3 Sheets—Sheet 1.

C. CHAMBERS, Jr.

Brick-Machine.

No. 207 343. Patented Aug. 27, 1878.

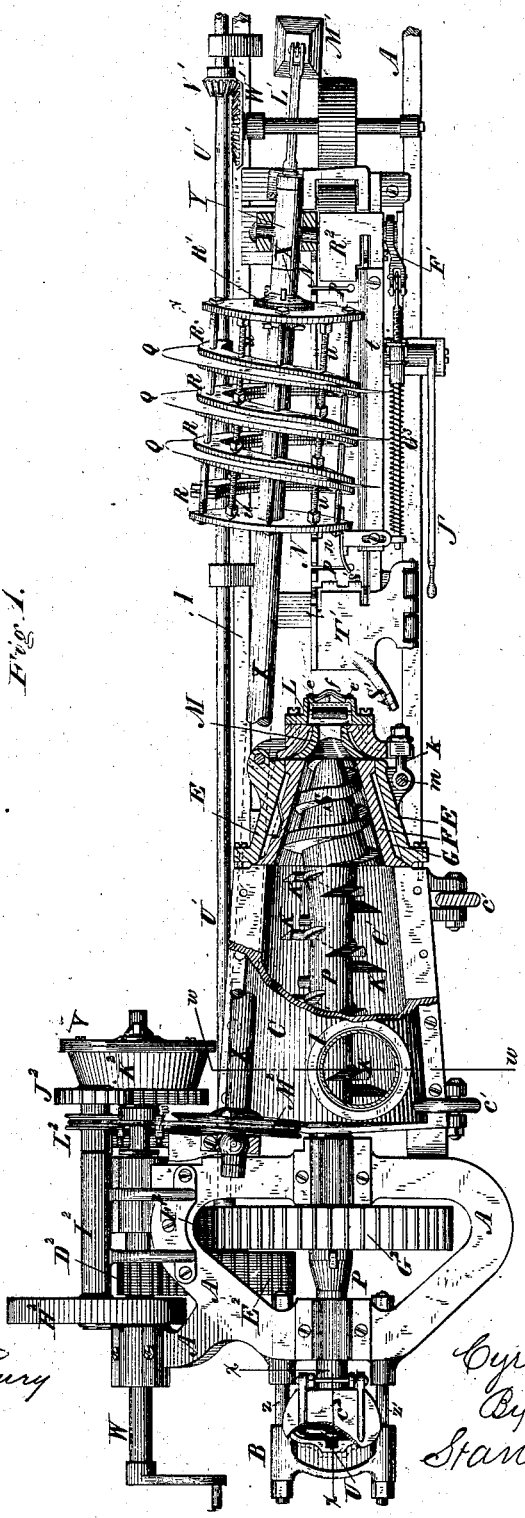

Fig. 1.

Witnesses.

Harry King

N. M. Stansbury

Inventor.

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By his Attorneys,

Stansbury & Munn

3 Sheets—Sheet 2.

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Fig 5.

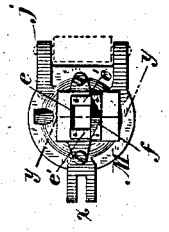


Fig 6.

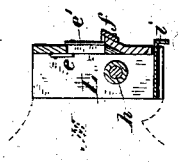


Fig 2.

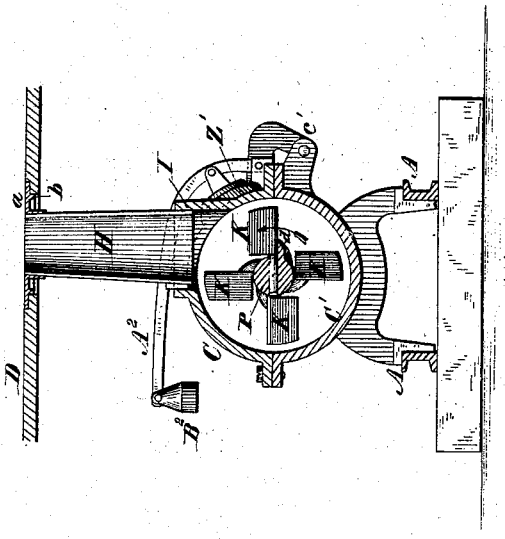


Fig 3

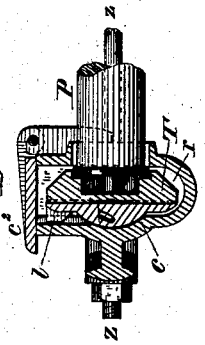
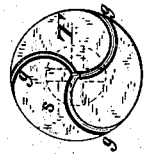


Fig 4.



