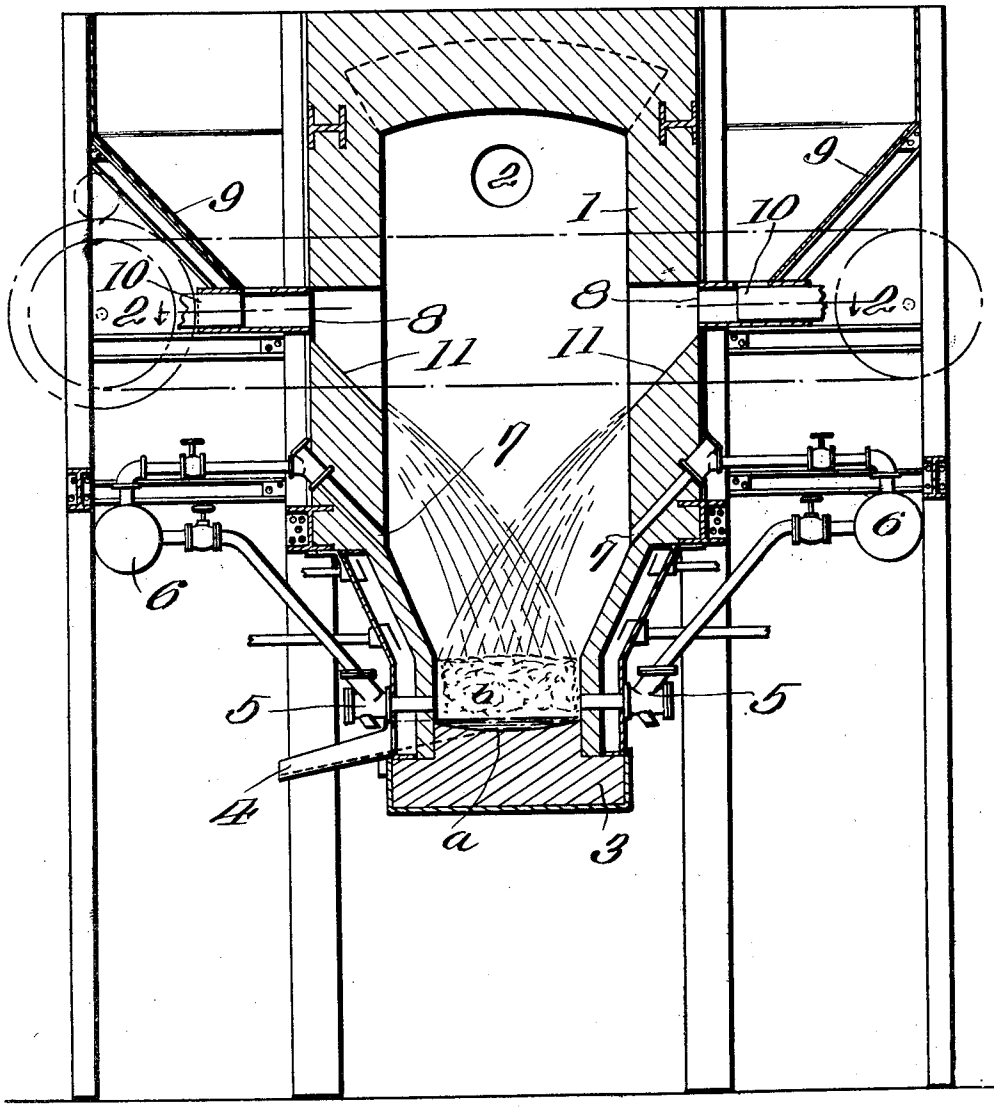
Dec. 13, 1927. 1,652,224

G. H. WARING

OPERATION OF FUME FURNACES

Filed June 4, 1925 2 Sheets-Sheet 1

FIG. 1.



