No. 750,022. PATENTED JAN. 19, 1904.

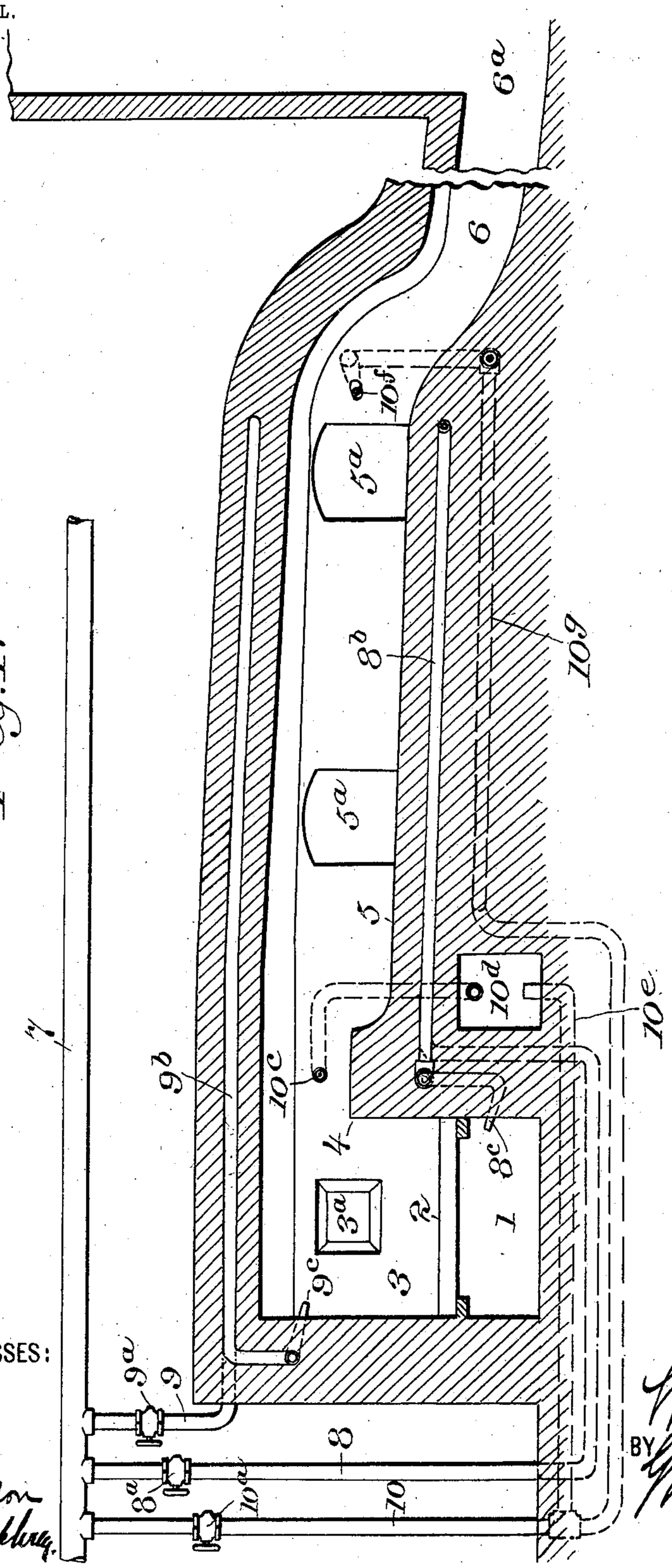
W. S. DEMPSEY.

METALLURGICAL FURNACE.

APPLICATION FILED DEC. 8, 1902.

NO MODEL. 2 SHEETS—SHEET 1.

Fig. 1.



WITNESSES:

J. E. Pearson

W. H. Pumphrey

INVENTOR

W. S. Dempsey

BY

Geo. H. Strickland

ATTORNEY

No. 750,022. PATENTED JAN. 19, 1904.

