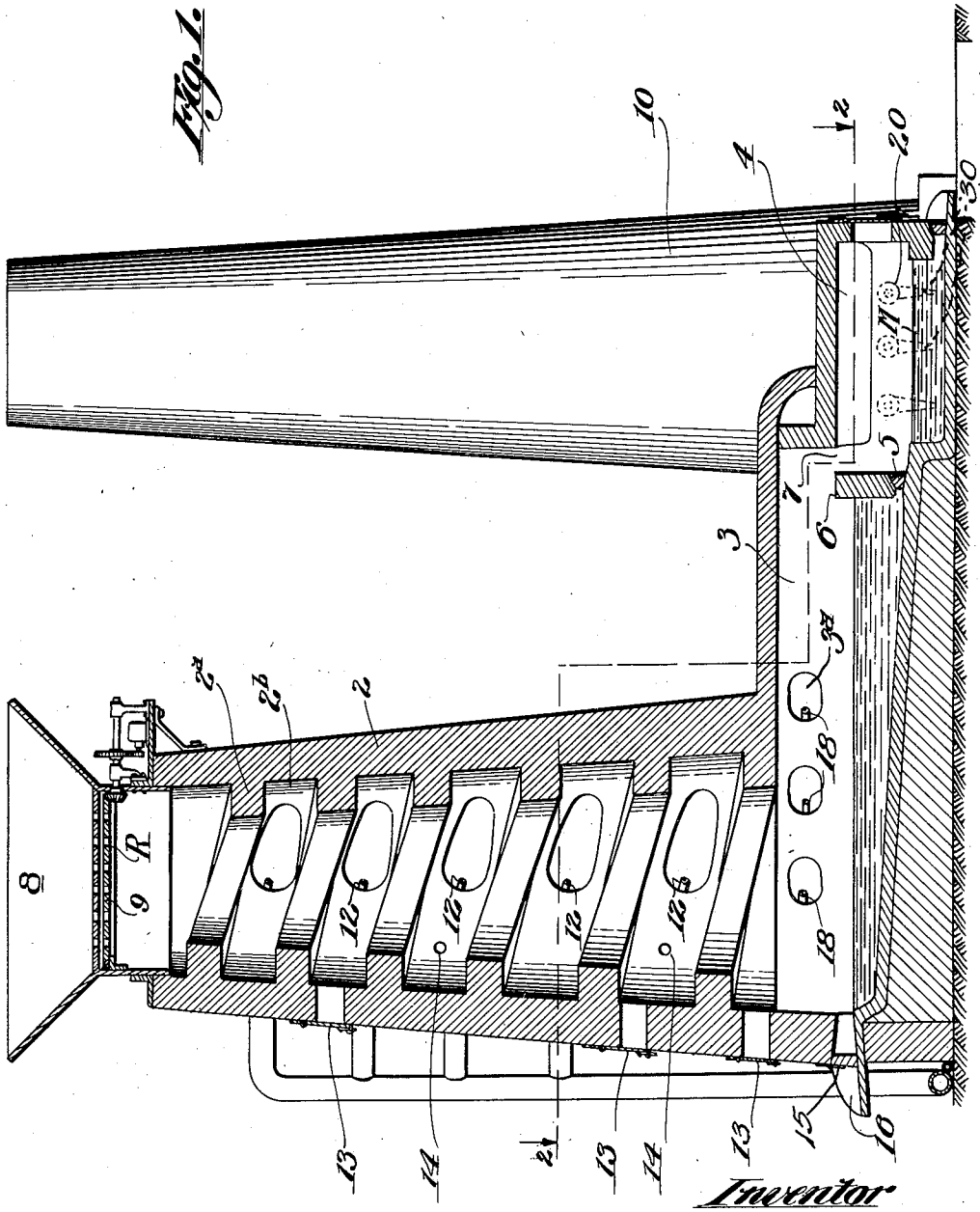
April 7, 1931. M. S. ROGERS 1,799,643

DOWN BLAST OIL SMELTING FURNACE

Filed Feb. 6, 1929 2 Sheets-Sheet 1

Fig. 1.



