

(No Model.)

2 Sheets—Sheet 1.

H. LANG.
FURNACE.

No. 581,596.

Patented Apr. 27, 1897.

Fig. 2.

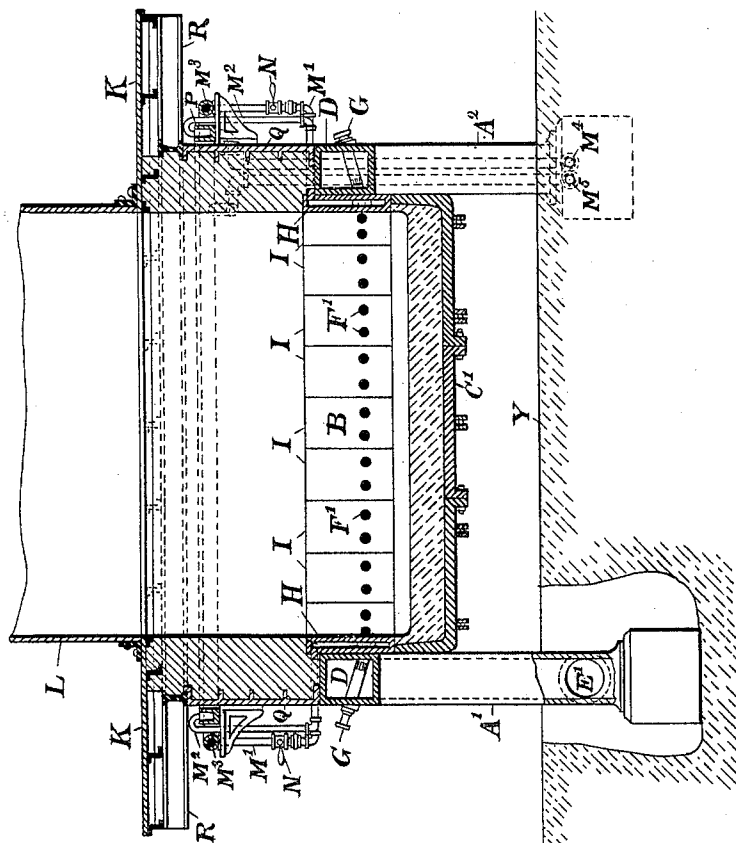
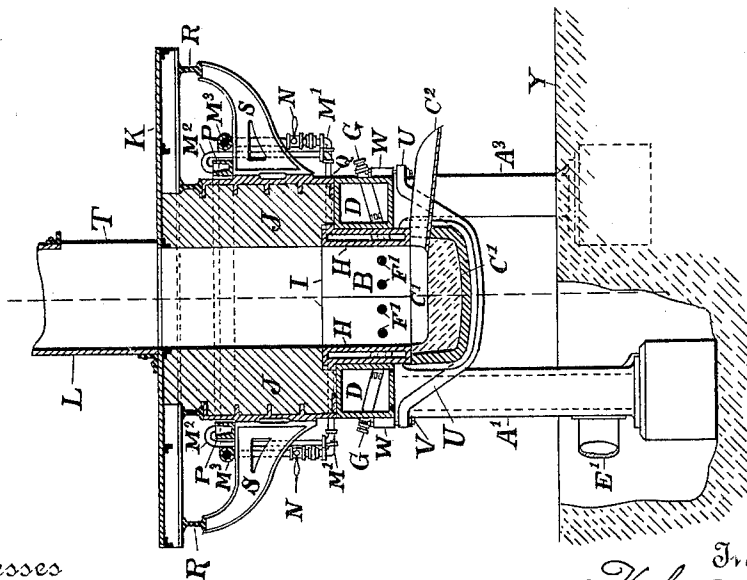


Fig. 1.