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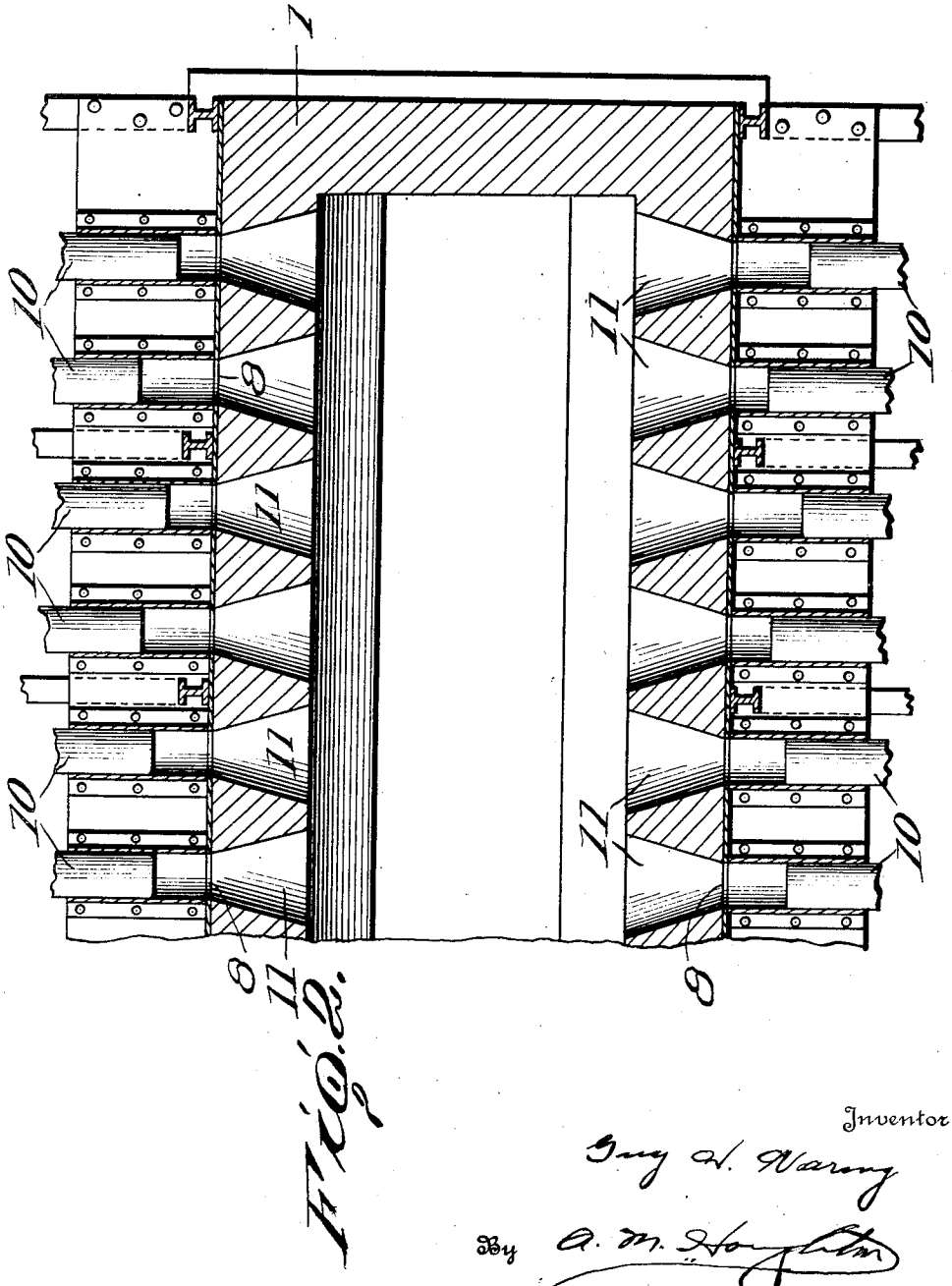


Fig. 2.

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Patented Dec. 13, 1927. 1,652,224

UNITED STATES PATENT OFFICE.

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OPERATION OF FUME FURNACES.

Application filed June 4, 1925. Serial No. 34,912.

This invention relates to the operation of fume furnaces; and it comprises a method of operating furnaces designed for fuming off and recovering metallic values wherein a replenished ignited bed or charge of ore materials containing zinc is established and maintained with the aid of air passing therethrough, (or "primary air") and the fumes burnt by air introduced above the bed ("secondary air") and wherein replenishment is effected by delivering ore thereto as spaced particles falling through the ascending hot gases burning with the secondary air and freely exposed thereto; and it further comprises as a new assemblage of apparatus elements a fume furnace provided with tuyères for primary air and for secondary air whereby a hot topped charge may be established and maintained, with upper fume removing means and with lateral charging ports and means such as an apron or spreader set in the furnace wall at an inclination usually around 45° whereby a tumbling motion in different forward directions is imparted to the particles; all as more fully hereinafter set forth and as claimed.

In the metallurgical treatment of refractory sulfid ores carrying lead and zinc for the recovery of the values in volatilized form, it is customary to use a fume furnace; a furnace in which there is established an ignited replenished bed of ore and fuel, the metallic values of the ore being driven off and collected as fume. This type of furnace is sometimes known as a pigment furnace when applied to the manufacture of such pigments as "sublimed white lead." The bed is generally run under reducing conditions and there may be a production of matte and of fused slag. Temperature is maintained by the introduction of air into the bed; the air passing through the bed and maintaining it in an ignited state. The vapors produced carry lead and zinc as well as, often, other metals in incompletely unoxidized form. When condensed, they yield a blue fume. In some types of these furnaces there is an introduction of secondary air at a point above the fire bed, this air burning the vapors and gases and giving a fume of oxidized character. It is to this latter type of furnace that the present invention particularly relates. In this type of furnace replenishment of the fuel bed may be, and usually is, by ordinary stoking means.

