

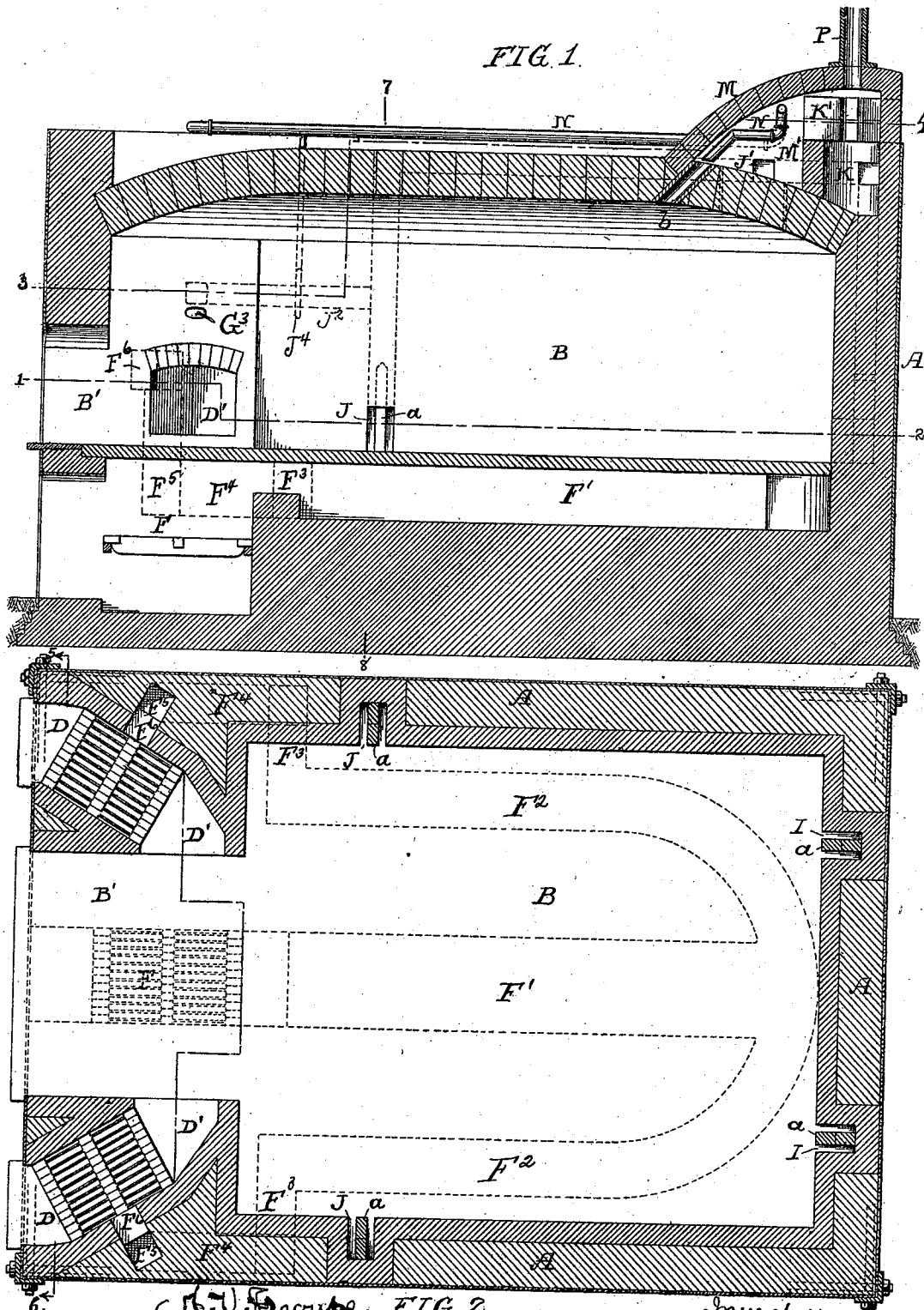
(No Model.)

3 Sheets—Sheet 1.

F. G. BATES.
METALLURGICAL FURNACE.

No. 502,167.

