T. M. KEKICH.

SMELTING FURNACE.

APPLICATION FILED JULY 3, 1912. RENEWED JUNE 25, 1914.

1,126,028. Patented Jan. 26, 1915.

2 SHEETS—SHEET 1.

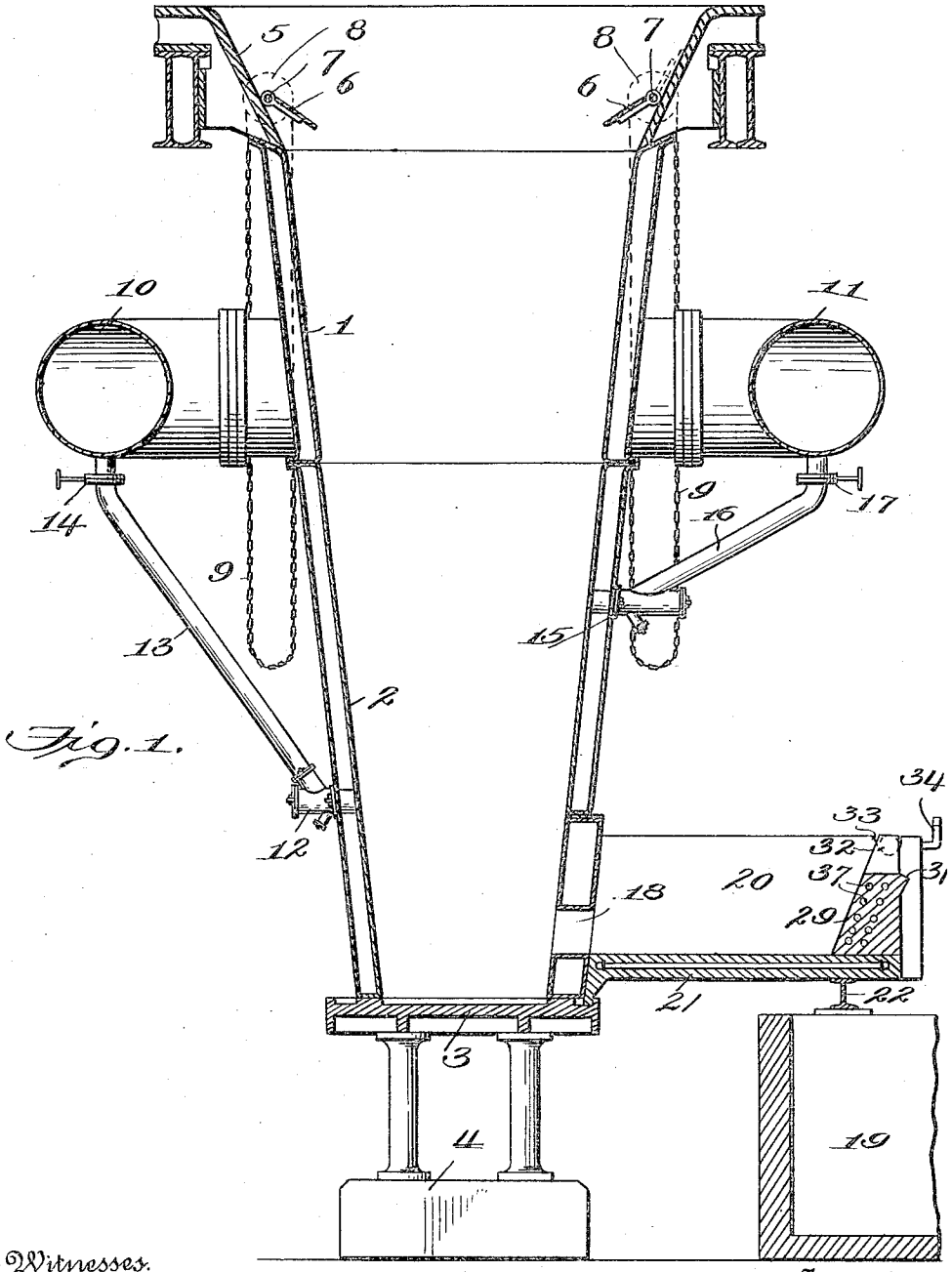


Fig. 1.

Witnesses.

