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PROCESS FOR SINTERING FINE OXID ORE AND METALLURGICAL PRODUCTS.

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1,221,962. Patented Apr. 10, 1917.

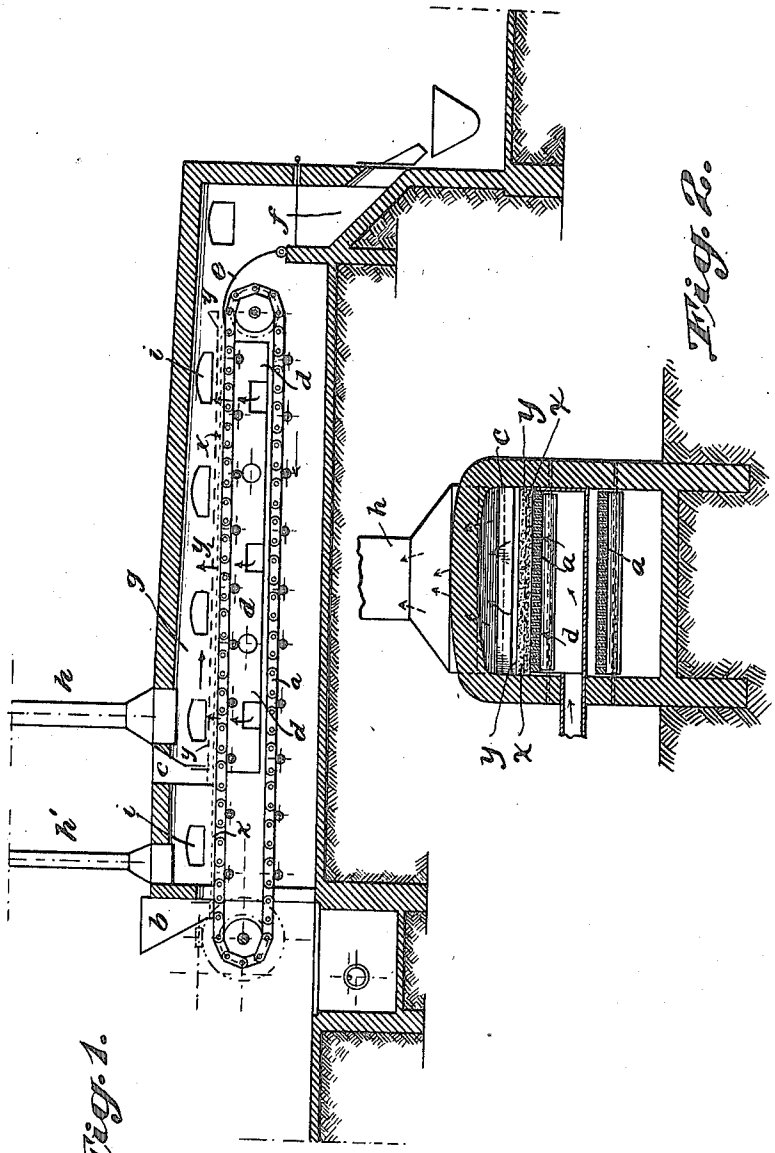

Fig. 1.

Fig. 2.

Witnesses
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PROCESS FOR SINTERING FINE OXID ORE AND METALLURGICAL PRODUCTS.

1,221,962. Specification of Letters Patent. Patented Apr. 10, 1917.

Application filed July 16, 1914. Serial No. 851,419.

To all whom it may concern:

Be it known that I, HEINRICH BITTMANN, metallurgical engineer, a subject of the Austrian Emperor, residing at Frankfort-on-the-Main, Hesse-Nassau, Germany, have invented certain new and useful Improvements in Processes for Sintering Fine Oxid Ore and Metallurgical Products, of which the following is a specification.

This invention relates to a process of sintering fine oxid ores and metallurgical products; and corresponding to that set forth in Letters Patent of the Kingdom of Great Britain and Ireland, No. 8,384 of 1914, granted upon application filed April 2, 1914.