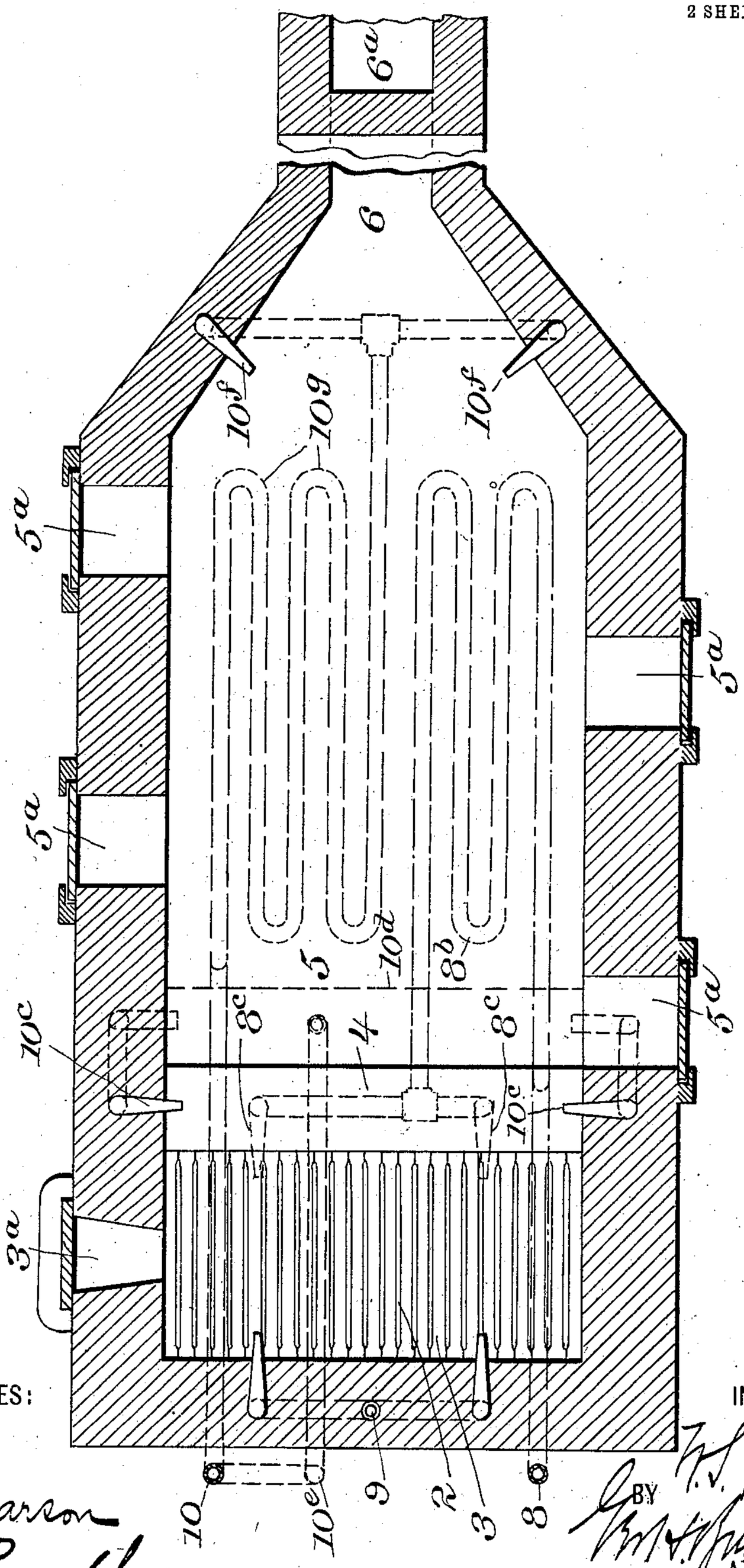
W. S. DEMPSEY.

METALLURGICAL FURNACE.

APPLICATION FILED DEC. 8, 1902.

NO MODEL. 2 SHEETS—SHEET 2.

Fig. 2.



WITNESSES:

J. E. Pearson

N. H. Humphrey.

INVENTOR

W. S. Dempsey

BY

A. Freeman

ATTORNEY

No. 750,022. Patented January 19, 1904.

UNITED STATES PATENT OFFICE.

WILLIAM S. DEMPSEY, OF NEW YORK, N. Y.

METALLURGICAL FURNACE.

SPECIFICATION forming part of Letters Patent No. 750,022, dated January 19, 1904.

