A. Woodworth, 3d & S. Mower,

Brick Machine.

No. 6,899. Patented Nov. 27, 1849.

Fig 1.

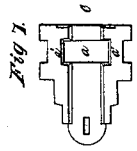


Fig 6.

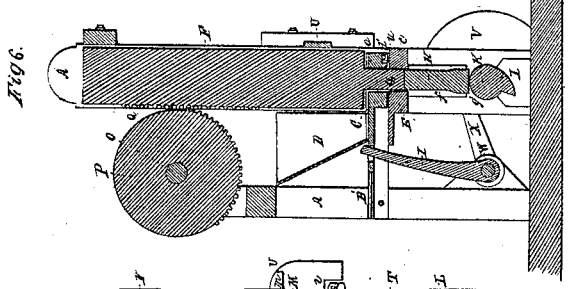


Fig 7.

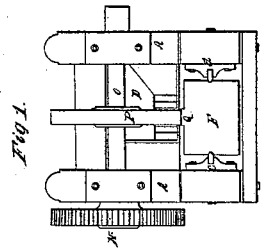


Fig 5.

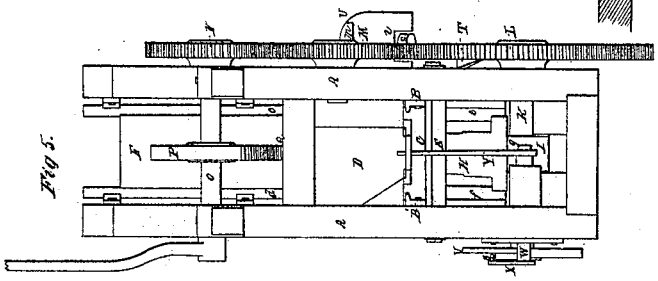


Fig 4.

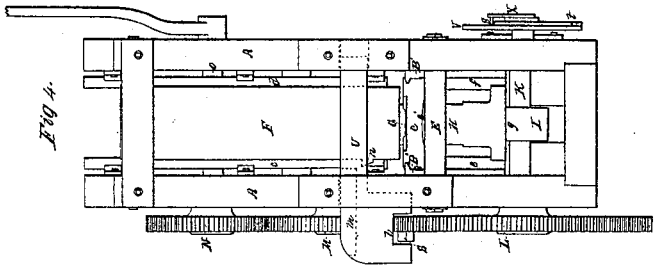


Fig 8.

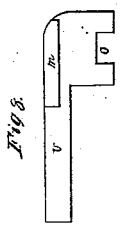


Fig 11.

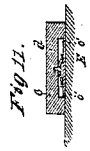


Fig 3.

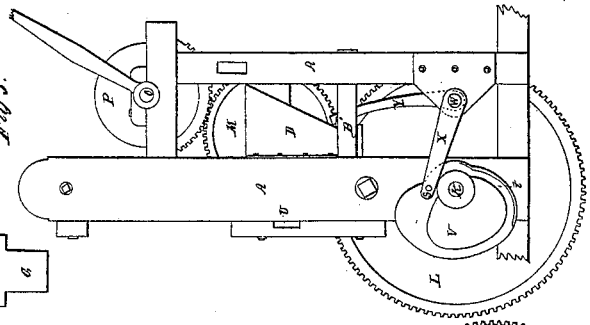


Fig 9.

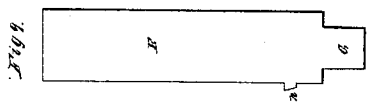


Fig 10.

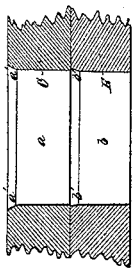
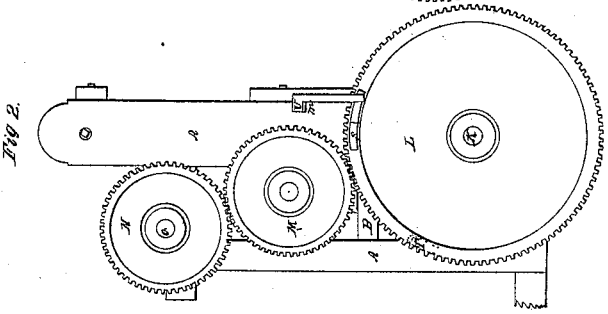


Fig 2.



