April 20, 1926. 1,581,522

H. STEHMANN

DEVICE FOR BURNING CEMENT, MAGNESITE, LIME, ETC

Filed August 30, 1921 2 Sheets-Sheet 1

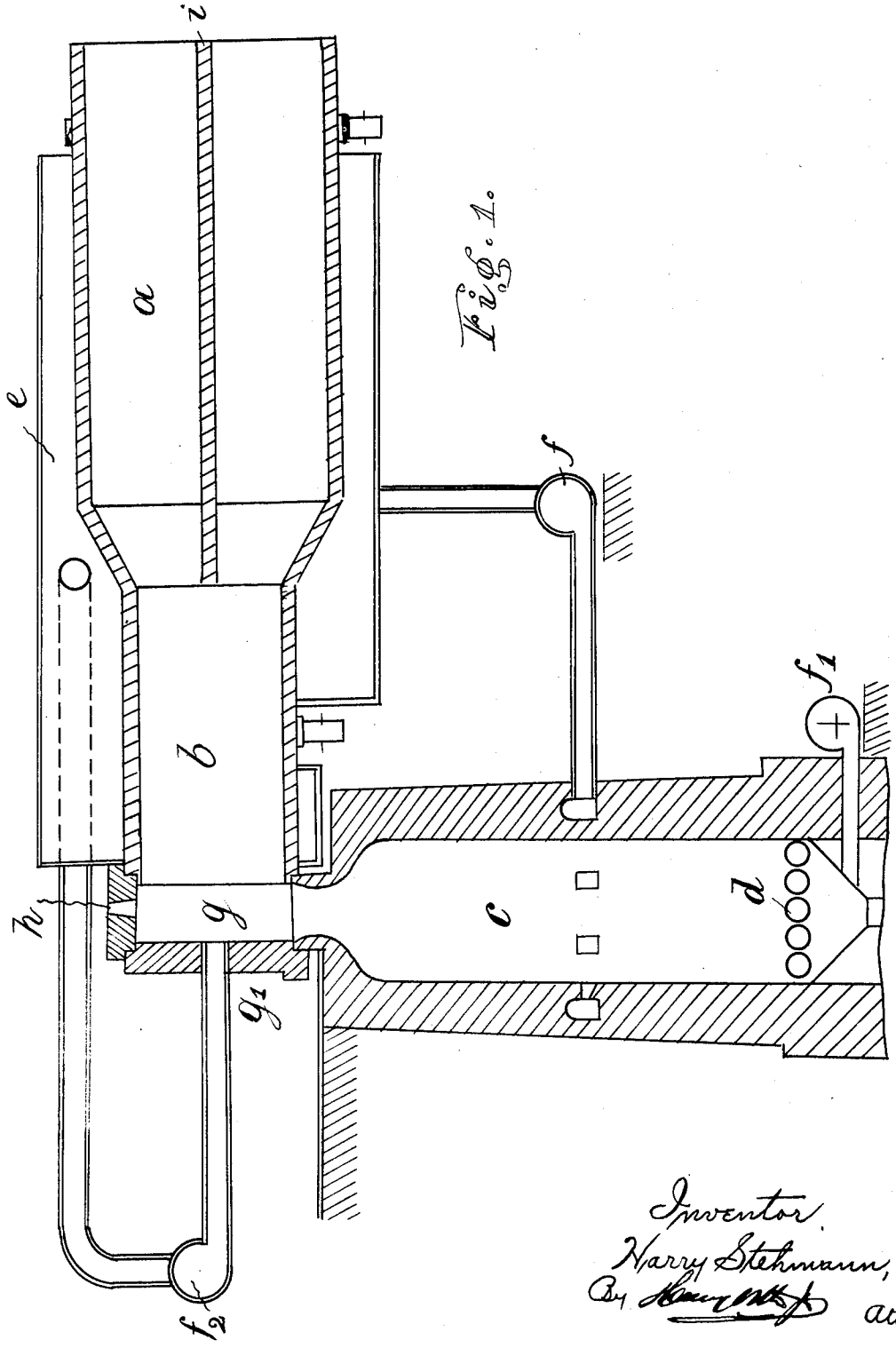


Fig. 1.

Inventor,
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Fig. 2.

