

H. HAUENSCHILD.
LIMEKILN OR FURNACE.

No. 453,774.

Patented June 9, 1891.

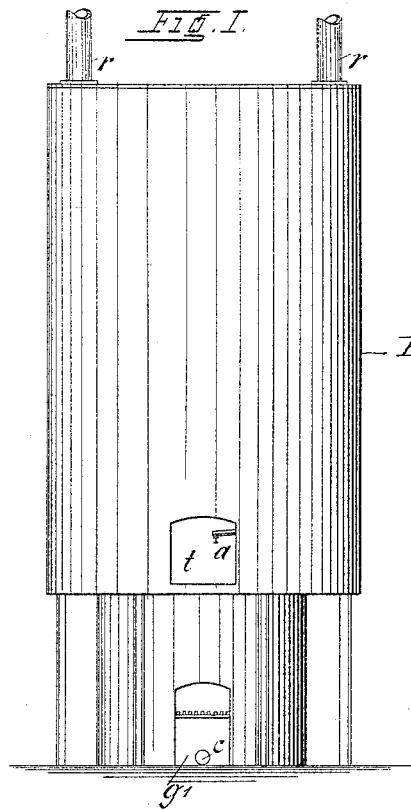


FIG. I.

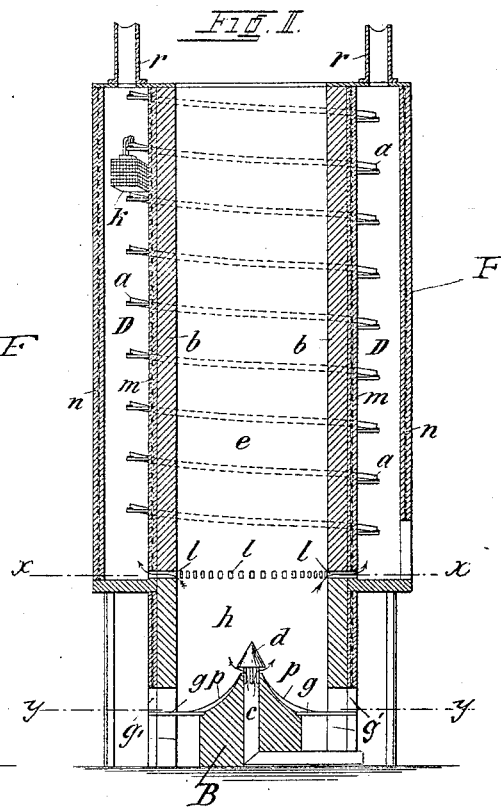
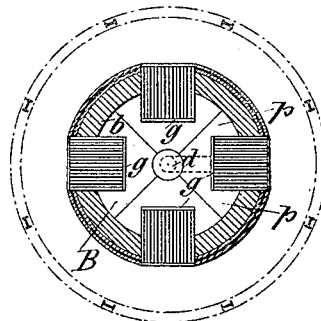
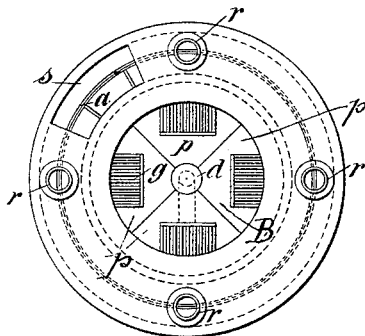


FIG. II.



Witnesses
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B. W. Sommers

Inventor
Hans Hauenschild
per Amy Orth
att'y

(No Model.)

2 Sheets—Sheet 2.

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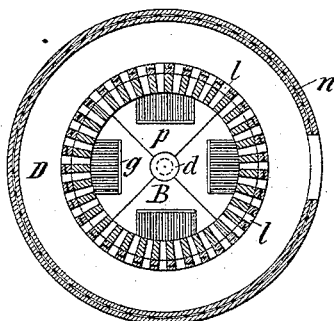
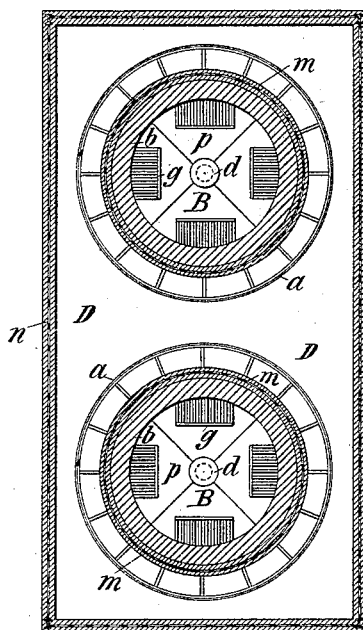


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Witnesses
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UNITED STATES PATENT OFFICE.

HANS HAUENSCHILD, OF BERLIN, GERMANY.

LIME KILN OR FURNACE.

SPECIFICATION forming part of Letters Patent No. 453,774, dated June 9, 1891.

