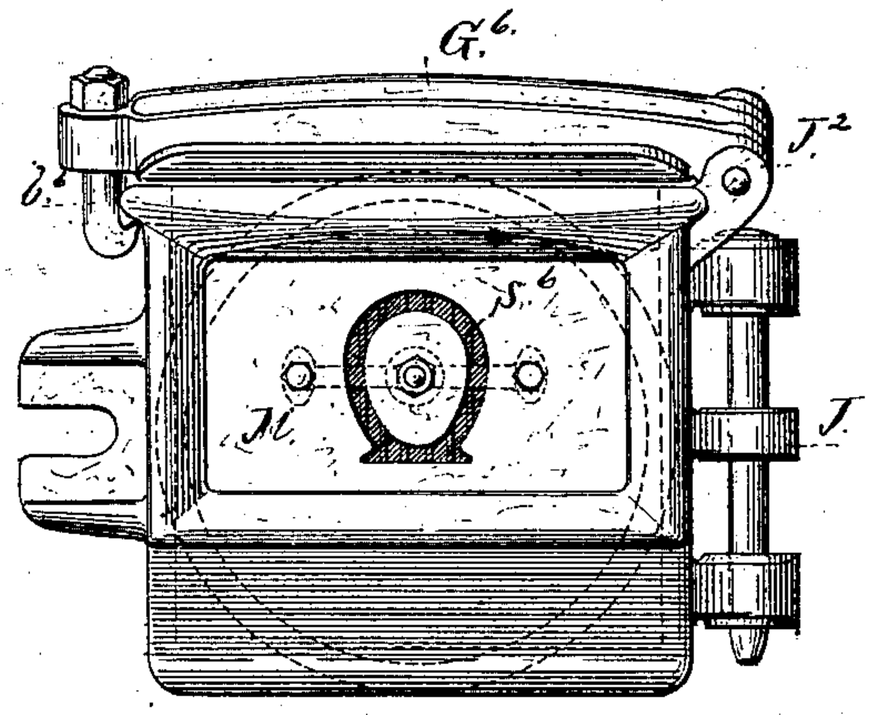



Fig. 31.




Witnesses:
Wm. D. Carson.
John. Burkhardt.

Inventor.
Cyrus Chambers, Jr.
by his Attorney
Joshua Pusey.

(No Model.) 13 Sheets—Sheet 13.

# C. CHAMBERS, Jr.

## BRICK MAKING MACHINERY.

No. 275,467. Patented Apr. 10, 1883.

Fig. 33.

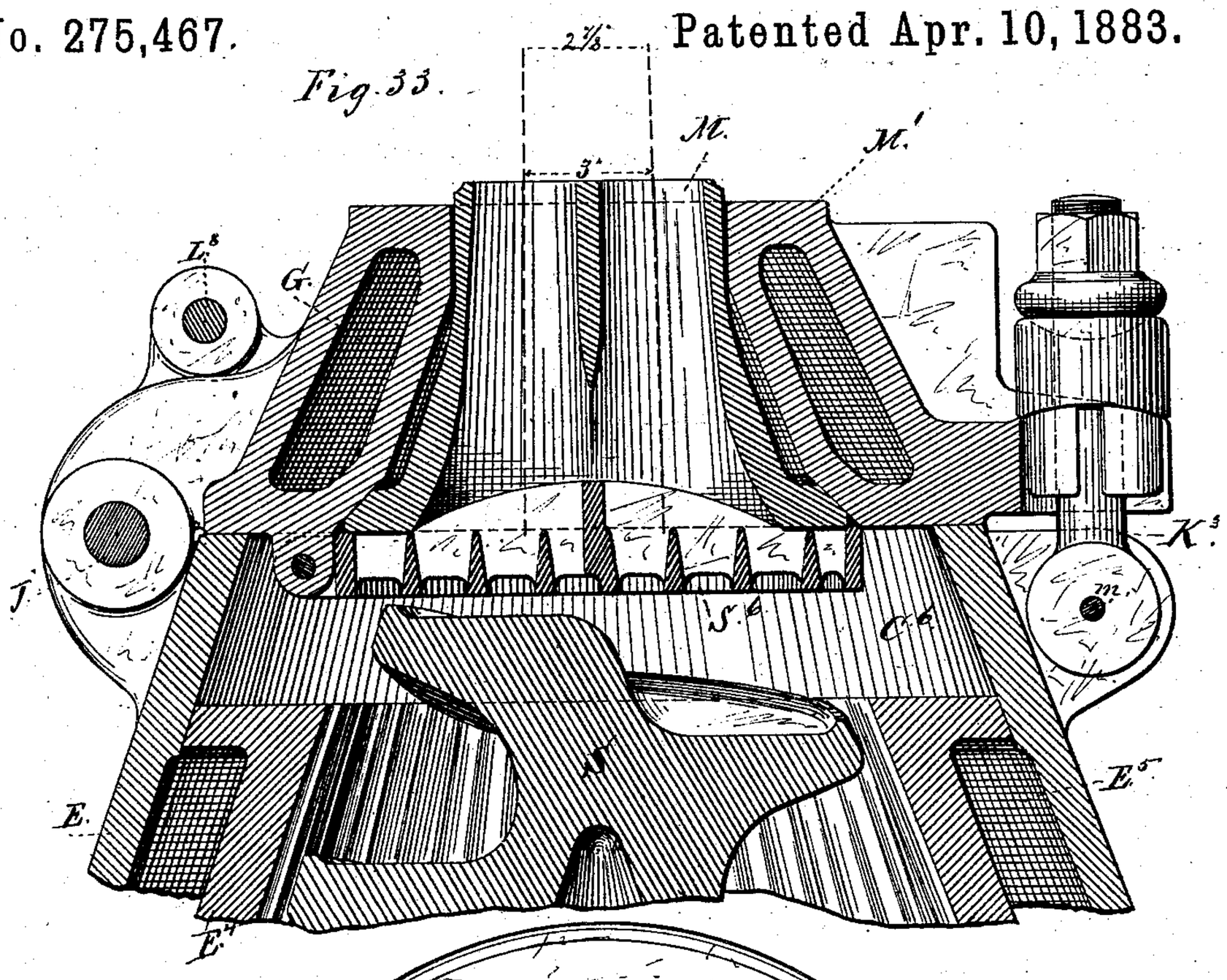
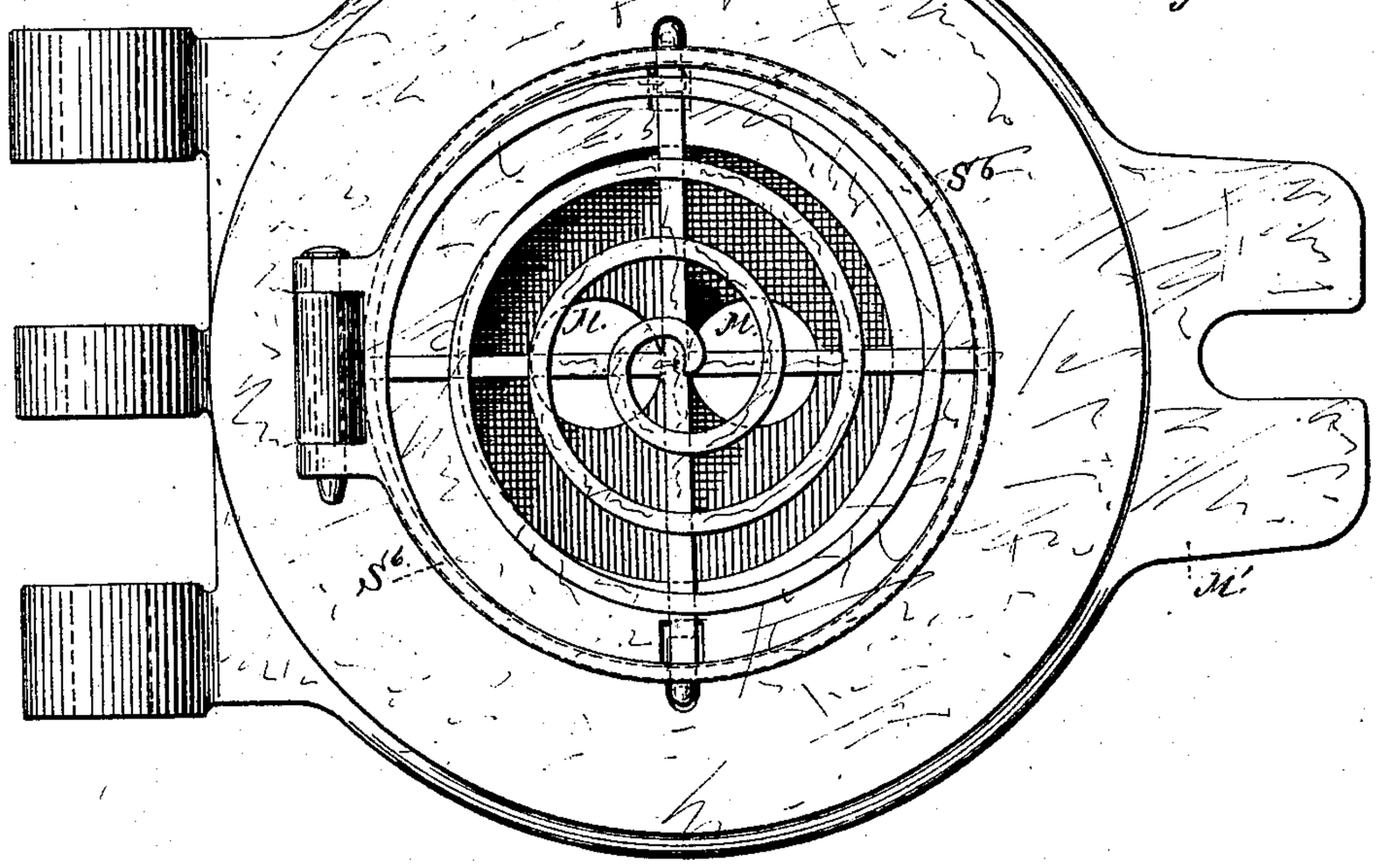



