2 Sheets--Sheet 1.

G. O. HOUCK & C. E. SAWYER.

Brick-Machines.

No. 139,894. Patented June 17, 1873.

Fig. 1

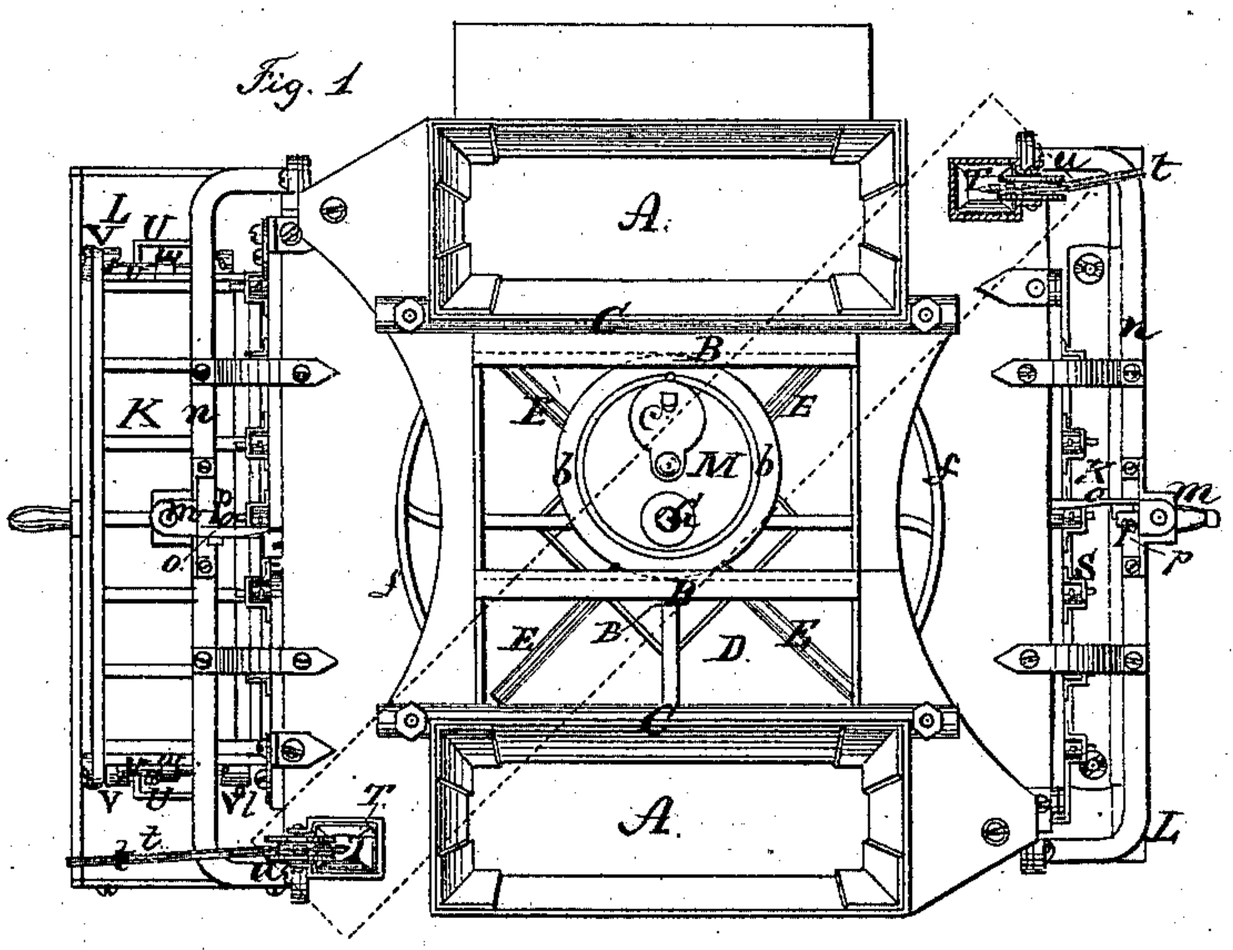


Fig. 5.

