(No Model.)

3 Sheets—Sheet 1.

W. E. GARD.

BRICK MACHINE.

No. 255,385. Patented Mar. 21, 1882.

Fig. 1.

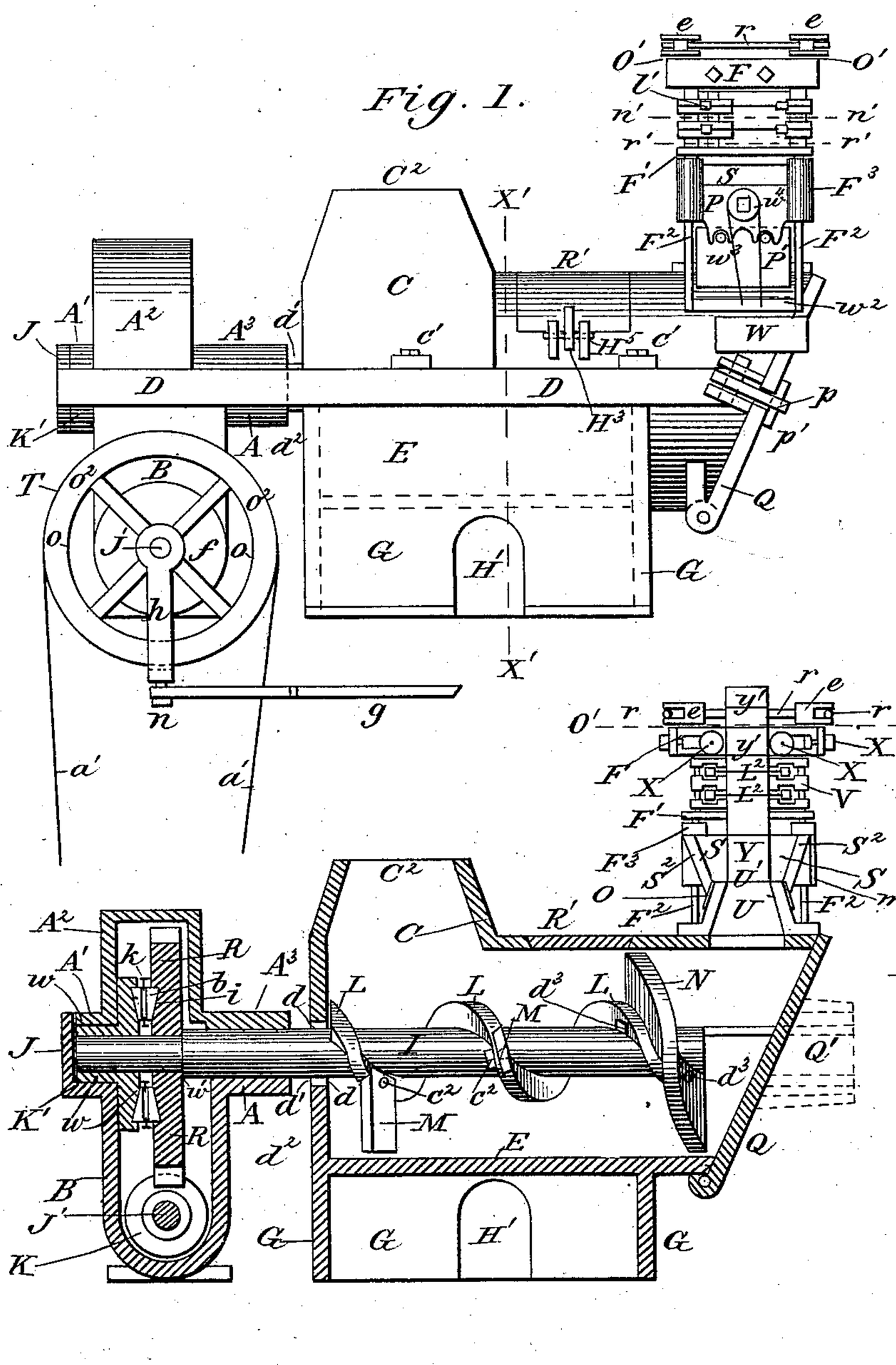


Fig. 3.

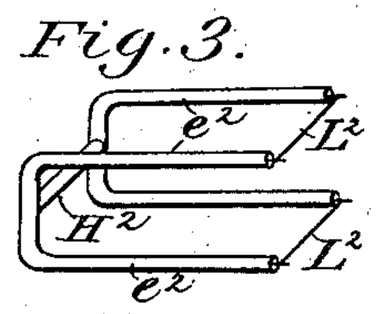


Fig. 4.

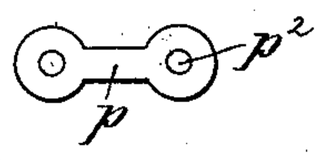
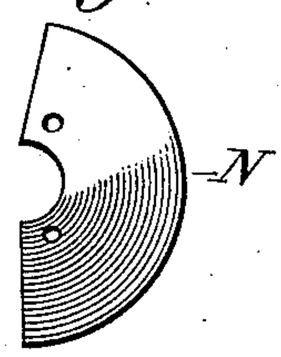


Fig. 2.

Fig. 5.



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(No Model.) 3 Sheets—Sheet 2.

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Fig. 6.

