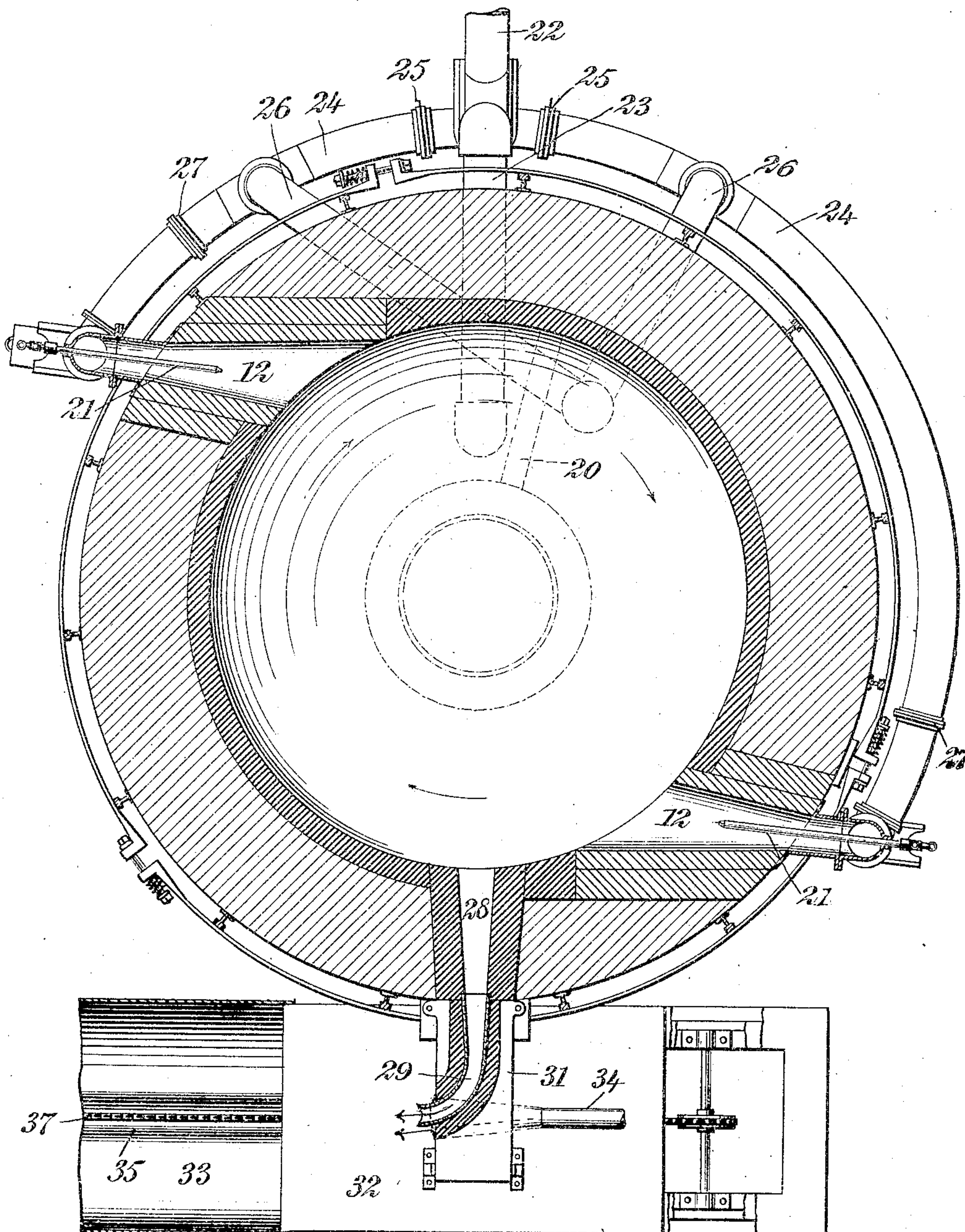


No. 798,312

PATENTED AUG. 29, 1905.