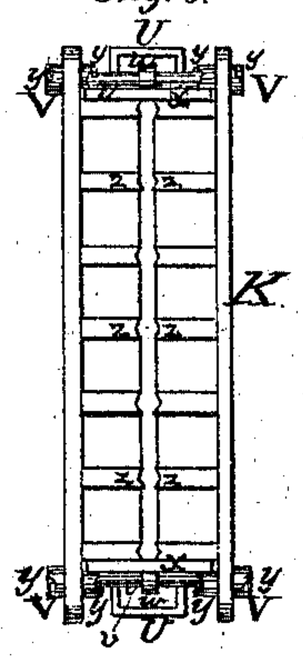
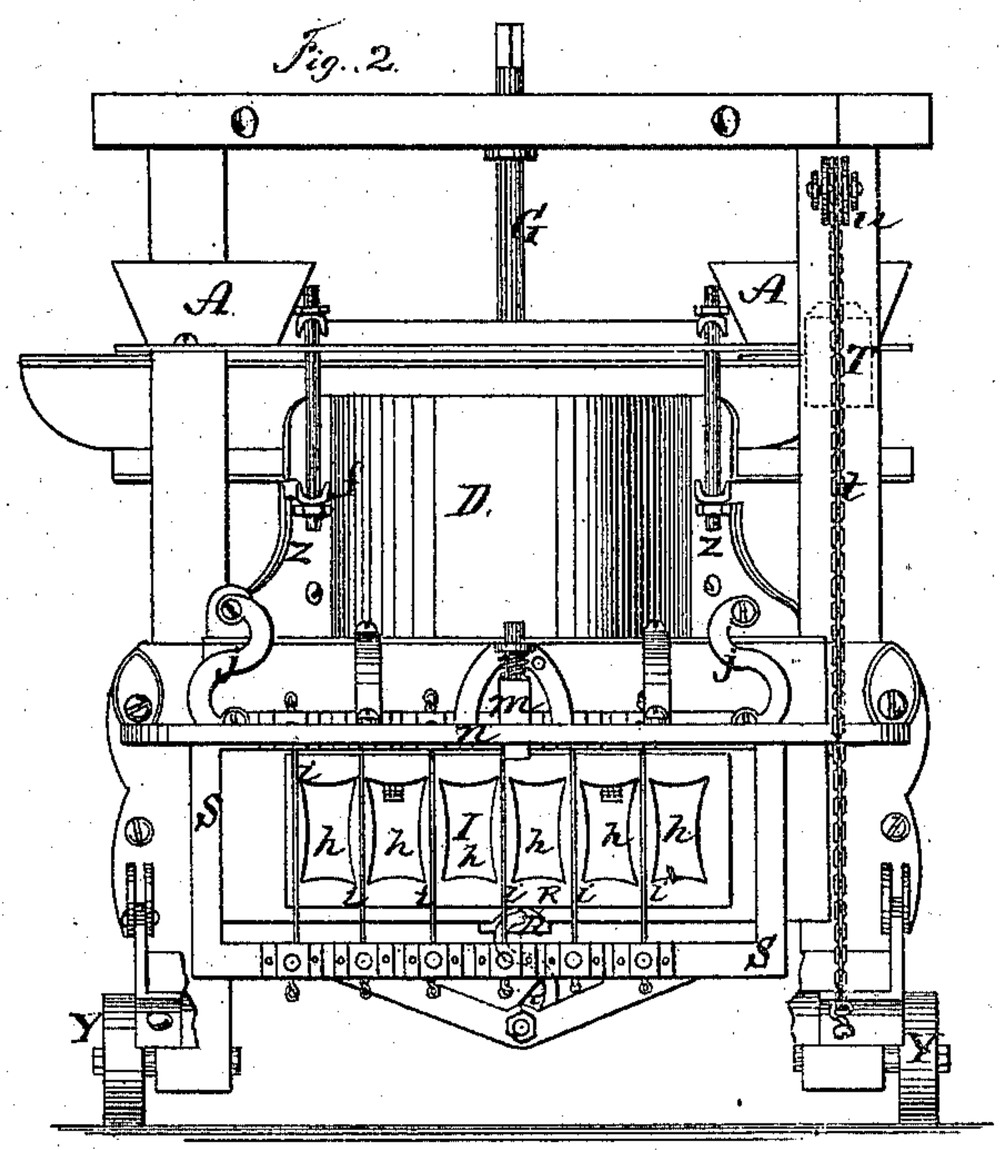


Fig. 2.