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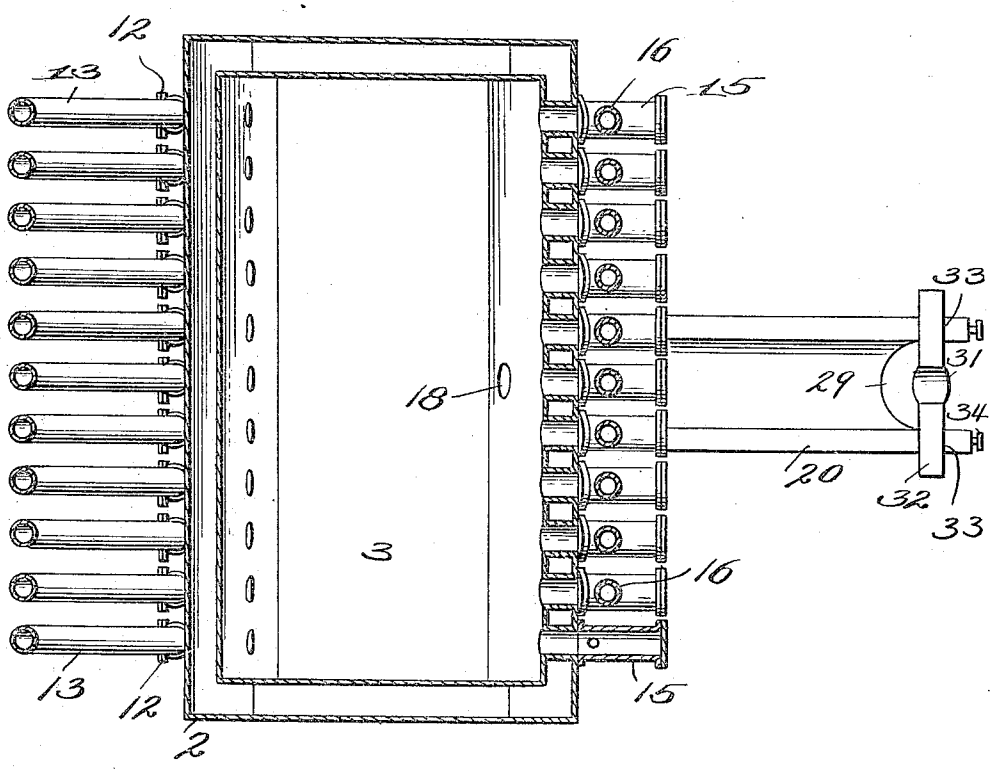
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2 SHEETS—SHEET 2.

Fig. 2.



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SMELTING-FURNACE.

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To all whom it may concern:

Be it known that I, THOMAS M. KEKICH, a citizen of the United States of America, (certificate of citizenship No. 1,497, county of Cascade, State of Montana,) residing at Aire Libre, Est. de Puebla, Mexico, have invented certain new and useful Improvements in Smelting-Furnaces, of which the following is a specification.

The present invention relates to improvements in smelting furnaces and more especially to blast furnaces of the type employed in the smelting of copper, lead and zinc, and the principal object of this invention is to provide an improved arrangement of the twyers for furnaces of this type wherein the twyers at one side of the furnace are raised or elevated with respect to those at the opposite side and the raised twyers enter the furnace at a level between the main air supply pipe and the lower tywers, the admission of air to the furnace from the upper and lower twyers being controlled by suitable valves to the end that the combustion within the furnace will be more complete, economy in fuel will be obtained, the capacity of the furnace will be increased, a reducing or oxidizing action may be obtained as desired, enabling a greater amount of pyrites to be treated, and producing at the top of the charge a preliminary roasting action, the formation of blow holes or obstructions is prevented, and other improved results in the operation of the furnace are obtained.

To these and other ends, the invention consists in certain improvements, and combinations and arrangements of parts, all as will be hereinafter more fully described, the novel features being pointed out particularly in the claims at the end of the specification.

In the accompanying drawing:—Figure 1 represents a general vertical section of a blast furnace constructed in accordance with the preferred embodiment of my invention; Fig. 2 represents a horizontal section through the furnace taken in the plane of the upper row of twyers.

The improvements provided by the present invention are applicable to smelting or blast furnaces of various kinds, one form of furnace being shown in the accompanying drawing as an example.

It will be understood that modifications and changes may be made in certain of these features in order that they may be applied to the best advantage according to conditions, and these modifications and changes may be made without departing from the essential features of the invention as defined in the claims.

In the present instance, the furnace comprises an upper section 1, a lower section 2 which embodies the cooling or water jackets, a bottom section or crucible 3 which rests upon an appropriate support 4, and a hopper 5 through which the charges are fed into the top of the furnace.

In order to enable the constituents of the charges to be properly distributed as the same are fed into the furnace, a pair of spreaders 6 are provided which in the present instance embody plates which extend across opposite sides of the hopper at the mouth or top of the furnace and are mounted on transverse shafts 7 which extend through the hopper. These shafts 7 are rotatable in order to vary the inclination of the spreaders 6 in a manner to distribute the charges properly within the furnace according to existing conditions, and by turning the shafts 7, the spreaders may also be swung into an inoperative position as shown by the dotted lines. Any suitable means may be provided for turning the shafts 7 to adjust the angles of the spreaders, these shafts in the present instance having sprocket wheels 8 secured to their outer ends, and endless chains 9 coöperate with the sprocket wheels and the lower ends of these chains are within reach of the operator, the chains thus providing convenient means for the adjustment of the spreaders.