H. L. & N. WRINKLE.
SMELTING FURNACE.
APPLICATION FILED JUNE 3, 1904.

2 SHEETS—SHEET 1.



WITNESSES:

John Bugstrom

Isaac B. Owens

Fig. 1.

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BY

Mumme
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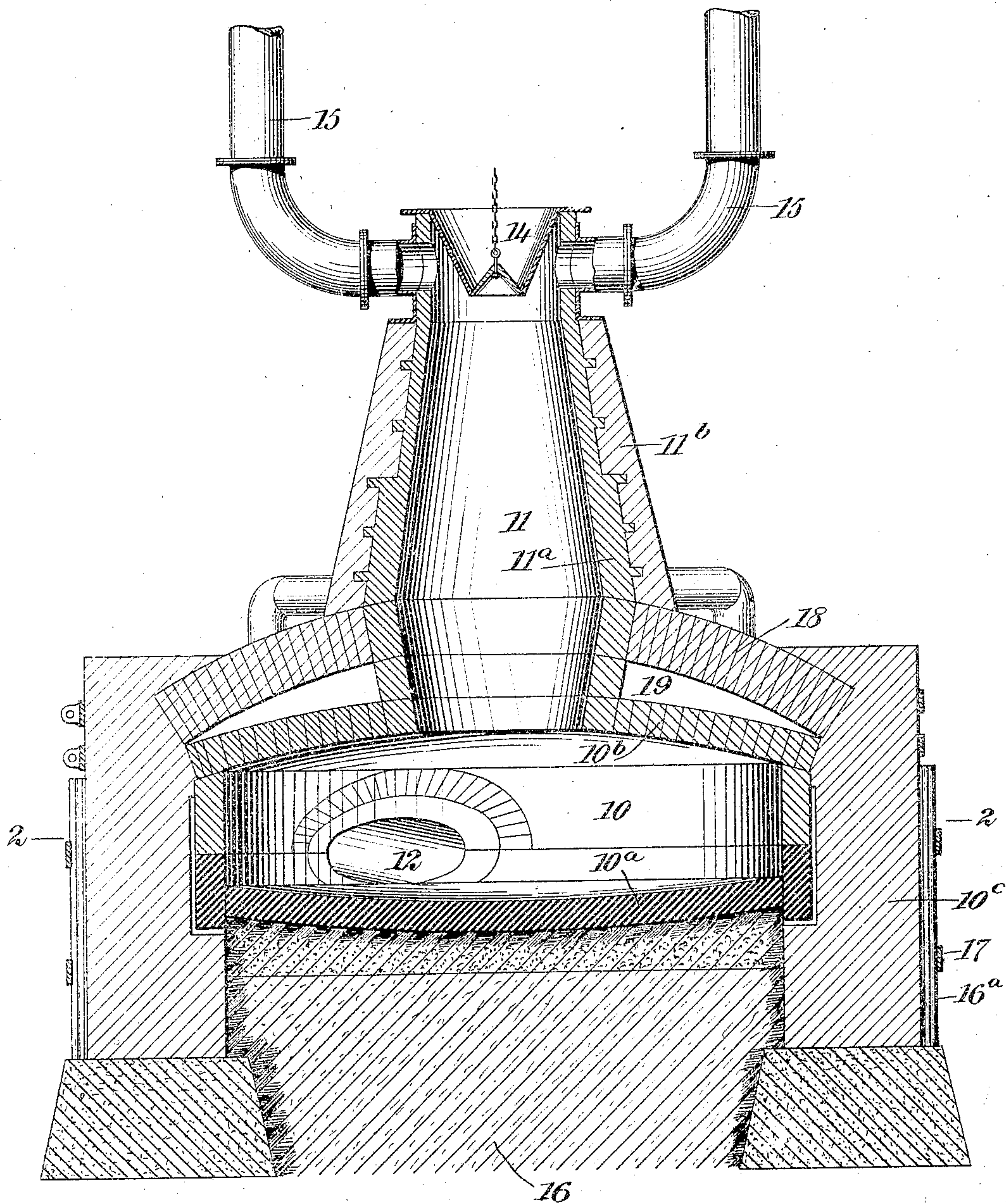
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2 SHEETS—SHEET 2.



