Oct. 19, 1926. 1,603,442

G. BALZ

ZINC BLENDE ROASTING KILN

Filed March 9, 1925 2 Sheets-Sheet 1

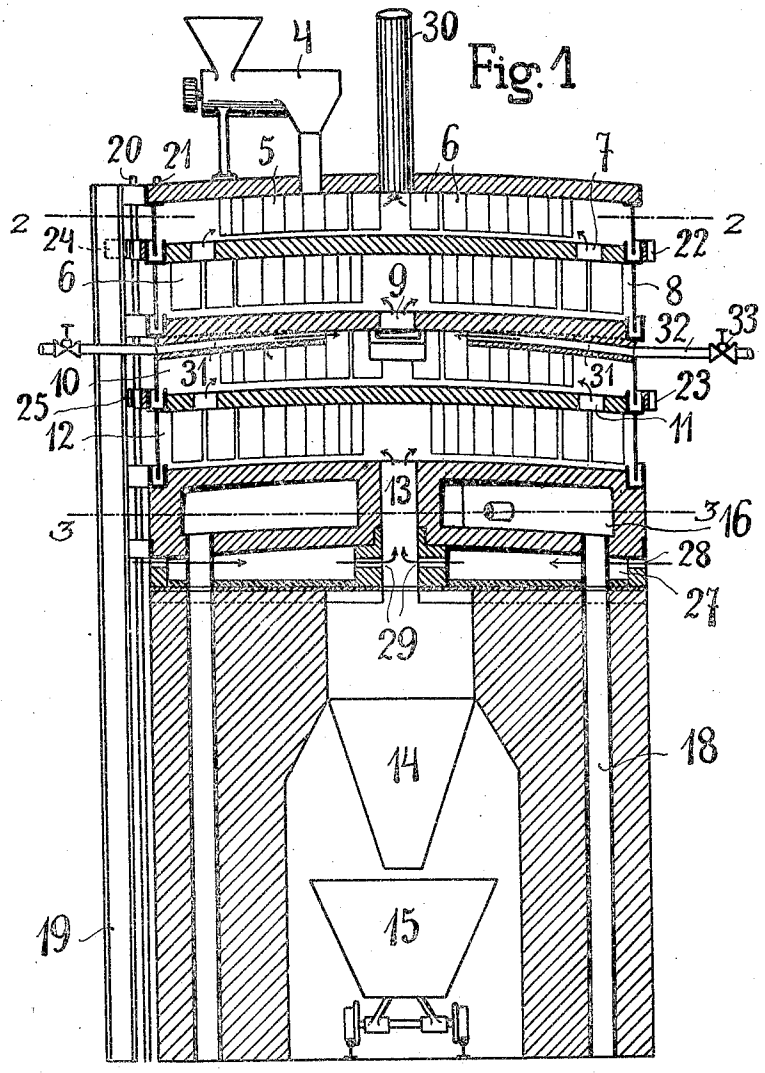


Fig. 1

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Fig. 2

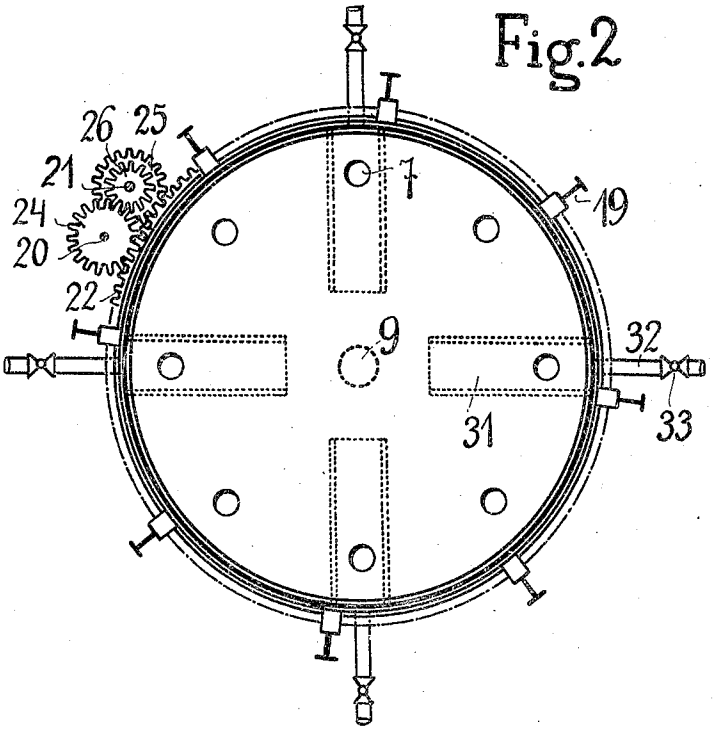
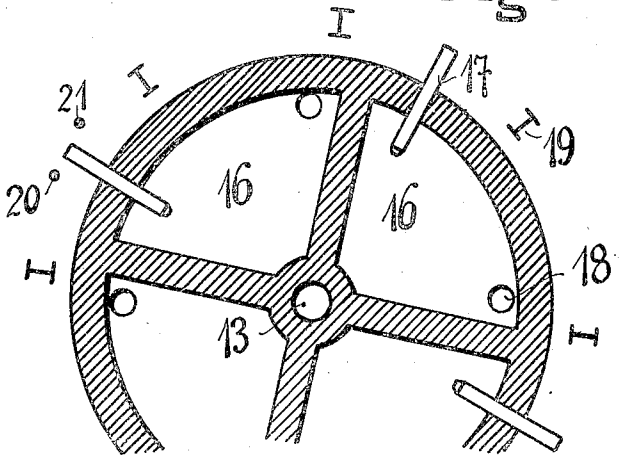


Fig. 3



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UNITED STATES PATENT OFFICE.

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ZINC-BLENDE-ROASTING KILN.

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Roasting down zinc-blende completely is very difficult owing to the very large amount of heat required. There are kilns in which the roasting proceeds comparatively quickly if the zinc-blende is stirred intensively during the roasting, but the life of these kilns is only short as certain parts thereof are subjected to severe wear and tear in consequence of the high temperature necessary.

My invention relates to a zinc-blende roasting kiln provided with means to produce and maintain a uniform temperature in all its parts whereby not only the life of the kiln is prolonged, but the quality of the product is improved in that the sintering of the blende and the caking together of its particles is prevented and its further metallurgical treatment is greatly facilitated. Another important feature resides in that the particles are being acted on by the air also while falling from an upper compartment down into a lower one.

The maintenance of a uniform temperature until the end of the roasting causes the roasting of the blende to proceed more intensively until the end of the roasting. This effect is attained by a particularly advantageous manner of supplying the air which is used not only for carrying through the roasting process, but also for compensating the temperatures existing within the several stories or compartments of the kiln. The air is supplied partly from below in order