Fig. 34.




Witnesses
Wm. D. Carson
John. Burkhardt.

Inventor:
Cyrus Chambers, Jr.
by his Attorney
Joshua Pusey.

# UNITED STATES PATENT OFFICE.

CYRUS CHAMBERS, JR., OF PHILADELPHIA, PENNSYLVANIA.

## BRICK-MAKING MACHINERY.

SPECIFICATION forming part of Letters Patent No. 275,467, dated April 10, 1883.

Application filed August 4, 1882. (No model.)

*To all whom it may concern:*

Be it known that I, CYRUS CHAMBERS, Jr., a citizen of the United States, residing at the city and county of Philadelphia, and State of Pennsylvania, have invented certain new and useful Improvements in Brick-Making Machinery, of which the following is a specification, reference being had to the accompanying drawings, (upon thirteen sheets,) in which like letters, where they occur, designate like parts.

Figure 1, Sheet 1, is a plan of the machine with my improvements. Fig. 2, Sheet 2, is a rear elevation, on an enlarged scale, of the improved former-die M; Fig. 3, a horizontal section; Fig. 4, a vertical longitudinal section of the same; Fig. 5, a vertical transverse section on line *e f* of Fig. 3; and Fig. 5½, a sectional view, (as on line *e f*, Fig. 3,) showing a die whose sides are curved outward instead of being straight, as in Fig. 5. Fig. 6, Sheet 3, is a top view (partly in section) of the former-die casing and adjacent part of the screw-case. Fig. 7, Sheet 4, is a front elevation of the sand-box. Fig. 8 is a vertical section of the same on line *a b* of Fig. 7. Fig. 9, Sheet 5, is a top view of the cut-off-chain stand with the chain removed. Fig. 10 is a side elevation (partly in section) of the same with the chain in position. Fig. 10½ illustrates, by side elevation, the system or arrangement of cut-off chain, plate, and off-bearing belt whereby the bricks are carried on from the former to the latter. Fig. 11 is a sectional view on line *a b*, Fig. 10, looking toward the front of the chain-stand. Fig. 12 is a top view of three connected links of the chain. Fig. 13, Sheet 6, is an enlarged plan view of a section of the chain. Fig. 14 is a side elevation of part of the severing-blade and sections of one of the links of the chain and supporting-roller. Fig. 15 is a transverse section of the blade in a slit of the chain, and showing also the mode of clamping the blade. Fig. 16 is a section of the blade, showing the mode of juncture of its segments. Figs. 17, 18, and 19, Sheet 7, are details of the clutch and blade driving gear and blade-frame, Fig. 19 showing the pitch-lines of the gear system. Fig. 20, Sheet 8, is a plan view of the blade-shaft driving-gear disconnected from the clutch. Fig. 21 is a side elevation of the same, showing the adjustable connection of the idler-gear box to the pedestal, and also indicating two different adjustments of the same. Fig. 22, Sheet 9, is a detail of adjustable pulley and its frame for the off-bearing belt. Fig. 23 is a longitudinal vertical section of part of the off-bearing frame, showing the arrangement of the off-bearing belt and the adjustable pulley, Fig. 22. Fig. 24, Sheet 10, is a side elevation, showing the general arrangement of my machinery, with the clay-elevator and the crushing, mixing, and water-sprinkling devices. Fig. 25 is a plan of the same. Fig. 26, Sheet 11, is an enlarged medial vertical section of the mixing-pit, Figs. 24 and 25, and mixing devices, showing the sprinkling apparatus, and also the conical clay-crushing rolls at the side of the pit. Fig. 27 is a view looking into the mixing-pit, the vertical shaft which carries the curved mixing-arms being cut off and the sprinkling devices removed. Fig. 28 is a cross-section of one of the mixing-arms on the line *a b*, Fig. 27. Figs. 29, 30, 31, and 32, Sheet 12, represent a die and case provided with a form of stone-screen to be used in connection with my machine. Figs. 33 and 34, Sheet 13, represent another form of stone-screen in connection with my machine.