Witnesses.

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3 Sheets—Sheet 3.

C. CHAMBERS, Jr.

Brick-Machine.

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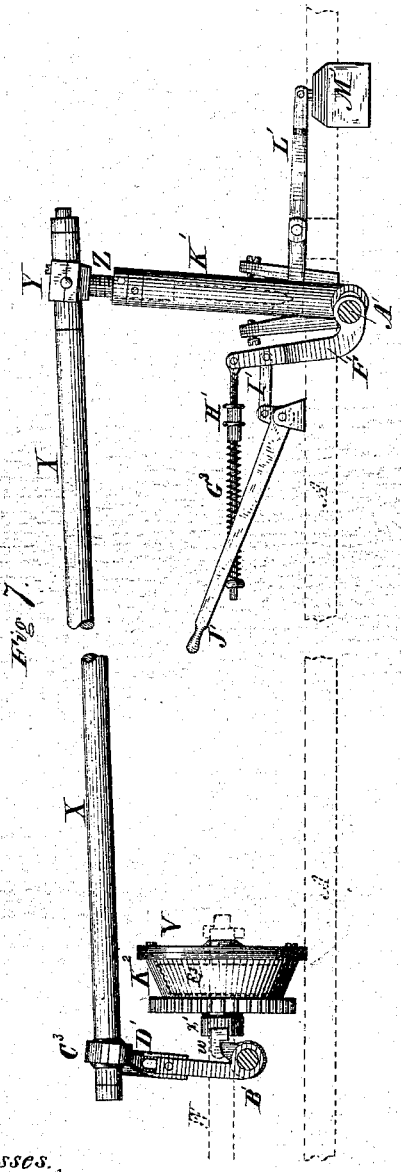

Fig 7.

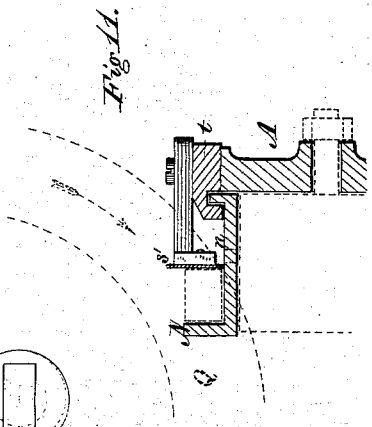

Fig 11.

Fig 9.

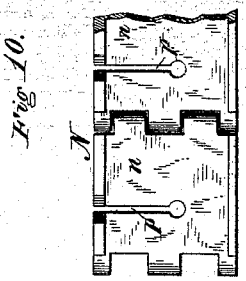

Fig 10.

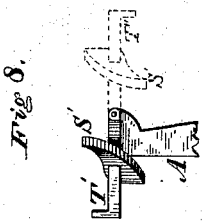

Fig 8.

Witnesses.

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UNITED STATES PATENT OFFICE.

CYRUS CHAMBERS, JR., OF PHILADELPHIA, PENNSYLVANIA.

IMPROVEMENT IN BRICK-MACHINES.

Specification forming part of Letters Patent No. **207,343**, dated August 27, 1878; application filed May 9, 1878.

To all whom it may concern:

Be it known that I, CYRUS CHAMBERS, Jr., of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Brick-Making Machines; and I do hereby declare that the following is a full, clear, and exact description of the 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 a part of this specification.

Figure 1 is a top view or plan of the machine. Fig. 2 is a vertical transverse section of the tempering-case and hopper on line *w w* of Fig. 1. Fig. 3 is a vertical longitudinal section, on an enlarged scale, of the thrust-plate and cross-head, taken on line *x x* of Fig. 1. Fig. 4 is a face view of the thrust-plate, showing the lubricating-grooves. Fig. 5 is a face view of the former and sand-box. Fig. 6 is a vertical section, on line *y y* of Fig 5, of the sand box and scraper. Fig. 7 is a side view of the automatic feeding mechanism. Fig. 8 is a front view of the safety mechanism on the rear of the chain-frame in front of the former. Fig. 9 is a diagram showing the relation between the diameter of the feeding-screw and the transverse section of the brick the machine is intended to make. Fig. 10 is a plan, on an enlarged scale, of part of endless chain N. Fig. 11 is a transverse vertical section of the same, showing the cap, flanges, and guiding-spring *s'*.