UNITED STATES PATENT OFFICE.

ARAD WOODWORTH, 3D, OF WORCESTER, MASSACHUSETTS, AND SAMUEL MOWER, OF PHILADELPHIA, PENNSYLVANIA.

BRICK-PRESS.

Specification of Letters Patent No. 6,899, dated November 27, 1849.

To all whom it may concern:

Be it known that we, ARAD WOODWORTH, 3d, of Worcester, in the county of Worcester and State of Massachusetts, and SAMUEL MOWER, of the city and county of Philadelphia and the State of Pennylvania, have invented a new or Improved Machine for Forming Clay into the Shape of Bricks; and we do hereby declare that the same is fully described and represented in the following specification and accompanying drawings, letters, figures, and references thereof.

Of the said drawings, Figure 1, denotes a top view of our said improved machine. Fig. 2, is an elevation of one side of it. Fig. 3 is an elevation of the opposite side of it. Fig. 4, is a front end elevation. Fig. 5, is a rear end elevation. Fig. 6, is a central, vertical and longitudinal section.

Before proceeding to specify the particulars touching the construction of our improved machine, we would remark that, in its operation on clay, which is generally to be used in a powdered, comminuted and slightly moistened state, it produces effects, which result from no other machine that has come to our knowledge.

The principal objects we have had in view in the production of our invention have been to obtain in some cheap and effective way, not only a means of effecting the expulsion of all or nearly all the air from the clay but one, at the same time which would impart to it a superior degree of compactness or density as well as smoothness of external surface of the brick. For this purpose we employ the percussion and concussion of a heavy ram or weight, the percussion tending in a great degree to increase the density of the clay, while the concussion of the blow disturbs the air therein and aids materially in its escape. In order to render the lower surface or bottom side of the brick as practically smooth and dense as the upper surface we also employ the usual power of compression, as will be hereafter explained.

The mode in which our machine is made to operate may be briefly stated as follows: During the entire process of pressing or forming a brick, it is subjected twice to the effect of percussion and once to that of compression. The percussion is produced by the fall of a piston and a heavy weight or ram attached thereto, the piston being caused to drop directly on the clay in the mold. In some instances it may be convenient to allow the piston to be detached from the ram and rest on the clay, the ram alone being raised up and suffered to fall upon the piston. The first percussion or blow of the ram takes place and produces a top density of the clay in the mold. The ram and its piston are next held stationary in position and the lower piston forced upward, so as to produce by compression a smooth and compact bottom surface on the clay. The machinery which holds down the ram is next put in operation so as to relieve the ram, and permit it to ascend. Next a further and trifling ascent (say about an eighth of an inch) of the lower piston, upper piston and ram takes place, for the purpose of raising the mass of clay a little in order to relieve it from much of its friction and adhesion against the sides of the mold, and also allowing to some extent the escape of air the sides of the mold being each made with a slight inclination to the horizontal plane, so as to make the mold smaller at the bottom part than it is at the top. Next the ram and its piston are elevated to their highest position and as soon as the piston leaves or emerges from the charging aperture *a*, the carriage C, is moved back far enough to carry the said aperture underneath the hopper in order that it may be refilled with clay in a powdered or comminuted state. Next the ram is again made to fall so as to produce the second percussion, which having been effected the lower piston is next raised still further and so as to elevate the brick out of the mold, and with the ram, piston and weight of the ram resting on the top of the brick in the meantime. As soon as the brick has been elevated entirely out of the aperture *b*, the ram is raised above the brick, and the carriage advanced from under the hopper, and so as to carry its charge of clay directly over the aperture *b*, and into the required position in order to receive a percussion from the ram, which next takes place and the formation of a second brick follows in manner essentially as above stated. Before however the ram falls, the cam I, is moved so as to permit the lower piston to descend to its lowest position.