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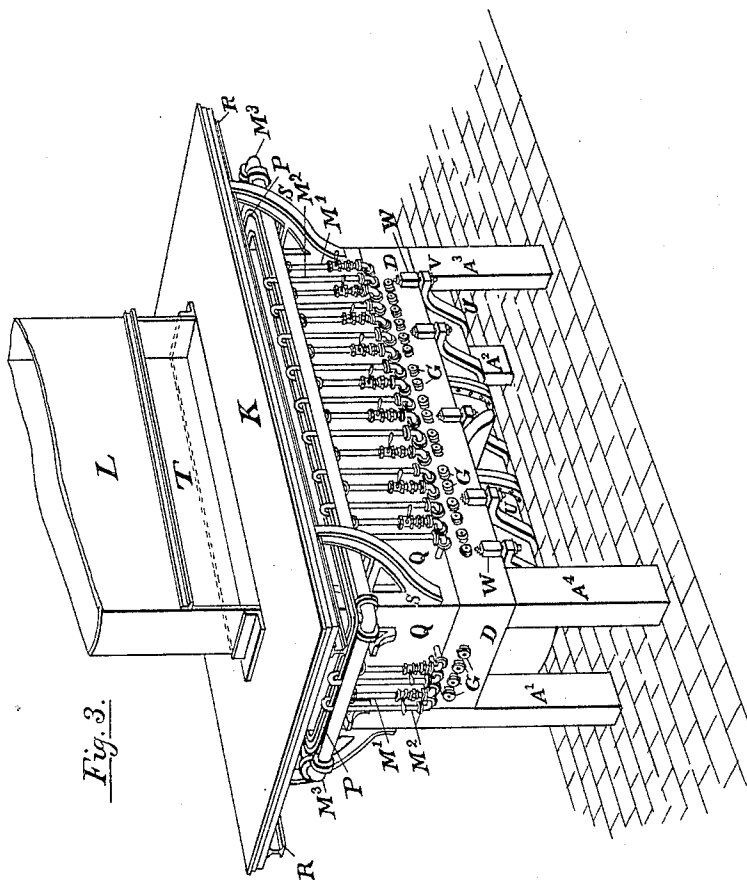
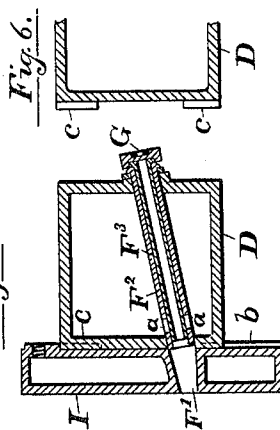
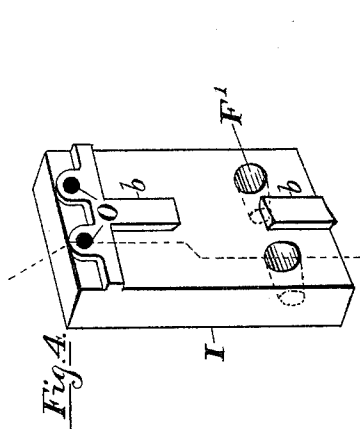
(No Model.)

2 Sheets—Sheet 2.

H. LANG.
FURNACE.

No. 581,596.

Patented Apr. 27, 1897.



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UNITED STATES PATENT OFFICE.

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FURNACE.

SPECIFICATION forming part of Letters Patent No. 581,596, dated April 27, 1897.

Application filed July 9, 1896. Serial No. 598,603. (No model.)

To all whom it may concern:

Be it known that I, HERBERT LANG, a citizen of the United States, residing at Oakland, county of Alameda, and State of California, have invented certain new and useful Improvements in Furnaces; and I hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to furnaces for smelting mineral ores, such as silver, gold, lead, copper, nickel, and the like, and to an improved construction of such furnaces comprising various features to be hereinafter explained.

