

No. 713,296.

Patented Nov. 11, 1902.

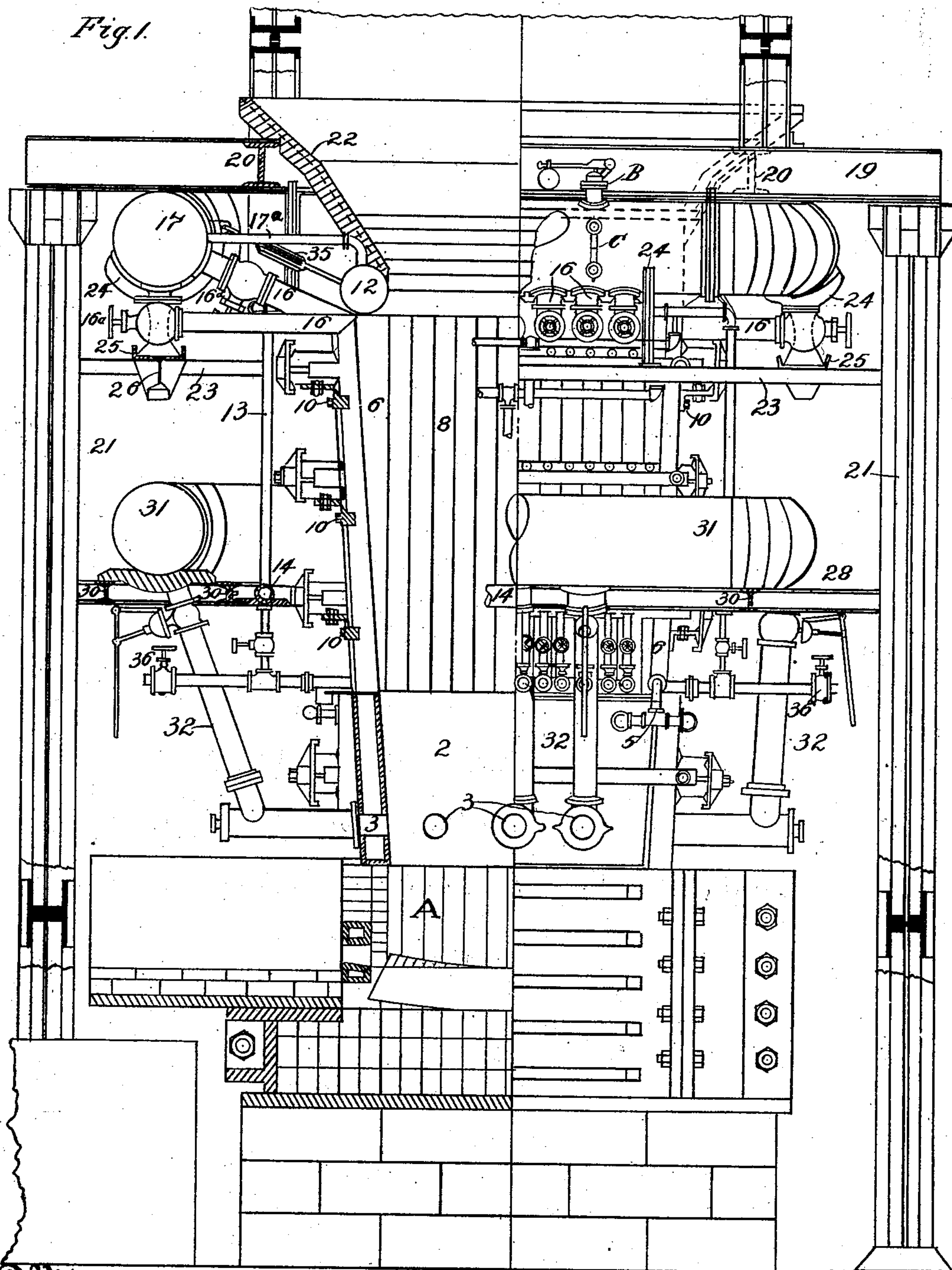
J. L. GIROUX.
STEAM GENERATING FURNACE.

(Application filed Apr. 14, 1902.)

(No Model.)

2 Sheets—Sheet 1.

Fig. 1.



