

S. CADDICK.

CONSTRUCTION AND PROTECTION OF PUDDLING FURNACE.
No. 183,126.

Patented Oct. 10, 1876.

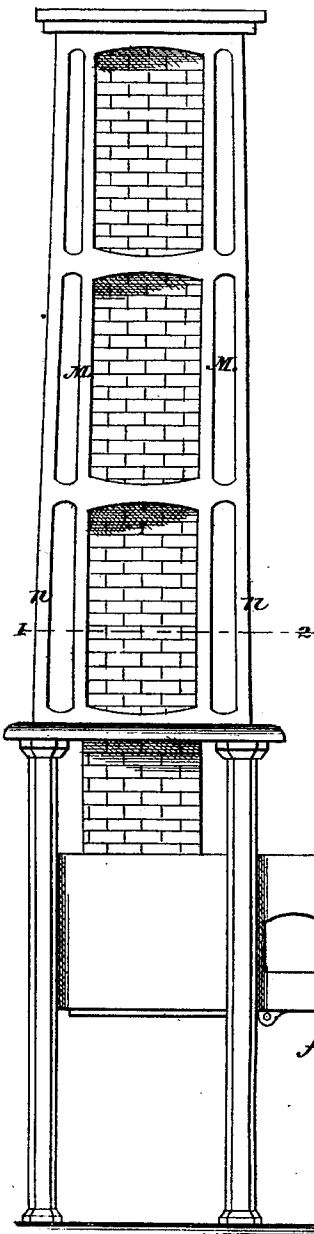
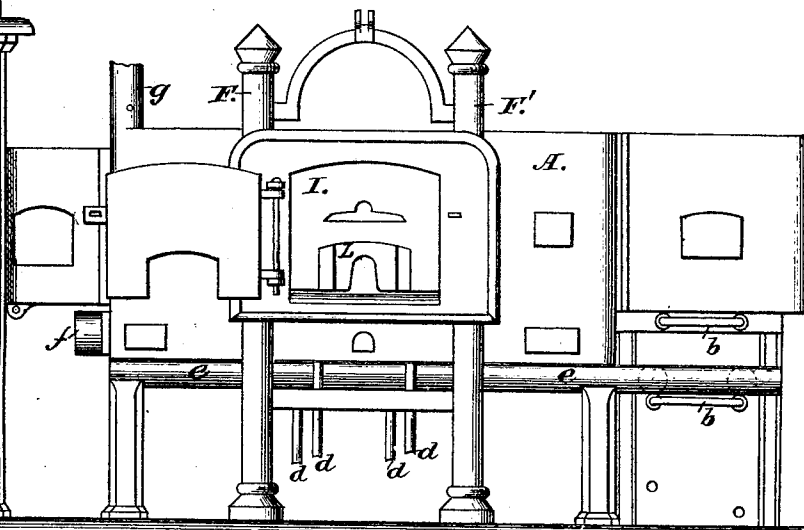
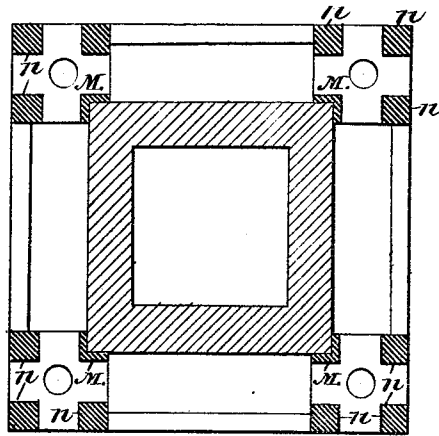


Fig. 1.

Fig. 2.



