(No Model.)

2 Sheets—Sheet 1.

R. R. MORRISON.

RECUPERATIVE TANK FURNACE.

No. 518,851. Patented Apr. 24, 1894.

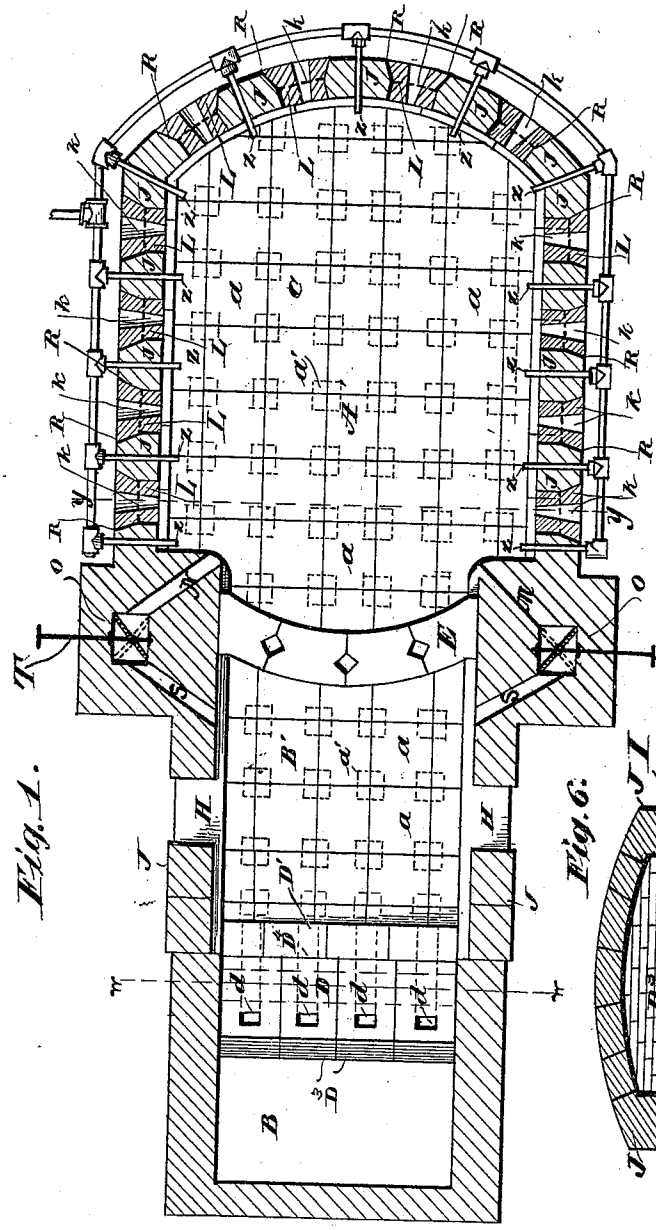

Fig. 1.

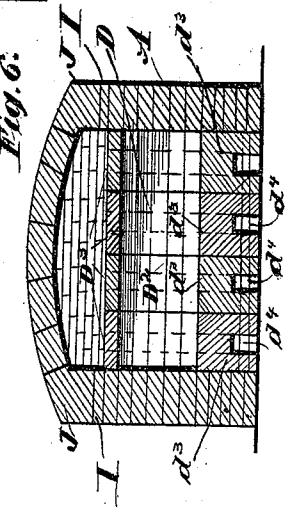

Fig. 6.

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(No Model.) 2 Sheets—Sheet 2.

R. R. MORRISON.

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Fig. 2.