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

This invention relates to that class of brick-making machines in which the clay is tempered in a case, driven out in a continuous bar through a forming-die, and cut into proper lengths by a severing mechanism.

A machine of that class is described or referred to in the Patents No. 39,884, September 15, 1863, No. 40,221, October 6, 1863, and No. 108,880, November 1, 1870; and the present invention consists in various modifications and improvements of the machines and devices described in those patents, the same being intended to remedy the defects disclosed by experience in the machine of 1863, by rendering the machine self-contained and better able to sustain the longitudinal strain or thrust of the pugging-shaft; to reduce the power required to drive it; to lessen the density and improve the molecular arrangement of the clay in the brick; to secure smoothness of surface on the sides and ends of the brick; to insure perfect uniformity of length, and to protect the machine as far as possible against the known causes of injury and breakage; and, finally, to improve its form and proportions, and the details of its operative parts.

The improvements consist—

First, in receiving the thrust of the pugging-shaft upon a plate placed upon the end of said shaft arranged to run true with it, and itself running in contact with a loose plano-convex plate placed in a corresponding cavity in the cross-head at the rear of the machine.

Second, in obviating the clogging of the hopper through which the clay is fed to the case by making the lower end of the hopper larger than the upper end, to insure the free discharge of the clay.

Third, in making the inlet through which the clay passes to the case circular, and inserting it tangentially to the cylindrical portion of the case, and on that side on which the entering clay will meet the tempering-knives as they are rising, so that the clay shall be kept loose and continually agitated, which materially lessens the clogging of the hopper.

Fourth, in arranging the tempering-knives around the pugging-shaft in a spiral winding in a direction opposite to that of the expressing-screw, or the reverse of that which would tend to force the clay toward the delivery end of the case, for purposes hereinafter explained.

Fifth, in supporting each tempering-blade by a projection upon the pugging-shaft placed behind the knife, said projections being set in a spiral upon the shaft, and having their faces so arranged that in passing through the clay they tend to force it toward the expressing-screw.

Sixth, in giving a peculiar location to the mouth of the expressing-screw, to facilitate the delivery of the clay from the knives to the screw and to prevent clogging.

Seventh, in so reducing the diameter of the

expressing-screw that the clay delivered by it through the die will undergo much less compression than in the former machine, and hence the lamination arising from torsion and compression will be much lessened and the brick rendered less dense, more homogeneous, and more tractable under the trowel. The practical limit I have found, by many experiments, to be a diameter of screw slightly greater than the longest diameter of the brick to be made.

Eighth, in making the former and die lining all in one piece, to insure greater smoothness and more uniform operation on the clay.

Ninth, in enlarging the hinge of the former and making its two outside sections equal to about one-third of the circumference of the former, and holding the same to the screw-case by a single swinging bolt, *k*, which turns on a wooden pin, *m*, for purposes hereinafter explained.

Tenth, in a device for cutting the bar of clay into the desired lengths for bricks by means of a spiral blade and endless chain, which divide the bar into perfectly uniform lengths, and give smoothness to the surfaces of the ends of the bricks.

Eleventh, in the mechanism for regulating automatically the relation between the speed of the bar of clay and that of the cut-off device, so that it shall be uniform under all conditions.

Twelfth, in a peculiar arrangement of the sand-scrapers, by which they do not come in contact with each other and form corners in which the clay can lodge; and, finally, in the improved minor details of construction hereinafter fully specified.

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

A marks the frame of the machine, on and in which the operative parts are supported and attached. The machine, when fixed in this frame, becomes a single system, self-contained, and requiring only a proper foundation to support it for operation. This was not the case with my machine of 1863, Patent No. 39,884.

This improvement in the system of framing enables me to erect the machine at the factory, and transport it, as a whole, to the place where it is to be used.

