

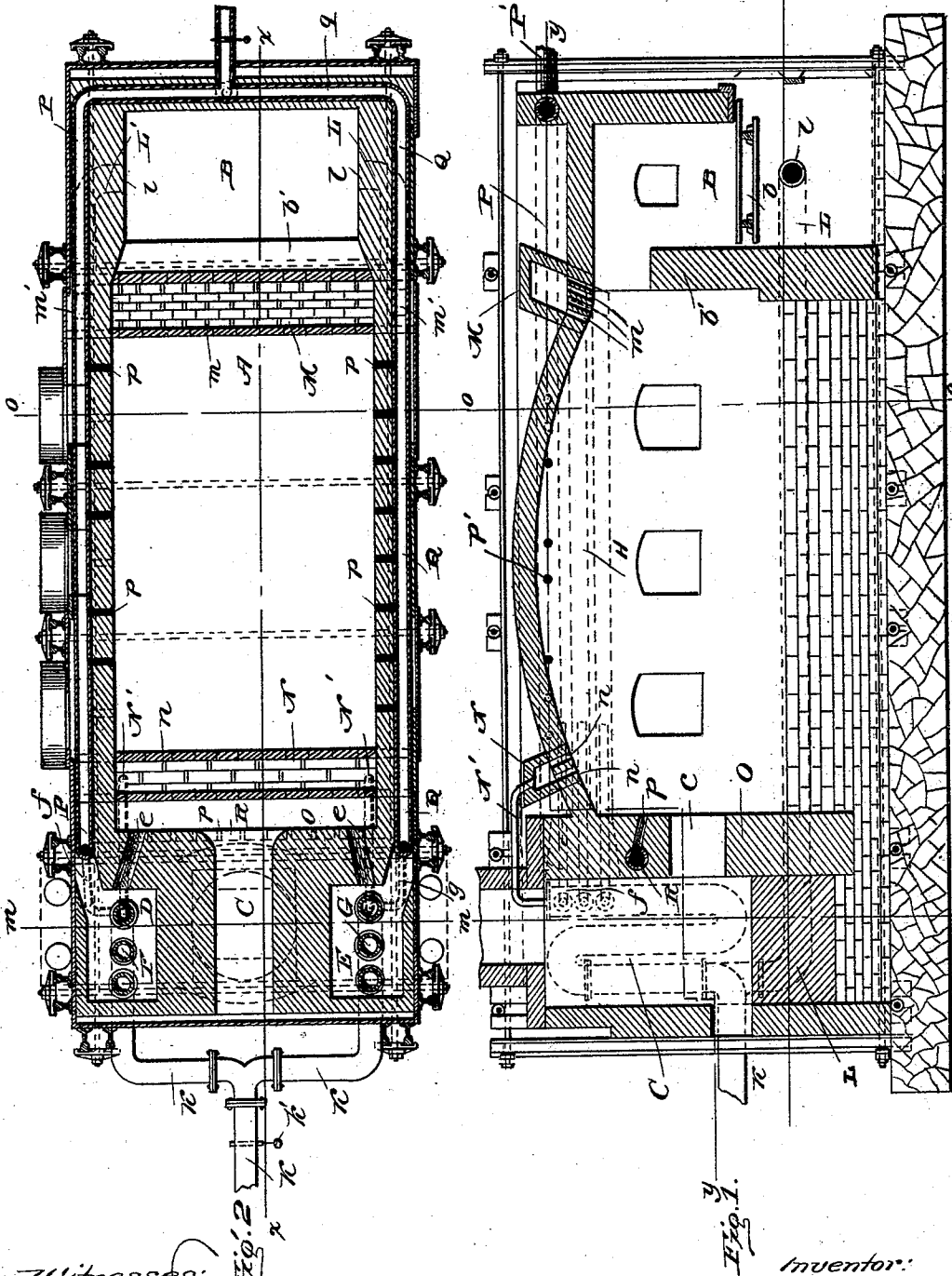
(No Model.)

2 Sheets—Sheet 1.

W. STUBBLEBINE.
METALLURGICAL FURNACE.

No. 498,089.

Patented May 23, 1893.