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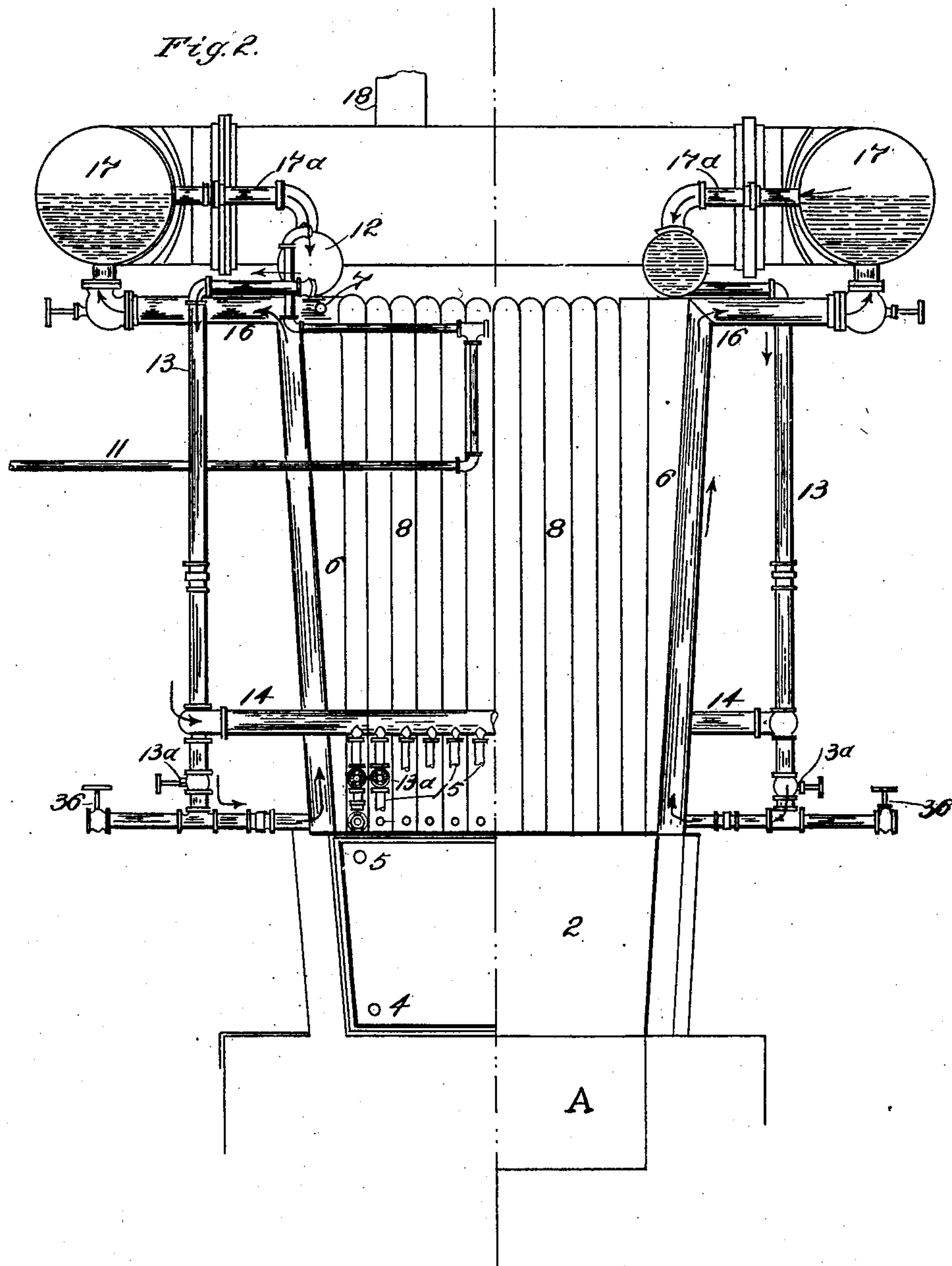
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2 Sheets—Sheet 2.



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UNITED STATES PATENT OFFICE.

JOSEPH L. GIROUX, OF JEROME, ARIZONA TERRITORY.

STEAM-GENERATING FURNACE.

SPECIFICATION forming part of Letters Patent No. 713,296, dated November 11, 1902.

Application filed April 14, 1902. Serial No. 102,724. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH L. GIROUX, a citizen of the United States, residing at Jerome, county of Yavapai, Arizona Territory, have invented an Improvement in Steam-Generating Furnaces; and I hereby declare the following to be a full, clear, and exact description of the same.

My invention relates to a combination furnace and steam-generator.

It consists, essentially, of a brick-lined crucible forming the lower part of the furnace, a water-jacket section composed of boiler-iron properly braced, with twyers through the inner and outer walls to admit air, having a water inlet and outlet, and a water-tube section located above the jacket and surrounding the furnace, said sections being connected with the water-jacket below and with a steam-drum above.

My invention also comprises details of construction which will be more fully explained by reference to the accompanying drawings, in which—

Figure 1 is a half-elevation and half-section of the lower part of the apparatus. Fig. 2 is a similar view with the beams and supports removed.