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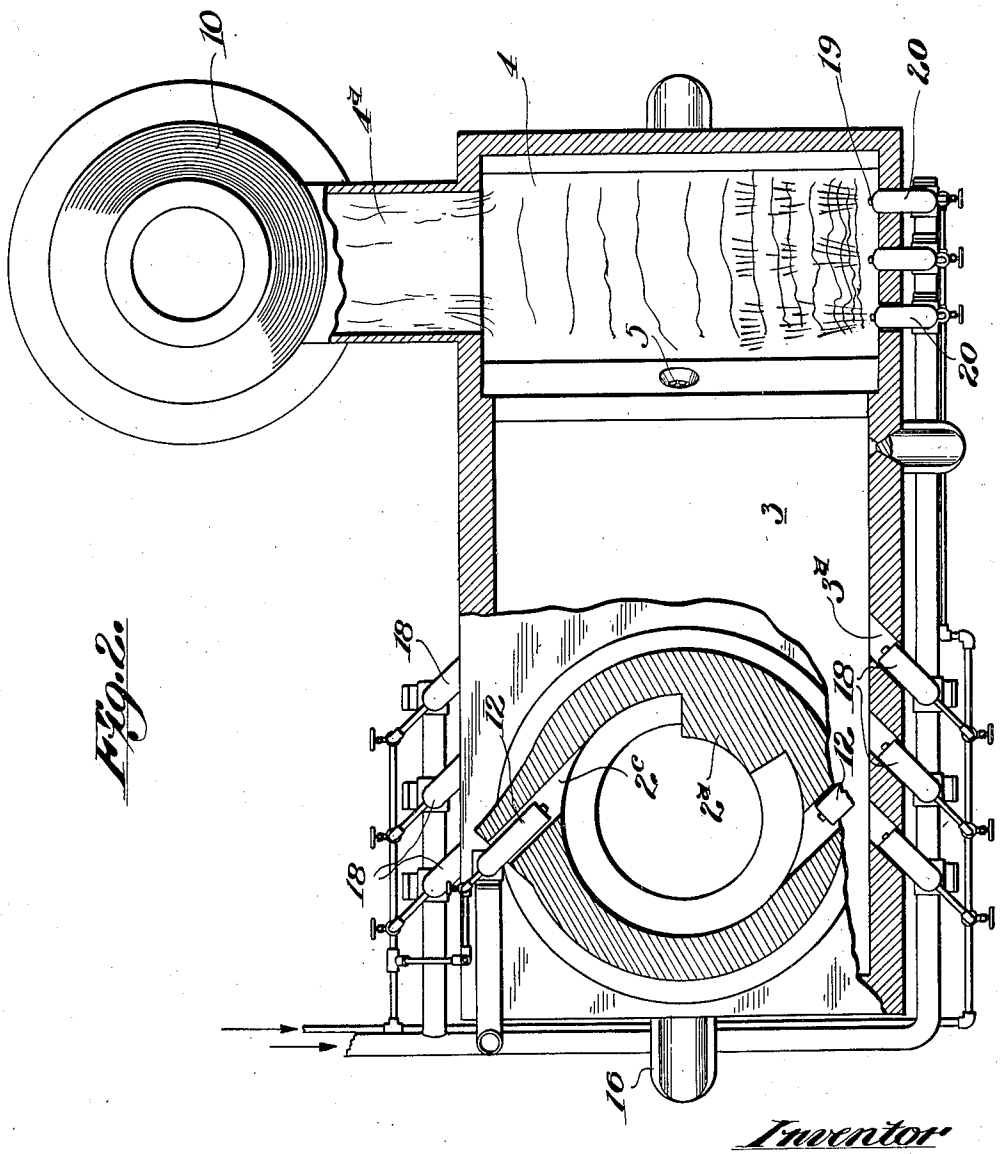


Fig. 2.

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UNITED STATES PATENT OFFICE

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DOWN-BLAST OIL-SMELTING FURNACE

Application filed February 6, 1929. Serial No. 338,015.

This invention relates to smelting furnaces and more particularly to a vertical down blast and up blast stack system. The application is a substitution for my abandoned application, Serial No. 666,749, filed October 5, 1923.

It is an object of the invention to provide, in combination in a smelting furnace, a vertical, down blast and up blast system of chimneys in a series, together with a settling chamber or forehearth, and to provide in the combination a secondary or converter hearth in serial relation, so that the molten metal in the forehearth can be drawn from below its burden of slag into the converter chamber and from this drawn separately.

Another object is to provide, in a vertical, down blast furnace, means for relatively increasing the length of time and path of travel of the charge descending therein and during the course of treatment. In this connection, it is an object of the invention to provide a vertical furnace stack having a substantially continuous, helical recess in its inner face and to form such recess by an inwardly projecting helix of suitable proportions forming a well defined ledge between faces of which the helical or circuitous passageway or recess is formed.

It is another object to provide means for the heating of the furnace by oil or gas fuel and to provide means for controlling the feed and admission of a pulverized mixture of the material to be treated and which may consist of raw ores of iron, mercury, copper, lead, and zinc, or which may consist of iron sands, flue-dust, concentrates, mill-dust and other comminuted forms of metalliferous substances.

It is an object to provide for the admission of the temperature-producing fuel as may be desired in the stack and in the forehearth and converting chambers and to provide for the admission of air as may be necessary, as well as for the introduction of carbon, such as soot, into the material to be treated.