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FIG. 2.

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UNITED STATES PATENT OFFICE.

HERBERT LAURENCE WRINKLE AND NOAH WRINKLE, OF KEELER,
CALIFORNIA.

SMELTING-FURNACE.

No. 798,312.

Specification of Letters Patent.

Patented Aug. 29, 1905.

Application filed June 3, 1904. Serial No. 210,966.

To all whom it may concern:

Be it known that we, HERBERT LAURENCE WRINKLE and NOAH WRINKLE, citizens of the United States, and residents of Keeler, in the county of Inyo and State of California, have invented a new and Improved Smelting-Furnace, of which the following is a full, clear, and exact description.

Our invention relates particularly to a fluid or pulverized-fuel burning smelting-furnace. As here illustrated it is designed for smelting soda; but the invention is useful in connection with any fuel and for smelting various other substances by slight modifications in the design of the furnace.

The invention resides in certain novel features of construction and organization, which will be fully set forth hereinafter.

Reference is had to the accompanying drawings, which illustrate an example of our invention, in which drawings like reference characters indicate like parts in both the views, and in which—

Figure 1 is a sectional plan on the line 2-2 of Fig. 2, this view also indicating by broken lines the arrangement of the air-blast conduits, which are located above the line of section; and Fig. 2 is a vertical section of the furnace.

The furnace is formed with a crucible or melting-chamber 10, above which is a stack or shaft 11, said crucible or melting-chamber being provided with tangentially-disposed twyers 12, the stack having a charging-hopper and bell 14 and outlet-conduits 15 for the waste gases. The furnace is constructed on a suitable base or foundation 16, and the crucible and shaft or stack are suitably lined, according to the work which the furnace is intended to perform. In the case of the soda-smelting furnace here illustrated the hearth 10^a and the lower part of the side walls of the crucible are formed of basic material, and the remaining interior brickwork 10^b of the crucible and 11^a of the stack are silica firebrick, the external brickwork 10^c and 11^b being of red brick.

As best shown in Fig. 2, the crucible 10 and shaft 11 are provided with bracing-staves 16^a and hoops 17, which may be of any desired form. The dome 10^b, forming the top of the crucible 10, is arranged below and spaced from the dome 18 and forms with the dome 10^b an air-chamber 19. The dome 18

also constitutes the support for the shaft 11, so that the inner dome 10^b or top of the crucible may be removed at any time for the purpose of repair without disturbing the stack. It will also be observed in this connection that the bottom 10^a of the crucible and the inner surface or lining 11^a of the shaft may be removed for repair without disturbing the other parts of the apparatus. The chamber 19 is provided with a partition or wall 20, extending from the stack outward to the sides of the furnace, (see dotted lines, Fig. 1,) which wall serves to facilitate the circulation of the blast through the chamber 19 for the double purpose of cooling the roof of the crucible and heating the air, all of which will be fully set forth hereinafter.

In connection with the crucible 10 and shaft 11 we desire to point out the relative area of these chambers and to explain that in using the furnace in connection with fluid fuel the area of the crucible is such that the material falling from the stack 11 into the crucible will occupy in the crucible the form of a truncated cone, the base of which does not extend farther than the outer or marginal limits of the bottom 10^a of the crucible. This provides in the outer portion of the crucible an unobstructed passage for the circulation of the burning gases, which gases in moving circularly around the crucible reverberate upon the matter in the crucible and finally work through the mass of material in the stack and pass out through the conduits 15, exerting meanwhile upon the material in the stack the necessary smelting, calcining, and drying action.

The twyers 12 being tangentially arranged cause the burning gases to take up a circular or spiral movement in the direction of the arrows indicated in Fig. 2. The fuel used in connection with the furnace in accordance with the example here illustrated may be either liquid or gaseous.