I have found that in the replenishment of the fire bed in this type of furnace, it is desirable to preheat and ignite the charging materials to some extent and to this end to deliver them through the ascending current of hot vapors and gases coming from the fire bed; and burning with the secondary air. In so doing, however, there is the difficulty that the particles are apt to become coated to a greater or less extent with oxid of zinc. This retards a number of the desired reactions and in the case of fuel impedes its rapid combustion. Also it has the objection of returning zinc uselessly to the fire bed. Again, it is desirable that the replenishment of the bed be uniform as far as possible since irregular deposits upon the surface of the bed seriously retard the desired reactions in the reaction bed. Also such accumulations are apt to pick up zinc oxid.

In the present invention I obviate these disadvantages and secure a desirable type of preheat and ignition of the charge by delivering it to the fire bed from above as spaced particles falling through the ascending hot gases and freely exposed thereto. So far as possible, I desire to have each particle of the charge spaced from its neighbors by the hot gases. As these hot gases contain an excess of oxygen and are at an extremely high temperature, usually at least 1400° C., the combustible elements of the charge at once become ignited giving off products of combustion which prevent free access of zinc vapors to the particle. The same is true of sulfids, arsenids, etc. in the charge. I find that as a result of this method of delivery of charge materials to the bed, they carry down but little condensed or sublimed zinc and the bed is replenished uniformly without interruption of or irregularity in the bed reactions. As a matter of fact the bed reactions are facilitated since the charged materials come to it already in a state of combustion and reaction.

To produce these results I introduce the charge materials through the side of the shaft or furnace wall at a point well above the bed level and the level at which secondary air is introduced; such charged materials being given a tumbling motion down an inclined plane just prior to their entry

into the furnace chamber. As a result they fall with a sort of trajectory; there is not a direct vertical fall, but a fall compounded with a radial motion due to the method of introduction. In practice I usually introduce material at two or more sides giving intersecting falling showers of material. I find that the angle of slope of the inclined planes upon which the material is laterally introduced should advantageously be more than 39° from the horizontal; and is best between 45 and 50°.

In the accompanying illustration I have shown, more or less diagrammatically an embodiment of my invention capable of use in the performance of the described process.

In the drawings, Fig. 1 is a vertical section certain parts being shown in elevation; and

Fig. 2 is a segmental horizontal section along lines 2—2 of Fig. 1.

Referring to the drawings, element 1 is a suitable low shaft of brick or other refractory material provided near its top with fume outlet 2 leading to means, not shown, for condensing and recovering fume. At its base the shaft is provided with removable hearth member 3 and outlet 4 for slag and matte. Tuyères 5 connecting with bustle pipe 6 supply primary air to the charge of ignited material. In the drawing a layer of matte and slag is represented by *a* and an ignited pervious charge undergoing reaction is indicated by *b*. As shown the shaft tapers at the bottom. Well above the ignited layer are tuyères 7 at an angle of about 45° and supplied from the same bustle pipe for introducing secondary air for burning the gases and vapors arising from the fuel bed *b*. At a point still higher are charging ports 8 through which material may be introduced from hoppers 9 by means of stoking plunger, ram or the like 10. Immediately below the charging ports 9 the wall of the furnace is cut diagonally to give room for sloping plate or plane 11 down which materials entering at 9 tumble, gaining a certain amount of forward velocity so that passing off the end of the inclined plane 11 the materials fall in a varying trajectory. As shown the furnace is provided with charging ports on two sides producing two cloud-like intersecting feeds which between them cover the upper surface of the charge *b*. The fall of the materials is, of course, somewhat retarded by the upward movement of the hot gases and vapors coming from *b*. In the region or area commanded by tuyères 7 there is intense combustion and great development of heat and the incoming materials passing through this region or area are fired and preheated, reaching *b* in a state of reaction.

Usual plunger operating means may be employed for operating the plungers 10 and it is advantageous that adjacent plungers on the same side should work out of phase and that diametrically opposed plungers should work out of phase.

What I claim is:—

1. In the operation of a fume furnace containing a replenished bed of zinciferous material with a supply of primary air below the bed and of secondary air above the bed, the method of replenishment which comprises introducing replenishing zinc bearing charge materials into the furnace at a point above the point of introduction of secondary air, fine charge materials being introduced with a tumbling motion through the lateral walls of the furnace in such a manner as to scatter the charge through the ascending gases.

2. In the operation of a fume furnace containing a replenished bed of zinciferous material with a supply of primary air below the bed and of secondary air above the bed, the method of replenishment which comprises introducing replenishing zinc bearing charge materials into the furnace at a point above the point of introduction of secondary air, fine charge materials being introduced through the walls of the furnace at an angle of about 45 degrees to the horizontal so as to scatter such material through the ascending gases.

3. In the operation of a fume furnace containing a replenished bed of zinciferous material with a supply of primary air below the bed and of secondary air above the bed, the method of replenishment which comprises introducing replenishing zinc bearing charge materials at a point well above the point of introduction of secondary air as spaced particles falling through the acending hot oxidized gases.

In testimony whereof, I have hereunto affixed my signature.

GUY HULL WARING.