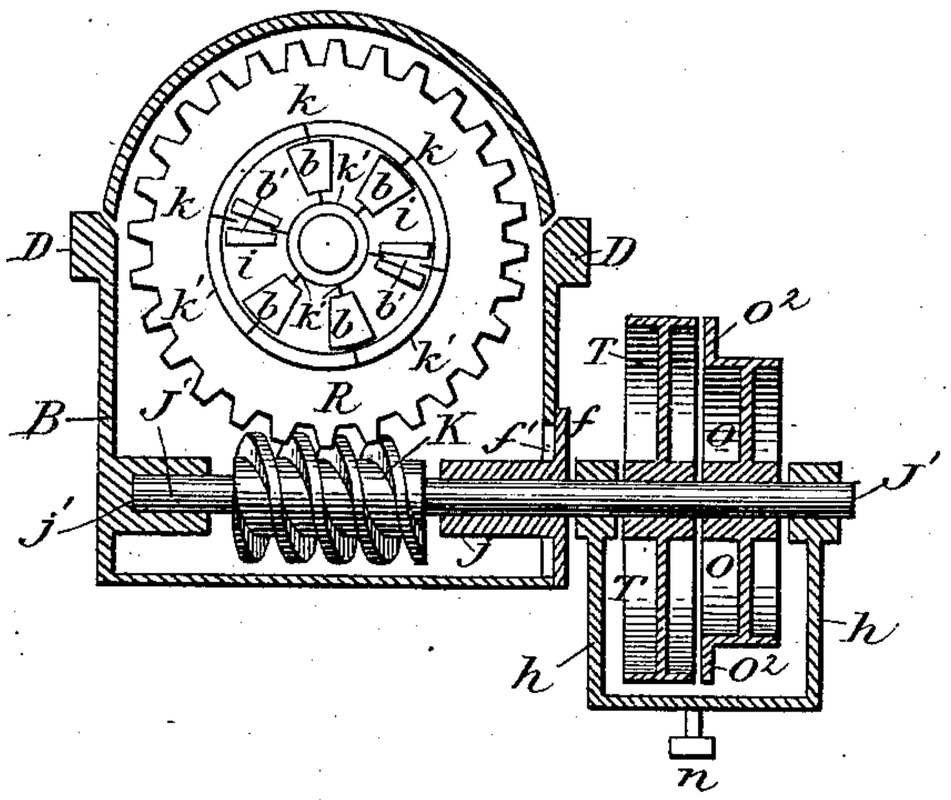


Fig. 9.

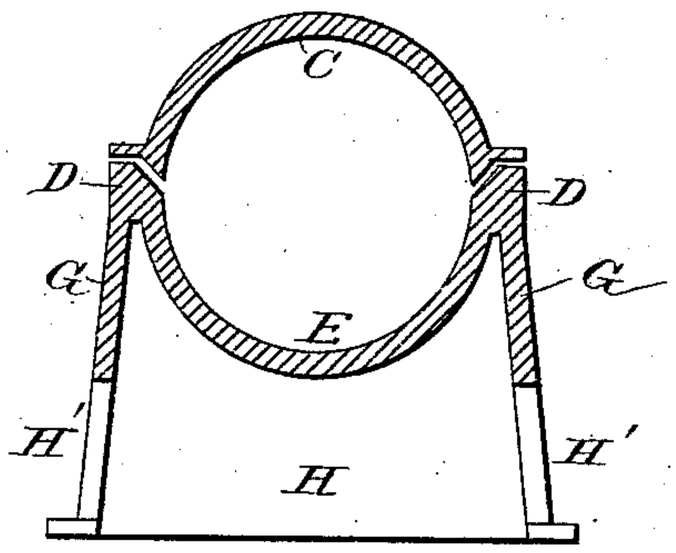


Fig. 7.

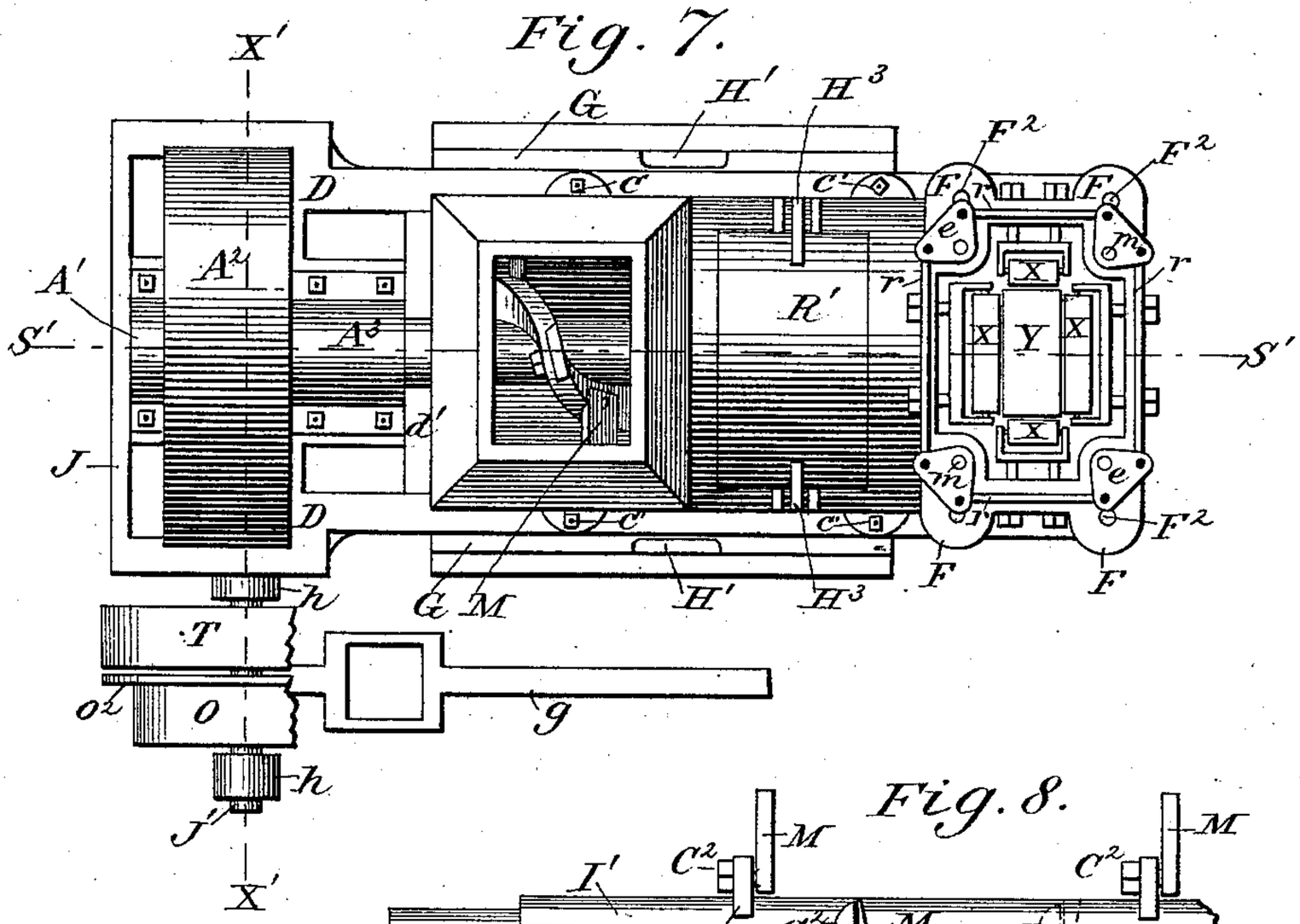
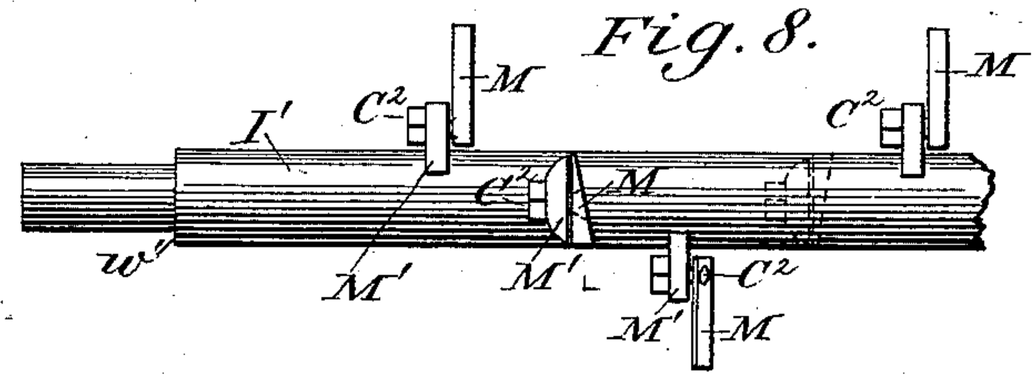


Fig. 8.



