(No Model.)

2 Sheets—Sheet 1.

J. ALTMEYER.

METALLURGICAL FURNACE.

No. 293,131. Patented Feb. 5, 1884.

Fig. 1.

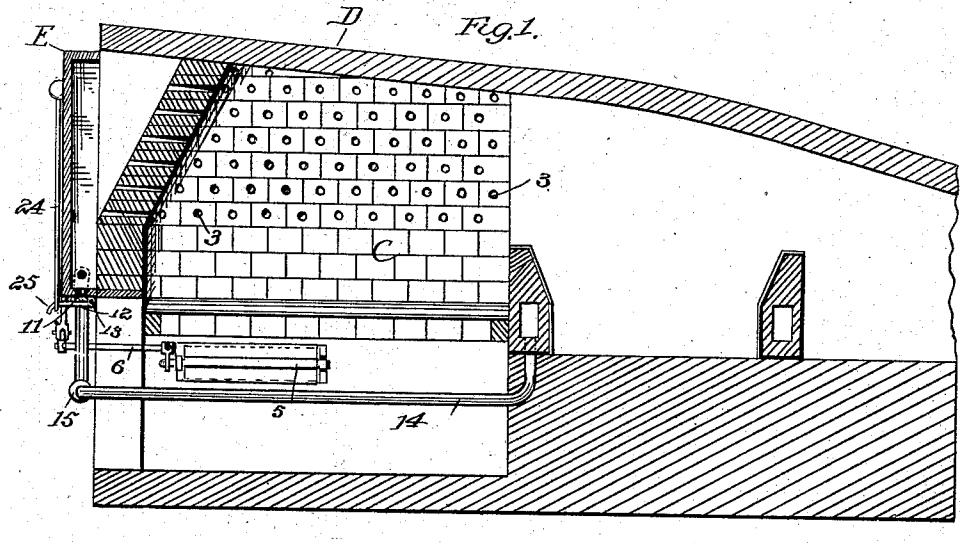
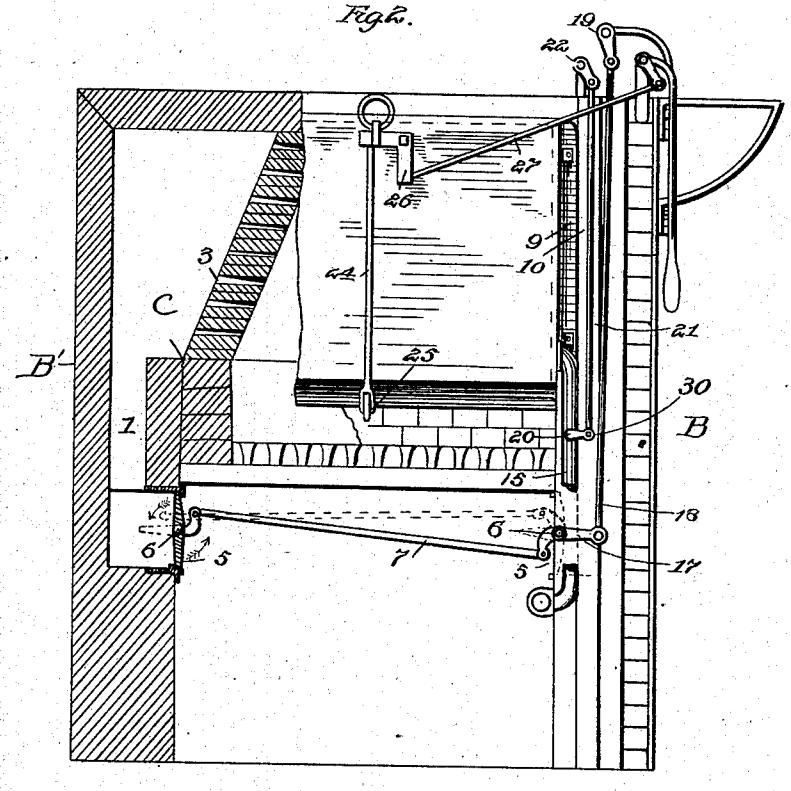


Fig. 2.



Attest:
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(No Model.) 2 Sheets—Sheet 2.

J. ALTMEYER.

METALLURGICAL FURNACE.