This invention relates to improvements in that class of brick-making machines in which the clay is successively tempered in a case, forced out therefrom in a continuous bar through a forming-die, sanded upon emerging from the die, cut into proper lengths by a severing mechanism, and finally delivered upon an endless off-bearing belt. This class of machines is illustrated in Letters Patent No. 39,884, of September 15, 1863, No. 40,221, of October 6, 1863, No. 108,880, of November 1, 1870, and my Patent No. 207,343, of August 27, 1878.

The improvements hereinafter described and claimed relate more especially to the machine described in the last-mentioned Letters Patent, and their main object is to perfect many of the details of its construction, tending to make it more durable, convenient, and efficient without affecting its essential principles or general mode of operation.

I shall now proceed to describe the continu-

ous operation of making ordinary bricks by my improved machinery, beginning with the clay fed to the crushing-rolls and ending with the bricks delivered upon the off-bearing belt, referring, as the description proceeds, to the construction, functions, and advantages of the several improvements, and describing certain devices for use under special conditions or for special purposes, finally designating the specific improvements by the claims.

The clay as taken from the bank is fed into a chute or opening, 1, Figs. 24 and 25, Sheet 10, in a platform, 2, in which opening is a pair of adjustable crushing-rolls, 3, above a moving endless belt, $E^4$, which is supported by transverse rollers *x* in a frame, $F^3$, and passes over a pulley, 4, at one end of the frame and a driving-pulley, 5, at the other. These crushing-rolls are conical, as shown, so as to work the stones or other hard or unyielding obstructions which may be in the clay to the rear, where they escape through an inclined chute, as hereinafter described in referring to the figures on Sheet 11. The details of construction of these rolls I purpose making the subject of a separate application for Letters Patent. The crushed clay falls from between the rolls upon the said moving belt, hereinafter termed the "elevator," and is carried by the latter into the inlet-pipe I of the tempering-case C, or into a mixing-pit, $P^5$, which will be hereinafter particularly described. Although the elevator may extend in any required direction or be inclined at any suitable angle from the inlet-pipe, (or the mixing-pit,) I prefer, for reasons hereinafter explained, to locate the same with relation to the off-bearing belt on frame $A^4$ as shown in Figs. 24 and 25, Sheet 10. I also prefer to locate the said crushing-rolls as shown in those figures—that is, just above the lower end of the elevator; but they may be placed elsewhere—as, for example, as in Figs. 26 and 27, Sheet 11, and hereinafter described. The clay which has entered case C, Fig. 1, is tempered and carried forward to the expressing-screw S by means of a series of spirally-arranged knives, K, adjustably secured to the revolving pugging-shaft P, which shaft is driven through intermediate gearing from the main shaft W, which carries the driving-belt pulley W′. A proper consistency is first given to the clay, if its condition require it, by adding more or less water thereto by means of a suitable sprinkling device, such as will be described farther on. The mass of tempered clay is forced by screw S into the former-die M, Sheets 1, 2, and 3, whence it issues in a continuous bar whose cross-section is that of the bricks to be made. The sliding of the surface of the clay upon its course to and from the die M is facilitated by means of heat from steam, which passes by way of the pipe $P^7$ through a chamber, $E^5$, between the screw-case E and its removable lining $E^4$, and also through a chamber, G, in the case M′ of the former-die, by way of pipe $P^8$. (See Fig. 6.) The former-die M is secured within its casing by the bolt-hooks $M^2$, Figs. 2 and 6, whence it may readily be removed and another substituted whenever required. Case M′ is hinged to the screw-case E, so as to swing horizontally upon bolt J, and is held closed by means of a bolt, $K^3$, which swings upon a safety-pin, *m*, (which will break when the strain of the moving body of clay becomes too great,) and engages with a slotted eye on the former-die case, as also shown in my said last-mentioned patent. In said Patent No. 207,343 one wall of the steam-chamber G next the former-die is shown constituted by the side of the latter, the joint being made tight by means of lead calking. The defect in that construction is in that this steam-joint between the junction of the former-die and its casing must be broken whenever a new die is to be inserted. This is obviated by confining the steam-chamber G wholly within the walls of the casing M′, as clearly shown in Fig. 6. The former-die is given the improved interior conformation seen in Figs. 2, 3, 4, 5, and 5½, Sheet 2. The improvement consists in making the top and bottom of the former-die convex and its sides straight, or more or less concave, as in Fig. 5½, instead of, as heretofore, making the sides of the same convex. This new form I find by experience is a great improvement upon the old ones, as the body of clay, which is retarded in the middle by the convexity of the former-die at the top and bottom, is better spread out laterally and the clay more forcibly packed in the corners than was the case when the sides of the former-die were convex. The bar of clay from die M issues directly into the sand-box L, Figs. 1, 6, 7, and 8. L is hinged, for convenience of opening, instead of being bolted, as heretofore, onto lugs projecting from case M′ at $L^8$, and is held shut to the case by the hook-latch L′, Fig. 6. The sand-scrapers *e e′* are held in a vertically-swung frame, $L^2$, hinged to the sand-box at 6, Figs. 7 and 8, Sheet 4. This scraper-frame $L^2$ is latched by a lateral spring-hook, $L^3$, on the upper hinge of box L, whereby, although holding the scrapers in position under usual conditions, it yields and opens when the bar of clay issues from the die unduly enlarged by reason of the clay being too wet. The sand-hopper $L^9$ of sand-box L, Figs. 6, 7, and 8, is provided with a slide-valve, $L^4$, whereby the flow of sand from the hopper through the holes $L^5$ may be regulated by means of the pivoted hand-lever $L^6$, whose lower end connects with said valve. Holes $L^5$ are preferably located to the sides of the path of the bar of clay, so that when the machine is started, or when the sand is about run out, the sides and bottom of the clay bar will always receive sufficient sand.