The object of my invention is to so combine a steam-producing apparatus with a furnace of any description that the heat from the smelting of the ore and the molten metal may be applied to generating steam for such furnace as it may be needed.

In the present case I have shown my apparatus as connected with a vertical-stack furnace, in which A is a cast-iron-plate crucible lined with brick and supported upon a suitable base. Above this crucible is a water-jacket section 2, having inner and outer walls of ordinary boiler-iron and substantially braced with I-beams or the like to give it sufficient strength. Through the inner and outer walls of this section are twyers 3 for the admission of air to the interior for the purpose of smelting the ore. This water-jacket has an inlet, as at 4, through which water is supplied, and a discharge at 5, through which the water may pass into a corner water-jacket, (shown at 6,) and it may be delivered from the top of such jacket through a pipe 7

into a suitable tank. Above this water-jacket section is a water-tube section consisting of vertically-disposed tubes 8. These tubes are arranged around the space devoted to the ore and form a continuation above the water-jacket. These tubes are supported, substantially, by a steel frame, as shown, and by means of this frame the tubes are all secured in place. Each tube is here shown as being held by a stud at the top, middle, and bottom, as at 10, and by a metallic strip clamped to the top of the water-jacket. Water entering through the feed-pipe 11 enters a large pipe 12 and passes through a pipe 13 into the supply-pipe 14. From this pipe it passes through the small pipe 15 into the lower ends of the water-tubes 8. At this point the water receives the heat from the smelting ore and steam is generated, which passes up the tube 16 and enters the steam-drum 17, from which it may be conducted to any point desired through the pipe 18.

The furnace proper is supported above the tube-section by a steel frame consisting of I-beams 19 and 20, bolted together to make a square or rectangular frame, and this rests upon columns 21, extending down outside and around the water-jacket and tubular section previously described. The upper part of the furnace (not here fully shown) is supported upon the frame, and also the cast-iron feed-plate 22.

23 is a channel-iron bolted at either end to the columns 21, and this affords a base to support the castings 24 of the steam-drum 17. Another channel-iron 25 rests upon this channel-iron 24, and to the bottom is bolted a stiffening I-beam 26. These together afford the base for the side supports of the steam-drum. The I-beam 28 is also bolted to the columns 21, and the supports for the supply-pipe 14 are fastened to this. The I-beams 30 are bolted at either end to the beams 28, as shown, and together afford a base for the support of the air-pipe 31. From this pipe air is conveyed by pipes 32 to the twyers 3. Upon the steam-drum may be located, in conjunction with the steam-discharge pipe and the usual safety-valves, water-gage, &c., as at B and C.

The structure being essentially as above

described, the operation will be as follows: Ore to be smelted, passing down through the upper part of the furnace, is directed by the feed-plate 22 into the space between the vertical tubes 8, thence into the water-jacketed portion 2, which is located above the crucible A. The shape of the furnace as here illustrated is rectangular and may be of any suitable form. A very suitable proportion as used in practice is about one hundred and eighty inches in one direction by fifty-six inches in the other in a horizontal plane. The pipes 8 stand slightly inclined on the longer sides of the furnace and approximately vertical at the ends, and this construction allows space for what I term the "corner" water-jackets 6. Air is delivered into the large pipe 31 and by means of pipes 32 is delivered at proper intervals to the twyers 3, opening through the water-jacket section, so as to deliver a blast of air into this portion of the apparatus. Water is supplied through the inlet 4 to the annular space of this water-jacket and rising within the space is delivered through the outlet 5, from which it may pass into the corner-jackets at 6. From the top of these corner-jackets the water may be delivered through an outlet-pipe, as at 7, and pass to a suitably-located receiving-tank. (Not here shown.) This partially-heated water is brought from the tank as required through the pipe 11 and is delivered from this pipe into the large pipe 12, surrounding the upper end of the water-tubes 8, and from this tube pipes 13 lead downward and by means of horizontal branches 14 extend around near the bottom of the vertical tubes 8. From the pipe 14 small pipes 15 deliver the water into the lower ends of these water-tubes, as shown at 15, so that the water circulating through these tubes receives the heat from the smelting ore and the steam which is generated passes up through the pipes 16 and enters the steam-drum 17. These pipes 16 are so disposed that each alternate pipe extends out horizontally beneath the steam-drum 17, and by means of an elbow a right-angled turn is made connecting with the bottom of the steam-drum. The intermediate pipes are in like manner extended diagonally up, so as to open into the side of the steam-drum 17 just below the center of the drum and at a sufficient distance from the inlet of the horizontal pipes previously mentioned so that access is easily obtained to either of said pipes, and by means of closing cocks or valves, as at 16^a, any connection with the steam-drum may be temporarily closed. In the same manner between the inlet-pipes 15 at the bottom connection may be closed by cocks, as shown at 13^a, so that any one or more of these pipes may be removed and replaced at any time without disturbing the others. Circulation from the steam-drum 17 thus takes place through the pipe 16 and thence back through the pipes 17^a into the water-supply pipes 12,