to be pre-heated, and partly laterally to and into one or several stories or compartments where it is conducted into the respective chambers directly below the vaults to be cooled. The air supplied from below is the primary air, and the other air is the secondary one. This secondary air cools the vaults and conveying teeth prevents them from smelting, and also prevents the zinc-blende from sintering.

The roasting kiln designed according to this invention distinguishes from other roasting kilns working with additional air in that in other kilns the air is either supplied by means of telescopically arranged shafts conducting it either into the stirring arms of the kiln or to the hearth level of the same, in both cases from the interior of the kiln to the outside thereof; in other words: the cooling air for the stirring arms is used also as roasting air or the zinc-blende roasting kiln in which the heat is supplied from above and fresh air is supplied from the sides to the hearth level. While, therefore, with the other kilns the fresh air is supplied through the wall of the kiln to the outer rim of the hearth level, where the air contacts with the heaped up material, roasting air is supplied, with my present improved zinc-blende roasting kiln, into the vertical discharge passage extending from the center of the lowermost compartment down to a discharge hopper or the like, and fresh air is supplied from the outside into the middle position of a compartment, the ceiling of which is provided with a central aperture through which the fresh air passes upwards into the next compartment, whereas the material treated in these latter compartments falls through said aperture into the compartment next below. The separately supplied roasting air and the separately supplied fresh air contact, therefore, with the material also while this falls freely from an upper compartment into the next lower one.