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2 Sheets--Sheet 2.

G. O. HOUCK & C. E. SAWYER.

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Fig. 3.

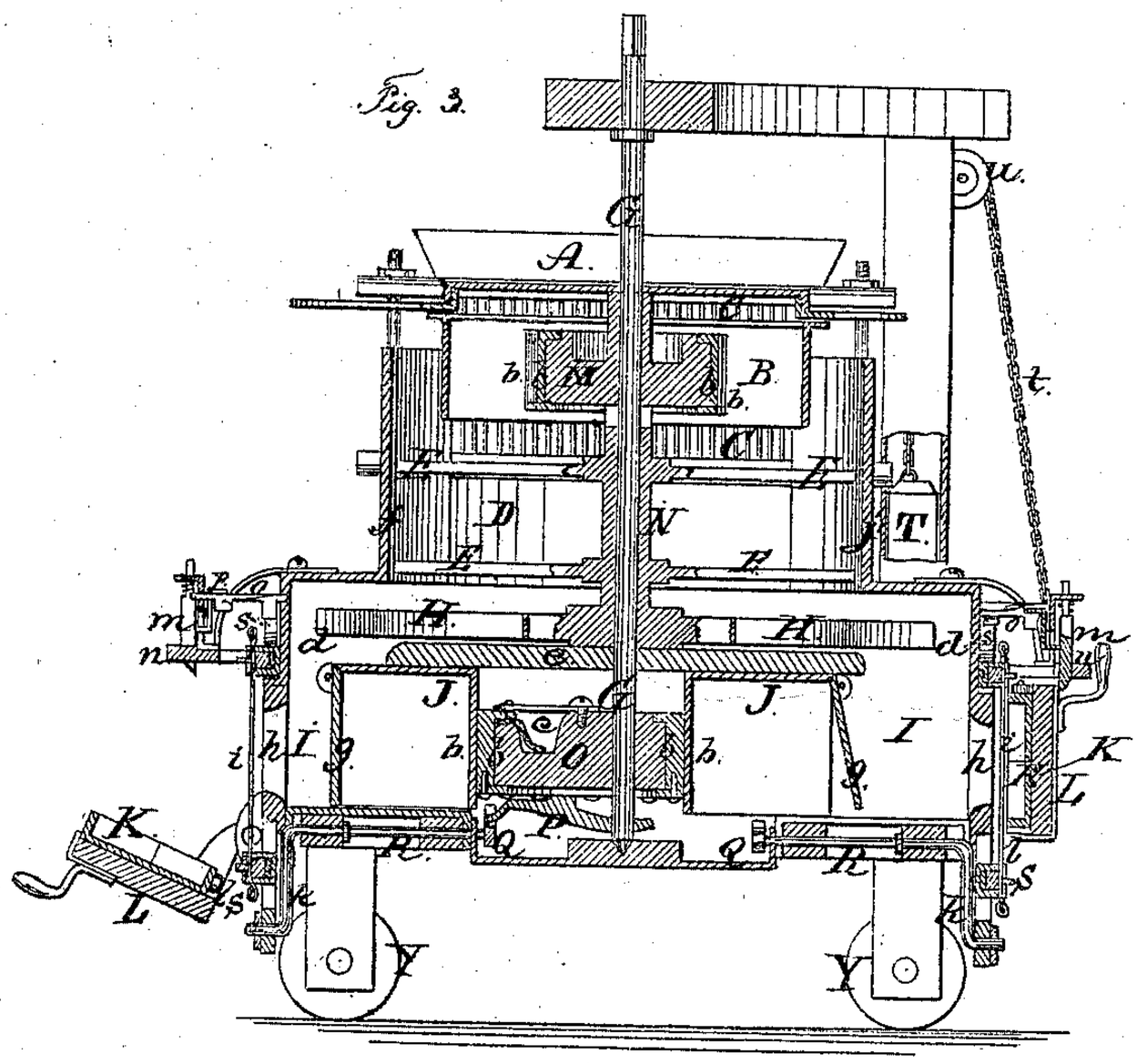


Fig. 4.