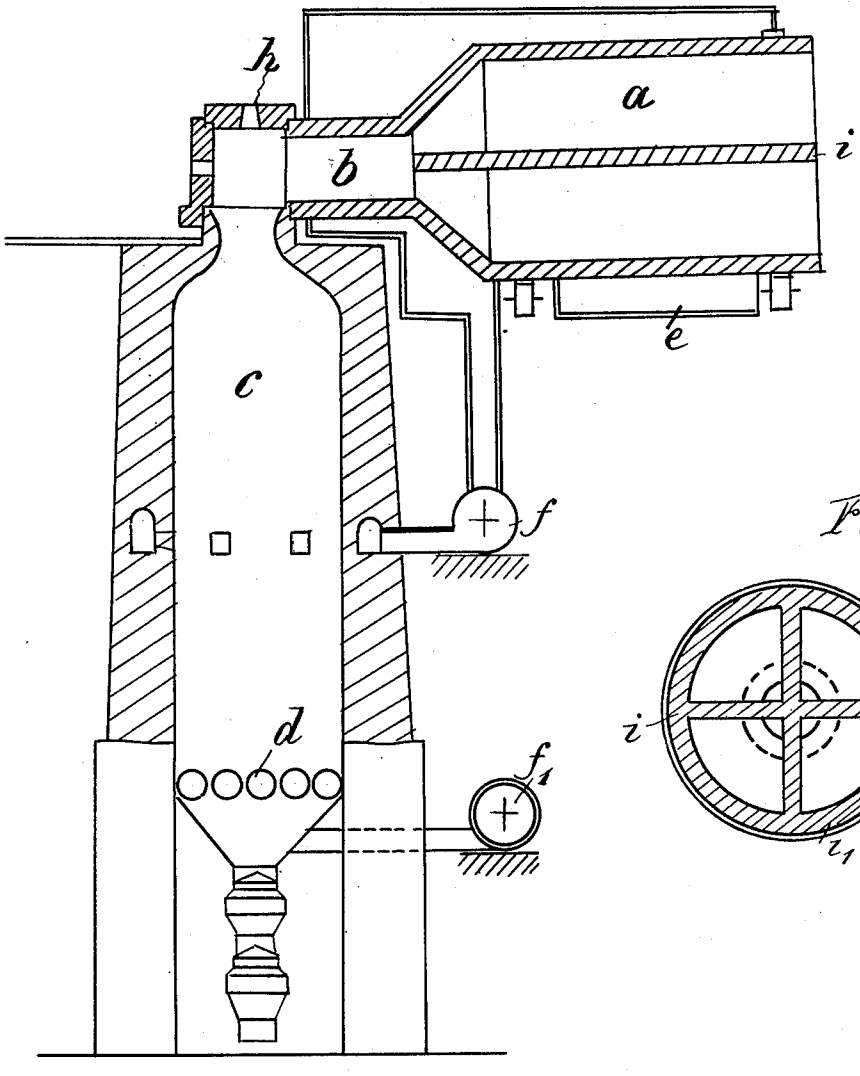


Fig. 3.

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UNITED STATES PATENT OFFICE.

HARRY STEHMANN, OF BERLIN-HOHENSCHONHAUSEN, GERMANY.

DEVICE FOR BURNING CEMENT, MAGNESITE, LIME, ETC.

Application filed August 30, 1921. Serial No. 497,025.

(GRANTED UNDER THE PROVISIONS OF THE ACT OF MARCH 3, 1921, 41 STAT. L., 1313.)

To all whom it may concern:

Be it known that I, HARRY STEHMANN, a subject of the German State, and resident of Berlin-Hohenschonhausen, in the State of Prussia, Germany, have invented certain and useful Improvements in a Device for Burning Cement, Magnesite, Lime, Etc. (for which I have filed an application for patent in Germany, January 14, 1920, #St. 32805); and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use the same.

A disadvantage of rotary kilns at present used for burning cement, magnesite, lime, etc. is that the waste heat is not utilized fully, and particularly the usual cooling drums used to transfer the heat of the clinker to the air of combustion have an insufficient effect. The apparent saving of heat of the material, the burning of which has been finished, causes in fact an increased expense for fuel used for further heating the slightly warmed cooling air up to the temperature of the combustion or clinkering zone.

The object of this invention is a device for burning cement, magnesite, lime, etc., consisting of a rotary kiln and cooling chamber which has the form of a shaft kiln of such height and size that the air is heated to the ignition temperature of the fuel by the material discharged from the rotary kiln. The shaft kiln must be large enough to expose the burnt material for a long time (12 to 24 hours) to the cooling air traversing the chamber in an opposite direction. By this means a relatively small quantity of air for the cooling is used, which, highly heated, is led to the clinkering zone, and there the fuel introduced is entirely burned.

Preferably the shaft kiln is built as an automatic kiln continuously discharging mechanically and closed entirely, whereby the heat is entirely used.

In the clinkering zone, or just before reaching it, the hot air current from the cooling chamber meets the fuel blown into the head of the rotary kiln, and produces a better combustion of the fuel in the clinkering zone than is possible by the arrangements now being used with the air current almost cold at the beginning of ignition.

The great amount of waste heat in a rotary kiln may be explained by the rapid movement of the gases into the calcining zone and the bad mixing of the burning material and the hot gases.

This loss of heat I avoid by giving to the calcining zone a section considerably larger than the clinkering zone. Instead of this larger section of the calcining zone or drum, several such drums connected to one clinkering drum may be used.

To attain a better mixing of the material with the heating gases, the enlarged calcining zone or drum is divided into several longitudinal chambers.