My improvements consist in a compact arrangement of the parts whereby all the various elements are brought within the contour of the main body of the furnace; in employing the legs or supports of the furnace as conduits for air and water; dispensing with external pipes below the furnace; in constituting the wind-box an integral and structural member of the furnace and its framing; in dispensing with all obstruction beneath and around the furnace except its main supporting-legs, constructing the water-jacket in separate removable sections, and in the manner of attaching the same and of circulating water therein; in a method of supporting the furnace-bottom by means of girders attached to the wind-box; in the method of constructing the twyer-pipes to control the blast, and in other features that will be pointed out in connection with the drawings and set forth in the claims at the end of this specification.

The objects of my invention are to render smelting-furnaces for minerals more compact, convenient, and durable; also, to simplify their construction and the renewal of such parts as are subject to wear or erosion by heat.

Referring to the drawings, Figure 1 is a transverse central section through a smelting-furnace constructed according to my invention. Fig. 2 is a longitudinal central section through the same furnace. Fig. 3 is an elevation in perspective of the same furnace. Fig. 4 is a perspective view of a unit or section of the water-jacket. Fig. 5 is a detail

showing the manner of connecting the water-jacket sections to the interior of the furnace. Fig. 6 is another detail view showing a section of the wind-box with the ledges or lugs for attaching the water-jacket thereto.

Similar letters of reference indicate corresponding parts throughout.

The furnace as a whole is supported on the legs A' A² A³ A⁴.

B is the shaft or furnace proper, and C' the bottom or hearth as arranged for smelting copper ores, both the metal and the slag flowing off at the spout C².

Air or blast from some suitable apparatus is delivered through the pipe E', placed underground, connecting to the hollow leg A' of the furnace, passing upward through this leg A' and to the right and left in the wind-box D, extending to all sides of the furnace B, supplying the twyers F' through the pipes F² and the perforations *a*, as seen in Fig. 5. These twyer-pipes are composed of an outer tube F², expanded and rigidly fastened in the sides of the wind-box D, and a movable inner tube or shell F³, that slides outward and inward to regulate or close the apertures *a* and thus control the blast as is required. To the outer end of this sliding tube F³ is attached the usual cap and sight-hole at G, through which the charge in the furnace can be examined when the furnace is in operation.

The wind box or receiver D extends each way from the leg A' to the leg A² and constitutes the main girders, on which rest all the elements of the furnace above that plane, including the refractory walls J, platform K, and chimney L, also the water-jacket I, as seen in the sections Figs. 1 and 2. The water-jacket is composed of a series of hollow sections I, as seen in Figs. 4 and 5, provided with twyers F', and are attached to the inside of the wind-box D by means of the dovetail ledges *b*, that fit into corresponding ledges *c* on the inner face of the wind-box D, as seen in Figs. 5 and 6. These ledges *b* and *c* are not continuous, but in two parts, so that when the units or sections I are raised so the ledges *b* disengage those marked *c* on the wind-box D these sections I can be moved inward, taken out, and replaced in case of their

being fractured or injured. To raise and remove these sections I, a portion of the masonry J is cut away at the top, and after replacing the section the cavity thus cut away is filled
5 with ganister or clay, so as to preserve a smooth inner face for the furnace.

To preserve the water-jacket sections I from the intense heat in the shaft B, they are made hollow, as seen in the section Fig. 5,
10 and are provided at or near the top with inlet and outlet ways O to receive the pipes M' M², as seen in Figs. 1 and 2, the water being supplied through the underground pipe M⁴, that passes up through the interior of the leg A²
15 and connects to the horizontal supply-pipe M³, that extends all around the furnace, as seen in Fig. 3. From this pipe M³ short pipes M' extend downward and connect to each of the sections I of the water-jacket, stop-cocks
20 N being provided to regulate the amount and shut off the water in case the water-jacket is broken and when the furnace is out of use.