Application filed November 22, 1890. Serial No. 372,307. (No model.) Patented in Germany November 8, 1889, No. 52,504; in France February 8, 1890, No. 203,679; in Belgium May 10, 1890, No. 90,510, and in Austria-Hungary December 10, 1890, No. 30,704 and No. 58,429.

To all whom it may concern:

Be it known that I, HANS HAUENSCHILD, professor, a subject of the Emperor of Germany, residing at Berlin, N. Reinikendorferstr. 4, have invented certain new and useful Improvements in Lime or Cement Kilns or Furnaces, (for which I have obtained Letters Patent in the following countries: Belgium, No. 90,510, dated May 10, 1890; France, No. 203,679, dated February 8, 1890; Austria-Hungary, No. 30,704 and No. 58,429, dated December 10, 1890, and Germany, No. 52,504, dated November 8, 1889;) 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 appertains to make and use the same, reference being had to the accompanying drawings, and to letters of reference marked thereon, which form a part of this specification.

The invention relates to furnaces or kilns for burning or calcining lime or cement or analogous materials. As a rule these furnaces or kilns have heretofore been constructed of masonry and lined with a fire-proof material. The inclosing walls for these structures have generally been made quite thick, so that a large amount of the heat supplied was absorbed and radiated from the outer surfaces, entailing considerable losses in heat on the one hand and a considerable loss of time in cooling the burned material before its removal. Furthermore, the lining of these furnaces or kilns wear or burn out rapidly, thus entailing a considerable expense in repairs and precluding a continuous operation. The wear of the lining of these furnaces or kilns is further greatly accelerated by reason of the admission of the air over the entire hearth or sole of the furnace, and in many cases in close proximity to the inner wall-surfaces. Finally, furnaces constructed as described demand a considerable floor-space.

My invention has for its object a construction of furnace whereby these disadvantages are in a great measure, if not entirely obviated, and whereby all or practically all of the radiated heat can be utilized, and to these ends the furnace or kiln is constructed of a suitable material provided with a fire-proof lining and inclosed in a chamber adapted to

be used for a drying-chamber for the utilization of radiated heat. Furthermore, means are provided for the admission of the air necessary to combustion in the plane of the axis of the furnace, and under some circumstances means for gradually conveying the materials to be dried from the top to the bottom of the drying-chamber, which is provided with suitable exhaust-pipes for exhausting the moist air from said drying-chamber; but that my invention may be fully understood, I will describe the same in detail, reference being had to the accompanying drawings, in which—

Figure 1 is an elevation of my improved furnace; Fig. 2, a vertical axial section; Figs. 3 and 4, transverse sections on lines x and y of Fig. 2. Fig. 5 is a top plan view, and Fig. 6 a transverse section, illustrating a couple of furnaces arranged within a single inclosing chamber.

In the described drawings like letters indicate like parts wherever they may occur.

For reasons hereinafter stated I prefer to construct the furnace F in the form of a cylinder, of a suitable material—for example, of metallic framing or open work with cement coating, or of sheet or cast metal in any desired number of sections bolted or riveted together; or said furnace may be constructed of two concentric sections when made of sheet metal for the purpose of giving it the necessary strength, as shown at m . The cylindrical furnace is provided with a lining b , of any usual or preferred fire-proof material, and is open at top and provided at bottom with a plurality of grates g and an opening g' , leading above and underneath said grates, respectively.

At the bottom and in the axial plane of the furnace is arranged an air-duct c , formed in a conoidal or preferably a pyramidal bottom B , that has as many sides p as there are grates g , so that the burned or calcined material can be discharged through said grate-openings, whose inner ends are seated at the base of the faces or sides p of the pyramidal portion of the said bottom B . In order to prevent the material entering the air-supply duct c and choking the same up, it is provided at its outlet with a conical hood and deflector d , that not only prevents the material from en-

tering the air-duct, but also deflects or directs the same toward the grate-openings *g'*.

That portion of the furnace immediately above the grates, and lettered *h*, serves as a cooling chamber or section wherein the burned material as it settles or sinks is cooled by the air admitted through the grates and through the air-duct *c*, while the remaining portion *e* of the furnace *F* above the portion *h* is the calcining or combustion chamber wherein the material is burned.

In practice I prefer to provide a number of radial flues or openings *l* in the furnace-wall, between the drying and calcining sections or portions, for the purpose of conducting the air that passes through the hot calcined material into the drying-chamber at the bottom thereof.

In order to supply the air necessary to combustion, any suitable means may be employed to force air through the duct *c*.

The furnace is inclosed in a cylindrical chamber *D*, formed by the cylinder *m* and the inclosing casing *n*, which may be constructed similar to *m*. The said chamber is closed at top, and in the roof thereof is provided a feed-opening *s*, adapted to be closed by a suitable gate or door. The diameter of the inclosing casing *n* relatively to the furnace proper is such as to form a drying-chamber around said furnace. As shown in Figs. 2 and 5, pipes *r* extend from the closed upper end of the drying-chamber for the purpose of exhausting the moisture-laden air.