A longitudinally-grooved roller, *h*, is placed transversely in the bottom of sand-box L, as shown in cross-section in Fig. 8 and by the dotted lines in Fig. 7. Over this roller, whose grooves are constantly filled with sand supplied from box L, the bar of clay passes as it is forced from the die M. It is made swelling

in the middle to correspond with the curve given to the bar by the die, which latter is usually made slightly convex at top and bottom, as seen in Fig. 2, Sheet 2. A part of the journal-frame $h'$ (in the boxes 7 of which journal 8 of roller $h$ runs) is made to cover the vertically-slotted openings 9 (indicated by the dotted lines in Fig. 8) in the case L, through which the shaft of the roller enters the case. The two parts of frame $h'$ are bolted together, forming a bow, as seen in Fig. 7, whereby a single screw, $h^2$, will serve to make the necessary adjustments and keep the boxes of roller $h$ always in line and cause it to run freely. The bar of clay, with the surplus sand removed therefrom by the flexible scrapers $e$ $e'$, emerges from the sand-box and slides onto a plate, $L^7$, Figs. 6, 7, and 8, which plate may be adjusted vertically or obliquely by means of screws $l'$ and $l^2$, as shown in Figs. 7 and 8, more clearly in the latter. In order to allow the sand-box to be swung open when necessary, the projecting end of this plate is cut off obliquely to correspond with the angle of the adjacent end of a plate, $L^{10}$, which is secured to the dust-apron, as hereinafter described, and which is practically an extension or continuation of the plate $L^7$. The bar of clay slides on from plate $L^7$ to plate $L^{10}$, thence to the endless cut-off chain N, Figs. 1, 9, and 10. On its way it is held to its course by an adjustable guide, $a$, attached to the sand-apron $a$ $a$, and farther on, on the opposite side, by a flange, $f$, of the cap $t$, and by an adjustable curved elastic guide, $g$, secured to cap $t$, whose office is to deflect the moving bar toward the vertical flange $f'$ of the cut-off chain N. The latter passes over a pulley, C C, journaled at one end of the chain-stand $C^2$, and pulley C C′ at the other end, Figs. 9 and 10, Sheet 5. Chain **N** is supported by rollers $B^2$, which turn upon studs $b$, bolted to the frame $C^2$, and the slack of the chain is sustained by pulleys $B^{10}$, Sheet 5. The links $n$ of chain N are held laterally in place by means of a cap, $t$, Fig. 11, which laps over their edges. They are turned up at right angles, forming the flange $f'$, Sheets 5 and 6, on the side next the spiral cut-off blade, so as to support and guide the bar of clay on the side. Each of these links is provided with a transverse slit, $p$, at about two-thirds the distance from the rear end of the link. Such distance apart of the slits, or, in effect, the length of each link, must always equal the length of the bricks to be cut off by the spiral blade Q, as hereinafter described.

Thus far the general construction and arrangement of the cut-off chain and its connections are substantially as described in my aforesaid Patent No. 207,343. The improvements I have made therein will now be set forth.

I make a groove, $g'$, Figs. 11, 13, and 14, in the angle of each link, on the side next the cut-off blade, the purpose of which groove is to prevent the corner of the clay bar from sticking in the corner of the link, and thereby "ragging" the edge of the brick and marring its appearance, as has heretofore frequently been the case. This groove, for reasons which will be obvious when the operation of the cut-off is understood, does not extend quite to the slits $p$, as shown. The faces of the links upon which the bar of clay rests are also raised slightly toward slits $p$, as indicated in Figs. 10, 13, and 15, for the purpose of securing a firm resistance to the cut of the blade, and to prevent the bricks from bulging up in the middle by reason of the depression of the ends of the same by the cut-off, owing to the fact that the accumulation of sand or other unevenness upon the under side of the bar of clay did not permit the latter at all times to rest directly and evenly upon the chain. Another improvement in the latter consists in making a lateral projection, $n'$, on each link, extending from the forward side of slits $p$, for the purpose of giving a greater purchase and wearing-surface to the sides of the slits, against which the spiral blade presses in propelling the chain, as hereinafter explained.

The forward chain-carrier pulley, C C, is vertically adjustable by means of screws 15, Figs. 10 and 11, in connection with a slot, 16, in the frame $C^2$. The rear pulley, C C′, is vertically adjustable by means of a screw, 17, Fig. 10. It is also horizontally adjustable by means of the screw 18, Figs 9 and 10, Sheet 5, the frame $C^2$ being suitably slotted, as shown in the latter figure. Such vertical and horizontal adjustability is required when the brick-machine is intended to turn out bricks of different length, for when the length of the bricks is to be changed the links $n$ must be changed to suit. Consequently it is plain that the said horizontal adjustment is necessary, and the vertical adjustment is required so that the level or height of the chain relatively may be preserved. With the shortest links the pulleys should be elevated the highest, and with the longest ones depressed the lowest.

The pulleys $B^{10}$, which support the slack of the cut-off chain, are given the form or outline shown in Fig. 11, their width being of course about and within that of the links of chain N, between the flanges on each side thereof. The outer corner—that next the flange $f'$ of the chain—of the pulleys is taken off, as shown, so that it will clear and avoid packing any clay that may chance to stick in the corner of the link. It will also be observed that there is a break, $x$ $x$, in the periphery of each pulley $B^{10}$, where the same does not come into contact with the chain. The object of this interval is to avoid a difficulty which has caused some annoyance, and that is the working of the sand and dirt which are deposited by that part of the links which bears the bar of clay upon the pulleys over upon that portion of the latter which is directly beneath the part of the chain which slides under the cap $t$, in which case the sand or grit causes the link and cap to wear rapidly away. The chain N is also protected from cuttings of clay carried through slits $p$ by the cut-off blade Q, as hereinafter described, by means of an inclined apron, $i'$, Figs 10 and

11, Sheet 5, which is hinged or otherwise secured to the chain-stand.