The framework by which the operative

parts of the machine are supported is represented at A, in the several figures. Connected with this framework are two horizontal rails or ways B, B′, arranged as seen in Figs. 4, 5, and 6, and made to support a horizontal sliding carriage C, which carriage consists of a block or thick plate of metal, formed as seen in top view in Fig. 7, and having a rectangular aperture *a*, made down through it. The movements given to the carriage are such as to carry the aperture *a*, first directly beneath the mouth of a hopper D, (in order that it may be filled with clay previously prepared and introduced into said hopper) and next out from underneath the same and directly over another and similar orifice *b*, formed through a stationary metallic bed or plate E, arranged just below the rails or ways B, B′, and at or near the front end of the machine as seen in Figs. 4 and 6.

Directly above the stationary part E, are suitable vertical and parallel ways or guides *c*, *d*, between which a heavy ram or hammer F, is placed, the said ram being supported by the said ways *c*, *d*, during its vertical movements. On the lower end of this ram, a rectangular piston G, is fixed, the said piston being made to fit into and enter the orifices *a*, *b*, as will be hereinafter explained.

H, is another piston, which passes up into the orifice or aperture *b*, and is arranged below the plate E, and supported by and made to slide on, two parallel and vertical guides or ways *e*, *f*, disposed as seen in Fig. 4. This piston is operated in part by a cam I, arranged beneath it and fixed on a horizontal shaft K. The weight of the piston H, is employed to depress it. If necessary, it may be provided with a spring or other proper contrivance suitably applied so as to effect its downward movements. The rotation of the shaft K, is produced by a train of gears L, M, N, the former of which is fixed on the shaft while the latter is attached to the main driving shaft O, which is disposed on the upper part of the framework as seen in the drawings. This shaft O, has another cogged wheel P, fixed on it at or near its middle, the said cogged wheel P, having teeth formed only on an arc of its periphery equal to about one third thereof, the remainder of the said periphery being made without any teeth projecting from it, the whole being as seen in Fig. 6. The said arc of teeth, is made to engage with a rack of teeth Q, affixed vertically to the rear side of the weight or ram F. During each revolution of the wheel P, its teeth while engaged with those of the rack Q, will elevate the ram, which as soon as they become disengaged will fall downward by the attraction of gravitation.

During the downward stroke or first percussion of the ram, the piston affixed to it is driven into the aperture *a*, and so as to compress by concussion and momentum the clay which may be within said apertures *a*, and *b*, and resting on the top of the piston H. When the blow of the ram is taking effect, the piston H, should be held perfectly stationary. For this purpose it is made to rest upon a cylindrical surface *g*, forming part of the periphery of the cam I.

Instantly or immediately after the blow of the ram has been given it (the ram) is held firmly down or prevented from rising upward by means of machinery to be hereinafter described, and while so held firmly the lower piston should be elevated a short distance (by means of the cam), one sufficient to compress the clay (or brick) on its underside, which compression is necessary to perfect the lower surface or part of the brick, and to insure an equal or proper degree of density throughout the mass composing it. This cannot be effected by means of the blow of the ram piston alone, for the lateral resistance and friction from the sides of the mold as well as other causes operate to prevent the same. In order to insure the required uniformity of smoothness both of bottom and top surfaces of the brick as well as the proper density it becomes necessary to make the compression by means of the lower piston as described.

The machinery which is brought into operation for the purpose of holding the ram in position while the lower piston is in the act of being elevated in order to effect the compression, is as follows: On the outer face of the gear L, and at or near its periphery a cam (S) is fixed; and at a short distance from the said cam and on the opposite side of the wheel and at or near the periphery of it, another cam (T), is similarly attached. A horizontal slide bar U, having a fork or opening *l*, operates in concert with the said cams that is to say the cam T, by striking and moving against the inner side of the opening *l*, moves or slides the bar U, inward; the other cam operates in a similar manner against the other side of the opening and produces a movement of the bar in the opposite direction. A small stud or projection *m*, is fixed to the rear side of the slide bar as seen in Fig. 8, which is a rear side view of the slide. There is also another stud *n*, made to project from the side of the ram, as seen in Fig. 9, which is a front side view of the ram. When the slide bar is moved inward it carries its projection *m*, directly over the stud *n*, of the ram, and so as to prevent any elevation of the ram until the said projection is next moved entirely from such position. Such movement of the projection is occasioned by the action of the cam S, against the fork of the slide. The sides of the mold composed of the two apertures *a*, and *b*, should each have a small inclina-