thence through the pipes 13, 14, and 15, as previously described. By means of the surrounding angle, channel, or I beams and the bolts or studs, as at 10, these pipes are all detachably supported to provide for necessary strength of the structure. The vertical portion of the tubes lying closely together form a sufficiently close chamber for the ore. The brackets 24, by which the steam-drum is supported, are so constructed as to leave spaces between them for the connection of the pipes through which the steam from the water-jackets is admitted into the drum. In order to securely hold the water-pipe 12 in its position upon the top of the vertical tubes 8, I have shown a system of rods with turn-buckles, by which a proper adjustment may be made, as shown at 35. The vertical water-tubes are each provided with a suitable blow-off cock, as shown at 36.

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

1. The combination with a smelting-furnace of a water-jacket section surrounding the lower part of the furnace, vertical water-tubes located above said section, a steam-drum, means connecting the tubes with said drum, and means for circulating water through the tubes.

2. The combination with a smelting-furnace of a water-jacket section, vertically-disposed water-tubes located above, surrounding and forming an ore-space interior thereto, a steam-drum located above the water-tubes exterior to the furnace-body and connections between the water-tubes and said drum, and water-inlet and steam-outlet pipes.

3. A smelting-furnace having vertical water-tubes and means for circulating water therethrough, a steam-drum above the plane of the upper ends of the tubes, and means connecting said tubes and drum, a steam-discharge pipe, and twyers adapted to admit air to the smelting ore.

4. A smelting-furnace consisting of a water-jacket having flat inner and outer walls, vertical tubes disposed side by side, superposed upon the water-jacket, connections by which water is admitted and circulated independently through the jacket and through the tubes, and I-beams extending transversely along the sides and holding the tubes in position.

5. The combination in a smelting-furnace of a series of vertically-disposed water-tubes inclosing the ore charge, said tubes being placed closely together, water-inlets at the bottom of the tubes and a steam-drum and connections between the tops of the tubes and said drum.

6. A smelting-furnace having the vertical water-tube jacket forming an inclosure for the smelting ore, a steam-drum located above and exterior to the planes of the sides of the jacket, pipes connecting the upper ends of the vertical tubes with the steam-drum, said pipes

diverging so that alternate pipes enter the steam-drum in different planes whereby convenient access and removal may be effected.

5 7. A smelting-furnace having a jacket formed of vertically-disposed water-tubes, a jacket coincident with the lower ends of said tubes and upon which they are superposed, connecting-pipes whereby water is circulated through the lower jacket and heated, other
10 pipes connecting with the lower ends of the vertical water-tubes, a horizontal pipe extending around and resting upon the upper ends of the tubes, connections between said pipe and the admission-openings in the bottom
15 of the tubes whereby circulation is effected.

8. A smelting-furnace having a water-jacket consisting of inner and outer shells, means for admitting water at the bottom and discharging it at the top thereof, approxi-
20 mately vertical tubes upon said jacket lying closely together and forming a smelting-chamber with flat inner and outer walls, pipes by which the hot feed-water from the lower jacket is delivered into the lower ends of the tubes,
25 a pipe lying upon the top of the vertical tubes, connections between said pipe and the bottom of the tubes, a steam-drum located above and exterior to the upper ends of the tubes and the water-pipe and connections between the
30 tubes and the steam-drum, and between the

steam-drum and the water-pipe whereby circulation is effected.

9. A smelting-furnace having a water-jacket, vertical tubes, a surrounding steam-drum and connecting circulating-pipes and
35 brackets upon which the steam-drum rests, with intermediate spaces for the connecting-pipes and beams upon which said brackets are supported.

10. A smelting-furnace having independent
40 vertical water-tubes, steam-drum, water-circulating pipes connecting with the steam-drum and the lower end of the water-tubes and metallic surrounding beams and studs by which each tube is independently connected
45 with and supported by the beams.

11. A smelting-furnace having a water-jacket consisting of essentially vertical tubes inclosing the furnace, a steam-drum and connections whereby water circulation is effected
50 with independent blow-off cocks located at the base of each tube whereby any tube may be blown off while the furnace is in operation.

In witness whereof I have hereunto set my hand.

JOSEPH L. GIROUX.

Witnesses:

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JESSIE C. BRODIE.