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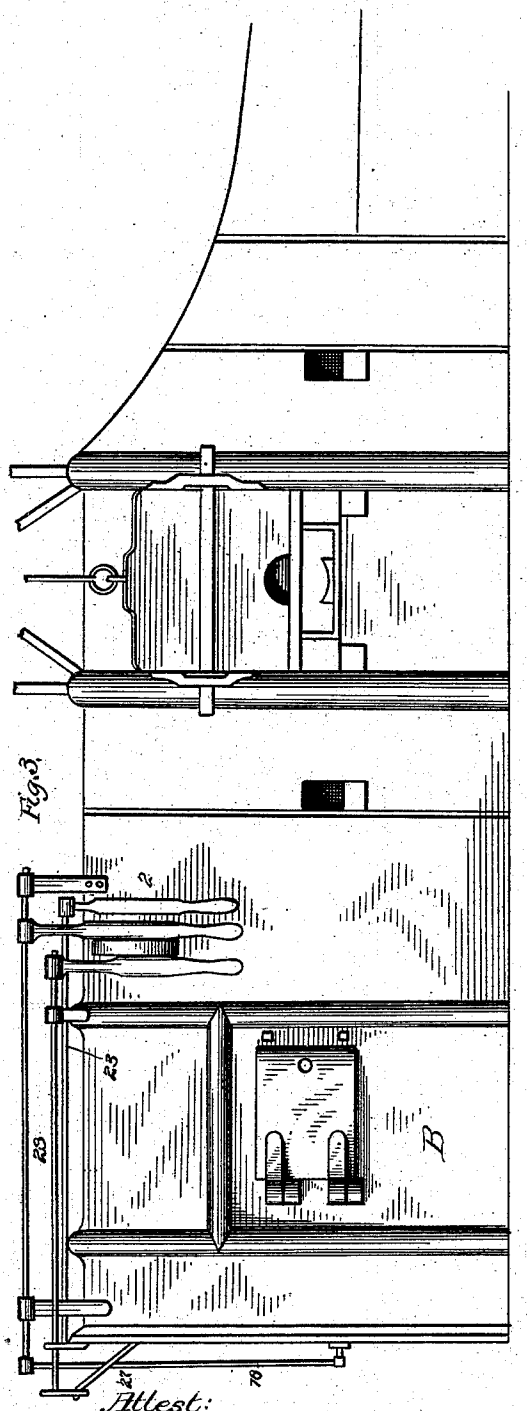

Fig. 3.

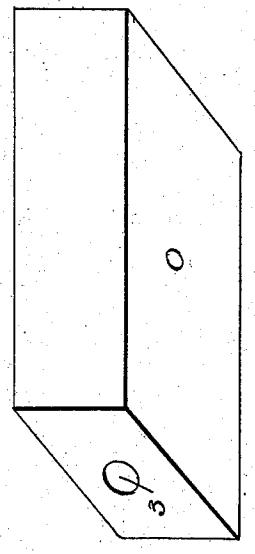

Fig. 4.

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UNITED STATES PATENT OFFICE.

JACOB ALTMEYER, OF BENWOOD, WEST VIRGINIA.

METALLURGICAL FURNACE.

SPECIFICATION forming part of Letters Patent No. 293,131, dated February 5, 1884.

Application filed March 21, 1883. (No model.)

To all whom it may concern:

Be it known that I, JACOB ALTMEYER, of Benwood, in the county of Marshall and State of West Virginia, have invented a new and useful Improvement in Metallurgical Furnaces; and I do hereby declare that the following is a full, clear, and exact description of the same.

My invention relates to furnaces, and is specially applicable to heating and puddling furnaces in the manufacture of iron, though in some respects is capable also of wider applications. It is an improvement upon the class of furnaces such as that shown in Letters Patent granted me on the 30th day of January, 1883, No. 271,393. In this patent I showed an invention in which I sought to effect a perfect combustion of the vapors distilling from the coal upon the grate by thoroughly intermingling with these vapors as they arose in the fire-chamber fine streams of, preferably, heated air, introducing the air by fine streams from every available direction. I thus consumed, under ordinary circumstances, all the combustible vapors and gases rising from the coal in the fire-chamber itself, or practically all of such vapors and gases, without permitting them to get over into the work-chamber to interfere with the operations therein; but for the more effectual carrying out of this operation under all circumstances I have found it necessary to provide some means for adjusting the proportions of oxygenizing air to the vapors and gases which are to be oxygenized. The amount of these vapors and gases necessarily varies with the variation in the condition of the fuel when stirred, or in different stages of combustion. These variations in the amount of vapors and gases evolved are not controllable. I have therefore sought to control the supply of oxygen, evenly distributed, as described, in the combustion-chamber, for the purpose of effecting the complete combustion of the vapors and gases at all times and under all circumstances. To this end I have connected the valves which control the supply of air to the air-chambers with a suitable lever or levers within the reach of the operator as he stands in front of the furnace, so that he may quickly and accurately modify the action of the air upon the fuel in the combustion-chamber without leaving his post of observation. In the second place, in order to adapt my apparatus to furnaces already completed without great and expensive changes, my invention consists of an iron air box or chamber adapted to be bolted to the end plates of the side walls of an ordinary furnace, and connected with suitable outside air-pipes, or provided with suitable outside air-openings and air-connections with the combustion-chamber. This box is also provided with dampers or valves in the air-supply pipes of the openings, and the dampers or valves, both in the boxes and in the furnace, whether such dampers or valves are at the end or upon the front and rear sides, are placed at the entrance of the air-chambers, and not at the openings from the chambers into the furnace.