Witnesses:

J. M. C. Sullivan
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Inventor:

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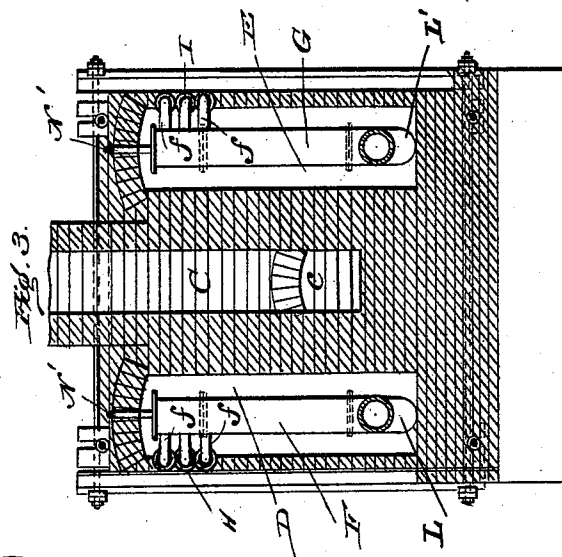
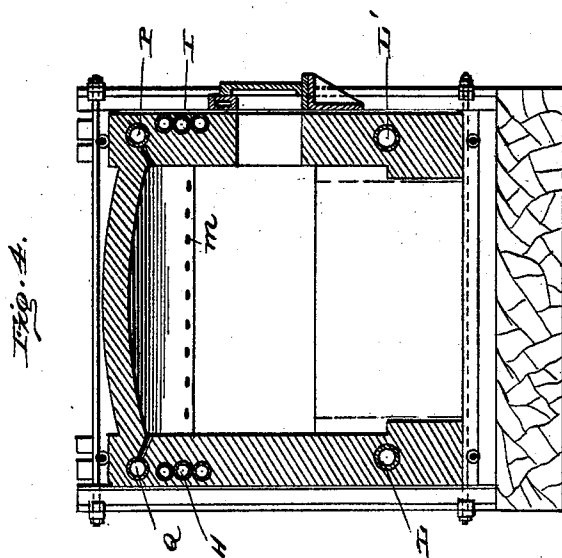
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2 Sheets—Sheet 2.

W. STUBBLEBINE.
METALLURGICAL FURNACE.

No. 498,089.

Patented May 23, 1893.



Witnesses

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UNITED STATES PATENT OFFICE.

WILLIAM STUBBLEBINE, OF BETHLEHEM, ASSIGNOR TO THE STUBBLEBINE FURNACE COMPANY, OF PHILADELPHIA, PENNSYLVANIA.

METALLURGICAL FURNACE.

SPECIFICATION forming part of Letters Patent No. 498,089, dated May 23, 1893.

Application filed October 10, 1892. Serial No. 448,403. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM STUBBLEBINE, a citizen of the United States, residing at Bethlehem, in the county of Northampton and State of Pennsylvania, have invented certain new and useful Improvements in Metallurgical Furnaces; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

The present invention is an improvement in reverberatory furnaces adapted for use as a heating, puddling, open hearth or other forms of metallurgical furnaces; and it is more particularly designed as an improvement on the furnace of the class forming the subject of United States Letters Patent No. 456,663, issued to me on the 28th day of July, 1891.

The object in view is to attain the more perfect utilization and combustion of the waste heat and gases from the working or puddling chamber of the furnace, and to control the blast and heat supplied to the primary grate or combustion chamber by means of a single valve so situated as to be easily manipulated by the workman. In this instance, I combine with a working chamber, an uptake, and a grate chamber, a series of heating chambers situated on opposite sides of the uptake and communicating with the rear part of the working chamber, heating coils in each of said chambers, a single blast-pipe having its branches coupled to the heating coils and provided with a regulating valve, and independent blast pipes extending longitudinally within the side walls of the furnace and each pipe coupled at one end to the heating coils and a branch of the blast pipe, the opposite ends of said longitudinal blast pipes opening into the grate chamber.