At the rear of the frame is a cross-head, B, (see Figs. 1 and 3,) attached to the frame by the bolts *z z*, and forming a box for the reception of the rear end of pugging-shaft P and the plates which receive its thrust. This box is provided with a cover, c^2, and its lower portion forms an oil-chamber, *r*, for the reception of the lubricant for the shaft and thrust-plate.

The rear side of the box is concave to receive the convex rearward projection of a loose plate, U, the front face of which is flat, as shown. This plate is prevented from turning by the lug *l*, entering a groove in the rear of the box.

In front of plate U is the thrust-plate T, against which the rear end of the pugging-shaft abuts. The thrust-plate is shown in section in Fig. 3, and in face view in Fig. 4. Its rear side is flat and runs in loose contact with plate U. Its face is provided with a cruciform indentation to receive a crab on the end of the shaft P, and an annular shoulder to hold the shaft and plate in line, so that they will run true together, and the plate be positively driven by the shaft. In the face of plate T are also formed curved grooves *g g g*, which, as the shaft turns, constantly lift the lubricant from the oil-chamber *r*, in which the plate turns, and apply it to the parts running in frictional contact. By this construction and arrangement of the box, plate, and shaft, the plate U, when the thrust of the shaft is received, is enabled to line up with the true-running plate T, and thus always present a good working and wearing surface.

C C^1 is the tempering-case, formed in two parts, hinged together at c^1, bolted on the opposite side, and capable of being thrown open when required. It is nearly cylindrical in form, its sides approaching each other gradually as they approach the screw-case or delivery end of the machine. Into the rear end of this case the clay is introduced through a conoidal hopper, H, projecting downward from a platform, D, Fig. 2, and having its larger opening at its lower end, to facilitate the delivery of the clay and prevent the clogging of the hopper.

The upper end of the hopper is provided with a flange, *a*, covering the opening in the platform, which opening is made large enough for the passage of the larger end of the hopper.

On the lower face of the flange is an annular rib, *b*, which enters the opening of the platform and holds the hopper in place. The lower end of the hopper hangs loose in the upper shell of the tempering-case C, so that if the platform should sag the hopper may descend, while the flange or cap *a* remains flush with the floor of the platform.

The clay enters the case through a circular inlet-pipe, I, inserted tangentially in the upper shell of the case, and on that side where the entering clay will meet the tempering-knives K on their upward course, and the lumps be continually agitated and the clay loosened, which materially lessens the clogging of the hopper.

The pugging-shaft P is provided with a series of tempering-knives, K K, arranged spirally around it on a curve running in the opposite direction to that of the spiral of the screw S, which is attached to the forward end of the shaft, and presses the tempered clay out through the die, as hereinafter explained. This arrangement of the knives obviates the

tendency, they would have, if placed on the same spiral as the screw, to drive the clay into the screw-case and compress it there, and produce clogging and an unnecessary density. Less power is consequently required to drive the tempering-knives, the function of each knife being merely to plow the clay over into the space left vacant by its predecessor, thus giving each knife a very narrow strip of clay to operate upon, and relieving it from sustaining the backward thrust of the entire mass of clay moving in front of it.

There is a projection, *d*, upon the pugging-shaft P at the back of each tempering-knife K, intended to support the knife and prevent it from being forced backward by the clay as the shaft revolves. These projections are set in a position oblique to the shaft P, and form a spiral upon it; but their faces are so arranged with reference to the direction of rotation of the shaft that they shall, by their revolution, impel the clay toward the expressing-screw S.

S marks the conical expressing-screw on the forward end of shaft P, rotating in the conoidal screw-case E, provided with a removable lining, F, between which and the outer shell is a steam-space, G. The removable lining is the invention of Wm. Mendham, assigned to me, and will be made the subject of another application for a patent.

The screw-case is bolted to the tempering-case, as shown. The screw S is similar in construction and operation to that heretofore used by me, except that its diameter is less, and the arrangement of its mouth or base relatively to the tempering-knives is different. In my original machine of 1863 the diameter of the screw was large in proportion to the size of the brick to be made; hence the large quantity of clay which the screw would contain had to be driven through the die at a great expenditure of power, and with the effect of so condensing, drawing, and laminating the material as to render the brick extremely hard and heavy, and somewhat difficult to cut with accuracy under the trowel. By reducing the diameter of the screw the amount of "drawing" to which the clay is subjected is greatly lessened, and the lamination in the shorter kinds of clay almost entirely prevented.