Patented July 25, 1893.



6. Witnesses { H. V. Grouse. FIG. 2.
R. Schleicher.

Inventor
Francis G. Bates
by his Attorneys ~~Houson~~ Houson

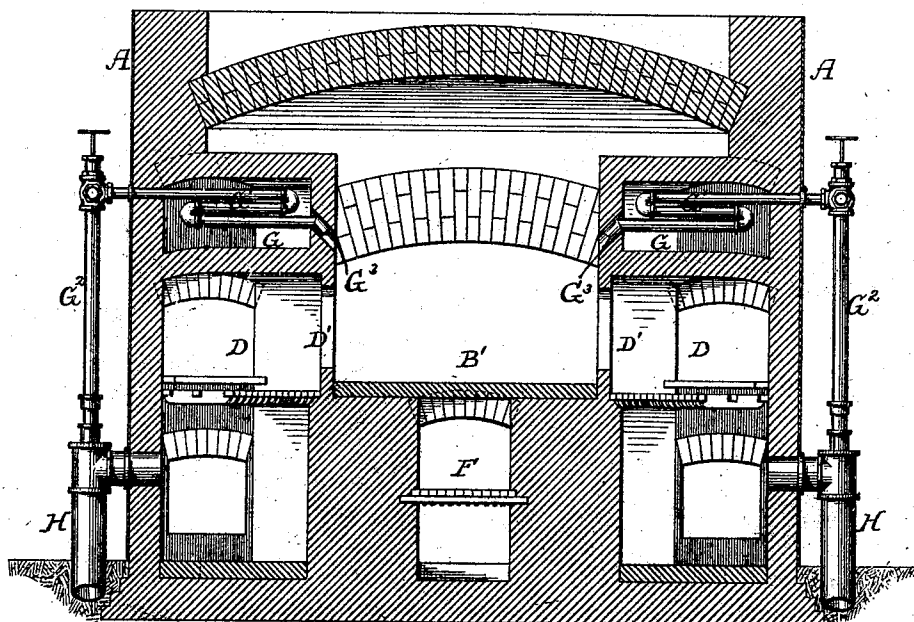
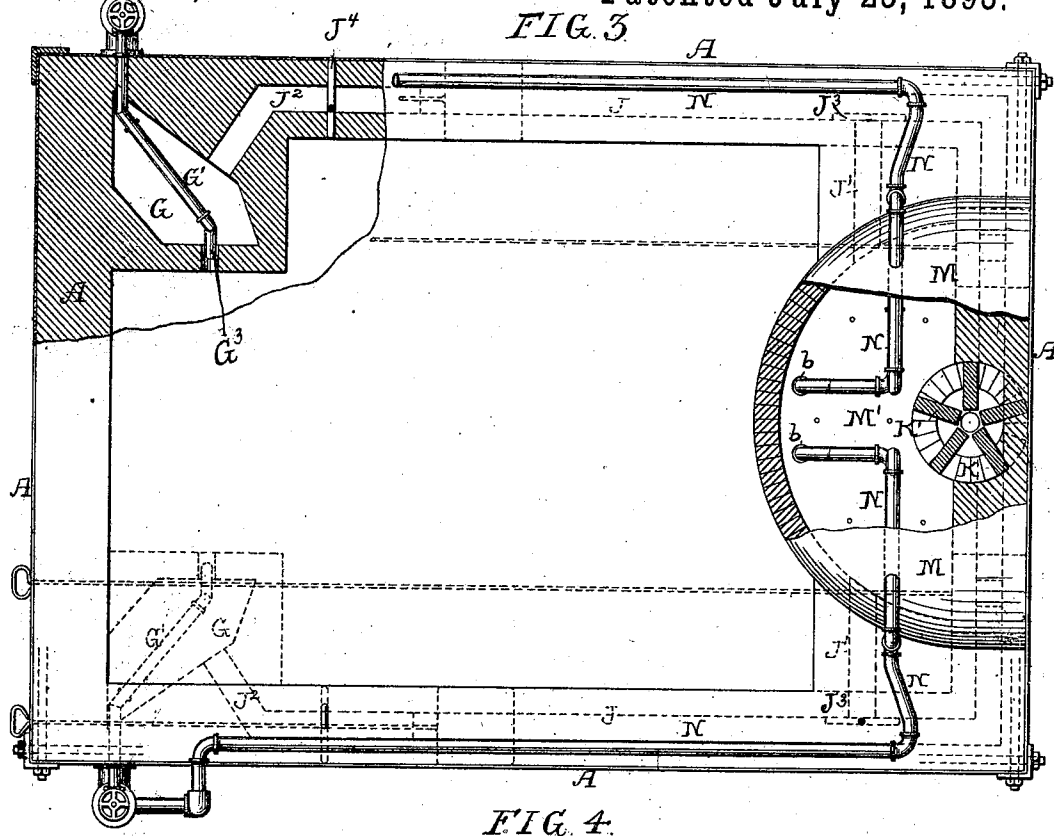