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BRICK MACHINE.

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Fig. 10.

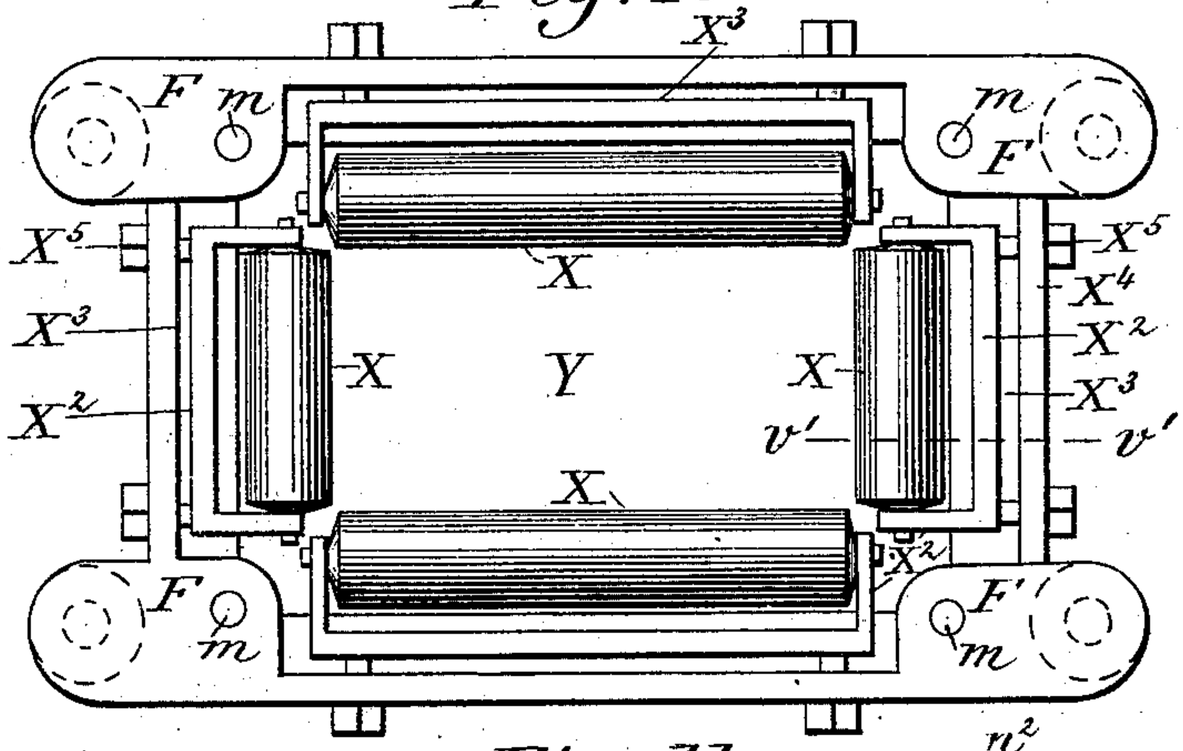


Fig. 13.

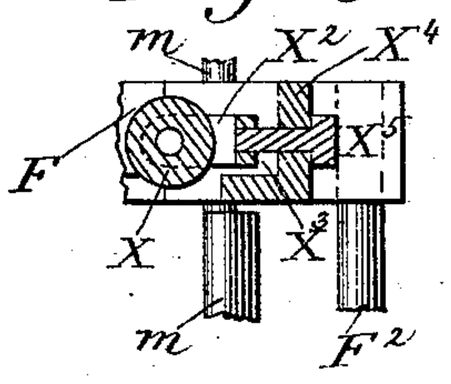


Fig. 11.