My invention is illustrated diagrammatically and by way of example in the accompanying drawings in which Figure 1 is a vertical axial section through the improved zinc-blende roasting kiln; Figure 2 is a horizontal section in the plane 2—2 of Fig. 1, and Figure 3 is a horizontal section in the plane 3—3 of Fig. 1.

The zinc-blende to be roasted is introduced at 4 into the compartment forming the uppermost story 5 of the kiln. The vaulted cover or ceiling above this compartment is provided with stirring and conveying blades 6 or the like by which the material lying upon the equally vaulted bottom compartment (5) is conveyed to aperture 7 through which the material falls down upon the equally vaulted bottom of compartment (8) forming the cover or ceiling of the next compartment below (10), and so on. Stirring and conveying blades 6 are provided also in all these other compartments, and are so designed that the material is conveyed alternately radially outwards and inwards. For the purpose of causing the material to be roasted to pass through the kiln in a downward direction and to convey the same to the apertures 7, 9, 11 and 13 of the individual compartments of the kiln the stirring or conveying blades 6 are provided which, as they are known per se, are indicated only in a diagrammatical manner in the drawings. Said conveying blades serve for turning or casting the material to be

roasted on each compartment bottom and for conveying the same towards the before-named apertures. Said conveying blades are made from refractory material and are arranged in a somewhat inclined position in the ceiling of each compartment, they act in such a manner that in the uppermost compartment they convey the material to be roasted towards the holes 7 while simultaneously turning, roasting or stirring said material. In the next compartment the material to be roasted is conveyed in such a manner that it ascends towards the aperture 9 through which it falls upon the bottom of the next compartment where it is again stirred and conveyed by said blades 6 towards the apertures 11 in order to pass finally through the aperture 13 of the lowermost compartment. The material arriving in the chamber 8, is, therefore, conveyed to the central aperture 9 thereof through which it falls into the compartment 10 which is provided with apertures 11 conducting the material into the other compartment 12 having a central outlet opening 13, through which the finished material falls into a hopper 14 conducting it into a truck 15.

12 denotes the lowermost compartment; below it is located the heating chamber 16 which may be designed for the burning of gas or of any other suitable fuel. If gas is used as fuel the chamber 16 is subdivided by partitions (Fig. 3), and each of the compartments thus formed is provided with one or more burners 17. 18 denotes vertical passages through which the waste-gases are conducted to regenerator-chambers or the like.

The kiln, as a whole, stands between vertically disposed girders 19. Between two thereof two vertical shafts 20 and 21 are arranged. The covers or ceilings of the compartments 8 and 12 are rotatory, and are provided with cogs 22 and 23 which mesh with cog-wheels 24 and 25, of which 24 is affixed to a shaft 20, and 25 is affixed to a shaft 21. The two shafts are coupled with one another by a smaller cog-wheel 26 secured to the shaft 21 and meshing with the cog-wheel 24, the arrangement being such that the two shafts rotate in opposite directions, as do, consequently, also the covers or ceilings of the compartments 8 and 12, whereby the distribution of the material over the bottoms located below said rotatory covers or ceilings is rendered very uniform.

The several superposed compartments are separated from one another in known manner by circular gutters encompassing the covers or ceilings, as shown (Fig. 1), said gutters being kept filled with roasted zinc-blende.

The zinc-blende introduced into the kiln through the feeding device 4 passes successively through all compartments, travels radially in each thereof, alternately radially inwards and outwards, and leaves the kiln in roasted state through the channel or passage already mentioned.

As regards the air and the passages provided for it, the arrangement is such that the air flows in a direction opposite to that of the material. The fresh air is introduced into the kiln through lateral passages 28 conducting it into a pre-heating chamber 27 located below the heating chamber or chambers 16. The pre-heated air leaves the chamber 27 through passages 29 conducting it into the chamber 12. The further path of the air is as follows: through openings 11, chamber 10, opening 9, chamber 8, opening 7, chamber 5, pipe 30. It is obvious that all chambers or compartments (5, 8, 10, 12) are being heated practically uniformly.