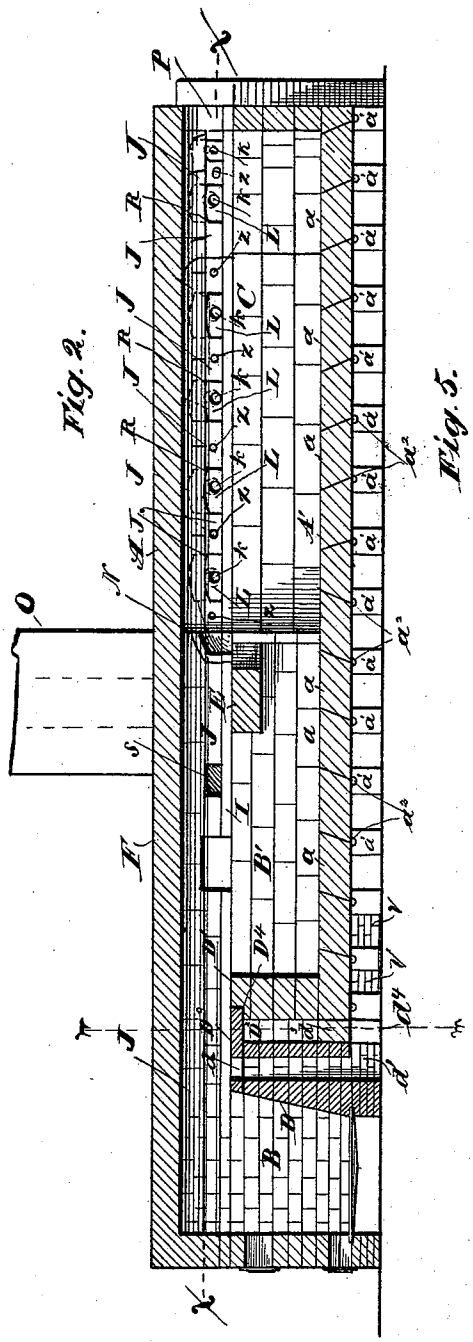


Fig. 5.

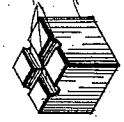


Fig. 4.

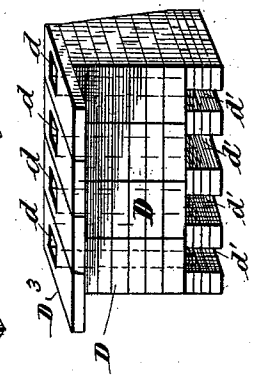
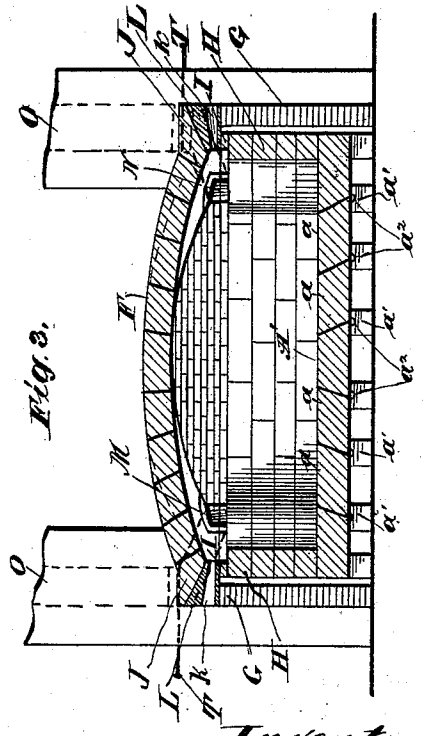


Fig. 3.



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REASON R. MORRISON, OF MINERAL POINT, OHIO.

RECUPERATIVE TANK-FURNACE.

SPECIFICATION forming part of Letters Patent No. 518,851, dated April 24, 1894.

Application filed March 23, 1892. Serial No. 426,166. (No model.)

To all whom it may concern:

Be it known that I, REASON R. MORRISON, a citizen of the United States, and a resident of Mineral Point, county of Tuscarawas, State of Ohio, have invented certain new and useful Improvements in Recuperative Tank-Furnaces; of which I hereby declare the following to be a full, clear, and exact description, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to improvements in tank furnaces, and is especially designed to operate as a recuperative, heating and working furnace, supplying hot air to jointly feed the combustion and heat the batch chamber. It is also designed to increase the economy of time and fuel—and permit of easy regulation of draft in the final tank—when one or more of the working or blowing holes are in use.