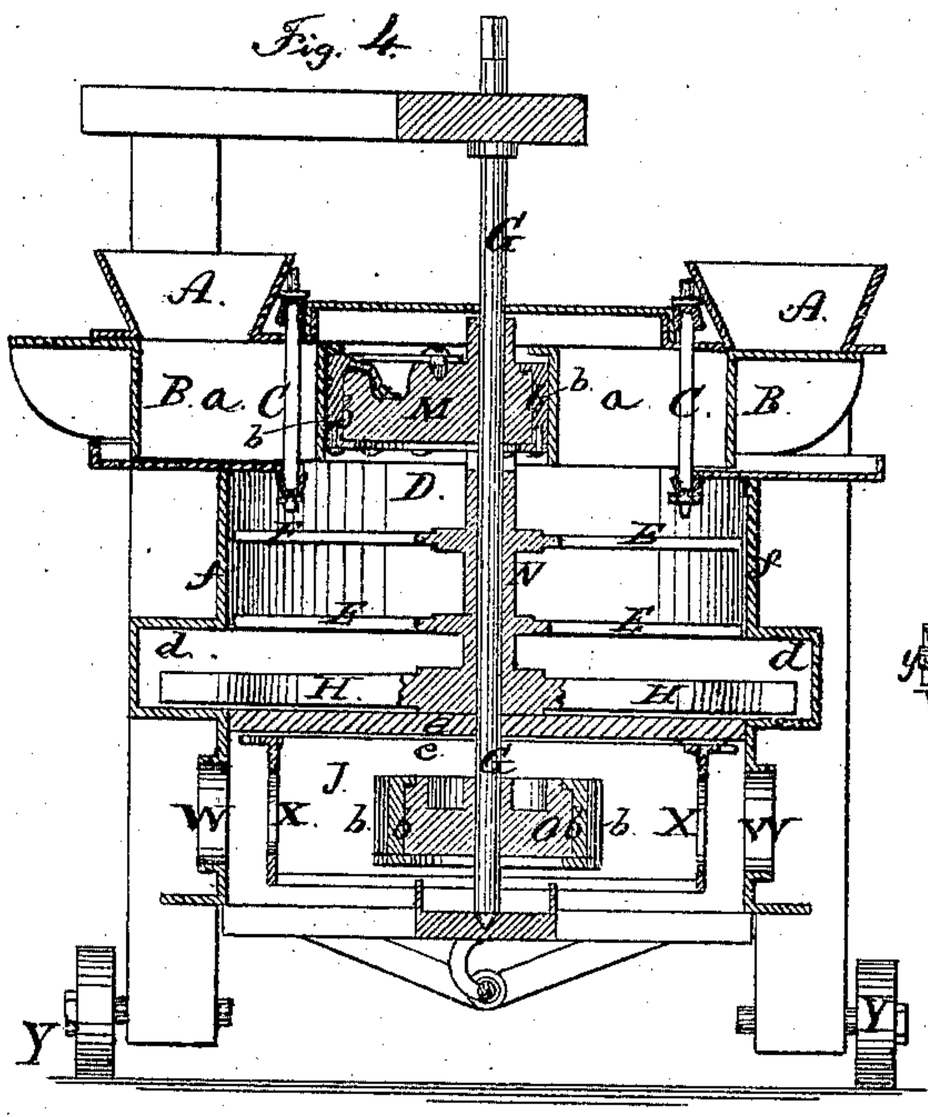


Fig. 7.

Fig. 8.

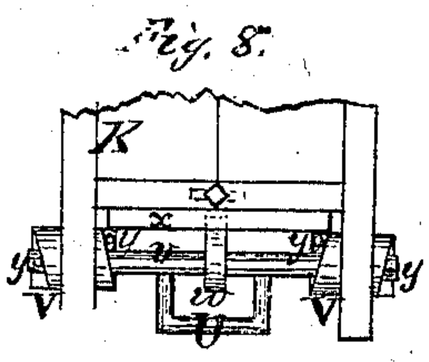
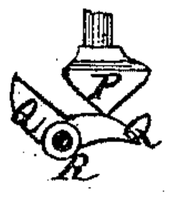


Fig. 6.



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UNITED STATES PATENT OFFICE.