My experiments have led me to adopt a diameter for the screw a little greater than the longest transverse diameter of the brick to be made.

It is important that the mouth of the screw should be so arranged relatively to the tempering-knives that the clay should be allowed to pass freely without clogging between the knives and the base of the screw. The spiral of the screw being opposite in direction to that of the line of knives, the two form at their point of junction the ends of a right and left handed thread, which would bring the second tempering-knife from the screw end of the shaft so close to the thread of the screw as to cause the clay to lodge between them. By placing the mouth of the screw opposite to and a little back of the first knife, said knife will feed the clay over into the cavity and between the thread of the expressing-screw, and the second one into the path of the first, and the third knife be sufficiently far from the screw to allow the clay to pass freely between them. On the forward end of the screw-case E is attached the former, with its die and lining both formed in one piece. The walls of the former are inclined, as shown, and guide the clay into the die, gradually imparting to it the rectangular form and reducing it to the size of the die, through which it emerges in the shape of a continuous rectangular bar, whose cross-section is that of the brick to be made. The former is hinged to the screw-case by a large hinge, *j*, the extremities of which are about one-third of the circumference of the former apart. On the side of the screw-case opposite to the hinge *j* is an eye, *x*, to which is hinged, by a wooden pin, *m*, a swinging bolt, *k*, which engages with an eye on the former, and locks it to the screw-case. Thus the former is held to the case at three equidistant points around its circumference, and yet can be opened or closed by the use of a single bolt. The wooden pin *m* is of such a diameter as to be amply strong to hold the former to its place when the machine is working under normal conditions; but should the clay become too stiff, or a large stone get in, so as to subject the machine to a dangerous strain, the wooden pin will be cut off before any other part of the machine will give way, and thus prevent serious injury.

In Patent No. 109,034 the former and die-lining are made in two parts, the former being of iron and the die-lining of steel; but it was found that the former wore away as well as the die, and when a new die was inserted an abrupt shoulder was formed at their line of junction, over which the clay had to be forced at the cost of power and of the perfection of the surface of the bar.

My improved arrangement of the sand-scrapers is illustrated in Figs. 5 and 6. This is an improvement on the invention of Wm. Mendham, assigned to me, for which another application for a patent will be made.

In the device of Mendham the sand-scrapers, which are made of rubber or leather, are arranged in rectangular form around the orifice in the sand-box through which the clay bar emerges, and lie in close contact with each other, forming at their intersections corners, which are apt to become clogged by weak or soft clay.

My improvement consists in arranging the top and bottom scrapers in different planes from each other and from the side scrapers, so that there is no contact between any of them to form corners. I place the upper scraper, *e*, nearest to the die, so that the sand scraped by it from the top of the bar drops in front of the side scrapers, *e' e'*, and is applied to the

sides of the bar, and thence, falling, is caught in the projecting bottom scraper, *f*, which, by the obliquity of its sides, directs the sand toward the middle of the under side of the bar. I provide the bottom of the sand-box with a slide for the convenience of removing the surplus sand.

The device for cutting the bar of clay into uniform lengths for bricks is radically different from that heretofore used. It consists, in the main, of a spiral severing-blade, Q, in combination with an endless chain, N, each link *n* of which equals in length that of the brick the machine is designed to make. In each link, at about two-thirds the distance from the die end, are slits *p*, through which the spiral blade Q runs. The chain is supported upon rollers, and passes around wheels at the end of the chain-stand. The links are held laterally in place by a cap, *t*, which laps over their edges.

The spiral blade Q is made of tempered sheet-steel, and has three full turns, the first two of which gradually increase in diameter from the forward or leading end of the blade, so that the blade, as it revolves, shall gradually enter and sever the bar of clay. By this construction the blade is caused to make a long drawing cut, which rubs out the clay before it, and leaves the ends of the brick perfectly smooth. Any small hard foreign substance that may be in the clay is either pushed out or to one side, and the rubbing action of the blade immediately fills the cavity thus made. By this process even a rough variety of clay can be cut quite smooth.

The third round of blade Q prevents the partially-severed bar of clay from yielding under the strain of the cut and separating before the blade completes the severing of it.

The links *n*, being turned up at right angles at their sides, support the clay at the bottom and edge. The blade Q being placed a little to one side of the chain, its drawing cut has a tendency to draw the clay into the angle of the chain, and this holds the bar in both directions while being cut.