Chain-carrier pulleys C C and C C′ are provided with a bevel-flange, $e^2$, on the outer side, (the links *n* having a corresponding bevel,) to take the side-thrust of an angular wire brush, *b b*, which is hinged on a shaft, *b b′*, in the bars of the frame $C^2$, Sheet 5. The function of this brush is to clear the links of chain N from any clay that may adhere to them. It is held up to its work by an adjustable weight, $b\ b^3$, on a lever, $b\ b^2$, on shaft *b b′*, and is located at the end of the cut-off-chain stand $C^2$, beneath an inclined dust-apron, *a a*, Figs. 1, 9, and 10, which serves to shield the links of chain N from sand falling from the bar of clay just after leaving the sand-box L. This apron is adjustably secure to the end of frame $C^2$ by means of screws or bolts working in slots 19 in the latter, so that it may be shifted longitudinally as required. Its top bears also the plate $L^{10}$, which is of steel, and is fastened to the flat part of the apron with screws. To it is also secured the adjustable side guide, *a*, previously referred to. Thus it will be seen that the sand-apron, with the said plate and guide attached thereto, may be shifted to suit any adjustment of the chain-carrier pulley C C′ made necessary by the lengthening or shortening of chain N, or otherwise.

The construction of the cut-off chain and its connections, as improved, having been shown, I shall now proceed to describe the device and its operation whereby the bar of clay moving forward upon the chain N is severed into bricks. As described in my said Patent No. 207,343, this consists, in the main, of a broad-sided spiral blade, Q, made up of conjoined sections of tempered sheet-steel clasped between two adjustable clamps, R, which are supported by a spider upon a shaft, X. The blade is placed a little to one side of chain N, so that its drawing cut will tend to draw the clay bar toward the angle of the chain. Its spiral pitch is adjusted to the length of the bricks to be made—that is to say, so as to correspond with the distance between the slits *p*—by means of bolts and nuts operating clamps R. The blade has three full spiral turns, the first two of which gradually increase in width from the forward or leading end, so that as it revolves the blade shall gradually enter more deeply into, until it severs, the bar of clay. The third turn prevents the partially-severed bar from yielding under the strain of the cut and separating before the blade completes the division thereof. One of the head-plates, R′, of the drum which carries the clamping-frame is held to the shaft X, Figs. 17 and 18, Sheet 7, between two friction-plates, $V^2$ $V^3$, which are adjustably keyed to said shaft, and have between them a leather friction-washer. The hub of the opposite head, $R^2$, is loose and free to rotate upon the shaft. This device is designed to drive the cut-off blade by friction, so that the latter shall not break should it, owing to a nail or other obstruction, become jammed in the slits *p* of the links of the cut-off chain, for in such case the shaft and the gearing through which it is driven will continue to revolve, thereby avoiding the possible breakage of the machine by reason of a sudden stoppage. The described general construction and attachment of the cut-off blade are similar to those of the machine of Patent No. 207,343. The improvements thereon which I have made are that, instead of brazing the ends of the blade-sections together, as heretofore, I join them with a V-groove, as shown in Figs. 14 and 16, Sheet 6, for economy in cost and more convenient removal of any section which may become worn or damaged; also, to facilitate the clamping and insertion of the blade; also, instead of securing the spiral-blade clamps R by means of the separate set or jam screws, in combination with plain bars connecting the heads of the drum as heretofore, I mount these clamps upon a series of threaded through-bolts, U, Figs. 1, 14, 15, and 17, and make the necessary adjustments by means of nuts *q′* upon the latter, as shown in Figs. 1 and 15. I also add projections *r′*, Figs. 14 and 15, Sheet 6, on the inside of the lugs of the clamps R, through which lugs the through-bolts U pass, in order to secure leverage and insure a proper bite of the opposing clamps upon the blade-sections.

It is obvious that when the blade Q, having been properly set, is caused to rotate toward chain N it will successively enter the slits *p* of the links of the latter and will advance the chain, and that the moving bar of clay must be divided into bricks of equal length, (being the distance between said slits,) and that the bricks will travel with and upon the chain. As the clay bar, while it controls, according to its driven speed, the movement of the spiral blade, it cannot of itself rotate the latter. The blade must therefore be driven, by suitable independent mechanism, at a speed having as nearly as possible a certain uniform relation to that of the bar issuing from the die of the machine; but as, owing to the variations in the consistency and quality of the clay, and from other causes, the bar issues with varying speed, some sensitive compensatory expedient must be used whereby the speed of the cut-off blade shall be regulated by that of the bar of clay. Such a device or system of devices is fully described in my said Patent No. 207,343. In order, however, to aid to a clear comprehension of the improvements which I have made in certain parts of the regulating mechanism, I shall describe the same in connection with my improvements.

The forward end of the shaft X—that nearest the cut-off blade Q—runs in a box, Y, with a universal joint, upon the summit of a column, Z, Sheets 5 and 7, which projects from a hollow standard, K′, supported by a transverse rock-shaft, $A^2$. Column Z is adjustable vertically by means of nuts $n^2$, working on the threaded part of the former, as shown. Its lower end rests in a notch, $n^3$, in the end of a lever, T′, which is pivoted at *p′*, and is coun-