A further object is to provide in a vertical down blast chimney system, means for permitting observation and also to provide explosion doors as may be necessary.

Other objects and advantages will be made manifest in the following specification of an embodiment of the invention illustrated in the accompanying drawings, wherein:—

Fig. 1 is a vertical section and elevation of one embodiment of the invention.

Fig. 2 is a plan and horizontal section approximately on line 2—2 of Figure 1.

The apparatus of my present invention by which comminuted material may be treated according to my present method consists of any suitable number of vertical stacks 2, of which only one is here shown, this stack being designed and arranged so that descending material therein will fall into the forehearth 3 preferably at one end of the same, and this forehearth is directly joined in serial fashion with a converting chamber 4, which in the present case is shown as at the opposite end of the forehearth from the end into which the stack 2 discharges.

Preferably, the bottom 3^a of the forehearth is inclined so as to permit the free, gravitational flow of the melt therefrom through an outlet 5 into the subjacent converter chamber 4; a suitable transverse wall 6 forms a bridge and end wall for the forehearth 3 and gases from the forehearth chamber may pass through a throat 7 from the forehearth into the converter chamber and thence up through a stack 10.

One of the important features of the present invention is the provision of means for relatively increasing the time required in the descent of material discharging from the hopper 8 and through the feed control gate 9 down into the stack 2, as compared to a down blast stack having no retarding means. The retarding means of the present invention consists preferably of a helical, inwardly projecting ledge or shoulder 2^a obviously built of the necessary fire-resisting material and forming a helical or circuitous passageway 2^b between faces which are longitudinally opposite as to the stack.

Air and fuel as may be necessary for the creation of the desired temperature are supplied through nozzle and burner means 12 which, as clearly shown in Figure 2, are arranged tangentially to the circular interior wall of the stock 2 and the nozzles, of which

any suitable number and desired arrangement may be provided, are positioned in nozzle pockets 2^c in the stack wall, these pockets opening in the bottoms of the turns of the helical passageway 2^b. From this it will be seen that as the comminuted material to be treated, of whatever its character, falls through the regulating and controlling discharge gate 9, the material is caught up by the swirling blast of flame and gases tangentially discharging into the stack 2 and therefore the period of descent is materially increased because of the greater length of path through which the material must pass in descending through the stack.

Safety or explosion gates 13 are provided at suitable intervals and locations in the wall of the stack, as also are the usual peep holes 14. The higher end of the forehearth 3 is provided at about the base of the stack with a slag opening 15 and below this there is shown a slag tap 16 through which slag from the forehearth may be drawn as necessary.

To obtain the desired degree of temperature and a proper and desired mixture of gases in the forehearth 3, the sidewalls of this chamber are shown as provided with pockets 3^a in which are arranged air blast and burner nozzles 18, these preferably being disposed obliquely and inclining toward the center and discharge end of the forehearth so as to facilitate and tend to direct the progressive flow of the gases and by-products of combustion toward the converting chamber 4 and toward the up blast stack 10, which is shown in Figure 2 as disposed at one end of the converting chamber 4 and is connected thereto by a passageway.

The desired temperature is obtained and controlled in the converting chamber by air and burner nozzles indicated at 19, these discharging toward the gas outlet passageway 4^a at the opposite end of the converter furnace.

The converter furnace is provided with suitable air tuyères 30, these preferably having their discharge ends located below the normal level of the melt M in the converter chamber.

From the above it will be seen that I have provided a down blast smelting system in which there is directly combined a forehearth, at the base of a down draft and reducing stack, and a converter chamber so that an economy in the utilization of the heated gases from the smelting furnace is obtained by passing these gases into the converter chamber and also running the reduced molten metal directly from the forehearth into the converter chamber and directly treating it for purification.

It will also be seen that I have provided an extremely simple, effective and durable means for materially increasing the length of time required in the fall of the comminuted substances from the top of the stack into the subjacent forehearth by the provision of the helical baffle and recess or path formed thereby down the inside wall of the chamber.

Further embodiments, modifications and variations may be resorted to within the principle of the invention.

What is claimed is:—

1. In a smelting furnace, a stack having means adjacent its top for feeding a comminuted material into the stack, said stack having on its inner surface a helical recess, and burners arranged at different points along the recess discharging in a direction downwardly along the recess.

2. In a smelting furnace, a down blast smelting stack, the interior of the stack gradually widening from top to bottom, there being a substantially continuous helical recess formed in the walls of the stack extending from adjacent the top to adjacent the bottom thereof, and burners arranged tangentially of the recess.

In testimony whereof I have signed my name to this specification.

MATTHEW S. ROGERS.