In the specification for United States Patent 844,355 of 1907 there is set forth a process for sintering fine oxid ores and metallurgical products, in which an air blast is blown or sucked through a mixture of ore and fuel, whereby the fuel is burned out and owing to the heat generated thereby the particles of the material to be treated sinter and bake together. According to the method described in the specification of the above referred to patent, the process is carried out in a converter furnace and in this case is done in an intermittent way, that is to say, after the converter has been filled and after the sintering of the contents of the converter is completed, the sinter cake obtained is removed from the converter by the tilting of the converter and a new charge is fed to the converter and subjected to sintering.

According to a well-known method the above described process is carried out in a continuous way by means of a grate to which is imparted an uninterrupted or intermittently interrupted movement. The present invention relates to a special mode of carrying out this known continuous method.

According to the said invention onto the farther end of the charge support or bed which is thus moved a layer of fuel (carbon) is charged in an ignited condition or brought to ignition and this ignited layer of fuel is brought by a movement of the base to the place where the ore is fed in. At this place on to the ignited layer of fuel a layer of material to be treated is charged and during the further movement of the charge support or bed the air for combustion is passed from below through the two layers of fuel and ore superimposed upon each other. Owing to the movement of the charge support or bed the discharge of the sintered material from the forward end of the grate can simultaneously take place.

In the accompanying drawings there is shown by way of example a device adapted to enable the process above described to be carried into practice, of which drawings Figure 1 is a longitudinal sectional view through the apparatus, and Fig. 2 is a transverse sectional view.

As charge support or bed for the grate there may be provided a chain grate *a* or the like, to which is imparted an uninterrupted or an intermittent movement in the direction indicated by the arrows; *b* is a feed hopper, at the rear end of the chain grate, by means of which during the movement of the grate a layer of fuel the upper limit of which is indicated by the dotted line *x—x* is charged on the same; and *c* is the feed hopper containing the ore. On the charge support or grate situated between the feed hoppers *b* and *c* the layer of fuel is brought to ignition, for which purpose pressure or suction blast may be employed.

A layer of material to be treated which is indicated by the lines *y—y* is charged on the fuel layer *x—x* from the feed hopper *c*. Below the charge support or grate situated between the feed hopper *c* and the foremost end of the grate is arranged an air box *d*, into which air is caused to enter, in order to pass upwardly from here by way of the grate and the fuel and ore layer. On the fore end of the base of the charge support or grate a scraper *e* is provided which when the charge support or bed is moved scrapes off the sintered material from the latter and brings same into an inclosed space *f* where the material may be temporarily retained preparatory to being delivered to a car or other conveying device by which it is taken away from the sintering apparatus. For conducting away the gases the grate base may be surrounded by a flue space *g* from which flues *h* and *h'* extend; and the flue may be provided with manholes *i*.

It is self-evident that for carrying out the process any other suitable form of charge support or bed, endless or otherwise and advantageously movable, may be used.

In many cases it may be of advantage to feed the ore on to the ignited layer of fuel

in several layers one after the other. This can be effected in a simple manner by providing several feed hoppers *c* arranged in series and provided with corresponding higher outlet openings.

When carrying out the process, as a rule less mixing fuel is required as is the case when working according to the example of carrying out the process in a discontinuous way described in the specification for Patent No. 844,355 of 1907, because the combustion of the mixed fuel progresses more intensely. When using a sufficiently deep fuel layer and not too thick a layer of ore the mixing fuel in the ore may in some circumstances be entirely dispensed with; in such cases therefore the sintering would be only effected by the ignited fuel passing below the charging place.

I have already stated that the invention herein described relates to a process for treating fine oxid ores, and similar metallurgical products; and I wish it to be understood that the term "ore" as herein used refers to mineral-bearing masses, whether in native condition or artificially formed, and that include not only metal oxid of one form or another but also other materials that are ordinarily found in these ores such as silica, earthy bodies, etc.