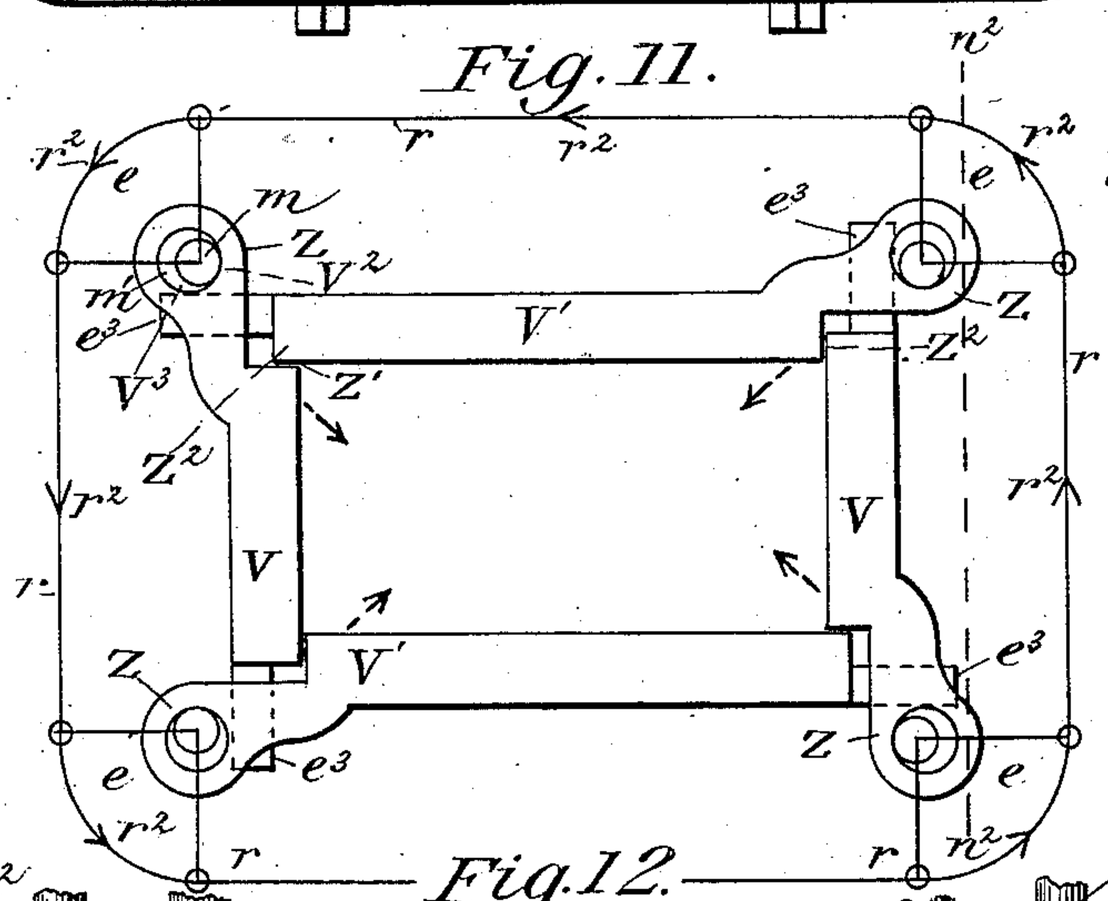


Fig. 14.

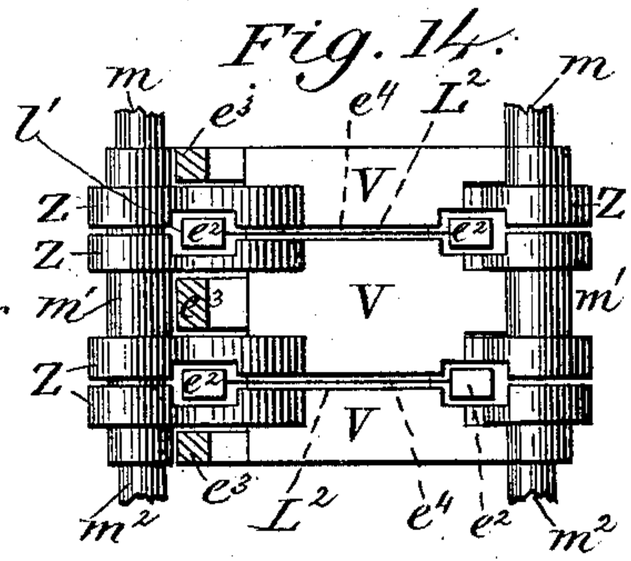


Fig. 15.

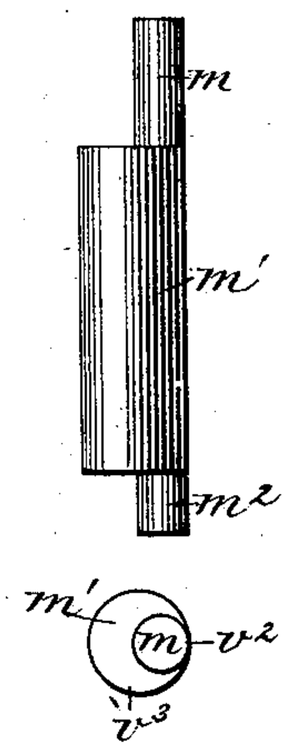
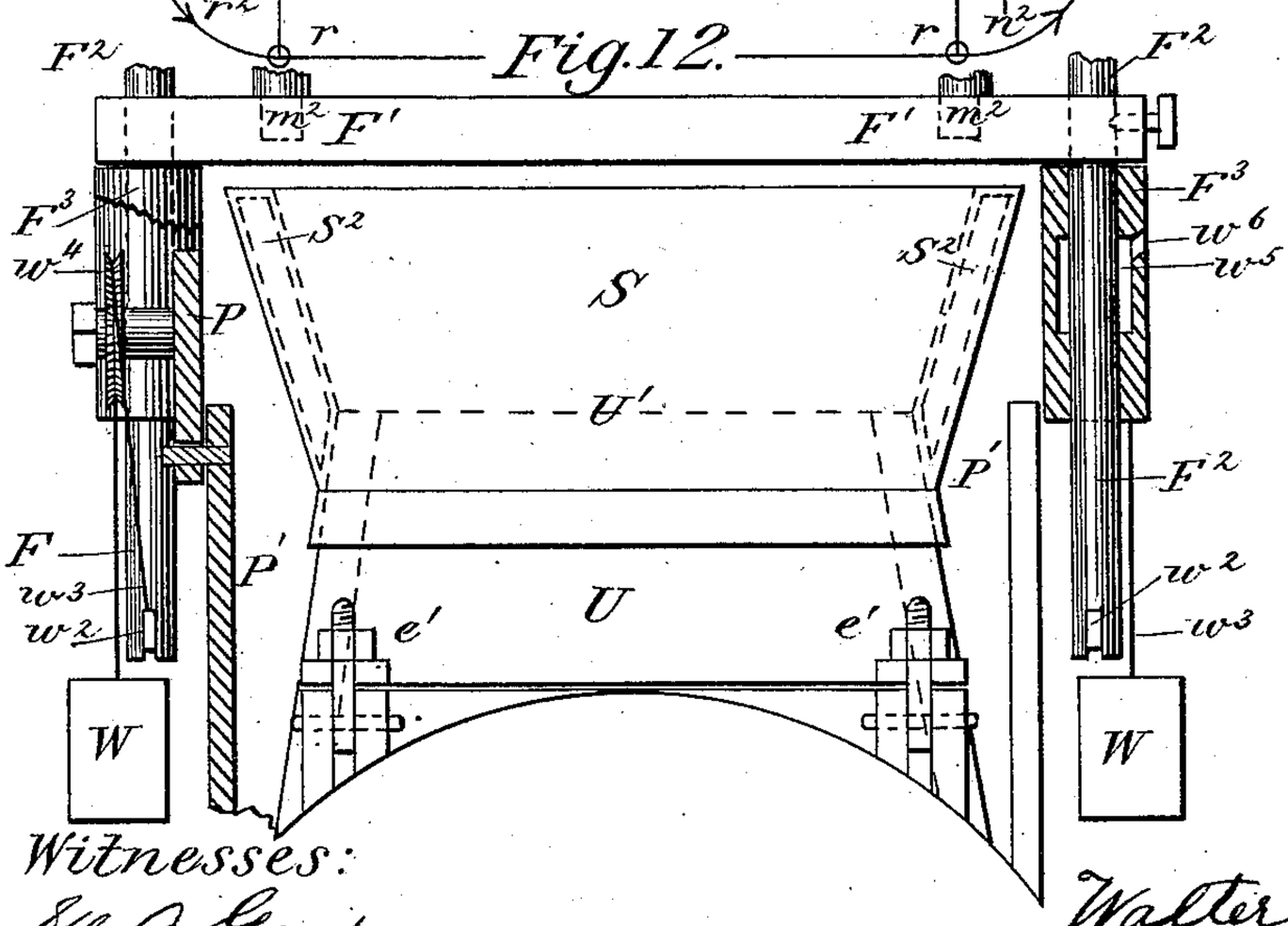


Fig. 12.