Application filed December 8, 1902. Serial No. 134,264. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM S. DEMPSEY, a citizen of the United States, residing at New York city, county and State of New York, have invented certain new and useful Improvements in Metallurgical Furnaces, of which the following is a specification.

My invention relates to metallurgical furnaces, and more particularly to means for delivering and distributing air in sufficient quantity and at proper points to supply the oxygen necessary for the complete combustion of the gases in the working chamber, the object being to obtain increased efficiency and effect greater economy in the consumption of fuel.

In the practical embodiment of my invention I provide, first, for the rapid reduction of the fuel and disengagement of the gases by delivering blasts of preheated air from points beneath the grate and direct the same upward through the mass of incandescent fuel toward the side wall or in opposition to the outgoing current of gases to produce immediate and effective diffusion. For the continued combustion of the half-burned hydrocarbureted gases above the fire additional blasts of heated air are delivered from suitable points in the front, rear, and side walls of the combustion-chamber, and as the air is discharged in fine jets an intimate mixture with the gases follows before the temperature of the carbon thereof is reduced below the point of ignition. The blasts from the side wall of the furnace drive the gases from the combustion-chamber into the working chamber, and the cross-blasts from the front and rear walls in being directed transversely through the outgoing current tend to break it up, and the air rapidly mixes with the heated gases in such proportions as to effect practically their complete combustion in the working chamber. To insure, however, against the escape of any unconsumed heat-giving products and at the same time render the combustion smokeless, I provide a final series of blasts adjacent to the chimney-flue and direct the same at a suitable angle to check the outflowing current and mingle with the gases to complete their combustion before they enter the chimney.

One embodiment of the invention is illustrated in the accompanying drawings, throughout the several views of which like numerals of reference indicate corresponding parts.

In the drawings, Figure 1 is a longitudinal sectional view illustrating the application of my invention to a well-known type of metallurgical furnace, and Fig. 2 is a horizontal sectional view thereof.

Referring to the drawings, an ordinary heating-furnace is shown, 1 indicating the inclosed ash-pit; 2, the grate; 3, the fuel-chamber, which is charged through the stoke-hole 3^a in the front wall; 4, the bridge dividing the fuel or combustion chamber and the working chamber; 5, the hearth, to which the material to be heated is entered through protected openings 5^a 5^a 5^a, &c., in the front and rear walls, and 6 the flue leading to the chimney 6^a. The hearth is arched over in the usual manner, so that the heat will be radiated from the arch upon the metal.

From a pipe 7, leading from a suitable source of supply, (not shown,) air under pressure is delivered to pipes 8, 9, and 10, each of which is provided with a valve 8^a 9^a 10^a for regulating the supply to the furnace. The air from pipe 8 is given a preliminary heating by being passed through a flat coil 8^b, embedded beneath the hearth, and is discharged from two or more blast-pipes 8^c 8^c, projecting from the bridge-wall into the inclosed ash-pit. These jets or blast-pipes are preferably given an upward inclination to direct the air through the grate-bars toward the side or end wall of the furnace, so as to distribute the same more effectively throughout the mass of fuel and render the combustion uniform over the entire grate-surface. By means of the valve 8^a the delivery of the air for these blasts may be varied as required. The pipe 9 is connected in a similar manner with an air-heating coil 9^b, extending above the furnace, and which may be either embedded in the brickwork or supported thereon and protected by a covering of non-heat-conducting material. The air from this coil is delivered to two or more jet or blast pipes 9^c 9^c, the same being preferably given a slight downward inclination to dis-

charge the air toward the bridge and drive the gases from the combustion-chamber into the working chamber. These blasts may be regulated by means of the valve 9^a. The pipe 10 is connected to supply two series of cross jets or blasts located, respectively, at points above the bridge and adjacent to the chimney-flue. The blasts 10^e 10^e are delivered, preferably, from opposite points in the front and rear walls of the furnace in the plane of the bridge a suitable distance above the same and are supplied from an air-heating box or chamber 10^d, located at one side of the bridge beneath the hearth and from which there is a connection 10^e with the supply-pipe 10. The second series of blasts 10^f 10^f, located at opposite points in the front and rear walls near the chimney-flue, are supplied from pipe 10 through an interposed heating-coil 10^g, embedded beneath the hearth. The supply for these two series of blasts may be regulated by means of the valve 10^a.