The main air supply or bustle pipe through which the air blast is conducted to the furnace is, in the present instance, divided to form branches 10 and 11 which extend to opposite sides of the furnace, and according to the present invention, the twyers at one side of the furnace are located at the usual level, while those at the

opposite side of the furnace are raised or elevated with respect to the opposite twyers.

In the drawing a horizontal row of twyers 12 located at the usual level constitute the lower set of twyers and each of these twyers is connected to the branch 10 of the bustle pipe by the pipe 13 which leads from the branch 10 and is provided with an individual air controlling valve 14, and a horizontal row of twyers 15 at the opposite side of the furnace and which are raised or elevated with respect to the twyers 12 occupy a plane between the twyers 12 and the main air supply or bustle pipe, each of the raised twyers 15 being connected by a pipe 16 to the branch 11 of the bustle pipe and is provided with an individual air controlling valve 17. By appropriately adjusting the air controlling valves 14 and 17, the proper amount of air may be fed to the different levels of the charge in the furnace.

The blast from the lower twyers 12 acts upon the lower portion of the charge while the blast from the upper twyers acts upon the upper portion of the charge, supplying oxygen sufficient to insure complete combustion of such partially consumed gases as may be released from the charge by the oxygen supplied by the lower twyers, and the blast from the upper twyers operates to produce an intense heat in the upper portion of the charge which is not affected by the blast from the lower twyers. The blast in the upper twyers thus permits the treatment of a higher mass or charge in the furnace, it prevents bridging or arching of the material in the upper portion of the furnace due to insufficient heat from the lower twyers, it economizes in the amount of fuel used owing to the more complete combustion which results, it avoids blow holes or air channels through the furnace, enables a larger percentage of the finer constituents of the ore charge to be successfully treated, and, moreover, enables either a reducing or an oxidizing action to be obtained so that in the treatment of pyrites, a preliminary roasting effect may be produced at the top of the furnace. Also, owing to the higher temperature obtainable by the more perfect combustion of the fuel, a greater quantity of ore may be treated with a furnace of given size.

The lower portion of the furnace is provided with an outlet 18 for the matte and slag. The flow of the metal and slag from the furnace and into the settler 19 is controlled by a tap or spout 20, the tap or spout provided by the present invention enabling the entire contents of the furnace to be quickly emptied into the settler should occasion require, thus avoiding injury or damage to the furnace and enabling the slag and metal to be separated without the necessity of re-treating the molten masses. This tap or spout in the present instance is of trough-like or semi-cylindrical form and is cast with water circulating or cooling pipes 21. The inner end of the tap or spout fits closely against the jacket 2 of the furnace and the interior of the tap or spout communicates with the outlet 18 thereof. The outer end of the tap or spout may be supported above the settler by a suitable cross beam 22 while the inner end of the spout is preferably attached removably to the furnace.

A removable gate 29 is provided which normally closes the outer or discharge end of the tap, this gate having a lip 31 over which the metal and slag flow into the settler. The gate is shaped to fit the substantially semi-cylindrical tap and it is provided with a pair of trunnions 32 which project in opposite directions from the top thereof, and these trunnions are adapted to fit in suitable seats or recesses 33 which are formed in the upper edges of the side walls of the tap. The gate may be held down by a pair of pins 34 which are adapted to be inserted into apertures in the walls of the tap and into registering apertures in the trunnions 32 of the gate. In order to further secure the gate in position or to prevent displacement thereof, it is preferably of substantially triangular form, or, in other words, its base is widened in a direction longitudinally of the spout or tap as shown in Fig. 1. When it is desirable or necessary to remove the gate to permit emptying of the furnace or for other purposes, it is only necessary to withdraw the locking pins 34 and to lift the gate by the attachment of a hoisting chain or other appropriate means to the projecting trunnions 32, and by removing the gate, the contents of the furnace may be quickly discharged into the settler where the slag will be separated from the metal in the usual way and without the necessity of re-treating the molten masses. The gate is also preferably cast with pipes 37 for the circulation of water for cooling purposes.

I claim as my invention:—

1. The combination of a blast furnace of the type wherein the constituents of the charge are arranged in layers therein, twyers adjacent to the bottom of the furnace and arranged only at one side thereof for supplying air to the lower portion of the furnace, and twyers on a level above the twyers first mentioned and arranged in reverse relation to the twyers first mentioned to supply air to the furnace at a higher level.

2. The combination of a blast furnace to contain a charge with the constituents arranged in layers, twyers at one side of the furnace adjacent to the bottom thereof and directed toward one side only of the furnace, twyers at the opposite side of the furnace

on a level above the twyers first mentioned and arranged in reverse relation thereto, and valves for independently controlling the supply of air to the furnace through said reversely arranged lower and upper twyers.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

THOMAS M. KEKICH.

Witnesses:
D. MORGAN,
MARY C. LENDRUM.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."