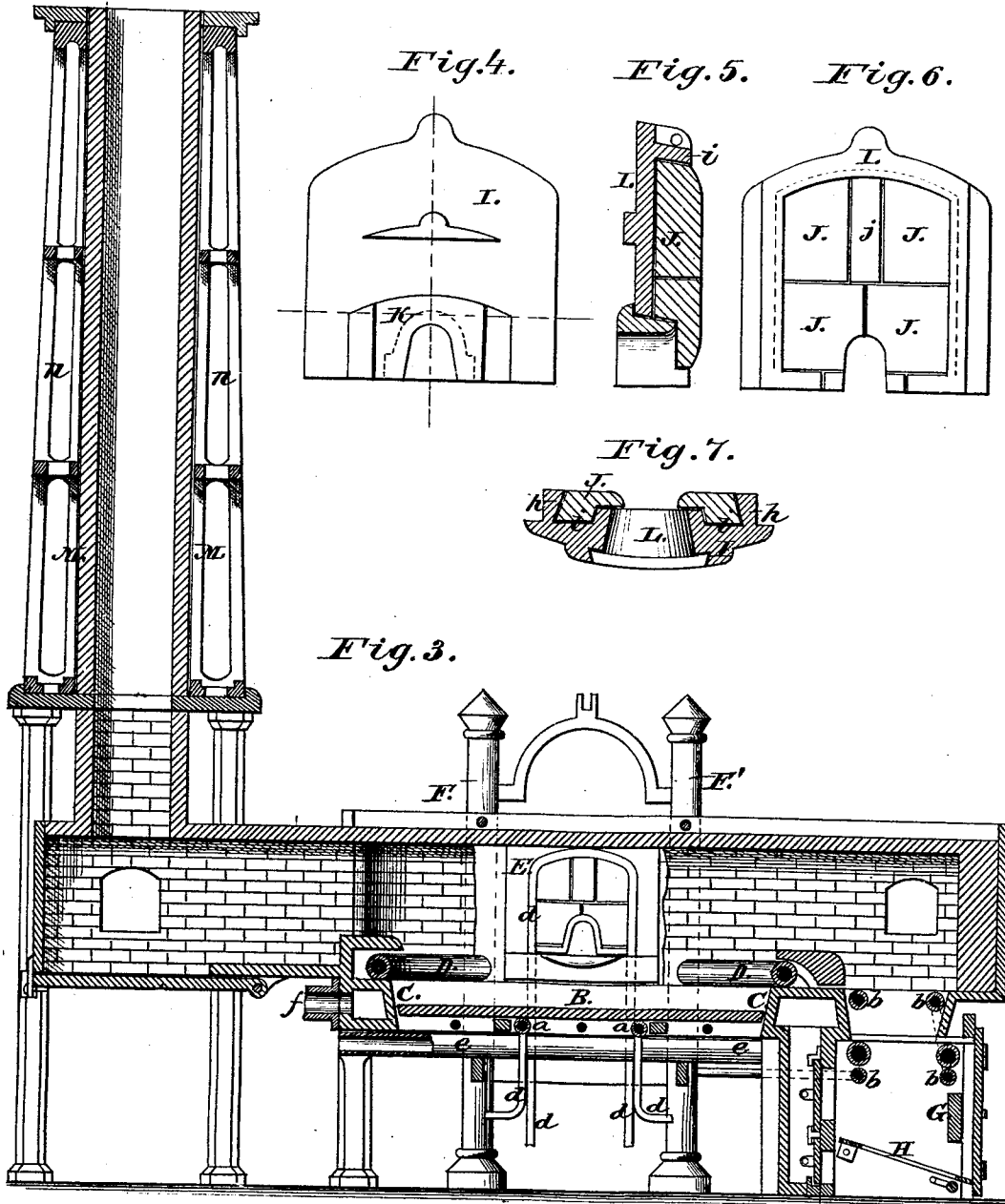
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Inventor.
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