My invention further consists in the combination with a working chamber and an uptake, of heating chambers situated on opposite sides of the uptake and communicating with the rear part of said working chamber, mixing flues extending longitudinally within the sides of the furnace and communicating at one end, with said heating chambers, heating coils in said heating chambers and discharging into the mixing flues, a discharge

chamber situated above the working chamber, near the bridge wall, connected with the longitudinal mixing flues, and provided with discharge openings into the working chamber, and another discharge chamber situated above the rear part of said working chamber, provided with openings in its bottom, and having direct connection with air heating coils.

My invention further consists in the combination with a working chamber and an uptake, of heating chambers situated on opposite sides of the uptake and communicating with the working chamber, heating coils in said heating chambers, discharge chambers extending transversely across the working chamber and provided with passages which open into said working chamber, mixing flues extending longitudinally within the sides of the furnace and connected at their rear ends with said heating chambers and with the heating coils therein, and discharging at their front ends into one of the discharge chambers, and a connecting pipe between the other discharge chamber and the heating coils.

Another improvement which I have made consists in the combination with a working chamber and its rear flue wall, of side pipes extending longitudinally within the sides of the furnace and provided with lateral outlets which discharge into the working chamber at the upper side thereof, a valved supply pipe coupled to the front ends of the side pipes, and a transverse pipe in the rear flue wall, connected to the rear ends of the side pipes, and having outlets which open into the working chamber.

The accompanying drawings fully illustrate my improved furnace, in which—

Figure 1 is a vertical longitudinal sectional view on the plane indicated by the dotted line $x-x$ of Fig. 2. Fig. 2 is a horizontal sectional view on the plane $y-y$ of Fig. 1. Fig. 3 is a vertical cross sectional view on the line m, m of Figs. 1 and 2, and Fig. 4 is a similar sectional view on the line $o-o$ of Figs. 1 and 2.

Like letters of reference denote like parts in all the figures of the drawings.

In said drawings, A is the puddling or working chamber of my metallurgical furnace.

B is the primary combustion chamber situ-

ated at the front end of the furnace, and C is the central uptake at the opposite rear end of the furnace and communicating with the working or puddling chamber A by the usual neck *c*.

The combustion chamber B is provided with the usual grate *b*, but any kind of carbonaceous or hydrocarbon fuel can be supplied and consumed in this chamber, the heat and gases resulting from such combustion being discharged over the bridge wall *b'* directly into the working chamber.

At the rear end of the furnace, and on opposite sides of the uptake C thereof, are the two heating chambers D, E, each of which communicates with the rear part of the working or puddling chamber, A, by means of the passages *e* so as to receive a part of the waste heat and gases from said working or puddling chamber and which are utilized, partially, to heat the heating coils F, G, and to be drawn into the mixing flues H, I, the latter extending longitudinally of the furnace to convey such waste heat and gases back to the front of the furnace, either into gas chambers or directly into the front of the working or puddling chamber. The air-heating coils F, G, are arranged in vertical positions in the heating chambers D, E, and each air-heating coil has a series of jet pipes *f*, *g*, which lead from the upper part of their respective coils and extend a short distance in the rear part of the longitudinal mixing flues, the jet pipes *f* of the heating coil F discharging into the series of flues or pipes H and the other series of pipes *g* of the coil G discharging into the other series of mixing flues I, as shown in the drawings.

The air blast is supplied to the heating coils F, G, by a single blast pipe K provided with the branches *k*, *k*, which pass through the rear end wall of the furnace and connect with the lower ends of said coils F, G, as shown by Figs. 1 and 2; and said blast pipe K is further provided with the single gate or valve *k'* by adjusting which the volume of air admitted to the heating coils and pipes can be regulated.

The blast of air to the primary combustion chamber C is supplied by means of the pipes L, L', which extend through the side walls of the furnace, longitudinally of the same. Each of said internal blast pipes L, L', is connected at the rear end to the lower part of the heating coil, and about the point where the branch *k* of the blast pipe K is connected to said coil, so that the pipes L, L', receive a portion of the air blast supplied by the pipe K to the heating coils. The front ends of the internal blast pipes L, L', terminate in ports *l* on opposite sides of the primary combustion chamber C, and as the air blast passes through these pipes or flues L, L', it is heated and discharged in such condition into the primary combustion chamber, at any suitable point therein, as for instance below the grate *c*, see Figs. 1 and 2.