It is necessary or desirable in my improved furnace, which requires the side air-chamber and numerous openings, to have inclined or arching side walls, and I use a form of brick having a longitudinal perforation or perforations to admit the air, and inclined ends, whereby the drip of the fused material off the brick may fall clear from the wall without running down to obstruct openings which may be below it.

I have shown my invention embodied in the furnace represented in the accompanying drawings, in which—

Figure 1 is a longitudinal section taken vertically through the center of the furnace. Fig. 2 is an end view of the furnace, partly broken away. Fig. 3 represents a front view. Fig. 4 is a separate view of the brick.

In these drawings, B represents the front, and B′ the rear, outer walls. The inner side walls are shown at C C, rising vertically to about the height of the bottom of the stoke-hole, and thence inclining inward until they reach the crown D of the furnace. This leaves hot-air chambers between the outer vertical walls, B B′, and the inner inclined walls, both at the front and back of the furnace, and these have connections with the interior combustion-chamber from the grate through the numerous small holes, 3, as shown in my patent. From these side chambers passages 1 lead vertically down to the air passage or passages that open into the ash-pit. The openings into the ash-pit are covered by valves or dampers 5 5, mounted upon pivotal rods 6 6,

that run lengthwise of the furnace, working in proper bearings. Only one of these rods need extend to the front for connection with operating mechanism on the outside, and the two valves or dampers are connected by a cross-rod, 7, whereby motion of one is communicated simultaneously to the other, the top of one opening inwardly and that of the other outwardly. The edges are beveled, as shown, so that they fit closely at the top and bottom. The position of these valves or dampers determines the amount of air which is to be admitted to the side chamber, and consequently the amount passing through the numerous holes into the combustion-chamber; but as the air is supplied, whether in greater or less quantity, to the heating-chambers, it is distributed uniformly through said chambers, and thence passes equally through all the holes in the inner wall and mixes uniformly with the vapors in the combustion-chamber. The valves or dampers I have here described may be applied without great change to ordinary furnaces already constructed, but not so easily to the end wall.

In order to adapt my invention to the end of the furnace, I omit or remove the outer end wall, and in place of such wall I substitute an iron box, E. This box may be cast in one piece with side flanges, 9, whereby it is bolted to the end plates, 10, of the side walls, by means of bolts passing through the flanges 9 and into threaded holes in the end plates. The box is closed except upon the inner face, which may open into the chamber. It extends from the top or crown of the furnace downward, forming a complete outer wall covering the inner or perforated wall and intermediate chamber. I provide it with holes 11 in the lower part, opening outward to the outer air, and over this is a hinged valve or damper, 12, turning up upon the shaft 13. Heated air from the fire-bridge box may be brought by pipes 14, entering at the ends of the box, and passing either inside of or outside of the wall, to the said iron box on the side of the furnace. In a boiling-furnace these pipes would be placed outside, but in any case may be led through the ash-pit. I provide the box E with these two sets of openings or passages for the air. I may use either one or the other, as I prefer, the pipes 14 being supplied with valves and operating mechanism, hereinafter described, whereby the air through them may be cut off or regulated at pleasure. When the pipes are arranged within the ash-box, they may be laid either above or beneath the dampers of the side chamber. As shown, I lead them through the ash-box below the dampers, and thence turn them upward vertically, as shown at 15, placing the valves in the vertical part, as at 30. The air thus admitted into the box E is heated by contact with the inner wall, and, in whatever amount supplied, passes uniformly through the holes 3, in the inner wall, commingling thoroughly with the vapors in the combustion-chamber.

In order to permit the operator to move at pleasure the side valves, 5, I place on the end of the rod 6, which projects to the front, a crank-arm, 17. This is connected by means of a rod, 18, and a crank-arm, 19, to a rod extending from the upper end of this crank-arm to the position of the attendant, where it is provided with a handle, as shown, by means of which he may readily operate both the side valves. In order to give him like control of the valve located in the vertical pipe 15, I provide the stem of this valve (shown in Fig. 2) with an arm, 20, and connect it by rod 21, which is connected by means of crank-arm 22 with a rod, 23, extending to the position of the attendant, and provided with a suitable handle, in the manner of the lever operating the valves 5 5.

The valve in the bottom of the box E is moved upon its pivot-rod 13 to open or close the openings in the bottom of the box by means of a rod, 24, secured to an arm, 25, projecting from the valve-plate; and this rod, through a bell-crank lever, 26, and rod 27, is connected to a rod, 28, extending to the position of the attendant, where it is provided with a suitable handle. I have also shown this rod 24 as provided with a ring or knob, by which it can be operated from that position.