tion to the horizon (say about a hundredth of an inch to one inch rise) and so as to make the mold largest at the top. Besides this flare of the mold each of the apertures *a*, *b*, has its upper edge beveled or chamfered down a little as seen at *a'*, *a'*, *b'*, *b'*, in Fig. 10. The object of this is to insure the entrance of the ram piston into either section *a*, or *b*, during the operation of the machine. One object of the inclination of the said sides of the mold, is to enable the brick, when it is raised a little by the elevation of the lower piston to free itself in a measure from adhesion to the sides preparatory to its receiving its second percussion. This elevation of the brick which next takes place overcomes much of its adhesion to the sides of the mold, and permits the escape of air which may have been compressed in the clay and in the direct vicinity of the external surface of the brick, which air is liable to expend and rupture or injure the surface of the brick. The expansion of such air having been permitted, the second percussion of the same takes place and effectually closes up or obliterates any of the imperfections of surface, consequent on such expansion or the escape of air.

In other machines which have sliding mold charges operating in connection with a mold, such chargers constitute no part of the mold as they do in our machine, for in the other machines they simply take the clay from the hopper and convey it over and into the mold. This done they next retreat and the piston follows down into the mold. In our machine there is no retreat before depression of the ram piston, but the charger or aperture *a*, remains in place over the mold while the first percussion takes place the ram piston being made to pass into and entirely through it. From this it will be seen that the lower part *b*, of the mold need only be made of a depth equal to a little more than the thickness of the brick, while the mold charger *a*, is made very much thicker or thick enough to contain as much powdered clay as can possibly be condensed into the part *b*. This clay is driven into the part *b*, by the first percussion of the ram. The compression of the lower face of the brick next follows. The brick is next elevated a very little in the mold and the carriage C, is made to retreat. The second percussion follows and completes the brick.

In the front part of the carriage C, and in advance of the aperture *a*, is a scraper or bar *c'*, which is fitted or arranged in a recess *d'*, made transversely up in the carriage, the said scraper being forced down against the upper surface of the mold plate E, either by means of its weight or by one or more springs, suitably placed above it. Fig. 11 is a longitudinal section of the scraper and parts adjacent to it. When the carriage moves over the mold plate E, the scraper will scrape off or remove the surplus clay which may have accumulated thereon. Its object is therefore to clear the mold plate from such refuse clay.

Immediately after compression of the clay has been produced on the underside as herein before specified the ram is set free so that it can rise upward. It is next elevated so as to carry its piston entirely out of the mold or apertures *a*, and *b*, and permit the carriage C, to be moved back a sufficient distance to carry the aperture *a*, directly under the hopper D. While the carriage is in this position the ram is a second time let fall upon the brick in the mold or that part of the mold termed the aperture *b*. Next the ram is moved upward, for a portion of its ascent through (or in consequence of) the next action of the cam I, which should be so constructed as to so act against the piston H, as to elevate it high enough to cause it to pass into the mold and press the brick upward and entirely through the aperture *b*. It will be seen that as the ram piston rests on upper side of the brick in the mold, if such brick be elevated, the ram and its piston must be forced upward with it. And here we would remark that this resting of the ram piston and weight of the ram on the brick while the said brick is being removed out of the mold is very important as it effectually prevents any breakage of the edges or corners of the brick and causes it to be delivered from the matrix in a perfect state.