The blade Q is held between two spiral clamps, R, which are adjusted to the proper length of the brick, and to correspond with the length of the links *n* by the screws *u*, as shown. When this adjustment has been completed the clamps R are closed upon the blade by the through-bolts *v*, which support the clamps, as clearly shown in Fig. 1.

The winch, Fig. 1, shows the point of application of the driving-power on the end of main shaft W. A gear, D^2, on this shaft, through intermediate gears, E^2 F^2, drives the large gear G^2, attached to the pugging-shaft P. On the inner end of shaft W is the clutch provided with the gear K^2, which drives gear J^2 on the end of the shaft I^2 of the fly-wheel H^2. On shaft I^2 is a pulley, L^2, connected by a band with a pulley, M^2, on the shaft X of the spiral blade Q. When the jaws of the friction-clutch V are closely engaged the fly-wheel H^2 is driven at increased speed and the shaft X at a corresponding rate; but when the jaws are less closely in contact the speed of the fly-wheel is correspondingly decreased. The movements of the friction-clutch jaws to and from each other are controlled by the longitudinal oscillation of the shaft X of the spiral blade Q, and that oscillation is caused by the action of the bar of clay against the blade, as hereinafter set forth.

The rotation of the spiral blade Q drives the chain N. The speed of the blade is controlled by the motion of the bar of clay as it issues from the die, and the longitudinal movement of the blade governs the friction-clutch V upon the end of the driving-shaft W, through which clutch power is communicated to drive the fly-wheel shaft I^2 and the pulleys L^2 M^2, which drive the blade Q.

The shaft X, upon which this spiral blade with its clamp is carried, runs in boxes Y C^3, with universal joints upon the end of upright levers Z D^1, supported by rock-shafts A^1 B^1. (See Fig. 7.) The rock-shaft B^1 on the main framing of the machine has upon it a very short lever, engaging with a washer bearing against the nut of the female portion *x'* of the clutch V, and by its movement increases or decreases the friction of the jaws of the clutch. The male portion E^3 of the clutch is driven positively by the main driving-shaft W through the adjusting-key, as shown. This male clutch E^3 is covered with wood in sections, set upon its end, so as to be easily renewed and present a wearing-surface that will not cut. Leather may also be used, or the segments of wood may be faced with leather.

Upon the rock-shaft A^1, carrying the cut-off shaft X at the blade end, is a lever, F^1, against which bears a spring, G^3, adjustable by the hand-wheel H^1, so that the amount of pressure applied to the clutch may be varied by this spring G^3, and transmitted, through the rock-shaft A^1 and cut-off shaft X and lever D^1, to the female jaw of the clutch.

The operation of this part of the machine is as follows: When the clay issues from the die faster than the spiral blade Q is running, it presses against the blade, moving it forward, thus forcing the clutch-jaws more closely together, increasing the speed of the fly-wheel, and consequently that of the cutting-spiral. Should the spiral Q run too fast for the clay, it will, by its reaction against the clay, screw itself back, and thus relieve the pressure on the clutch, and be retarded by the diminishing speed of the fly-wheel shaft, the blade thereby becoming an automatic regulating device, wholly under the control of the issuing bar of clay, and much more sensitive than the old device.

To the same lever, F^1, to which the spring G^3 is attached is coupled, by a link, I^1, a hand-lever, J^1, whereby the friction of the clutch may be controlled by hand when desired.

The arm K^1 upon the rock-shaft A^1, carrying the spiral end of the cut-off shaft, is made hollow, and through it extends the lever or column Z, carrying the box Y, the lower end of which rests in a notch in the end of a lever, L^1, which is counterweighted by M^1, so as to nearly balance the weight of the spiral blade Q and its shaft. By this means the power required to raise the spiral Q is reduced to little more than that required to cut off a brick, so that when the blade Q strikes a hard substance which it cannot displace or cut through, the blade rides up over it, lifting its shaft X and box Y, and thus passes harmless over all such obstructions. Should the blade be suddenly caught in the chain from any defect, or be wedged by a nail or other article, so as to prevent its revolving, the flat friction-plate R^1, against which the forward head of the spiral drum is forced by a key, (the other end turning loose upon the shaft,) slips, allowing the fly-wheel H^2 and cut-off shaft X to continue to revolve, thus avoiding the sudden stopping of those parts, which would be liable to cause damage to the machine. The bar of clay, as it issues from the die and sand-box, is received on a table, T′, hinged at the side, as shown, so that it can be turned up laterally out of the way when desired.