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Witnesses
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Inventor
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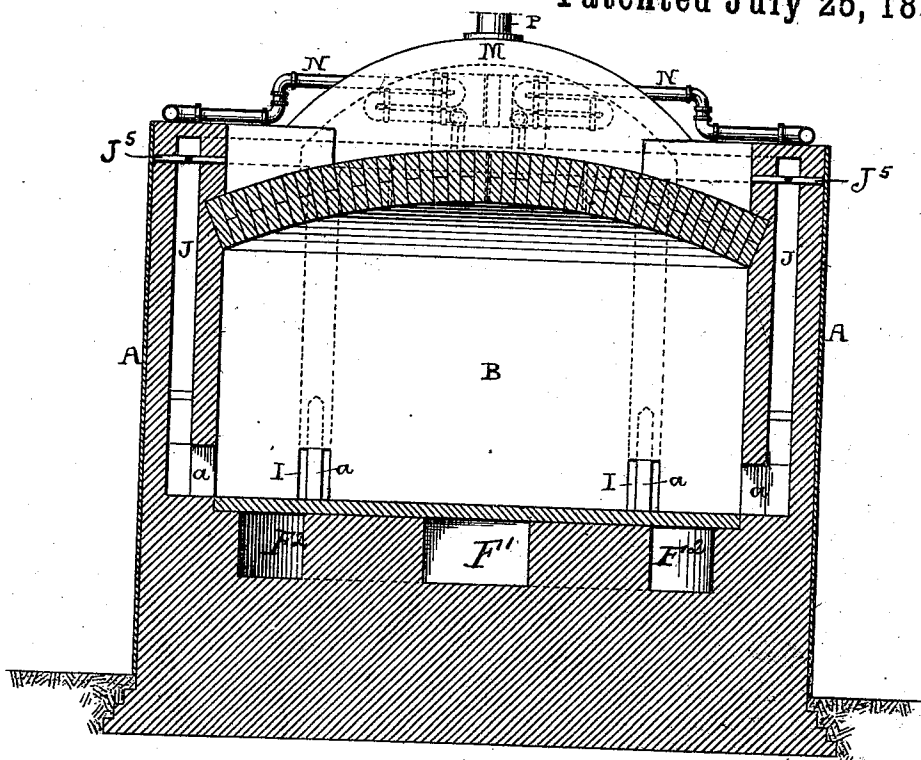