The cool water entering the sections I of the water-jacket sinks to the bottom and the
25 heated water rises to the top, flowing off through the pipes M² into a trough and then down a drain-pipe M⁵, inclosed in the furnace-leg A², as indicated by dotted lines in Fig. 2, all exposed pipes for both supply and waste
30 being placed above the wind-box D and sight-way at G or above the chamber B of the furnace, out of the way of the attendants, and offering no obstruction at the floor-level.

Around the masonry J, I place a covering
35 of metal plates Q, that rest on the wind-box D and form flush surface and support on all sides of the furnace up to the platform-girders R. These girders R are two in number at each side, one resting on the top of the
40 plates Q and the other on brackets S, bolted to the plates Q, as seen in Figs. 1 and 3. The chimney L is attached to the platform K or fastened in any suitable manner, and is provided with a charging-door at T, through
45 which fuel, ore, and fluxes are supplied to the furnace in the usual manner.

The height or length of the water-jacket sections I, the masonry J, and chimney K are arranged to suit the purposes to which the
50 furnace is applied, these elements being foreshortened in the drawings to render their relation and connections more clear.

The furnace bottom or hearth C' is supported by the bent girders U, held by the bolts
55 V, passing through the lugs W on the wind-box D, as seen in Figs. 1 and 3. This permits easy removal and replacing of the bottom or hearth C' in cleaning and to give access to the furnace or for any other purpose.

The wind-box D extends wholly around the furnace except the space occupied by the legs
60 A' A², the former communicating each way for the blast to the leg A², which forms a conduit for the supply and drain pipes M⁴ M⁵, as before explained. In this manner it will be seen that from the ground or floor line Y up to the wind-box D the furnace-legs are the

only members that occupy this plane or offer obstruction and that the wind-box D forms the next section of the furnace, acting as a
70 conduit or receiver and also as a girder to receive the masonry J and the covering Q, the whole being parallel on the outer face and symmetrical, also providing strength and solidity to the whole structure, saving space and
75 contributing to the convenience of constructing and operating the furnace. It will also be seen that the water-jacket sections I, the bottom C', the masonry J, also the wind and water fittings, can all of them be removed
80 and replaced without deranging or disturbing other parts injuriously and in a short time.

Having thus described the nature and objects of my invention and the manner of constructing and operating the same, what I
85 claim as new, and desire to secure by Letters Patent, is—

1. In a smelting-furnace, a plurality of hollow box-formed legs or supports, one or more
90 of which connects with an air-inlet and serves as a wind-conduit, a wind-box supported directly upon and over the said legs and communicating with the said wind-conduits, and a refractory wall located upon and supported
95 by the said wind-box, substantially as specified.

2. In a smelting-furnace, a plurality of hollow box-formed legs or supports, one or more
100 of which connects with an air-inlet below the floor-level and serves as a conduit for wind supplied thereto, a wind-box supported directly upon the said legs and in communication with the said wind-conduits, and a refractory wall upon and supported by the said
105 wind-box, substantially as specified.

3. In a smelting-furnace, a plurality of hollow box-formed legs or supports to sustain the
110 furnace, arranged respectively as conduits for wind, and for water-pipes, said legs being provided with inlet-ways below the floor-level, and respectively communicating with the wind and water supply connections to the furnace appurtenances at and above the twyers,
115 substantially as specified.

4. In a smelting-furnace, a plurality of box-formed legs or supports, one or more of which
120 connects with an air-inlet and serves as a wind-conduit, a continuous wind-box of angular cross-section supported upon the said legs surrounding the lower part of the furnace on
125 all sides, provided with twyers and twyer-pipes, and suitable connections between the same and the wind-box, said wind-box being in communication with the said wind-conduits, and a refractory wall upon and supported by the said wind-box, substantially as
130 specified.

5. In a smelting-furnace, a hollow continuous girder and wind-box of angular cross-section surrounding the lower part of the same
135 on all sides and supporting the furnace, in combination with hollow box-formed legs on which the said hollow girder and wind-box rests, and by which it is supported, and air-

passages to the wind-box through one or more of the said hollow legs, substantially as specified.