My invention further consists in the combination and arrangement of parts and details of construction, as hereinafter described, shown in the accompanying drawings and more specifically pointed out in the claims.

In the accompanying drawings, Figure 1 is a horizontal section of a tank furnace on line *x*—*x* of Fig. 2. Fig. 2 is a longitudinal vertical central section. Fig. 3 is a transverse section on line *y*—*y*, of Fig. 1. Fig. 4 is a detail of the forward portion of bridge. Fig. 5 is a detail. Fig. 6 is a transverse section on line *w*—*w*, Fig. 1.

In the drawings A represents a glass furnace, in which B represents the combustion chamber over the fire grate, B′ the batch chamber, and C the liquid glass chamber.

D is the bridge in front of the fire box and D′ the rear wall of the batch chamber which rests upon the bottom of the furnace, a space at D^2 being left between the walls to prevent the liquid metal from percolating into the fire box in case of leakage.

D^3 are blocks connecting the walls together at the top, the shoulder D^4 preventing them from moving backward.

The bridge wall D is provided with vertical air passages *d*, through which the air to promote combustion is drawn, so as to commingle with the burning gases driven over the bridge from the fire grate. The supply of air from these passages is furnished from beneath the furnace as shown in the figures. It will be seen that the bottom of the furnace at A′ is composed of rectangular bricks —*a*, the corners of which are supported upon blocks —*a*′, provided with transverse grooves —a^2, in such manner as to leave free circulation between the blocks for air. It will also be seen that the vertical passages —*d*— are continued outward at *d*′, to meet the open passages between these blocks *a*′, while an additional block d^3 is placed between the walls D and D′, to prevent the weight of the metal from pushing out the lower floor brick. This block is of course perforated at d^4 so as to afford continuations of the passages as shown at *d*′. This block is placed on the same horizontal line as the bottom blocks of the furnace, which have a tendency to move outward from the action of the liquid metal which insinuates itself in any crevice and by its weight and wedging action when liquid and its expansive property during the heating and cooling process when the metal is low exerts a constant longitudinal pressure. The longitudinal passages between the blocks are bricked up for a slight distance from the bridge walls, to give direction to the draft, and inclose the heat as at *v*.

E is the bridge separating the batch and liquid glass chambers, inserted at either end in large blocks suitable for the purpose.

The roof F of the furnace is formed of an arch of such form as to most effectively radiate heat to the tank. The weight of the arch F rests as shown upon columns G of brick or iron placed exterior to the lining H.

A layer of thin top bricks —I closes the opening between the furnace wall and arch. The springer blocks J forming the abutments of the arch are pierced where needed for working holes or for access to rings, as at R. These openings may be reduced when desired by blocks L pierced with openings K. It will be seen that the weight of the roof rests upon the columns which compose the outer wall and that this form of construction permits access to the top layer of bricks on the wall, or those which are most easily destroyed by heat, without the necessity of tearing down any part of the wall, roof or springer walls.

M and N are flues from the side of the liquid or working tank chamber, C into side chimneys O. At the extremity of the tank an opening P is made to permit the products of combustion to escape directly through the tank into a hood of the usual construction. The advantages of these side flues are largely in the control given by them of the heat in working the chamber, for instance if the working holes are opened, the side flues can be opened to relieve the men of the excessive heat, but still to retain the necessary temperature for working. Again if one side of the furnace becomes too hot or too cold for working and cross drafts endanger the quality of the glass in the tank, by opening or shutting one or the other of the dampers T T in the side flues, this can at once be regulated, and directed to alternate sides. Again a great economy in fuel can be maintained with less variation in the heat in the tank;—since the re-heating and melting can commence immediately upon the closing of the doors of the hood, and cease to any degree desired, when the holes are opened, and for this reason the operators at the holes need spend no time in waiting for re-heating.