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UNITED STATES PATENT OFFICE.

WALTER E. GARD, OF BALTIMORE, MARYLAND.

BRICK-MACHINE.

SPECIFICATION forming part of Letters Patent No. 255,385, dated March 21, 1882.

Application filed September 5, 1881. (No model.)

To all whom it may concern:

Be it known that I, WALTER E. GARD, of Baltimore, in the county of Baltimore and State of Maryland, have invented certain new and useful Improvements in Brick-Making Machinery; and I do hereby declare that the following is a full, clear, and exact description of my invention, which will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters of reference marked thereon, which form part of this specification.

This invention belongs to that class of brick-making machinery in which the clay is tempered in its passage through a horizontal pug-mill by a continuously-revolving shaft to which tempering-blades are attached, and at its end an expressing-screw which forces the clay through a die which forms and guides the clay upward in a continuous column or bar, where it is sanded, pressed, and cut by a severing device into the designed size for brick, which are then ready to be taken from the machine for hacking upon the drying-yard.

Figure 1 of the drawings is a representation of a side elevation of my improved brick-machine. Fig. 2 is a central vertical longitudinal section thereof, taken on the line S′ S′ of Fig. 7. Fig. 3 is a perspective view of the wire-cutter frame. Fig. 4 is a top view of link *p*, which holds a wooden pin of the safety-valve. Fig. 5 is a top view of the detachable expressing-screw wing N of Fig. 2. Fig. 6 is a vertical transverse section of the master-gear worm-wheel R, its oil-case, and connections, taken on a line, *x′ x′* of Fig. 7. Fig. 7 is a top view or plan of the machine. Fig. 8 is a view of a modification in the construction of the pug-mill shaft I of Fig. 2. Fig. 9 is a vertical transverse section of the pug-mill and its supports, taken on the line *t′ t′* of Fig. 1. Fig. 10 is a top view of the guide-rollers for the column of clay, on an enlarged scale, and is taken on the line *o′ o′* of Figs. 1 and 2. Fig. 11 is an enlarged top sectional view, showing the operation of the press, taken on the line *n′ n′* of Fig. 1. Fig. 12 is an end view of the die, sand-receptacle, and lower parts of the counterweighted carriage-frame for the press and guide-rollers. This view, made on an enlarged scale, is taken from below the line *r′ r′* of Fig. 1. Fig. 13 is a sectional view of a guide-roller and its adjusting-screw, taken on a line, *v′ v′*, of Fig. 10. Fig. 14 is a partial end view of the press, to represent its links and slots for guiding the wire cutter, and is taken on the line n^2 n^2 of Fig. 11. Fig. 15 represents an enlarged side and top view of the eccentric-shaft of the press.

The same letter indicates the same part in all of the figures in which it occurs.

My improvements consist—

First. In simplifying the mechanism used to communicate power to this class of machinery by using but one gear-wheel and pinion and running them both in oil.

Second. In receiving the thrust of the pug-mill shaft upon friction-rollers which revolve in oil between friction-plates and are arranged to run true with said shaft.

Third. In placing all of the bearings of the shafting in the oil-case, to insure their being properly lubricated.

Fourth. In casting an enlarged flange or strengthening-web on the pug-mill, connecting the cross-head (which receives the thrust of the pug-mill shaft) directly with the delivery end of the machine, as a substitute for the large bolts or rods formerly used for that purpose.

Fifth. In making the machine of fewer parts by so forming the enlarged flange that it will connect the main supports or frame of the machine together, all of the shafting being thus held in perfect line without an expensive foundation for that purpose being necessary.

Sixth. In protecting the pug-mill from the effects of undue internal pressure arising from any obstruction or too great stiffness of the clay, by making a swinging door at the delivery end of the machine act as a safety-valve, wooden pins being used to hold it shut, which break under an extra strain, allowing the door to fly open, instantly relieving the machine of the pressure, and thus preventing its being broken.

Seventh. In keeping the gearing and bearings from exposure to dust, sand, or grit by a covering which connects in one casting the cap of the friction-plate, the covering of the master-wheel, and the cap of the main bearing of the pug-mill shaft.

Eighth. In making a continuous spiral thread

around the pug-mill shaft like a worm or screw, which extends but a short distance out from the shaft, and is not intended to take the place of tempering-blades, but is especially designed to obviate the clogging of the pug-mill shaft and force the clay that would otherwise adhere to it toward the expressing-screw at the delivery end of the machine.

Ninth. In making detachable tempering-blades without shanks, removable at pleasure, less expensive to replace when worn out, and easily attached to a web or a shank, which is made a part of the pug-mill shaft.

Tenth. In a modification of the construction of the pug-mill shaft without its continuous spiral thread, but with projections or stationary shanks to which detachable tempering blades can easily be attached. This will lessen the expelling area which presses the clay. Some varieties pack easily, and will not admit of too great a pressure while being made into brick.

Eleventh. In making a detachable wing (or wings) to the expressing-screw which can be easily attached to a flange, web, or shank on the pug-mill shaft, thus making it much less expensive to replace expressing-screws when worn out.

Twelfth. In facilitating the removing of obstructions in the pug-mill by making an opening in its top which is closed by a covering constructed with a hinge on each of its ends, so that by removing the bolt which keeps it shut on one side the other side will act as a hinge by which the door may swing open.

Thirteenth. In placing a die in such a position that it will form or guide a bar of clay upward.

Fourteenth. In the arrangement of a simple receptacle for sand which receives the bar of clay from below, and in its passage upward through this receptacle, it is properly sanded without either rollers or scrapers being necessary.

Fifteenth. In the use of a receptacle for sand which has hollow sides for the introducing of steam or other means to keep the sand hot when it is desired to save it as much as possible.

Sixteenth. In the application of heated sand to the bar of clay, thereby effecting a great saving in sand, which is very expensive in some places.

Seventeenth. In a form to surround the bar of clay and yet not prevent its passage through it, with slots in its sides and ends, cut at right angles to the bar of clay, so that when a severing device passes through them and the bar of clay it will not mar its surface by tearing it away as the severing device leaves it; but as these slots were properly spaced it will have cut the bricks of uniform thickness and with perfect edges, the slot being only of a width to properly receive the severing device.

Eighteenth. In a counterweighted carriage in which the above-described form and other parts, hereinafter named, are placed and balanced. By this means the power required to raise them and their carriage is reduced to such an extent that it does not retard the free and continuous passage of the column of clay while it is being operated upon, after which the carriage is easily returned to its starting-place, ready to operate on the next part of the bar of clay in its upward passage.