GEORGE O. HOUCK AND CHARLES E. SAWYER, OF SPRINGFIELD, OHIO.

IMPROVEMENT IN BRICK-MACHINES.

Specification forming part of Letters Patent No. **139,894**, dated June 17, 1873; application filed September 11, 1872.

To all whom it may concern:

Be it known that we, GEORGE O. HOUCK and CHARLES E. SAWYER, of Springfield, in the county of Clarke, and State of Ohio, have invented an Improved Brick-Machine; and we do hereby declare that the following is a full and exact description thereof, reference being had to the accompanying drawings making part of this specification—

Figure 1 being a top view of the machine; Fig. 2 a side elevation thereof; Fig. 3 a central vertical section thereof, in a plane cutting from side to side; Fig. 4, a central vertical section of the same, in a plane cutting at right angles to the section in Fig. 3; Figs. 5, 6, 7, and 8, views of parts detached.

Like letters designate corresponding parts in all of the figures.

The organization of our machine is such that it receives the raw clay, separates it from stones, roots, and other coarse impurities, divides the lumps thereof, tempers the same, fills the molds therewith, cuts off the mass of clay from the bricks in the molds, and again straps them, thus making perfectly-tempered bricks, and molding them in the manner of hand-molding, and more perfectly than can be done by hand, and doing the work automatically, after receiving the raw clay, until the molds filled with the molded bricks are presented ready to be taken away.

The raw clay is first shoveled or dumped into two hoppers, A A, on opposite sides of center of the machine. Under these hoppers plays a horizontal reciprocating trough or plunger, B, which forces the clay received from the hoppers through sets or grates of knives C C into the tempering-chamber or pug-mill D, thereby separating it from and excluding all stones, roots, and other improper obstructions, and cutting the lumps of clay into fine pieces. In the tempering-chamber a set of arms, E E, on the vertical driving-shaft G, temper the clay; and a set of wide arms, H H, immediately over the bottom of the chambers, sweeps the clay, as fast as tempered, into chambers I I, in front of the ends of a reciprocating-plunger J, which alternately drives the clay out through directing-orifices into the molds K K, held closely up thereto on supporting racks or shelves L L at the sides of the machine. The movements of the machine are all effected by means of the vertical driving-shaft G, which receives, by a sweep or other means, motion from animal, water, steam, or other power. First the reciprocating trough or plunger B receives its motion therefrom by means of an eccentric-wheel, M, on the shaft acting within and against two opposite portion-walls of said plunger. Below this eccentric-wheel the tempering-arms E E and sweeping-arms H H fit into sockets in a cast-iron sleeve, N, slipped over and coupled fast to the shaft G, and below this sleeve another eccentric-wheel, O, communicates the reciprocating motion to the molding-plunger, J, in the same way as the plunger B is driven by the eccentric-wheel M; and on the lower end of the shaft is secured a tappet-arm, T, which, striking against knuckles Q Q on horizontal crank-shafts R R, operates the cutting off and strapping-wires, and by the same means lets down the mold shelves or racks after the molds are filled. The trough or plunger B under the hoppers A A receives additional clay from the hoppers at every time when its two receptacles, *a a*, move outward therein alternately, and in moving inward again toward the centre of the machine, draw the clay through the grates C C of knives, or sharp-edged bars, which are set at the desired distance apart to exclude impurities above any designated size, and cut the clay to the requisite fineness. In order that the accumulating stones and other obstructions in the plunger-receptacles may not fill the same, and impede the movements of the plunger, and may not be forced against the knives and do injury thereto, the plunger ends do not work close to them, but there is left at the termination of each inward stroke of the plunger a space in the receptacles, say four or five inches wide, thus affording room for the obstructions to accumulate to a certain extent, and then they are removed. The construction of the eccentric wheel M is peculiar: It has an anti-friction ring *b* around its periphery, turning freely on the eccentric, so that, since its outer surface bears against the adjacent surfaces of the plunger, more or less smeared with clay, which would cause considerable friction and great wear if the eccentric should rub