By the means above described the operator, without moving from his place at the working-chamber, can control all the valves, and by observing the condition of the interior of the working-chamber can keep it clear under all circumstances.

The brick (shown at O) I make rectangular, with the hole running through the center of its length. The ends I bevel, as shown, so that whichever end is placed inward it inclines over the grate, and any melted material from the brick will drop, instead of running down to obstruct the hole below. It also enlarges the air-chambers.

In the application of this furnace to the manufacture of iron by means of the regulated air-supply in the combustion-chamber and its thorough mixture with the carbon vapors or unconsumed products of combustion, these products may be varied and modified as they pass over to the working-chamber, so as to adapt them to the metal in its different stages of treatment.

In a heating-furnace, where piles or blooms of muck-iron are heated, preparatory to reducing them for nail-plate or other purposes, the piles or fagots must be brought to a welding-heat. When so welded, they are removed by the workman successively and treated in their turn. Those remaining in the furnace are liable to two difficulties: first, if the furnace is continued in action with the same air-supply and the same draft, the iron remaining in the furnace and awaiting treatment is overheated and wasted. If the damper on the stack is closed and the air-supply unchanged, the working-chamber is filled with smoke,

which obscures the fagots or piles and renders the work of removal difficult, and at the same time the iron is cooled, hardened, and injured. With my furnace the damper in the stack may be closed when the fagots or piles are brought to a welding-heat and the supply of air maintained by increase of the valve-opening in the air-chambers, to compensate for the lessened draft due to the closing of the stack-damper. If this damper is closed and the draft lessened or cut off entirely, the indraft from the air-chambers is obviously diminished. This lessens the supply of air, and as the generation of vapors from the fuel continues there is an increase of unconsumed or unoxygenized carbon, which goes over to the working-chamber with the effect heretofore explained; but by increasing or rather maintaining the supply of air by increasing the air-supply openings, I practically maintain the consumption of the products of combustion and keep the working-chamber clear, and render the heat milder without liability to injury to the iron by reason of contact with the unconsumed carbon or other products of vaporization of the fuel. In a puddling-furnace the effect is practically the same. When the iron has come to nature and is ready to ball, a milder heat is desired in order to prevent the waste of iron. If the stack-damper be lowered and the air-supply valves unchanged, the lessened air-supply, due to diminished or obstructed draft, causes unconsumed products of combustion, which fill the working-chamber with smoke, so that the workman cannot see to ball the iron. The iron is also liable to harden and cool, so that the workman is compelled to raise again the stack-damper and increase or renew the draft; but by increasing the air-passages when the draft is diminished or cut off I maintain a milder heat, and so nearly consume the smoke that the working-chamber is left clear.

Obvious advantages arise from this construction, partly indicated above, which may be briefly stated or recapitulated: first, the furnace is smokeless; second, by first regulating the draft and avoiding smoke I get a superior quality of iron, specially adapted to the manufacture of nails, as well as other purposes, the iron being of finer grain, more nearly resembling steel; third, I consume less coal; fourth, in a puddling-furnace the yield of muck-iron from the pig is largely increased over the yield from an ordinary furnace; fifth, I save in the wear of fire-brick in the furnace fire-chamber, neck, and stack; sixth, the furnace works more rapidly, and the construction generally is such that with the use of my box I may change an ordinary furnace with very little cost, ordinarily not over fifty dollars.

I am aware that furnaces have been heretofore shown having air-chambers with openings leading into the combustion-chamber, and also having air-supply pipes with independent valves for supplying air above and below the grate.

Having thus described my invention, I claim—

1. In a furnace, an air-chamber on each side of the combustion-chamber having openings into said combustion-chamber above the fuel, air-passages leading from said air-chambers to the ash-pit, and valves at each opening in the ash-pit, connected to each other and to suitable operating mechanism, whereby air may be supplied to the two air-chambers, and thence to the combustion-chamber in regulated quantities, substantially as described.

2. The furnace having side chambers separated from the combustion-chamber by inclined perforated walls with valve-passages leading to the ash-pit, and an air-chamber composed of an iron box having flanges bolted to end plates on the end side walls and communicating to the fire-chamber through the perforated wall, air-pipes connecting said box with the heating-passage in the fire-bridge wall, and valves for regulating the supply of air through said pipes, the parts being constructed and arranged substantially as described.

3. The side walls of the furnace having perforations leading into the combustion-chamber, air-passages leading into the ash-pit, and a perforated end wall covered by a separate iron box having flanges, and bolted to the said wall, and suitable valves arranged and adapted to be operated substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

JACOB ALTMEYER.

Witnesses:
A. L. PELLEY,
JOSEPH MARPLE.