In Fig. 1 are also shown side flues S S leading from the batch chamber into the side chamneys O, by which the heat can be diverted from the working chamber, or in case the heat is intensified by flames derived from gas jets, as *z*—*z*, around the sides of the tank in addition to the fire grate, the flames can be made to pass through the working chamber and out of the side chimneys through flues S in the batch chamber. Angular valves T can be employed for this purpose, so operating as to close the passages N and M while the passages S are open. By means of these flumes located on either side of the floating bridge, it will be observed that the draft can be readily cut off from either the batch or liquid metal chambers and if the liquid metal chamber becomes too hot near the working holes, by closing the flues leading from that chamber the draft will then be restricted to the batch chamber through the flues on that side of the floating bridge, and a perfect quiet will remain in the liquid metal chamber till gradually cooled. This could not be accomplished by placing the side flues over the bridge, which would then draw the heated air from both chambers. It will be observed that by this arrangement a practically continuous melting process is obtained.

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

1. In a recuperative tank furnace, the combination of a perforated bridge wall and a solid tank wall between the fuel and batch chambers, a vertical air inclosure D^2 between said bridge and chamber wall, perforated blocks D^3 placed over and covering said bridge and air space, a shoulder D^4 on chamber wall against which said block D^3 abuts, and block d^3 separating the lower portions of the bridge and chamber wall, in combination with the passages *d* and passages underneath the furnace, substantially as described.

2. In a recuperative tank furnace, the combination with combustion, batch and liquid metal chambers, of a perforated bridge wall and a solid tank wall separating the combustion and batch chambers, a floating bridge between the batch and fluid metal chambers, open air passages underneath the batch and liquid metal chambers communicating with vertical air passages in the bridge, an arched roof covering the chambers, a line of springer blocks supporting said roof and provided with openings, supports for said springer blocks located exterior to the lining wall of the furnace, and side flues and chimneys on either side of the floating bridge, substantially as described.

3. In a recuperative tank furnace, the combination of combustion, batch and liquid metal chambers, bridge and chamber walls separating the combustion and batch chambers, a floating bridge separating the batch and liquid metal chambers, an arched roof over the chambers, springer blocks supporting the roof, supports for the springer blocks exterior to the lining wall of the furnace, side flues piercing the wall of said springer blocks and located on either side of the floating bridge, and chimneys communicating with said side flues substantially as described.

4. In a recuperative tank furnace, substantially as described, the combination of combustion, batch and liquid metal chambers, a floating bridge between the batch and liquid metal chambers, an arched roof over the chambers, side flues and chimneys located on each side of the floating bridge whereby the draft can be excluded from either the batch or liquid metal chambers, substantially as described.

5. In a recuperative tank furnace, the combination of combustion, batch and liquid metal chambers, a bridge and chamber wall separating the combustion and batch chambers, vertical air passages in the bridge, and stools transversely grooved on their upper surfaces for free air circulation and located underneath the adjacent corners of the floor blocks, whereby continuous open air passages are formed communicating with the vertical passages aforesaid, substantially as described.

6. In a recuperative tank furnace, the combination of combustion, batch and liquid metal chambers, a bridge and chamber wall separating the combustion and batch chambers, vertical air passages in the bridge, and stools located underneath the adjacent corners of the floor blocks whereby continuous open air passages are formed communicating with the vertical passages aforesaid, substantially as described.

7. In a recuperative tank furnace, an arched roof F of low degree of curvature, springer

blocks J, perforated at R, as described, exterior supports G, upon which the springer blocks rest, and blocks I, connecting said blocks with the inner walls of furnace, substantially as described.

8. In a recuperative tank furnace, the combination of an arched roof F, supported independently of the furnace walls upon springer blocks resting upon exterior supports, a layer of detachable connecting blocks, between the springer blocks and inner wall, side openings through the springer blocks, for working holes, and flues leading to side chimneys, substantially as described.

9. The combination with a tank furnace of the floor blocks and the grooved supporting stools for the same; said stools being so located under said blocks that their grooves lie directly under the joints of the same, substantially as described.

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