terpoised by a weight, U′, gaged so as to nearly balance the gravity of the end of the shaft X and the cut-off blade Q, with its attachments. By this means the force required to raise the shaft, &c., is reduced to a little more than that required to sever the bar of clay, so that when the blade strikes a stone or other unyielding object in the clay which it cannot displace the blade rides up over it, lifting the shaft and column Z. The rear or driving end of shaft X runs in a box, $C^3$, with a ball-and-socket joint upon the end of an upright lever, D′, (to which box $C^3$ is adjustably secured,) which is supported by a rock-shaft, B′, on the main frame of the machine. B′ carries a very short lever or arm, $D^2$, which engages with a washer, $D^3$, bearing against the end plate of the female portion of a cone-clutch, V, which is loose upon the main driving-shaft W of the machine, and by its movement—*i. e.*, arm $D^2$—increases or permits a diminution of the friction of the clutch-cones. The male cone $E^3$ is driven positively by the main shaft W. An adjusting-key, *f f*, as clearly seen in Figs. 1 and 17, passing through shaft W and a slot in the hub of the cone $E^3$, takes the thrust of the latter. An improvement upon this part of my machine of Patent No. 207,343 consists in employing, in connection with this key *f f*, an adjusting screw or bolt, *y*, which, being secured in shaft W, also serves to keep the key firmly in place. Another improvement consists in introducing a spring, *e e*, Fig. 18, between the male and female cones of the clutch in order to quicken their separation. The female clutch V is provided with a gear, $K^2$, which meshes into and drives a gear, $J^2$, on the end of a shaft, $I^2$, which carries the fly-wheel $H^2$. In lieu of the chain or band whereby motion was transmitted to the blade-shaft X, as in my Patent No. 207,343, I substitute an improved mode of connection, which is a train of gears, $K^4$, $K^5$, and $M^3$, on the shafts $I^2$, $I^3$, and X, respectively, Figs. 1, 17, 18, and 19. The idler-gear $K^5$ on shaft $I^3$ meshes into the teeth of gear $M^3$ on shaft X on the one side, and into the teeth of gear $K^4$ on shaft $I^2$, which bears the fly-wheel $H^2$, on the other.

As seen in Figs. 1, 17, and 20, the blade-shaft X is not parallel with the main shaft W (or with the bar of clay) and the faces of the gears upon the latter. Therefore, in order to smoothly transmit motion from gear $K^4$ through $K^5$ to $M^3$, the middle shaft, $I^3$, which bears the idler $K^5$, is inclined both to $I^2$ and shaft X, and the face of the idler is somewhat conical and its teeth placed obliquely thereon. The journal-boxes of shafts $I^2$ and $I^3$ are supported by a pedestal, $P^2$, which is bolted to the main frame A A, as seen in Figs. 1, 20, and 21. Owing to the different pitch given to the cut-off blade Q, according to the length of bricks which it may be set to make, and as the blade must always cut the bar of clay at right angles, the inclination of the shaft X, with its gear $M^3$, must be altered accordingly. At the same time it is necessary to shift the idler $K^5$ to suit the changed angle of the shaft X. This is accomplished as follows: The box $P^3$ of the idler-shaft $I^3$ is made vertically and circularly adjustable upon pedestal $P^2$ by means of bolt 10, Fig. 21, which passes through a slot, 11, in lug 12 of the box. Thus the position of the idler may readily be regulated, or another of different diameter be substituted and adjusted when it is desired to alter the relative speed of the shaft X. Two different adjustments of the same idler are indicated by the broken lines in Fig. 21, Sheet 8.

In my said Patent No. 207,343 the regulating hand-lever (J, hereinafter referred to) was connected by a lever system with the rock-shaft which sustains the hollow standard K′, which carries column Z and blade-shaft X, as shown in Fig. 7 of that patent. This lever and its connections I have now removed, and another lever, J′, Figs. 1, 17, and 18, substituted, but applied in an adjusting-boss on the before-mentioned transverse rock-shaft B′, which shaft carries the short arm $D^2$, impinging against the washer $D^3$ of the friction-cone. J′ is regulated by a weight, *w*, instead of by a spring, as heretofore, which may be shifted along the lever to the position desired.

Having described the construction of all the essential or important elements of chain N and the cut-off blade Q and their connections and relative arrangement thereof, I shall now proceed to explain their *modus operandi*.

If the bar of clay issued from die M at all times with uniform speed, all regulating devices could be dispensed with and the cut-off blade be driven positively and directly from the main driving-shaft; but such evenness of flow of the clay cannot be practically sustained. When the bar travels relatively faster than the blade is running it presses against the latter, moving it forward, the oscillating movement being permitted by reason of the manner in which shaft X is supported, as has been described. This results in moving the lever D′, which vibrates the arm $D^3$ and causes the cones of clutch V to hug more closely. The speed of the fly-wheel $H^2$ is thereby increased, and consequently, through the intermediate gears, that of blade Q. Should the latter run too fast for the clay bar, it will, by its reaction against the clay, screw itself back to a certain extent, and thereby relieve the pressure of the cone-clutch, and thus its rotation be retarded by the diminished speed of the fly-wheel shaft, the blade in this way operating as an automatic regulator much more sensitively than as in my former machine of Patent No. 207,343. This automatic regulating system, although practically perfect under normal or usual conditions, is not, however, in all cases sufficiently quick, owing to the *vis inertia* of the fly-wheel and other parts. Therefore it is provided that this sometimes deficiency shall be made up by the operator in charge of the machine working the lever J′, which, as previously described, acts upon the clutch V. When he depresses the lever the faces of the clutch are brought more closely