Nineteenth. In a sliding and adjustable form or press which presses the brick or presses the sand into the bar of clay, if desired, as it passes through it, and as it is also connected with the counterweighted carriage it does not retard the free and continuous passage of the bar of clay.

Twentieth. In combining the form-press and severing device, when desired.

Twenty-first. In a set of rollers to properly guide the bar of clay from the die through the sander and severing device.

Twenty-second. In forming and connecting the supports to the pug-mill so that a convenient tool-box or receptacle for articles will be formed under it. This will strengthen the frame of the machine, as well as utilize an available space hitherto neglected. This receptacle can be provided with doors and locks at its openings, if so desired.

Finally. In the improved minor details of construction, which are hereinafter fully specified.

To enable others to make and use my improvements, I will proceed to describe the construction and operation of this my improved brick-machine, referring to the drawings by the letters of reference marked thereon.

The cross head J at the rear of the machine sustains the strain and pressure caused by the working of the pug-mill shaft I.

B is an oil-case, in which the master-wheel R and its driving-pinion K work.

D is an enlarged flange or strengthening-band, which connects the cross-head J, the oil-case B, and the pug-mill E, in which the clay is tempered, and G forms the support of the pug-mill. These five different parts of this machine, J B D E G, are all connected and made into one piece or casting, and taken together they constitute the frame of the machine, on and in which all of the operative parts are supported and attached, and thus constructed all that is now required is a proper foundation to support its weight for operation.

The bearing K′ in the cross-head J holds the friction-plate *w*, in which the end of shaft I revolves, while its shoulder *w′* communicates the thrust to the friction-plate *w*, that does not revolve, as the friction-surface *i* and friction-roller *b* do, when working and under pressure. To keep these friction-rollers from touching or interfering with each other, they have holes *b′*, (see Figs. 2 and 6,) in which pins *k* of rings *k′ k′* fit. As there is but little strain against these pins, they are made very light, being only required to separate the rollers *b*.

R is a master-wheel fixed upon and driving

the horizontal pug-mill shaft I. This wheel I prefer making in the form of a worm gear-wheel, and its motive power may be applied at any suitable angle whatever. I have found that a steadier and more even operation of this wheel may be effected by driving it with a worm or spiral screw-pinion, K, engaged at its under side and running constantly in the lubricant of case B, thus producing a more evenly-running machine with a corresponding diminution of wear to the gearing. The power is communicated to the worm-pinion K (which is keyed to the shaft J′) by the driving-belt *a′* (see Fig. 1) on tight pulley T.

When the machine is not in operation the belt *a′* is shifted by means of the shifter-arm *g* (which is connected with an adjustable or swinging shifter-arm support, *h*, by the bolt *n*) upon a loose pulley, *o*, which is two inches smaller in diameter than the tight pulley T. This difference between the diameters will slacken the belt *a′* about three inches, and thus relieve the loose pulley from the tension of the belt, (which was necessary to drive the machine,) as well as take the strain from the belt.

To keep the belt *a′* from being injured when it becomes necessary to shift it from the loose pulley *o* to the tight pulley T, I place a straight flange, o^2, upon the loose pulley. (I am aware that this straight flange o^2 is an old device for this purpose, and I believe common property.)

The bearings *j j′* of the worm-shaft J′ are placed in the oil-case B. The flanged head *f* of bearing *j* tightly covers the opening *f′*, (through which the worm K is taken out of or inserted into the case B,) and thus prevents any escape of the lubricant therefrom.

C E is the pug-mill, in which the clay is tempered. It is formed in two parts, held together by bolts *c′*, but capable of being separated and taken apart when desired. The opening C^2, for introducing clay into pug-mill C E, grows larger toward the bottom so that clay will not lodge or adhere to its sides in passing through.

In my former patent brick-machines (1875, 1876, and 1878) the pug-mill shaft bearing was placed so close to the pug-mill that much trouble was experienced by clay working back into it, absorbing the oil, thus wearing away the shaft and its bearing by the undue friction thus caused. In this machine I provide an opening or escape, *d*, in pug-mill C E, a space, *d′*, between the bearing A and the pug-mill, also a larger space, d^2, which separates the pug-mill and the oil-case, so as to leave no place to lodge upon, and thus prevent its reaching the main bearing A and doing the damage as heretofore. The pug-mill shaft I is provided with a series of detachable tempering-blades, M M, attached to a continuous thread, L, arranged spirally around it. This arrangement of the continuous thread L is made to obviate the tendency in some kinds of clay to adhere to the shaft and not move forward toward the expressing-screw blades N, thus producing a clogging up of the mud-shaft I and pug-mill C E, besides causing an unnecessary waste of power.

I am aware that screw-threads fastened permanently to a revolving shaft have before been used; but that arrangement was designed to dispense entirely with tempering-blades, which I wish to be clearly distinguished from the continuous spiral thread L shown by me, which is especially designed and purposed to keep the pug-mill shaft I from clogging, but not in any case to dispense with tempering-blades. If the clay is of that nature that it feeds too fast by the use of this continuous spiral thread L, with the pressing area which it presents, in combination with the area of the detachable blades M, and tends to drive the clay into the delivery end of the pug-mill and compress it there faster than it can pass out of its proper exit, the die U thus producing an unallowable density and consequent strain upon the thrust-place W, then take out shaft I and put in shaft I′, which is a modification in the construction and differs only in dispensing with the continuous spiral thread; but for convenience in attaching the knives M it has projections or stationary shanks M′, to which, by bolts c^2 or other means, said detachable knives can be affixed, thus reducing the pressing area to that of the knives alone. The less the pressing area the greater the saving in power, while properly tempering the clay.

N marks the detachable wing of the expressing-screw. This wing may be attached to the thread L of the pug-mill shaft I, or to a flange on a shaft where the thread is not used, or to a shank similar to M′ of shaft I′ by countersunk bolts d^3 or other means. A double threaded or winged screw can be made by using two of these wings N; but as this will increase the pressing area it is best decided by the kinds of clay to be worked. There are supposed to be as many varieties in clay as in wood. If one detachable wing N, and without the continuous spiral thread L, will do the work properly, it should be used to make the brick less dense and easier to be cut with the trowel, which is quite an important item in manufacturing brick.

In my brick-machines of 1875, 1876, and 1878 I used tempering-blades with shanks solidly attached and not detachable. As soon as the tempering-blade would wear out the shanks were useless; also, the hub of the expressing-screw could not be used after its wings had worn away. To provide against this loss I make a detachable tempering-blade and tempering expressing-screw blade or wing, as above stated.