thereon, this rubbing, by the construction specified, is obviated, the friction-ring simply rolling over the said surfaces. In order to exclude the clay from the interior contact between the ring and the eccentric-wheel, inner flanges on the ring inclose or cover the edges of the eccentric-wheel, and the protected contiguous surfaces are kept lubricated by means of oil contained in a close box, *c*, in the wheel, as shown, covered by a lid; and a wick which conveys the oil through an aperture in the periphery of the eccentric-wheel to the surfaces, as shown in Figs. 3 and 4. The lower eccentric O, is constructed in a similar manner. Under the tempering-chamber D proper, in which the tempering-arms E E revolve, there is a space, *d*, above the bottom *e* of the chamber which is widened out beyond the diameter of the chamber or tub-case *f*, forming offsets thereby, which are covered by the case of the machine, wherein the clay is relieved of the weight of the superincumbent clay in the tempering-chamber, and whereby it is delivered to the filling-chambers I I, relieved from too powerful pressure. The sweeping-arms H H, over the mill bottom or table *e* have flat sides, and are sufficiently wide to sweep the clay as fast as required into the filling-chambers. The filling-plunger J reciprocates under the bottom or table *e*, which protects and relieves it from the weight of the clay above. It is made in one casting or piece of metal, faced with steel where the eccentric works, and is firm and strong, though comparatively light. It alternately forces the clay from the two chambers I I, into the molds held against the sides of the machine opposite to the said chambers. Its driving ends *g g* are hinged at their upper edges to the plunger, as shown in Fig. 3, so as to swing out and in, a very important provision. Otherwise, after the plunger has filled a set of molds, and then has begun to recede, since no air can get between the plunger and molds in the wet plastic clay, the plunger would draw the clay again out of the molds by atmospheric pressure. But by thus hinging the ends of the plunger, it can, from the first, freely recede, while the swinging ends remain behind till the clay is cut off and separated from the molds, and thereby allow the ends to follow the plunger.

The delivering and directing orifices *h h* in the sides of the machine, in front of the chambers I I, are in metallic plates and flare toward the inside, and they are wider and longer at the corners than in the middle, so that the edges curve inward at the middle on every side, as seen in Fig. 2. The size of the orifices, also, is somewhat less than the molds, even at the corners, so that the clay will enter the molds without disturbing the sand sprinkled on their inner surfaces to cause the bricks to draw readily from the molds, and so that the clay will fill the corners of the molds completely and make perfectly-formed bricks. The frames S S of wires *i i* are suspended each by two swinging (**S**-shaped) arms *j j* from the frame of the machine, and are connected, respectively, with the crank-shafts R R by vibratory arms or cranks *h k* on the said shafts, to which the alternate reciprocating movements are communicated by the tappet-arm P, as above specified. These movements of the wire-frames are both horizontal and upward, and then back, horizontal, and downward a sufficient distance to cause each wire to completely sweep across a brick, and first cut the thread or web of clay from the clay in the molds at the upward movement, and then, on the downward movement, after the receding of the plunger J, withdraws the clay from contact with the clay in the molds, and allows the said molded clay to expand and swell outward from the mold-surface as it does to strap off the surplus clay therefrom. In this way the bricks are perfectly finished. All the surplus clay not retained in the molds is returned into the filling-chambers I I, and none is wasted or dropped from the machine. The wires *i i*, by their double movement, lateral and vertical, make a cleaner cut and divide more easily and smoothly than they otherwise would. They are secured in their frames S S by passing one end of each through a pin in the lower side of the frame, and the other end up through a hole in a pin or peg in the upper side of the frame, and bringing it down round the pin and twisting it round the wire below. Then, by turning the pin with a key fitting over a square end thereof and turning the pin, the wire is stretched in the manner of tuning the strings or wires of a musical instrument. This way is simple and cheap and obviates the use of ratchets and detents. The pins have shoulders at their outer journals to gage their outward positions accurately to the molds; and behind their inner ends or shoulders there are India-rubber blocks *q*, as seen in Fig. 7, or equivalent springs, to keep the wires pressed outward to the molds. The wires move close in front of the filling orifices of the machine. The molds K K are placed on the racks or shelves L L, when the latter are let down in nearly a horizontal position, as shown at the left hand in Figs. 1 and 3. There are pins or guides *l l* on the shelves, against which the inner edges and one end of the molds bear to adjust and determine the position of the respective mold-compartments to the filling-orifices in the sides of the machine. Then the racks or shelves are raised by hand till the molds are brought close up to the sides of the machine, as shown at the right hand in Figs. 1 and 2. They are then caught and held automarically by spring-catches *m m*, each mounted on a bow or projection, *n*, on one side of the machine. These catches are automatically raised at the proper moment, after the molds are filled, and allow the mold-racks, with the molds and newly-molded bricks thereon, to fall into the horizontal position, thus presenting the molds and bricks ready to be carried off. This raising of each catch *m* is effected