As the operation will be generally understood from the foregoing description, I will describe the same briefly. In operating a furnace of the construction described it is first charged in the usual manner with gas-producing coal, and after a portion of the fuel has been raised to a state of incandescence the air for continuing the combustion is admitted at points beneath the grate from a series of blasts discharging into the inclosed ash-pit. These blasts are inclined so as to impinge upon and mix intimately with the mass of incandescent fuel upon the grate. The force of the blast through the fuel directed toward the side or end wall of the furnace in opposition to the outgoing current acts beneficially in promoting the intermixture of the combustible gases generated prior to their meeting with the supply of air for combustion at the entrance to the heating or working chamber. As both efficiency and economy depend largely upon generating the heat in the locality where it is to be absorbed—that is, in contact practically with the material to be heated—the gases in the combustion-chamber are driven into the heating-chamber by the force of the blasts 9^c 9^c, &c., controlled by the valve 9^a. By means of the cross-blasts at the bridge an additional supply of air is admitted, which tends to break up the outgoing current of gases and rapidly mixes with the same in such proportions as to effect their complete combustion in the working chamber. To prevent the escape of any unconsumed combustible matter which may be carried along with the products of combustion, the flow is checked by the cross-blasts at the entrance to the chimney-flue, and the combustion is thus rendered complete by the resulting diffusion of air, the spent gases passing off through the chimney.

The main advantages of the invention consist, first, in a material saving in the consumption of fuel as a result of the united economy derived from the use of heated air and the regulation of the supply to that which is consumed in effecting complete combustion, and, second, to an increase in efficiency resulting from the facility for generating the most intense heat in the working chamber or in the locality where it is to be absorbed.

It will be understood that I do not wish to limit myself to the exact construction and arrangement shown, as various changes may be made without departing from the spirit and scope of my invention. For example, the invention may be readily applied to other types of furnace and steam-jets substituted for the blast-pipes, it being immaterial whether air or steam is employed. Other means may be employed for heating the air, or the coils might be differently arranged. The number of valves might be increased to provide one for each blast-pipe, or by changing the connections the number of valves employed might be reduced. Spraying-nozzles might be substituted for those shown, &c.; but all such modifications I consider obvious and immaterial variations of form and not of substance and still within the meaning of the present invention.

Having therefore described my invention, I claim—

1. In a metallurgical furnace the combination, of a working chamber and a combustion-chamber opening into the same, oppositely-disposed blast-pipes below and above the grate in the combustion-chamber, the blasts above the grate being arranged to drive the gases generated toward the working chamber and the blasts below the grate being directed angularly in an opposite direction to those above the grate, and cross-blasts within the working chamber directed from the opposite sides of said chamber and backward toward the combustion-chamber.

2. In a metallurgical furnace the combination, of a working chamber and a combustion-chamber opening into the same, oppositely-disposed blast-pipes below and above the grate in the combustion-chamber, the blasts above the grate being arranged to drive the gases generated toward the working chamber and the blasts below the grate being directed angularly in an opposite direction to those above the grate, and cross-blasts within the working chamber directed from the opposite sides of said chamber and backward toward the combustion-chamber together with a source of air-supply and means for preheating the air for the blasts.

3. In a metallurgical furnace the combination, in a heating-furnace, of a working chamber and a combustion-chamber opening into the same, oppositely-disposed blast-pipes below and above the grate in the combustion-chamber, the blasts above the grate being ar-

ranged to drive the gases generated toward the working chamber and the blasts below the grate being directed angularly in an opposite direction to those above the grate, and cross-blasts at opposite ends within the working chamber directed from the opposite sides of said chamber and backward toward the combustion-chamber, together with a source of air-supply, heating-coils interposed between the source of supply and the various blast-pipes and means for regulating the delivery of air.

In testimony whereof I affix my signature in the presence of two witnesses.

WM. S. DEMPSEY.

Witnesses:

J. E. PEARSON,

FRANK O'CONNOR.