6. In a smelting-furnace, a hollow continuous girder and wind-box of angular cross-section surrounding the lower part of the same on all sides and supporting the furnace, hollow legs directly under and supporting the said wind-box, air-passages to the said wind-box through one or more of the said hollow legs, and twyers and twyer-pipes located in the said wind-box, composed of fixed and movable tubes respectively, one within the other, the fixed tubes being perforated to admit air from the wind-box in graduated supply dependent on the position of the movable tubes, substantially as specified.

7. In a smelting-furnace, a plurality of hollow box-formed legs or supports, one or more of which connects with an air-inlet and serves as a wind-conduit, in combination with a wind-box of angular cross-section supported directly upon and over said hollow legs and in communication with the said wind-conduits, a refractory wall located upon and supported by the wind-box, said wind-box being provided with twyers and twyer-pipes one within the other respectively, the outer pipe or twyer being fixed in the outer and inner sides of the wind-box and passing through the same, and perforated, and the inner pipe being movable within the outer pipe, whereby the perforations in the latter may be covered and uncovered at will, and the supply of air to the twyer from the wind-box thus controlled and regulated, substantially as specified.

8. In a smelting-furnace, a hollow continuous girder and wind-box of angular cross-section surrounding the lower part of the same on all sides and supporting the furnace, flush with the walls thereof on the outer faces, in combination with a water-jacket removably sustained on the inside of the said girder and wind-box, and means for supplying air to the said wind-box, substantially as specified.

9. In a smelting-furnace, a hollow continuous girder and wind-box surrounding the lower part of the furnace and supporting the same, in combination with a water-jacket forming the inner wall of the furnace, composed of independent hollow sections removably sustained on the inner face of the said girder and wind-box, and means for supplying air to the said wind-box, substantially as specified.

10. In a smelting-furnace, a water-jacket composed of independent hollow sections provided with dovetail ledges on their outer

faces in combination with a wind-box provided on its inner face or wall with corresponding dovetail recesses, whereby the said sections are removably attached to the said wind-box, substantially as specified.

11. In a smelting-furnace, in combination with a wind-box surrounding the same, a water-jacket composed of independent hollow sections attachable to and removable inwardly from the said wind-box, provided with twyers at the bottom and water inlets and outlets at the top, substantially as and for the purpose specified.

12. In a smelting-furnace, in combination with a wind-box surrounding the same, a water-jacket composed of independent hollow sections removably attached to the inner wall of the said wind-box, provided with twyers, and a water-supply pipe extending around the furnace above the twyers, with pipe connections from the said main supply-pipe to the said sections, provided with cocks whereby the water-supply is regulated, substantially as and for the purpose specified.

13. In a smelting-furnace, a hollow continuous girder and wind-box surrounding the lower part of the furnace and supporting the same, with means for supplying air to the said wind-box, in combination with a sectional water-jacket furnace-lining connected thereto, superimposed masonry forming the upper portion of the shaft sustained upon the said girder and wind-box, and sustaining-plates located upon the exterior of the said masonry, flush with the girder and wind-box on the outer face thereof, substantially as and for the purpose specified.

14. In a smelting-furnace, the combination of the hollow supporting-legs one or more of which connects with an air-inlet and forms a wind-conduit, the girder and wind-box located thereon, said wind-box connecting with said wind-conduit, the water-jacket sections supported on the inner face of the girder and wind-box, the masonry wall sustained upon the said girder and wind-box, flush on the inside with the inner face of the water-jacket sections, and the outer covering-plates borne upon the outer face of the said masonry wall, flush with the outer face of the girder and wind-box, all substantially as and for the purpose specified.

In testimony whereof I have hereunto affixed my signature in the presence of two witnesses.

HERBERT LANG.

Witnesses:

THOS. J. BARBOUR,
JAMES L. KING.