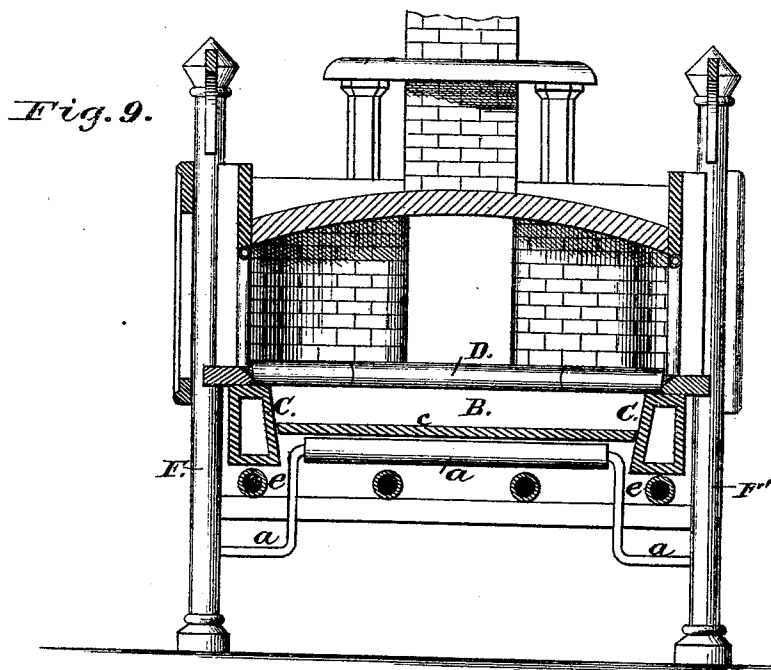
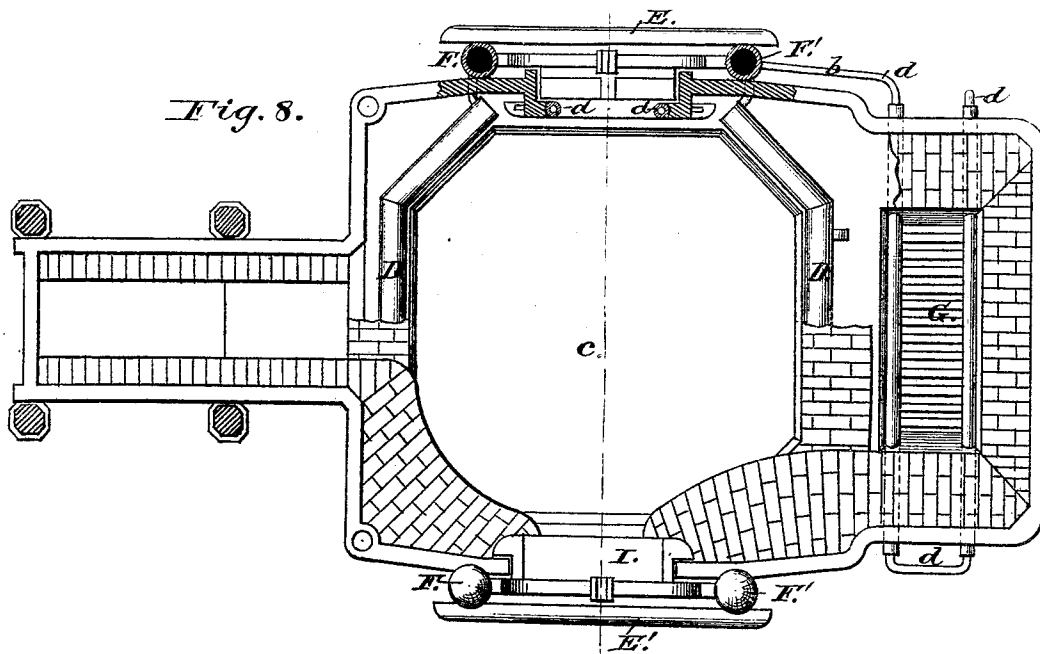
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UNITED STATES PATENT OFFICE.