It is well understood that the treatment of fine oxid and similar ores, which do not carry in any considerable quantities as a component part a native combustible element, such as sulfur or its equivalent, in order to sinter or agglomerate such ores, that is, to cause the particles thereof to cohere together and form masses adapted for blast furnace treatment, depends upon activities different from those developed in sintering ores of the sulfid class. Particularly in treating fine iron oxid ores to cause the particles to cohere and form masses suitable for treatment in a blast furnace it is important that silicating of the metal should not take place, as that is highly undesirable.

The process herein described is especially adapted for treating iron oxid ores, as it permits an easy control of the various steps of the operation and the chemical reactions and physical effects which take place in working the process. The layer of ignited and burning carbonaceous fuel supplies the heat necessary to a working of the process, and also the carbon oxid gases that interact with the metallic oxids of the ore, causing reactions to take place that result in the cohering of the masses of the ore without the metal being silicated. These reactions take place while the burning layer of carbonaceous fuel and the ore are in respective layers superposed one upon the other, the layer of ore being as represented comparatively thin so that the heat generated by the combustion of the fuel layer after performing its necessary work readily escapes by conduction through short paths, and by radiation, and therefore the ore mass is not raised to such high temperature as permits and induces undesirable reactions to take place. It is well understood that ores adapted for treatment in a process such as described vary to a considerable degree, some requiring a higher degree of heat than others for the most desirable results, and some requiring more of the carbon oxids, or a prolonged presence thereof, in contact with the ore, to secure the best results; and the process herein described is adapted to secure the best results in these respects as by regulating the relative proportions of the fuel layer and the ore layer, and also the force and rapidity of the currents that supply combustion-supporting gases, so that a more intense combustion and hence a higher heat, or a slower and more prolonged combustion, may be secured as circumstances may require, and these adjustments may be made quickly and during the operation of the apparatus as conditions may suggest.

Having now particularly described and ascertained the nature of said invention and in what manner the same is to be performed, I declare that what I claim is:

1. The herein described process of treating metal oxid ores that are initially in a fine condition to form therefrom coherent, thin, agglomerated or sintered masses suitable for blast furnace treatment, it consisting in forming in superposed relationship to each other a layer of carbon fuel and a layer of the ore to be treated, causing the layer of fuel to actively burn under the influence of a current of combustion-supporting gas supplied thereto, thereby generating heat and producing carbon oxid gases, forcing the products of combustion from the said burning fuel layer and the gaseous bodies mixed therewith through the ore layer and causing reactions to take place among the metallic oxid particles thereof under the influence of the heat and the carbon oxid gases, whereby the ore masses are caused to cohere and form agglomerated masses.

2. The herein described process of treating metal oxid ores that are initially in a fine condition to form therefrom coherent, thin, agglomerated or sintered masses suitable for blast furnace treatment, it consisting in forming a layer of ignited carbonaceous fuel, applying thereto a layer of oxid ore to be treated, causing air to pass through the said superposed layers to maintain combustion in the fuel layer, thereby generating heat and producing carbon oxids, and causing these carbon oxids and the gaseous bodies mixed therewith to pass through the superposed ore layer and caus-

ing the metal oxids in the latter, due to heat and the presence of the carbon oxids produced by the burning of the fuel layer, to cohere and form agglomerated sintered masses.

3. The herein described process of treating metal oxid ores that are initially in a fine condition to form therefrom coherent, thin, agglomerated or sintered masses suitable for blast furnace treatment, it consisting in forming a layer of ignited carbonaceous fuel, subjecting this layer to an air current whereby it is brought to a condition of active combustion, then applying thereto a layer of the ore to be treated, and continuing the passage of air upwardly through the said superposed layers and causing the heat generated by the combustion of the ore layer and the carbon oxid gases produced thereby to pass through and act upon the ore mass, whereby the metallic oxids are caused to cohere and form agglomerated or sintered masses of the ore.

In testimony whereof I have affixed my signature in presence of two witnesses.

HEINRICH BITTMANN.

Witnesses:
ROBERT ENGLER,
JEAN GRUND.