In facilitating the removing of obstructions in the pug-mill I make an opening in C, closed by the door R′, which has a hinge, H^3, on each of its ends, so that by removing the pin H^5 (see Fig. 1) on one side the other side or hinge enables the door to be opened, and thus I am enabled to open the pug-mill from either

side, while formerly these openings could only be reached from one side, thereby causing a delay and an inconvenience that the hinge H^3 and pin H^5 are designed to remedy.

Inasmuch as the most important feature of my invention consists in forcing a continuous column of clay upward and sanding it in its passage to the severing mechanism in the simplest manner possible, I wish to be understood as meaning in any decidedly upward angle by the expression "upward."

On the top of the pug-mill C is attached by swinging bolts e' (see Fig. 12) a die, U, which directs the column of clay upward. Its sides are tapering, with its smallest part U′ (made the size of the brick to be formed) at that point where the continuous column of clay leaves it. This column of clay is forced to take an upward direction by the pressure of the expressing-screw N, the inclination of the swinging door Q, which guides the clay into this die, opening upward. The exact shape of the swinging door Q or the placing of the die U in the position described is not a positive necessity in the carrying out of my invention, as the die could be placed in the center or at the base of the swinging door Q, or in many other places, and its delivery-mouth still direct the column of clay upward. After the continuous column of clay leaves the die at U′ it enters the improved sand-box S, (shown in Figs. 2 and 12,) which consists in a receptacle for the sand, so placed in close connection with the die U that when it is filled with sand it will not escape below, as the bar, Y, of clay, passes continuously upward through the said box, and is sanded by the dry sand adhering to its moist sides, the surplus sand falling back into the sand-receptacle S. I have found by experience that a very much smaller quantity of sand will adhere to the surface of the column of clay if it is applied hot, and the smallest quantity of sand that can possibly be made to adhere to its surface will make the best looking skin or face after the brick is pressed and burned, always provided that it is evenly sanded. The sand-receptacle S can be made with hollow sides S^2, in which steam can be introduced, which expels the moisture from the sand and keeps it hot while being applied. This is not a necessity to those using horse or water power to drive the machine, as the cost of applying steam to dry the sand might be made much greater than the cost of the wasted sand as it is commonly applied. The sand may be heated by fire or lamp, if so desired. After the web of clay, Y, Fig. 2, is sanded it passes into the form V, which is by preference combined with the press for pressing the sand into the column of clay either before or after the cutting-wires L^2, Fig. 3, are passed through (by slots e^4 in the form V) the column of clay. This form is a great and important improvement in this class of machinery, and its construction and operation will be described as separate from the press.

The form V V V′ V′, Figs. 11 and 14, can be made in one piece or with four separate sides, as here shown. It surrounds the bar of clay. The slot e^4 is a little larger than the wire L^2. The slot l' (see Figs. 1 and 14) is made large enough to allow free passage and play to the wire cutter-arms e^2, which work in it. The slots e^4 are made of equal distance apart, and are at right angles to the column of clay. The wires L^2, which are attached to the wire cutter-frame, Fig. 3, are pushed, preferably by hand, through it, and sever it into bricks y' of a uniform thickness, which corresponds to the space between the slots e^4 e^4 of the form, Fig. 14. The sides of the form are to prevent the column of clay from being torn at that point of its surface where the severing-wires L^2 leave it in passing through, and this form is especially designed for that purpose, as well as to so guide the cutter L^2 that the bricks would be of uniform thickness and severed at right angles to their sides, leaving perfect edges.

I have found a convenient method of attaching the prepared cutting-wires L^2 to the steel prongs e^2 of the cutter-frame, Fig. 3—namely, by making at the end of each prong e^2 a stationary or fixed pin or hook, over which the prepared wires L^2 (twisted so as to have eyes formed in each end which fit over the fixed pins in the prong e^2) are placed, while the prongs are pressed together, springing apart and stretching the wires L^2 tightly between them on being released. This arrangement permits of an easy and quick replacement of any wires that may break. The handle H^2 is where the power is applied to sever the column of clay by pushing the wire through it along the slots e^4 of the form V V V′ V′, as above described.

The above-described form, with its wire-guides e^4 l', is in this machine by preference combined with the press, (see Fig. 11 and 14,) which is constructed to press the sand into the sides of the brick by the peculiar operation, arrangement, and shape of the separated sides or links V V V′ V′, forming tight and perfect corners z', but which do not come in contact with each other, so as to interfere in the least with the operation. They are held in position to form or press the brick into a shape or size that the machine is designed to make by eccentric-shafts (see Figs. 11 and 15) turning in the corner bearing, z, of each link. To give the desired movement to this shaft, Fig. 3, which is necessary in moving the links or sides of the press in or out, there is placed at the top of each shaft, on its pivot-axle m and keyed to it, the bell-crank e, (see Fig. 7,) connected with each other by the rods r, and by moving them in the direction as indicated by the arrow-heads r^2 on the skeleton-lines r of Fig. 11 the desired inward movement of the sides V V V′ V′ is given to press the brick. An opposite movement of the rods r will release the brick, as it causes the form to enlarge by the sides or links moving outward.

To better show this operation of the press, we will look at the upper left-hand corner of Fig. 11 and more fully describe the effect of a movement in the rods *r* and its connections. The real center axle or pivot, *m m*², of this eccentric-shaft is at its extremities, the crescent shape *m'* showing its throw or eccentricity, Fig. 15. When this shaft is moved by rods *r* and bell-crank *e* in direction *r*² it causes the point *v*² of the eccentric *m'* to enter like a wedge or come between, so as to separate the real center *m* of the eccentric-shaft and the side of the bearing *z* it is nearest to in link *v*, and as the center *m* is fixed, the link *v*, being movable, is moved in the direction of Y, the brick. The point *v*³ of the eccentric *m'* is at the same time separating the back of *e*³ of link V' and the center of *m* in the direction of Y. The resultant motion is in the direction as indicated by the arrow in Y or the brick at the corner *z'*, and as each corner of this form will operate the same from like reason, then the end links, V V, and side links, V' V', will all move in the direction as indicated by the arrows, and thus compress or reduce in size the plastic form of the brick Y when the rods *r* are moved in the direction shown by the arrow-heads *r*² of Fig. 11. After the brick has been pressed, as has been fully described above, the brick is released by moving the rods *r* in an opposite direction to that indicated by the arrow-heads *r*² of Fig. 11.

To permit the corners *z'* of the press to pass each other and not interfere, the face of the links V V V' V' is extended and fits against the ends of the links at *z*², to which it is closely held by the eccentric *m'* of the shaft, Fig. 3, which, while it permits a free and end motion, also prevents a separation or side motion. (See Figs. 11 and 14.)