Soon after the ram piston rises out of the aperture *a*, of the sliding carriage C, the machinery which operates the said carriage, causes the carriage to retreat to the extent of its motions. As soon as the brick has been elevated out of the mold, the ram piston is raised off the brick, and the carriage is moved forward, and against the brick so as to move it off the top of the piston H, which has been previously elevated so that its upper surface is in a level with the top surface of the plate E. Immediately after the brick has been entirely removed from the mold, the aperture *a*, filled with clay is brought directly over the aperture *b*, and the ram dropped so as to cause its piston to pass into and through the aperture *a*, and thereby force and compress the clay into the aperture *b*. The remainder of the operation of forming the brick is as herein before described.

The machinery which operates the carriage C, consists of a cam V, (fixed on the shaft K) and a horizontal fulcrum or rocker shaft W, and two arms X, Y, extending from the two ends of said shaft as seen in the drawings. A projection *s*, from the arm X, is made to enter and work in the

groove t, of the cam V. The upper end of the arm Y, is carried through a hole made through the rear end of the carriage C, and so as to allow of the horizontal movements of the carriage produced by the combined operation of the cam V, and the arms X, Y, when said cam is put in rotation by the shaft to which it is affixed.

The lower part of that portion of the plate C, which is directly front of the aperture a, is elevated a short distance above the top surface of the plate E, so as to leave an air escape space as seen at u, in Fig. 6. The object of this space is to allow the air expelled from the clay in the mold by percussion and concussion of the ram, to rush freely away from the mold. From the great compactness of the clay after it has been thus operated on, it is presumed that such compactness arises in part from the pressure of the atmosphere induced by the effect of concussion, the blow of the ram causing such a lateral expulsion of the air in the clay that before it can return the particles of clay become so consolidated together as to prevent it from resuming its place.

By the employment of percussion we induce a sudden concussion or disturbance of the particles of air in the clay, such concussion as before stated operating greatly toward improving or increasing the density of the clay under the blow of the ram. We also by simple and cheap means, produce a compressing of the clay far beyond what it has been customary to effect by the usual expensive toggle joints or other contrivances generally employed for such purpose. We therefore produce a new or improved effect and by machinery very much cheaper, comparatively speaking, than such as has heretofore been used for pressing bricks.

We are aware that the mere employment of a ram or falling weight to produce density, is not new. Consequently we do not claim such nor do we claim as our invention, the combination of the percussion ram and its piston (whether connected to it or separated from it) the brick mold, and lower expulsion piston H; the whole being made to operate in such manner on clay in the mold as to compress said clay and afterward expel it from the mold; but

We do claim as auxiliary thereto and in combination therewith,

1. Machinery for holding the ram and its piston stationary (just subsequent to its first blow) and elevating the lower piston in the mold in order to produce direct compression on the lower face of the brick in manner and for the purpose as above stated, the machinery employed for such purpose being the forked slide bar U, its projection, the projection on the ram and the cams which operate the slide bar and lower piston as specified.

2. We wish it understood that we make no claim to a sliding mold charger in connection with a mold and hopper as constructed and made to operate prior to the date of our invention, but what we do claim as our improvement is to so construct and use the sliding charger in connection with the ram piston as above specified, as to render it (the said charger) a part of the mold during and for some time after the first percussion of the ram, the same being for the purpose of attaining certain advantages we have above maintained.

3. We further claim the weighted or spring scraper c', in its combination with the carriage C, and the mold plate E, and for the purpose of cleaning the top surface of the mold plate as described.

4. We also claim as a further improvement to so construct the mold, with the flaring or inclined sides and combine them with mechanism for lifting the brick, a short distance just previous to the second percussion as specified as to not only enable the brick to be freed in a measure from its adhesiveness to the mold, but to permit the compressed air or part of the same in the immediate vicinity of the surface of the edges of the brick to escape as explained; the diminution of adhesiveness tending to lessen the friction of the clay against the sides of the mold under the second percussion of the ram.

In testimony whereof we have hereto set our signatures this twenty-fourth day of July A. D. 1849.

ARAD WOODWORTH, 3D.
SAML. MOWER.

Witnesses:
R. H. EDDY,
M. F. HOBBS.