by means of a rock-shaft, *o*, situated across the bow-frame *n*, and having on one end a cam to lift a projection, *p*, of the catch, and on the other end a projection reaching downward in the path of an upward projection, *s*, on the wire-frame S, which, when the frame ascends, strikes the said projection on the rock-shaft and turns the same simply without effect; but when the wire-frame again descends it strikes the said shaft-projection, and, by turning the shaft, causes the cam-projection on the other end of the shaft to lift the catch *m* by the projection *p* thereon. The catch is pressed down by a coiled spring or its equivalent. The racks or shelves L L with the filled molds K K thereon, descend by their gravity as soon as released by the catches. To obviate their descending with too much force a counter-balance is applied to each rack. For this purpose one of the posts *r r* of the machine, on each side, is made hollow and sufficiently high to receive a counter-weight, T, (Fig. 3, shown in dotted lines,) and a cord or chain, *t*, extends therefrom over a pulley, *u*, at the top of the post and down to one of the outer corners of the rack, as represented. The weight is so adjusted that it nearly counter-balances the rack or shelf when empty, so that, after the empty molds are placed thereon, very little power is required to lift it up to the side of the machine, and when the molds are filled, the force of the descent, as above indicated, is thereby checked, so that no damage arises therefrom.

Our molds K K are of peculiar construction. First, they are made about one-sixteenth of an inch longer and wider at the back, or closed side, than at the open side, where the clay is filled in, the sides and ends of the molds, therefore, being slightly contracted from back to front. The reasons for this contraction are, first, because the compression of the clay is greatest at the open side, being closer to the filling-plunger, so that when the bricks come out of the mold they swell more at that than at the other side; and, second, because the bricks are delivered from the molds with the open or wire strapped side down, and the plastic nature or condition of the clay causes the lower side to expand a little by the weight of the clay above. The enlargement given to the other side of the bricks in molding is intended to exactly counter-effect the above named two causes of irregularity, and thereby to produce bricks perfectly square and regular. We do not confine ourselves to the extent of enlargement of one side of the molds above specified, but would vary therefrom, as experience may dictate. Second, we divide the molds centrally and longitudinally into two parts, as shown in Fig. 5, so that the two parts can be closed together for filling, and separated somewhat, as indicated in the figure, for delivering the bricks out of the mold. At each end there is a handle, U, the shaft *v* of which extends outward through the projecting sides of the mold, as shown. Each shaft *v* has an enlargement *w* in the middle, which turns in a groove or notch in a cross-piece, *x*, at the end of the mold, thereby keeping the handle-shaft central in position. Where the shaft extends through the sides of the mold, there are stationary cam-bearings V V in the sides, having cam-surfaces, both on the outer and inner ends, so that pins or projections *y y*, Figs. 5 and 8, on the shaft act alternately on the outer and inner ends thereof when the shaft is turned on its axis. The whole arrangement is such that when the mold is held open side up and suspended by the handles U U the handle-shafts are turned a little in the required direction to cause the pins on the outer ends thereof to act on the cam-bearings V V, and press the two halves of the mold together; but when the mold is turned over, to deliver the bricks, the weight thereof acting on the handles turns their shafts the other way, so that their inner pins or projections operate against the inner ends of the cam-bearings and separate the parts of the molds, thus disconnecting the ends of the bricks entirely from the mold, and disengaging the sides thereof when they come freely out. The handle-shafts may be kept raised by springs to hold the parts of the mold together, except when delivering the bricks. The ends of the mold-halves are connected with dowel-pins so that they always remain accurately in proper relative positions, and fit together accurately. The back of the mold-halves is beveled on the outside, where they come togther, making nearly sharp edges, to prevent the accumulation of clay or of anything that would prevent their shutting close together at all times. The contiguous edges of the partitions between the mold-spaces also are notched or grooved vertically, as shown in Fig. 5, at *z' z z*, making sharp external edges, for the same purpose. The front or open edges of the mold are covered with steel or other metal to prevent too much wear. Also, the beveled and notched edges of the bottom and partitions where the halves come together are similarly covered or lined.