SAMUEL CADDICK, OF PEMBROKE, MAINE.

IMPROVEMENT IN CONSTRUCTION AND PROTECTION OF PUDDLING-FURNACES.

Specification forming part of Letters Patent No. 183,126, dated October 10, 1876; application filed June 9, 1874.

To all whom it may concern:

Be it known that I, SAMUEL CADDICK, of Pembroke, in the county of Washington and State of Maine, have invented a new and Improved Puddling-Furnace; and that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, making a part of this specification.

This invention is in the nature of an improvement upon the puddling-furnace for which Letters Patent of the United States were granted to me October 29, 1867.

My invention therein consists in the improved means employed for a better circulation of air for feeding the fire, and for a circulation of water to protect the more exposed surfaces, all as more fully hereinafter explained.

In the accompanying sheets of drawings, Figure 1 is a side elevation of my improved puddling-furnace; Fig. 2, a plan view of stack and supporting frame and clamps; Fig. 3, a longitudinal section of puddling-furnace; Figs. 4, 5, 6, and 7 details of puddle-doors, showing their construction, and also the construction of bit; Fig. 8, a plan view of furnace, partly in section; and Fig. 9, a cross-section of same.

Similar letters of reference indicate like parts in the several figures.

A represents a puddling-furnace, which may be of any desired size, and constructed of the usual materials. Surrounding that part B of the furnace where the iron is puddled is a metallic chill, C. This chill may be circular, hexagonal, or of any other desired shape, and it is hollow or formed with a continuous channel passing within it. On the top of the chill C, and surrounding it, are affixed, in any desirable way, water-pipes D, and to the under side of the bed-plate *c* are secured water-pipes *a*. Surrounding the inner frame-work or mouths E E' of the furnace are water-pipes *d* *d'*. Passing along the upper edge of the furnace, immediately above the grate-bars, is a water-pipe, *b*. This pipe passes along one edge, returns, and passes along the other edge, passes down and immediately below one of the blast-pipes, and returns, passing beneath the other of said blast-pipes.

Supporting the sides of the furnace, at or

near the doors of the same, are columns or standards F F'. Through the columns F is admitted the water which supplies the several pipes hereinbefore described, and through the columns F' it is discharged. Supporting the furnace proper on its under side are a series of tubular bearers, *e e*. These bearers may connect at their front ends in any desired manner with the blast-pipe, and at their rear ends with a blast-box, or in any suitable way convey the blast to the furnace-fires. Beneath the ordinary grate G is placed a supplementary grate, H. This supplementary grate may or may not be connected to the blast, as desired. The inner doors I through which the iron is stirred or puddled are formed on their inner side or face, so that sections of fire-brick may be inserted therein, and held in position by a dovetailed flange, *h*, formed on the inner edge of the door.

My puddling-furnace being constructed substantially as above described, its operation is as follows: The fire having been kindled on the grate G, the iron undergoing the process of puddling is placed in the bed B, and a blast being forced through the orifice *f* which opens into the channel of the chill C, it is conducted through and around said channel into a blast-box or otherwise, and thence through suitable perforated outlet-pipes to the furnace-fire. It will be readily seen, therefore, that this means of supplying the blast is efficacious in two respects. It constantly circulates within the chill a current of cool air, which reduces the temperature of the chill, and preserves it from burning, and by the time the air has circulated around the chill it has become heated sufficiently to form, as it were, a hot-blast for the furnace-fire, and thereby effects a large saving in fuel, and consequent economy in the production of the iron.

As an additional economy, I construct below the furnace or grate G an additional or supplementary furnace or grate, H, for the purpose not only of heating the air and other gases that pass up from the ash-pit, but also allowing it to catch the partially-consumed coals that fall from the upper furnace, and fully complete their combustion. This supplementary furnace may or may not be supplied with blast, as desired.

In puddling-furnaces heretofore constructed

the water-channels around the mouths of the furnace-doors and beneath the puddling-pit and other places throughout the furnace have been cast with the several parts so that when these channels were burned up or the plates were fractured it became necessary to supply new plates with new water-channels at considerable expense, besides interrupting the operation of the furnace. By my improvements, however, I attach to the inner edge of the openings in the furnace pipes *d d'*. These pipes may be secured to the furnace-mouths by lugs or clamps, or in any suitable manner, so as to keep them in position, one end of each pipe connecting with the columns *F* and the other end opening into the columns *F'*, the supply of water being through the columns *F*, which act as mains, and the outlet being through the standards *F'*, as before described.

Secured to the bed-plate *c* are water-pipes *a*. These pipes are not cast into or with the bed-plate in the ordinary way, but they are attached to the bed-plate by lugs and bolts, or in any way, so that, if the plate burns out or becomes fractured or warped, the water-pipes remain undisturbed, and can be readily affixed to a new plate as soon as it is placed in position. These pipes receive their supply of water from the columns *F*, and they discharge it into the columns *F'*.

Surrounding the upper edge of the chill *O* is a water pipe or pipes, *D*. This may be one continuous pipe or may be sections, and they are secured to the upper surface of the chill by brackets or lugs, or in any way, so that, when the chill burns out or is fractured, the water-pipes remain intact and are readily adjusted to the new chill when fitted. This pipe receives its supply of water from the standards *F*, and discharges it into the standards *F'* in the same manner as do the other pipes.