FIG. 5.

Witnesses
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R. Schleicher.

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UNITED STATES PATENT OFFICE.

FRANCIS G. BATES, OF PHILADELPHIA, PENNSYLVANIA.

METALLURGICAL FURNACE.

SPECIFICATION forming part of Letters Patent No. 502,167, dated July 25, 1893.

Application filed March 26, 1891. Serial No. 386,415. (No model.)

To all whom it may concern:

Be it known that I, FRANCIS G. BATES, a citizen of the United States, and a resident of Philadelphia, Pennsylvania, have invented certain Improvements in Metallurgical Furnaces or Ovens, of which the following is a specification.

My invention relates to metallurgical furnaces such as are employed for heating or reheating metals or for the melting or puddling of the same, and to converting ovens and the like, the object of my invention being to so construct such a furnace or oven as to provide for the effective combustion of the gases arising from the fuel, and to produce and maintain an intense heat in the working chamber of the furnace. This object I attain in the following manner reference being had to the accompanying drawings, in which—

Figure 1, is a longitudinal section of my improved metallurgical furnace or oven. Fig. 2, is a sectional plan view of the same, on the line 1—2, Fig. 1. Fig. 3, is a plan view partly in section on the line 3—4, Fig. 1. Fig. 4, is a transverse section on the line 5—6, Fig. 2; and Fig. 5, is a transverse section on the line 7—8, Fig. 1.

A represents the outer wall or casing of the furnace within which is the working chamber B, access to which may be had in any convenient manner, as for instance, through an arched opening or passageway B', at the front of the furnace as shown in Figs. 1 and 2, or through suitable openings at the sides of the furnace, as in an ordinary heating or puddling furnace.

At each of the front corners of the furnace is a fire place D, preferably inclined toward the center of the furnace, each of these fire places communicating through a short lateral passage D' with the arched passage B' and thence with the working chamber B of the furnace.

At the center of the front portion of the furnace and in a plane below that of the corner fire places D and also below the floor or bottom of the working chamber B of the furnace is a third fire place F, the products of combustion from which pass beneath the bottom of the furnace chamber B first rearwardly through a flue F' to the rear end of the furnace and then forwardly through flues F² on

each side to a position adjacent to the corner fire places D where they are deflected through flues F³ into flues F⁴ in the side walls of the furnace and rise through flues F⁵ on the outer sides of the corner fire places until they reach a point above the level of the fuel in said fire places, whereupon they discharge through flues F⁶ into the corner fire places, or rather into the combustion chambers formed in the upper portions of said fire places, the unconsumed products of combustion from the lower central fire place being thus re-ignited and consumed in their passage through the working chamber of the furnace.

Above each of the fire places D D is a chamber G closed except for a gas inlet, referred to hereinafter, and a downwardly inclined communication with the passage B' leading into the working chamber of the furnace and within each of these chambers G is located a coiled pipe G' which serves to supply air from a branch G² of the blast pipe H which supplies the forced draft for the fire place D. The delivery end of this coiled pipe is bent downward at an angle and extends part way through the opening or passage, G³ whereby the chamber G communicates with the passage B'. When the blast of air passes through the coil G', therefore, and is discharged from the end of the same a partial vacuum is created in the chamber G, so as to induce a flow of heated gases into the same as hereinafter set forth.

The furnace has two outlet flues I I at the rear, one near each corner of the chamber B, and also two side outlet flues J J near the front end of said chamber, but I find it preferable to divide the lower or inlet end of each of these outlet flues by means of a central slab or tile a so as to provide each flue with two contracted mouths meeting at a short distance above the inlet, thus providing for a quick indraft of gases into the flues and a slower flow of said gases along the flues. By reason of the separation of the fire places at the front end of the furnace, the separation of the outlet flues at the rear end of the furnace and the use of the side outlet flues communicating with the front portion of the working chamber, the passage of the products of combustion through, or their disposal in said working chamber can be readily governed;

for instance, if the dampers in the flues I are open and the dampers J³ in the flues J are closed, the products of combustion from the furnaces D, on entering the heating chamber will have a tendency to converge, and after meeting in the center of said chamber, will diverge, a portion escaping through one flue I, and a portion through the opposite flue.

If it is desired to modify the tendency of the products of combustion to converge, this may be done, and said products may be caused to spread more evenly throughout the width of the heating chamber by opening the dampers in the side flues J, which thus tend to draw a portion of the products of combustion laterally in the front portion of the working chamber.

On the roof of the furnace, at the rear end of the same, is a dome M containing a short chimney K and inclosing a chamber M', a portion of the products of combustion rising through the chimney being discharged into this dome which may also, if desired, receive the products of combustion from the side flues J J through short lateral passages J' controlled by suitable dampers J³. The side flues J also have branch flues or passages J² communicating with the chambers G and provided with dampers J⁴, so that when desired, a portion of the gases from the chamber B can be directed into said chambers G and then ejected therefrom by the heated jets from the pipes G', the hot air mixing with the gases in their discharge.