In order to prevent the covers or ceilings, as well as the conveying means, from being slagged, separate lateral air-pipes 32 (Figs. 1 and 2) are provided. I have shown such pipes only in connection with the cover or ceiling pertaining to the chamber or compartment 10. Each of these air-pipes is provided with a valve or the like for regulating purposes. The cover or ceiling just mentioned is stationary and the pipes 32 terminate near the central aperture 9 through which passes the air originating from the chamber 27, as well as the air introduced through the pipes 32. There arises a certain compression at the opening 9, said compression being caused by the air-current passing through the pipes 31 and striking again the air-current ascending through the holes 13 and 9 in consequence whereof the velocity of the air flowing from the chamber 27 to the chamber 10 is diminished a little, the heat carried along with this air being thereby caused to act a little upon the kiln-parts cooled by this air, and the temperatures in the various parts of the kiln being compensated more effectively among each other which is useful for the life of the kiln. Another useful effect produced by the lateral introduction of the secondary air in the manner described consists in the zinc-blende being prevented from sintering and agglomerating, and as it is exposed to currents of cold air when dropping through the central aperture 9 it becomes porous which renders it more easily workable in the ensuing metallurgical processes.

The mantel of the kiln may be provided with inspection holes permitting the observation of the roasting process from without.

I claim:

1. A zinc-blende roasting kiln, comprising, in combination, a structure composed of superposed parts and forming superposed compartments, of which the bottom of every upper one forms the cover or ceiling of the

next lower one, and of which every second part in downward direction is rotatory; means for turning the rotatory parts of the structure; means for introducing the zinc blende into the uppermost compartment, and means for conveying it alternately radially outwards and radially inwards through the successive compartments; an air-heating chamber located below the lowermost compartment, and means for supplying air into this chamber and discharging it from it into the discharge passage for the roasted zinc-blende; and pipes extending radially inwards from the outside to near the center of one of the intermediate bottoms upon which the blende is moved radially inwards and is delivered into the compartment below it through a central aperture, said pipes terminating near this aperture; and means for introducing cold air into the said pipes, substantially as set forth.

2. A zinc-blende roasting kiln, comprising, in combination, a structure composed of superposed parts and forming superposed compartments, of which the bottom of every upper one forms the cover or ceiling of the next lower one, and of which every second part in downward direction is rotatory; means for turning the successive rotatory parts of the structure in opposite direction; means for introducing the zinc-blende into the uppermost compartment, and means for conveying it alternately radially outwards and radially inwards through the successive compartments; an air-heating chamber located below the lowermost compartment, and means for supplying air into this chamber and discharging it from it into the discharge passage for the roasted zinc-blende; and pipes extending radially inwards from the outside to near the center of one of the intermediate bottoms upon which the blende is moved radially inwards and is delivered into the compartment below it through a central aperture, said pipes terminating near this aperture; and means for introducing cold air into the said pipes, substantially as set forth.

3. A zinc-blende roasting kiln, comprising, in combination, a structure composed of superposed parts and forming superposed compartments, of which the bottom of every upper one forms the cover or ceiling of the next lower one, and of which every second part in downward direction is rotatory; means for turning the rotatory parts of the structure in opposite directions, and means for reversing the direction of rotation of said rotatory parts of said structure; means for introducing the zinc-blende into the uppermost compartment, and means for conveying it alternately radially outwards and radially inwards through the successive compartments; an air-heating chamber located below the lowermost compartment, and means for supplying air into this chamber and discharging it from it into the discharge passage for the roasted zinc-blende; and pipes extending radially inwards from the outside to near the centre of one of the intermediate bottoms upon which the blende is moved radially inwards and is delivered into the compartment below it through a central aperture, said pipes terminating near this aperture; and means for introducing cold air into the said pipes, substantially as set forth.

In testimony whereof I affix my signature.

GEORG BALZ.