M, N, are two discharge chambers situated on the top or roof of the furnace, over the working or puddling chamber therein. The gas chamber M lies over the front part of the working chamber, near to the bridge wall *c'*, and in its lower or bottom side said chamber has a series of openings *m* which extend through the roof of the puddling or working chamber to discharge into said working chamber. The front ends of the longitudinal mixing flues H, I, open through the ports *m'* into the front discharge chamber M, at opposite ends of the same; and thus the heated air and gases receive from the heating chambers D, E, and the air blast from the heating coils, which are commingled in the mixing flues and heated during their passage through said flues, are discharged through the ports *m'* into the discharge chamber M and thence through the openings *m* into the working chamber. The other elevated discharge chamber N is located in front of the rear flue wall at the neck of the furnace, and this chamber N receives air from the air heating coils F, G, through the pipes N', N'. Said chamber N is also provided in its lower side with the series of discharge openings *n* that extend through the roof of the working chamber, whereby the heated air received by the chamber N from the air heating coils F, G, are discharged into the rear part of the working chamber A. These two discharge chambers M, N, extend transversely across the chamber of the furnace, and they serve as the convenient means for discharging the heated gases and air of the mixing flues and air heating coils into the working chamber.

I have also provided means for admitting heat to the upper part of the working chamber at different points along its two side walls and the rear flue wall O of the furnace. This means consists of the longitudinal pipes P, Q, which are arranged in the side walls of the furnace, and the transverse pipe R in the rear flue wall O thereof, each of these pipes being provided with a series of transverse passages *p*, which extend through the furnace walls into the working chamber. The transverse discharge pipe R connects with the ends of the side pipes P, Q, at the rear part of the furnace, and it lies a sufficient distance above the neck and flues *d* in the rear flue wall. The front ends of the side pipes or flues P, Q, are coupled by a pipe *q* in the front end wall of the furnace, and to this pipe *q* is coupled the supply pipe P' having a gate or valve therein.

Having thus fully described my invention, what I claim is—

1. In a furnace, the combination, with a working chamber, an uptake, and a grate chamber, of the heating chambers situated on opposite sides of the uptake and communicating with the rear part of the working chamber, the heating coils in each of said heating chambers, the single blast-pipe K having its branches coupled to the heating coils and pro-

vided with a regulating gate k' , and the independent blast pipes L, L' , extending longitudinally within the side walls of the furnace and each pipe coupled to one of the heating coils and a branch of the blast pipe K , the opposite ends of said longitudinal blast pipes L, L' , opening into the grate chamber, for the purpose described, substantially as set forth.

2. In a furnace, the combination with the working chamber and an uptake, of the heating chambers situated on opposite sides of the uptake and communicating with the rear part of said working chamber, the mixing flues extending longitudinally within the sides of the furnace and communicating, at their ends, with said heating chambers, the heating coils situated within the heating chambers and discharging into the mixing flues, the discharge chamber M situated above the working chamber, near the bridge wall, and connected with the longitudinal mixing flues, and provided with the discharge openings m , and another discharge chamber N situated above the rear part of the working chamber, provided with the openings n in its bottom, and having direct connection with the air heating coils, substantially as and for the purpose described.

3. In a furnace, the combination with a working chamber and an uptake, of the heating chambers situated on opposite sides of the uptake and communicating with the working chamber, heating coils in said heating cham-

bers the discharge chambers M, N , extending transversely across the working chamber and provided with passages which open into said working chamber, the mixing flues extending longitudinally within the sides of the furnace and connected at their rear ends with the heating chambers and with the heating coils therein and discharging at their front ends into the chamber M , and the connecting pipes N' between the chamber N and the heating coils, substantially as and for the purpose described.

4. In a furnace, the combination with a working chamber and its rear flue wall, of the side-pipes P, Q , extending longitudinally within the sides of the furnace and provided with the lateral outlets p which discharge into the working chamber at the upper side thereof, the valved supply pipe P' coupled to the front ends of said side-pipe, and the transverse pipe R in the rear flue-wall, connected to the rear ends of the side pipes, and provided with the lateral outlets extending into the working chamber at right angles to the outlets of the side pipes, substantially as described.

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

WM. STUBBLEBINE.

Witnesses:

W. A. ERWIN,
ELLA J. BAUM.