By the above-described arrangements it is possible to charge the calcining zone with a greater amount of material to be burned, move it more slowly forward, and likewise, by a slower movement of the gases make better use of their heat in the rotary kiln over practically the whole cross-section. By these means the length of the rotary kilns and the buildings containing them is very much curtailed, and the radiating surface of the rotary kiln is lessened.

The so shortened rotary kiln is furnished with a mantle and the air heated by the radiation in the interspace between mantle and rotary kiln is exhausted and sent through the cooling chamber, so that the radiated heat can also be used with profit.

Generally the material in the lower, narrow part of the rotary kiln is so highly heated that it is already sintered, or the sintering is completed in the upper parts of the shaft kiln without the addition of more fuel. To complete the sintering in case, under the most adverse conditions, the sintering in the rotary kiln might not be finished, be it accidentally or intentionally, it is possible to supply additional fuel to the shaft kiln through a special opening in the head over the shaft kiln.

Referring to the drawings—

Figure 1 is a vertical section of a kiln embodying my invention.

Fig. 2 is a like view of a modification, and

Fig. 3 is a cross-section of the calcining chamber.

Figure 1 represents the rotary kiln as having an enlarged calcining zone *a* and the smaller continuation *b* for the clinkering

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zone. For example, the latter has the diameter of a common rotary kiln, while the calcining zone *a* is of greater diameter.

The material to be sintered passes from the clinkering zone *b*, into the cooling shaft or shaft kiln *c* furnished with an automatic discharge device *d* and closed entirely. The rotary kiln has a mantle *e* whose ends are partly or wholly open. Out of this mantle the blast device *f* draws the air heated by the radiating rotary kiln, and forces it into the cooling shaft *c* at about the middle, and into the material to be cooled. The blast *f'* forces cold air under the grate or discharge device *d* into the cooling shaft. Both streams of air are heated strongly by the material to be cooled and then pass into the clinkering zone of the rotary kiln at *g*. The third blast device f^2 draws the hot air out of the mantle *e* and forces it, mixed with fuel into the head of the rotary kiln. Here and in the lower part of the clinkering zone *b* the cooling air strongly heated, meets the stream of fuel blown in at *g'*.

It is possible in using the ordinary rotary kiln that the material which is discharged into the cooling drum is not well burned, and a clinkering of the material is impossible. By my invention, in such a case, the clinkering of the material afterwards is possible in the upper part of the cooling shaft *c* by the highly heated air, and it may be necessary with some materials to discharge them, not yet clinkered into the cooling shaft, to avoid over-burning by the highly heated air.

If the heat is not sufficient there can be introduced through the opening *h* granulated fuel to complete the clinkering. If the clinkering is effected chiefly in the upper parts of the cooling shaft, the clinkering chamber *b* can be shortened, as in Fig. 2, and the clinkering completed altogether by the fuel introduced through the opening *h*.

By this means, for the first time, it is possible to burn in the shaft kiln with a coal rich in gases without loss of the distilling gases of the fuel, which was heretofore impossible in automatic shaft kilns.

Figure 3 illustrates in section the separating walls *i*, *i*, separating the calcining zone into four chambers..

I claim—

1. In the art of burning cement, magnesite, lime etc., in a rotary kiln connected substantially air tight at its discharge end to a cooling chamber into which the hot product of the kiln is discharged; the method which comprises forcing air for supporting combustion through the chamber and the hot product therein; maintaining the relative quantities of air passing through the chamber and of said hot product in said chamber, adequate to heat the air to the ignition temperature of the fuel used for heating the kiln as the air leaves said chamber.

2. In the art of burning cement, magnesite, lime etc., in a rotary kiln connected substantially air tight to a cooling chamber into which the hot product of the kiln is discharged; the method which comprises forcing air for supporting combustion and heated by said kiln through the chamber and the hot product therein, maintaining the relative quantities of air passing through said chamber and of hot product in said chamber adequate to heat the air to the ignition temperature of the fuel used for heating kiln as the air leaves said chamber.

3. In the art of burning cement, magnesite, lime etc., in a rotary kiln connected substantially air tight to a cooling chamber into which the hot product of the kiln is discharged; the method which comprises supplying combustion air heated by the heat passing through the kiln walls, to said chamber at a point intermediate its height and supplying a further quantity of cold air to said chamber at its bottom and maintaining the total quantity of air passing through said chamber relatively to the quantity of hot product in said chamber sufficient to heat the air to the ignition temperature of the fuel as the air leaves said chamber.

4. In a device for burning cement, magnesite, lime and the like, a rotary kiln, a mantle therefor, a shaft kiln into which the rotary kiln discharges and to which it is connected substantially air-tight, means to blow fuel across the top of the shaft kiln into the rotary kiln, means to supply hot air from said mantle to said blowing means, means to supply hot air from said mantle to about the middle of the shaft kiln, a device to continuously discharge said shaft kiln, a device to close the bottom of said shaft kiln air-tight, and means to supply cold air between both devices.

In testimony that I claim the foregoing as my invention, I have signed my name.

HARRY STEHMANN.

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