21 indicates the fuel-nozzles, which are projected, respectively, into the twyers 12 and provided with the necessary complementary devices for varying the amount of the fuel and the admixture of air therewith. As shown in Fig. 2, the conduit 22, leading from the discharge of the air-blast, has a branch or extension 23 passing into the chamber 19 at one side of and adjacent to the partition 20 thereof. From the conduit 22 branches 24 pass, respectively, to the twyers 12, these branches

being commanded by air-valves 25, which may be of any form desired. Leading from the chamber 19 at the side of the partition 20 opposite the side on which the branch 23 is located are two branch conduits 26, which pass, respectively, into the branches 24. Between the branches 26 and the twyers 12, air-valves 27 or other desired means for controlling the air movement are located, these valves commanding the movement of air through the branch conduits 24. Upon supplying the blast to the conduit 22 said blast passes into the chamber 19 and through the same, from which it passes out through the branches 26 and 24 to the respective twyers 12. The movement of the air-blast through the chamber 19 serves, therefore, the twofold result of cooling the top wall 10^b of the crucible and of heating the blast preliminary to its introduction into the furnace through the twyers. This heating of the blast brings about a more thorough mixture of the air and fuel, and consequently a more thorough combustion of the fuel in the furnace.

According to the embodiment of the invention here illustrated the outlet from the crucible consists in a radial passage 28, having a spout or continuation 29, the spout being curved to discharge the material horizontally and tangentially from the furnace. Said spout is mounted on a suitable support 31, and this in turn is sustained on a table 32, which is arranged below the spout and projected into a tunnel or receiver 33. Below the spout 29 is arranged a blast-tube 34. The discharged material is gathered in the tunnel 33, and said tunnel is provided at its lower portion with a trough 35, in which the material discharged from the furnace is gathered.

37 indicates the conveyer-chain for carrying the material through the tunnel.

The organized operation may be traced as follows: The material to be smelted should be charged through the bell 14 into the shaft 11, whereupon it will fall upon the bottom of the crucible 10 and assume the form of a truncated cone, as before explained, the material then rising in the stack to a point dependent upon the amount charged into the furnace. Upon turning on the air-blast and fuel the burning gases will move with a swirling or circular motion in the upper part of the crucible around the cone-like body of the material therein and will be reverberated by the upper wall of the furnace down on this material, fusing the same and finally passing up through the mass of material in the stack and out through the conduits 15, during which passage the material in the stack is dried and calcined.

After the operation of the furnace begins the air-blast in passing through the chamber 19 will cool the upper walls of the crucible and will in turn be subjected to a preliminary heating, thus increasing the efficiency of the blast. The molten product of the furnace is run off through the outlet 28 and spout 29.

Having thus described our invention, we claim as new and desire to secure by Letters Patent—

1. A smelting-furnace having a crucible provided with a permanent outer top wall, a stack sustained by said outer top wall, an inner top wall for the crucible located below and spaced from the outer top wall to form a chamber between said walls, the stack extending through both of said top walls and means for circulating an air-current into said chamber and from the same into the crucible, for the purpose specified.

2. A smelting-furnace having a circular crucible, a permanent outer top wall for the crucible, an inner top wall below the outer wall and spaced therefrom to form a circular chamber, a stack sustained by the outer top wall and passing through both top walls, a radial partition in the circular chamber, an air-blast pipe passing into the chamber at one side of the partition, and an air-blast pipe passing from the chamber at the other side of the partition and leading into the crucible.

3. A smelting-furnace having a circular crucible, a permanent outer top wall for the crucible, an inner top wall below the outer wall, and spaced therefrom to form a circular air-chamber between the two walls, and a stack sustained by the outer top wall and passing through both top walls to communicate with the interior of the crucible.

4. A smelting-furnace having a circular crucible, a permanent outer top wall for the crucible, an inner top wall below the outer wall, and spaced therefrom to form a circular air-chamber between the two walls, a stack sustained by the outer top wall and passing through both top walls to communicate with the interior of the crucible, and means for circulating an air-blast through said circular air-chamber and from the same into the crucible of the furnace.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

HERBERT LAURENCE WRINKLE.
NOAH WRINKLE.

Witnesses:

BEN P. HUNTER,
JOHN McCORD.