together and the speed of the fly-wheel and the cut-off blade are increased. The bricks cut off from the bar of clay by blade Q are propelled forward upon chain N onto an adjustable plate, $d^4$, which is secured to the chain-frame; thence to the off-bearing belt O B, Figs. 1, 9, 10, and 10½, which passes over a pulley, $d^3$, journaled in a bracket, $d$ $d$, at the end of the chain-frame, and which belt is always driven faster than the greatest speed at which the bar of clay issues from the die of the machine, thus separating the bricks for the convenience of handling by the off-bearers. The off-bearing belt is kept to its path by means of two side guide-pulleys, $d$ $d^2$, pivoted on an adjustable plate, $d$ $d'$, which is secured to the front of bracket $d$ $d$. The lower front and rear corners of the bricks made by the machines heretofore constructed by me have been frequently marred by being dragged and torn in passing onto the off-bearing belt. This defect has given me some difficulty. I have, however, remedied the same in the following manner, reference being now had especially to the illustration Fig. 10½, Sheet 5: The plate $d^4$, upon which the bricks slide from the cut-off chain, is placed slightly below the horizontal line of the top of the chain, and the pulley $d^3$ is placed so that its belt O B will come a little below the said plate. As the bricks advance each successively overhangs plate $d^4$, it being lifted a little by the link as it rides up over the pulley C C, until the link drops, when the brick is left upon the plate, whence it is forced by the advancing bricks behind until its center of gravity is beyond the forward edge of the plate $d^4$, when, tipping forward, it comes into contact with the off-bearing belt directly over the pulley $d^3$, and instantly partakes of the motion of the belt before the front edge of the brick comes into contact with the latter. It will be observed that for some distance in advance of pulley $d^3$ the usual supporting-rollers in the belt-frame have been removed. This allows the slack of the belt to sag down away from pulley $d^3$. The double incline $g$ $g$, Figs. 10 and 23, is to support that part of the belt when the machine is stopped and the bricks allowed to accumulate, owing to the stoppage of the belt a little before that of the cut-off. Otherwise the general construction and arrangement of the off-bearing frame and belt and their connections are the same as heretofore. I have, however, added an improved tightener-pulley and frame for the off-bearing belt, which is clearly shown in Figs. 22 and 23, Sheet 9. It consists of a pulley, $h$ $h^3$, journaled in a rigid bowed frame, F, which is provided with guide-flanges $c$, Fig. 23, whose distance apart is equal to that of the beams of the frame $A^4$. It is secured to the under side of the latter by means of screws $s'$, which pass through longitudinal slots $s^2$, Fig. 22. The rear part of the pulley-frame projects below the belt-frame, serving as a support for a scraper, O, which is adjustably secured thereto by means of bolts passed through slots $s^3$. The cross-bar at the front of the frame F has an eye for the reception of the tension-regulating bolt $i$ $i$, which is also passed through an eye in a transverse bar, $T^4$, which is screwed to the frame $A^4$. By screwing up the nut $n^5$ on the end of the bolt $i$ $i$ the belt O B, which passes around pulley $h$ $h^3$ and other pulleys, W W, of the system, may be tightened at will.

It is obvious that by the described construction the tightener-pulley may always be readily kept in line and the scraper in the same relative position therewith, which would not be the case if the shaft of the pulley were journaled in independent boxes, one on each side of the belt-frame.

The stretch of belt between the pulleys W W is supported by a pulley, $j$ $j$, journaled in a rigid bowed frame, similar to frame F, and secured to the lower beams of the belt-frame by screws. A scraper, O', for pulley $j$ $j$ is also adjustably secured to the frame of the latter in the same manner as scraper O is secured to frame F.

As hereinbefore stated, it is preferred to arrange the clay-elevator belt with relation to the machine and the brick-off-bearing belt as shown in Figs. 24 and 25, Sheet 10. This is as follows: The frame $F^3$, which carries the elevator $F^4$, is placed near to and in a vertical plane parallel with the frame $A^4$, which bears the off-bearing belt; and its lower extremity is carried below and beyond the end of frame $A^4$, as shown in said said figures. A grated screen, S', secured just below the end of the latter, extends obliquely to the side of the elevator-frame above its belt. By this arrangement any imperfect bricks which the off-bearers shall not see fit to take off are carried forward until they fall upon the screen, and thence upon the elevator-belt, to again pass through the machine. Sometimes it is desirable to temper the clay more than once by the machine. This, it is clear, may readily be done any number of times continuously with the described arrangement. It is preferred to provide screen S' with holes or slots, as shown, so that the sand knocked off by the falling bricks will drop through and may be used again.

Fig. 26, which is a vertical section, (on line $c$ $d$, Fig. 27,) and Fig. 27, which is a plan, represent a device which I employ, in connection with my brick-machine, for mixing clay, coal-dust, sand, &c., and carrying the mixture to the mouth of the inlet-pipe of the tempering-case of the machine. They also show devices for wetting the clay, so as to bring it to the proper consistency.

The mixing apparatus consists of a circular pit, $P^5$, into which the clay, &c., are deposited, and curved arms $C^a$, fixed to the square shoulder $q$ of a vertical shaft, $A^{10}$. The latter is rotated in the direction of the arrow, Fig. 27, by suitable gears driven from the pulley $W^3$. The mixing-arms $C^a$ lie close to the bottom of the pit. They are preferably beveled on the

front side, as shown in Figs. 27 and 28, (the latter being a section on line *a b*, Fig. 27,) so that they will slide beneath the clay, &c., and lift the same to fall over again, which aids in more thoroughly mixing the material. The curvature of the arms $C^a$ and the direction of their rotation cause them to carry the clay, &c., in toward the pipe I, which leads into the tempering-case C of the machine. The clay may be delivered into the mixing-pit by means of the elevator-belt, arranged as shown in Figs. 24 and 25; or it may be dumped directly into the pit; or the crushing-rolls 3, which, as previously described, were located above the lower end of the elevator, may be placed at one side of and just above the mixing-pit, as shown in Figs. 26 and 27, Sheet 11, the clay being crushed by passing between them before falling into the pit. In the latter case an opening, O O, is made in the side of the pit, through which the stones cast upon the inclined chute $i^2$, by reason of the enlarged diameter of the conical rolls at that end, escape outside the pit.

The means for sprinkling the clay, &c., with water consists of a supply-pipe, A″, Fig. 26, which gives directly into the inlet I of the machine, also a pipe, $A^{12}$, extending over to the side of the mixing-pit, which pipe is provided with a series of small holes for the escape of the water. It extends horizontally from the shaft $A^{10}$, which has a chamber therein connecting with the supply-pipe $A^{13}$. This connection is made by means of an ordinary stuffing-box, $l^2$. It is obvious that as the shaft $A^{10}$ rotates the water issuing from the holes in the pipe $A^{12}$ will be sprinkled over the clay in the pit. It is sometimes advisable to use either one only, and sometimes both together, of these wetting devices. Pipes $A^{11}$ and $A^{13}$ are preferably carried below the floor to which the mixing-pit is secured to that of the brick-machine, and are provided with cocks *c s* near the latter, so as to be convenient to the person in charge of the machine, one of whose duties is to observe and correct the consistency of the clay as it issues from the machine, and to increase or lessen the supply of water if and as circumstances may require.