Extending downwardly at an angle from the front of the dome into the working chamber of the furnace are passages b which receive the discharge ends of air pipes N communicating with the branches G² of the blast pipes H, the jets thereby formed serving to return to the working chamber of the furnace the products of combustion which enter the chamber M' of the dome, the air being also mixed with these products of combustion so as to regenerate the same and cause their ignition when they again enter said working chamber.

Mounted on the short chimney K are a series of internally projecting slabs or blocks K' which closely approach at their inner ends, and form a central contracted flue, through which a portion of the products of combustion can rise directly to the contracted discharge stack P mounted on the dome, the remaining portions of the products of combustion escaping through the openings between the slabs into the chamber M' of the dome, and being thence returned into the working chamber of the furnace.

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

1. The within described heating furnace or oven having at the front separate fire places discharging into the working chamber, exit flues at the rear of said working chamber, and side flues communicating at their front ends with said working chamber at points adjacent

to the front fire places, and at their rear ends with the outlet flue, substantially as specified.

2. The within described heating furnace or oven, having at the front opposite side fire places, and a central fire place in a lower plane, the side fire places communicating directly with the working chamber, but the central fire place communicating with said chamber through flues located beneath the floor of the chamber and discharging directly into the products of combustion from the side fire places, substantially as specified.

3. The combination in a metallurgical furnace or oven, of the working chamber, the side fire places arranged to discharge their products into said working chamber, a central fire place in a lower plane than said side fire places, and flues extending from said central fire place, first rearward and then forward beneath the bottom of the working chamber, then upward through the side walls of the side fire places to a point above the fuel therein, and then laterally into said side fire places so as to discharge directly into the products of combustion arising from the fuel in said fire places, substantially as specified.

4. The combination in a metallurgical furnace or oven, of the working chamber, fire places at the front end of the same, and outlet flues having bottom inlets communicating with the working chamber, and provided with slabs or blocks so as to divide and contract the mouths of said flues, substantially as specified.

5. The combination in a metallurgical furnace or oven, of a working chamber having side outlets, fire places at the front of the furnace communicating with said working chamber, chambers above said fire places, air heating pipes located in said chambers, and communications between said chambers and the side outlets of the working chamber, said chambers having contracted outlets through which the air heating pipes discharge so as to induce a flow of gases into and through said chambers, substantially as specified.

6. The combination in a metallurgical furnace or oven, of the working chamber, fire places at the front end of the same communicating with said chamber, a dome surmounting said working chamber at the rear end, outlet flues for the products of combustion leading from said working chamber to the dome, the chimney communicating with said dome, passages leading from the dome into the upper portion of the working chamber, and an air pipe forming a heating coil in said dome, and discharging into said passage so as to cause the return of a portion of the products of combustion mixed with hot air, into said working chamber, substantially as specified.

7. The combination in a metallurgical oven or furnace, of a working chamber, a front fire place communicating therewith, a dome surmounting the working chamber at the rear end, exit flues for the products of combustion, communicating with the chimney and also

with the heating chamber within the dome, a passage leading from the dome into the upper portion of the working chamber, and an air jet pipe discharging into said passage, and causing a return flow of the products of combustion into and through the dome chamber, and thence back into the working chamber, substantially as specified.

8. The combination in a metallurgical oven or furnace, of the working chamber, the fire place, the dome surmounting the working chamber at the rear end of the furnace, the discharge stack on said dome, the short smoke chamber communicating with the exit flues

of the working chamber, inwardly projecting slabs inclosing a central flue at the top of said smoke chamber, but having spaces between them, a passage through which the dome chamber communicates with the working chamber, and an air jet pipe discharging into said passage, substantially as specified.

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

FRANCIS G. BATES.

Witnesses:

WILLIAM D. CONNER,
HARRY SMITH.