The bricks are delivered by the chain to a sliding plate, R^2, which, in turn, delivers them to an off-bearing belt, (not shown,) but which is substantially like that shown and described in the patents previously referred to, said off-bearing belt being always driven faster than the greatest speed at which the bar of clay issues from the die, thus separating the bricks for convenience of handling by the off-bearers.

Should the wooden pin *m*, by which the former is held shut, break and allow the former to fly open during the time the hinged table T′ is down, some part of the machine would be broken or displaced were it not for the curved incline S′, attached to table T′, under which the nut of the former-bolt K slides, and turns over the table T′ out of the way. (See Fig. 8.)

At a point opposite to that at which the chain N reaches a horizontal position is secured to the cap *t*, which holds down the chain, a slide, on the end of which is a spring, *s′*, for the purpose of guiding and holding the bar of clay against the angular side of the chain.

To protect the tempering-case from the effect of undue internal pressure arising from any obstruction or too great stiffness of the clay, a safety-valve, Z′, is inserted in the shell, as shown in Fig. 2, provided with a lever, A^2, and weight B^2.

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

1. In combination with the pugging-shaft P, an enlarged thrust-plate, T, placed on the rear end of said shaft, running true with it, and in contact with a loose plano-convex plate, U, in the cavity of the cross-head, all as and for the purpose set forth.

2. The conoidal hopper H, provided with a flange, *a*, and annulus *b*, and arranged with its larger opening downward, in the manner and for the purposes stated.

3. In combination with the shell of the tempering-case, the inlet-pipe I, inserted tangentially into said case on the side on which the tempering-knives are on the ascending part of their revolution, as and for the purpose specified.

4. The shaft P, provided with tempering-knives K, arranged in a spiral line opposite in direction to that of the threads of the expressing-screw, in the manner described, and for the purpose set forth.

5. The spirally-arranged knives K, supported at the back by projections *d* on the pugging-shaft, set in a spiral, and having their faces set to impel the clay toward the delivery end of the machine, as described.

6. The expressing-screw S, having its mouth set a little back from and opposite to the first tempering-knife, in the manner and for the purpose specified.

7. The expressing-screw having a diameter at its delivering-point not more than double the greatest diameter of the forming-die.

8. The former and die-lining, made in one piece, as described, for the purpose stated.

9. The former provided on one side with the enlarged hinge *j*, and on the other with the swinging locking-bolt *k*, attached by the wooden pin *m*, in the manner described, for the purposes set forth.

10. The sand-box provided with flexible scrapers *e e′ f*, arranged in different planes, so that no corners shall be formed to become clogged by weak and soft clay, as described.

11. The cut-off mechanism consisting of the endless slitted belt N, in combination with the spiral blade Q, constructed as described, and running in the slits of the belt, in the manner and for the purpose stated.

12. The spiral blades Q, having enlarging diameters, as described, held between the adjusting-clamps, and united by through-bolts to the circular heads attached to the shaft X, as shown and described.

13. The blade-shaft X, running in journal-boxes supported by universal joints upon oscillating levers, and connected by pulleys with the clutch and fly-wheel which control the speed of the cut-off mechanism, in the manner described.

14. The combination of the weighted lever L^1, hollow arm K^1, and rod Z with the journal-box of the blade-shaft X, in the manner described, for the purpose of balancing the blade and enabling it to clear obstructions, as specified.

15. The combination of the main shaft W, clutch V, gear K^2, fly-wheel shaft I^2, pulleys

L^2 M^2, and shaft X of blade Q, in the manner and for the purposes described.

16. The combination, with the hinged former, constructed as described, of the hinged table T′, provided with the slide S′, in the manner and for the purpose specified.

17. The sand-box constructed as described, and provided with a sliding bottom, *i*, as and for the purpose stated.

In testimony that I claim the foregoing as my own invention I affix hereto my signature in presence of two witnesses.

CYRUS CHAMBERS, JR.

Witnesses:
S. BERNARD CHAMBERS,
WILLIAM MENDHAM.