Passing from one of the columns *F* is a pipe, *b*, which enters into the fire-box immediately above the grate-bars, passes along one edge of the same, returns and passes along the other edge, goes down and passes into the supplementary fire-box, passes along below and in contact with one of the blast-pipes, returns and passes below the other blast-pipe, and discharges into the standard or column *F'*, keeping up a constant circulation of cool water, preserving the walls of the fire-box and the blast-pipes from intense heat. This pipe is not cast onto or with any part of the furnace or blast-pipes, but is secured thereto, as are the other water-pipes, so that they may be replaced, if necessary, without disturbing their contiguous parts, or, in case the contiguous parts are burned out or fractured, the pipes remain intact, and can be fitted to the new parts when placed in position.

If, for any reason, it is thought desirable to discontinue the blast from the chill, or if more blast is required than can be admitted through the chill, the blast may be admitted through the tubular bearers *e*, and thence conducted into a blast-box, or otherwise to the fires.

This blast may be introduced into the bearers through hollow uprights *g*, or, as before stated, it may be introduced in any way thought advisable.

Instead of lining the inner face of the inner or protecting doors *I* with fire-brick, in the ordinary manner, depending upon cement and iron straps to hold the fire-brick material in position, I cast or otherwise form this door with a flange, *h*, having formed in its inner face an inclined recess, *i*. The fire-brick *J* are molded with their edges at an angle that will fit into this inclined recess, so that when they are in position the last brick *j*, acting as a key, will hold them firmly in position. The advantages of this method of lining the doors are that any part of the brick-work that has been burned, warped, or otherwise destroyed, may with great facility be removed and new sections replaced without disturbing the whole lining, and also the brick-work being confined by an equal pressure throughout, it is not so likely to warp and bulge by the action of the heat as it would otherwise do.

As is well known, the bit or orifice *K*, through which the puddling-irons are introduced, is rapidly worn away by the friction of the irons against them, in which case the door is generally discarded for a new one. By my improvement I affix to the front of the door a movable wrought-iron bit, *L*, so that as the bit becomes worn a new one may be replaced at once without disturbing the door. This bit may be attached by slides or lugs and bolts, or in any way.

As is well known, it is necessary to cover the outer surface of the brick forming the chimney-stack with the ordinary red brick, so that the fire-brick may be preserved from the weather and kept in position. To obviate the necessity of this construction, and at the same time to bind the stack with a uniform pressure, so that it will not warp from unequal expansion or contraction, I inclose the four angles of the stack with angle-irons *M*. These irons may be of cast or wrought iron, and are preferably made in sections and bolted together. Surrounding these irons and supporting them and the stack, is a frame, work, *N*, composed of uprights *n n n*. This frame-work is cast with or otherwise connected to the angle-irons *M*, and forms part of them. The lower part of the frame-work sets into a base, *O*, and the upper part of it is bolted to a cap, *P*. This cap being flush, or nearly so, with the upper end of the stack, the cap *P* not only tends to stiffen the whole frame-work, but it acts as a shield to prevent the carbonic and other noxious gases from enveloping the end of the stack and disintegrating the brick.

Under the stack, or what is technically known as the "stove" is fitted a door, *R*, which opens downward for the purpose of dropping the accumulated ashes, &c. As an additional means of holding the fire-brick to their inner surfaces, I cast the doors with a

concave inner surface, and cause the bricks to be formed with corresponding convex surfaces, so that they may be held in place by the fitting curved surfaces together with angular flange before described.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a puddling-furnace, the combination of the hollow chill C, inclosed on all sides, and extending above and entirely around the bed-plate, the connecting blast-pipe *f* on one side and an outlet-chamber on the other side opening into the fire-box, constructed and arranged substantially as described and shown.

2. In a puddling-furnace, the combination, with the frame-work of the doors, of the re-

movable water-pipes *d d'* attached to the inner edge of the openings, and the supporting water-columns F F', constructed and arranged substantially as described and shown.

3. In a puddling-furnace, the combination of the supporting water-columns F F' and the water-pipe *b*, constructed and arranged substantially as described and shown.

4. In a puddling-furnace, the combination of the supporting water-columns F F' and the water pipe or pipes D, constructed and arranged substantially as described and shown.

SAMUEL CADDICK.

Witnesses:

WILLIAM K. CAMERON,
WM. W. McLAUCHLAN.