We also have an improved mold for making "pressed" brick with the machine. It is not divided into separable halves as is the other mold, but it is made wider and longer at the back than at the open or filling side, similar to the other mold. With this mold we use a removable board to cover the back of the mold, cleated at the back or ends to prevent warping. The molds are first oiled and filled in the machine as usual. The bricks are then simply left on the board, the slightly-flaring mold being lifted therefrom, leaving the bricks to dry on the board without handling or disturbing. A sufficient number of such drying boards are prepared for use. There may be cleats on the upper sides of the boards at the ends, as thick as or a little thicker than the bricks, so that one board may be placed on another, with the bricks thereon, thus piling

them and occupying less room therewith. The greater length and thickness of the bricks at the back, in molding, compensates for the greater swelling of the clay at the front. These pressed bricks are beautifully square and even in size, whereas the common pressed bricks, being pressed after partial and unequal drying, are very uneven in thickness, and are not square nor perfect because of handling.

The tempering-chamber case of the brick-machine is made in sections, generally four, bolted together by flanges *z z*, Fig. 2, so that ready access can be had to the interior. The grates or knives are readily removed for sharpening or repair by drawing out the side-bolts which hold them in place, and then lifting the knives upward.

There are openings W W, Fig. 4, in the sides of the machine, opposite to the lower eccentric-wheel O, to enable the same to be reached for replenishing the oil-cup therein with oil. Openings X X in corresponding positions are also made in the sides of the lower plunger J for the same purpose.

The machine is made mostly of iron, a few parts, as the racks or shelves L L, being made of wood. It is very compact, and is mounted on small wheels Y Y, by which it is moved about in the yard, on planks or timbers, from one heap of clay to another, so as to save carting or carriage, and while one set of workmen is preparing one heap, another set may have the machine working at another heap, without interfering, therefore, one with the other.

With a machine of usual size, each mold K holds six bricks, and since the machine makes three revolutions a minute, and the bricks are molded alternately at each side of the machine, thirty-six bricks are molded per minute, and two thousand one hundred and sixty per hour.

What we claim as our invention, and desire to secure by Letters Patent, is—

1. The combination of the hoppers A A, stationary vertical grates or sets of knives C C, and tempering-chamber D, substantially as and for the purpose herein specified.

2. The combination of the reciprocating trough or receptacle C, hoppers A A, and tempering-chamber D, substantially as and for the purpose herein specified.

3. The eccentric-wheels M O, provided respectively with friction-rings *b b* around their peripheries, substantially as and for the purpose herein specified.

4. The covered oil-cups or cavities *c c*, located respectively in the eccentric-wheels M O for lubricating the peripheries thereof, substantially as herein specified.

5. The frames S S of wires arranged so as to have the curved vibratory movement endwise, and upwardand downward, substantially as herein specified.

6. The combination of the spring-catch *m* attached to each bow or projection *n* of the frame, the rock-shaft *o*, and projection *p*, the wire-frame S, and projection *r* thereon, or its equivalent, substantially as herein specified.

7. The counter-weights T T located in the posts *s s* of the frame, in combination with the racks or shelves L L, substantially as and for the purpose herein specified.

8. The molds K K enlarged at the bottom, constructed in two parts, with beveled or notched adjacent edges, and provided with handles U U on cam-shafts *v v*, and cam-bearings V V, all substantially as and for the purpose herein specified.

9. The combination, in a brick machine, of substantially the following devices: A hopper or hoppers A A to receive the clay, a reciprocating trough or receptacle B to transfer the clay between the knives or grates C C into a tempering-chamber D, chambers I I to receive the tempered clay from the tempering-chamber ready to fill into the molds, a reciprocating plunger J to force the clay into movable molds K K, all substantially as herein specified.

Specification signed by us this 12th day of July, 1872.

GEORGE O. HOUCK.

CHARLES E. SAWYER.

Witnesses:

GEO. HERNER,

F. O. CUMMINGS.