Fig. 14, (which is a slightly reduced end view taken on the line *n*² *n*² of Fig. 11,) represents the end links, V, upon the eccentric-shaft *m m' m*². These links are separated, as before fully described, by the slots *e*⁴ *e*⁴ *l' l'*.

The bearing or lug *z* is separated to allow the end *e*³ of its fitting link to freely work between, and prevents an upward or downward displacement. Each link has one or more lugs at one end, with the above-described space for the end *e*³, and at the other end the projection *e*³ itself, so constructed that it works between the lugs *z z* and eccentric *m'* of the eccentric-shaft.

Links V V V' V' may have, if desired, a recess at the point *z*², where they work in contact, in which any lubricant desired can be placed to lessen the friction thus caused and facilitate its easy operation.

The rollers X, situated above the sander and press (see Figs. 2 and 10) to guide the bar of clay Y in its upward passage through them, are supported by the frame F F', in which are the fixed bearings for the centers *m* of the upper axle or pivot of the eccentric-shaft, on F, and *m*² the lower axle on F'. (See Fig. 15.) Between these parts of the frame F and F' the form or press V V V' V' operates. F is separated from F' the proper distance by rods F² of the counterweighted carriage, hereinafter described. The guide-rollers may be made adjustable by fixing in frame X², with space X³ for liners, against which it is drawn by screws X⁵ in the back support, X⁴. The rollers may be made adjustable or fixed, as preferred.

The movable or counterweighted carriage, with its upper part, F, lower part, F', bearings F³ for guide-rods F², to move freely up and down in a direction parallel to the sides of the column of clay Y, its cross-bar *w*², the ends of which are fixed in slots of the guide-rods F², and attached at its center by cord *w*³, passing over pulley *w*⁴, with weight W, is all constructed and arranged, as described, to balance the press guide-rollers and its connections, so that the power required to raise them is reduced to such an extent that it does not retard the free and continuous passage of the column as it is being operated on while in motion. The bearing F³ is made to hold a lubricant in the recess *w*⁵, formed between its ends to insure the rod F² being properly lubricated and protected from the dust and grit. An oil-hole, *w*⁶, may be made to connect with the recess *w*⁵ at its upper end. These bearings F³ are connected by cross-pieces P, and are supported (at the slotted bearing, open on its under side, to facilitate the removal of the carriage and its parts when desired) by studs fixed in support P' of pug-mill C. (See Figs. 1 and 12.)

With the exception of the shape of the dies, press, and rollers, when formed to make brick, this machine can be used to work any plastic material. At Q', Fig. 2, a tile-die may be placed, if desired.

What I claim, and desire to secure by Letters Patent as my improvements in brick machinery, is—

1. The combination of the oil-case B, horizontal shaft J', worm-pinion K, worm-gear R, and pug-mill shaft I or I', constructed and operated substantially as and for the purpose described.

2. A pug-mill shaft with a friction surface, *i*, firmly attached, friction-rollers *b*, operating between it and friction-plate *w*, all combined, substantially as and for the purpose herein specified.

3. The combination of oil-case B, worm-gear R, friction-plates *w i*, and rollers *b*, as set forth.

4. The oil-case covering A², with caps A' and A³ attached, substantially as specified.

5. The combination of cross-head J, flange D, and pug-mill E, when constructed and cast in one single piece, as herein specified.

6. The cross-head J, oil-case B, flange D, pug-mill E, and supports G, constructed and arranged substantially as shown and described.

7. The bearing A, case B, opening *d*, opening *d'*, and space *d*², so arranged and constructed as to prevent clay from working into the bearing A, as set forth.

8. A shoulder, *w'*, on pug-mill shaft I or I',

adapted to fit against a master-wheel, R, for the purpose of keeping the shaft from being forced through the wheel by the back-pressure of the clay, as specified.

9. A tempering-blade, M, without a hub or shank, in combination with a bolt, c^2, or its equivalent, used to attach the blade M to a projection, L or M′, on mud-shaft I or I′, substantially as specified.

10. A pug-mill shaft with spiral thread L, in combination with a detachable tempering-blade M, substantially as described.

11. An expressing-screw wing, N, without a hub, made in one piece with it, in combination with bolts d^3 and projection L or M′ of mud-shaft I or I′, as specified.

12. A pug-mill shaft with a continuous spiral thread, L, in combination with a detachable expressing-screw wing, N, constructed as described.

13. A tempering-blade, M, without a hub or shank, in combination with an expressing-screw wing, N, without a hub, as specified.

14. The projection M′ of a pug-mill shaft, I′, so made that it performs the office of a hub or shank for a tempering-blade, M, which is attached to it by a bolt, c^2, or its equivalent, as specified.

15. The safety-plate R′, with hinge H^3, arranged as and operating in the manner herein set forth.

16. The die U, constructed and arranged to guide a bar of clay so that it will take an upward or ascending direction as it issues from said die, substantially as described.

17. The die U, to guide a bar of clay so that it will take an ascending or upward direction, in combination with a receptacle, S, filled with sand and placed on top of said die U, which causes the sand to adhere to the ascending bar of clay without the use of rollers, as specified.

18. The die U, in combination with swinging bolts e', as set forth.

19. The sand-receptacle S, so arranged that the material to be sanded enters at the bottom or under side of the receptacle and passes upward to be sanded, in the manner described.

20. A sand-receptacle, S, with hollow sides S^2, in which steam or hot fluids can circulate to keep the sand dry, substantially as and for the purpose set forth.

21. The application of heated sand to a bar of clay in its passage through a sand-receptacle, as herein specified.

22. The slots e^4 in form V, through which a severing device may be passed, as specified.

23. The links V V′, in combination with eccentric-shaft m m' m^2, or its equivalent, for the purpose described.

24. The rods r, bell-crank e, eccentric-shaft m m' m^2, and links V V V′ V′, all arranged and operated substantially as and for the purpose herein stated.

25. The counterweighted carriage F F′ F^2 F^3 W, substantially as herein described, for the purpose set forth.

26. The die U, sand-receptacle S, press V V V′ V′, and guide-rollers X, when combined and operated as herein shown and described, for the purpose set forth.

27. The sand-receptacle S, so constructed and arranged that it will sand a bar of clay while it is passing through it in an upward and ascending direction without the use of rollers or other means to cause the sand to adhere to the bar of clay, as specified.

In testimony that I claim the foregoing as my invention I affix hereto my signature, in Baltimore, in the presence of two subscribing witnesses, this 30th day of August, A. D. 1881.

WALTER E. GARD.

Witnesses:
WILLIAM E. GARD,
S. H. GARD.