It is sometimes necessary or desirable to screen the clay on its way to the die of the machine. This is the case when it contains an unusual quantity of stones, or when it is necessary to free it entirely of stones—as, for example, in making drain-tiles with dies such as are shown in Figs. 29, 30, 31, and 32, Sheet 12. Fig. 29 is a plan with the cover removed, showing one form and arrangement of such a screen in connection with my machine. Fig. 30 is a vertical section, and Fig. 31 a front view, looking toward the die M. It will be seen by Fig. 30 that the screen $S^6$ is secured obliquely across the die, within the chamber $C^6$ of a case, $M^6$, which is hinged to the screw-case E, Fig. 29, of the machine. The clay forced by the screw into the said chamber passes on through the grated screen $S^6$ to the die M; but the stones or other hard obstructions larger than the meshes or slots of the screen are forced up, by reason of the obliquity of the latter, to the upper part of chamber $C^6$, whence they may be taken out from time to time, as may be necessary, by removing the cover $G^6$. This cover or lid being hinged to the case $M^6$ at $J^2$, as shown, and provided with the bolt-hook $b^6$ on the opposite side, Fig. 31, it may be readily thrown back and again secured after the stones which have accumulated have been removed. Figs. 33 and 34, Sheet 13, represent another form and arrangement of such a stone screen and chamber used in connection with my machine. Fig. 33 is a horizontal sectional view, showing the end of the screw-case E, the screw S, its end projecting into the stone-chamber $C^6$, and the screen $S^6$, hinged to the former-die case M′, across the former-die M. Fig. 34 is a rear elevation of the screen, the former-die case, to which it is hinged, being removed from the screw-case. The screen consists of a spiral, as shown, whose turn is in the direction of rotation of the expressing-screw S. The stones which may be in the clay, coming into contact with the screen, are gradually worked around and outside the spiral, by the action of the screw, to the periphery of the chamber $C^6$, whence they may be removed when necessary after bolt $K^3$ is loosed and the former-die case M′ is swung open upon its hinge J.

Having thus described my improvements, what I claim—all substantially as and for the purposes hereinbefore respectively shown and set forth—is as follows:

1. The former-die M, having its top and bottom convex and its sides straight or concave.

2. In combination with the former-die M, the casing M′, having the steam-chamber entirely within the same, so as to avoid breaking the steam-joint when the die is removed.

3. The combination, with the casing M′ and the former-die M, of the bolt-hooks $M^2$.

4. The combination of the sand-box L with the case M′, when said box is hinged to said case.

5. The combination of the sand-box L with the scrapers *e e′*, secured to the swinging frame $L^2$, hinged to the sand-box.

6. The combination of the sand-box, provided with the openings $L^5$, with the slide-valve $L^4$ and actuating-lever $L^6$.

7. In combination with the sand-box, the longitudinally-grooved adjustable roller *h*.

8. The combination of the sand-box, having the described slotted openings, with the bowed journal-frame *h′* and adjusting-screw $h^3$.

9. In combination with the sand-box, the plate $L^7$, adjustably secured thereto.

10. The chain-protecting dust-apron *a a*, located at the end of the chain-frame.

11. In combination with the chain N, the inclined protecting-apron *i*.

12. The vibrating brush *b b*, in combination with the chain N.

13. In combination with chain N, the carrier-pulleys C C and C C′, adjustably secured

to the chain-frame $C^2$ by means of the screws and slots, as shown, whereby the described vertical and horizontal adjustments may be independently effected.

14. In combination with the off-bearing belt O B, the side guide-pulleys, $d$ $d^2$, pivoted on the adjustable plate $d$ $d'$.

15. In combination with the cut-off blade, the links $n$ of chain N, having their faces raised toward slits $p$.

16. In combination with the cut-off blade, the links $n$, when provided with the projections $n'$.

17. In combination with the cut-off blade, the links $n$, when provided with the corner-grooves $g'$.

18. In combination with chain N and pulleys C C and C C', the return supporting-pulleys $B^{10}$, provided with the interval $x$ $x$ in the face of the same.

19. The combination of the chain N and pulleys C C and C C' with the pulleys $B^{10}$, provided with the offset $z'$.

20. The spiral cut-off blade, made up of segments whose contiguous edges are respectively provided with V-shaped tongues and grooves.

21. The combination of the spiral cut-off blade Q, composed of segments joined together by a V-shaped fitting, with the clamps R.

22. In combination with the blade-clamps R and drums R' $R^2$ upon shaft X, the threaded through-bolts U, provided with nuts $q'$.

23. The clamps R, provided with the projections $r'$, in combination with the bolts U and nuts $q'$.

24. In combination with the friction-clutch, fly-wheel $H^2$, and shaft X, carrying the cut-off blade, the gear system $K^4$, $K^5$, and $M^3$.

25. In combination with the gears $K^4$ and $M^3$, the idler $K^5$, with its shaft inclined to and between the axes of the shafts of $K^4$ and $M^3$, and having a conical face provided with oblique teeth.

26. The combination of the key $f$ $f$ on shaft W and the clutch mechanism with the adjusting-screw $y$.

27. In combination with the cut-off blade and its shaft X, the clutch and connecting gears with the adjustably-weighted regulating hand-lever J'.

28. The combination of the rigid bowed and flanged frame F, carrying pulley $h$ $h^3$, rotating in a plane at right angles to the plane of said frame, together with the separate transverse bar $T^4$ and the tightener-bolt $i$ $i$.

29. The combination of the pulley-frame with a scraper, O, secured thereto, whereby when the former is adjusted the relative position of the scraper to the pulley will remain unchanged.

30. The elevator-belt, arranged, as shown, with relation to the off-bearing belt, whereby the material carried over the end of the off-bearing belt will be delivered onto the elevator and returned by the latter to or near the inlet-pipe of the brick-machine.

31. The combination of the mixing-pit provided with an opening leading into the case C, and the curved arms $C^a$, lying in said pit and secured to a vertical shaft rotated by suitable mechanism in the relative direction indicated by the arrow in Fig. 27, whereby the material will be carried in toward the inlet-pipe.

32. In combination with the mixing-pit and the curved arm $C^a$, secured to the vertical shaft $A^{10}$, the sprinkling-pipe $A^{12}$, extending from said shaft over and above the pit, and connected with a water-supply pipe, $A^{13}$.

33. The screen $S^6$, located within an enlarged chamber, $C^6$, between the die and the clay-expressing mechanism, whereby the stones or other obstructions are worked outwardly to the sides of said chamber beyond the path of the moving body of clay.

34. The chain N, plate $d^4$, and the off-bearing belt O B and its pulley $d^3$, when combined and successively arranged in relation with each other in the manner specified, whereby the front and rear lower corners of the bricks are protected from injury.

CYRUS CHAMBERS, JR.

Witnesses:

ELIZABETH CHAMBERS,

I. H. CHAMBERS.