At the foot of the drying-chamber *D* suitable discharge-openings *t* are provided for the discharge of the dried material, said openings being normally closed by doors. (Not shown.)

In the manufacture of lime or cement the drying-chamber may be utilized with great advantage for drying the raw material previous to its being charged into the furnace *F*; and to this end the drying-chamber may be charged with such raw material, and when dried withdrawn therefrom and introduced into the furnace from above, together with the necessary combustible materials. In practice, however, I prefer to dry the raw material gradually, and to this end I provide a spiral way or conveyer *a*, from which baskets, constructed of a foraminous material, are suspended and gradually carried from the top to the bottom of the drying-chamber, so as to have said material not only dry but ready for introduction into the furnace, said baskets being introduced into the drying-chamber through the opening *s* at top and removed through one of the openings *t* at bottom.

Inasmuch as the radiated heat of the furnace-walls is utilized for drying purposes, said walls are correspondingly cooled, and are thus kept at a comparatively low temperature, which, in conjunction with the strong central draft through the furnace, prevents the melting of the furnace-lining or the coating thereof with cement-slag, so that the furnace may

be kept in continuous operation. The cooling of the calcined or burned material and the drying of the raw material are materially expedited by the air passing through the said material while in the lower or cooling portion or chamber of the furnace, which air is not only heated but also deprived of its moisture, and flows through the radial openings *l* into the drying-chamber *D* and thence through the material therein.

The cylindrical form of the furnace admits of the ready removal from above of slagged masses of cement that may adhere to the furnace-lining in the combustion-chamber and which would otherwise interfere with the uniform operation of burning.

Inasmuch as the raw material contracts materially during calcination or burning, the tendency of the material will be to move away from the vertical furnace-walls toward or to the axis of the cylinder, so that the inner surfaces will not prevent or interfere with the free downward movement of said material.

A furnace constructed as described is much more durable than those of usual construction, and, as will be readily understood, occupies but a comparatively small space, while the feeding of the raw material and the withdrawal of the products are greatly facilitated and admit of the inclosing of two or more furnaces within one and the same drying-chamber, as shown in Fig. 6, in which two such furnaces are encompassed by a drying-chamber. As the temperature within the cooling-space *h* of the furnace is comparatively low, the fire-proof lining may be dispensed with for that portion of the furnace. Of course it will be understood that neither the furnace nor its inclosing casing need be of cylindrical form; yet so far as the furnace proper is concerned I prefer, for various reasons hereinabove stated, and for the reason that a hollow cylindrical body is of greater strength than a hollow angular body, to adopt the cylindrical form for the furnace proper.

Having described my invention, what I claim is—

1. A furnace or kiln for burning or calcining lime or cement, consisting of a vertical cylinder provided with feed and discharge openings at opposite ends, respectively, a lining of fire-proof material, and an encompassing chamber having likewise a feed and discharge opening at opposite ends, respectively, as and for the purpose set forth.

2. A furnace or kiln for calcining or burning lime or cement, consisting of a vertical cylinder provided with a fire-proof lining and with feed and discharge openings respectively at opposite ends, an air-supply duct extending axially for a short distance into the furnace at the bottom thereof, inclined directing-surfaces arranged around said flue to direct the material to the discharge-openings, and a protecting-hood above the flue to prevent the material from entering the same, in

combination with a chamber encompassing the furnace and having feed and discharge openings respectively at opposite ends, as and for the purpose set forth.

5 3. The combination, with a furnace for calcining or burning lime or cement, of an encompassing chamber provided with feed and discharge apertures respectively at opposite ends, and a conveyer within said chamber for
10 conveying the material fed thereto from the feed to the discharge aperture, as and for the purpose set forth.

4. A furnace or kiln for calcining or burning lime or cement, consisting, essentially, of
15 a suitably-lined furnace having feed and discharge apertures respectively at opposite ends, an encompassing casing having also feed and discharge apertures respectively at opposite ends, and a conveyer in said chamber
20 for conveying the material from the feed to the discharge aperture, as and for the purpose set forth.

5. A furnace or kiln for calcining or burning lime or cement, consisting, essentially, of
25 a suitably-lined cylindrical furnace having feed and discharge apertures respectively at opposite ends, an encompassing casing having also feed and discharge apertures respect-

ively at opposite ends, and a spiral conveyer encompassing the cylindrical furnace in said
30 chamber for conveying the material from the feed to the discharge aperture, as and for the purpose set forth.

6. A furnace or kiln for calcining or burning lime or cement, consisting of a vertical
35 cylindrical furnace open at top and provided with a lining of fire-proof material and with radial flues near the lower end thereof, a pyramidal bottom of masonry for said furnace, an air-duct extending axially through
40 said bottom, a series of grates radiating from the pyramidal portion of said bottom, and suitable grate-openings, in combination with an encompassing chamber in communication
45 with the furnace through the radial flues, said chamber having feed and discharge apertures respectively at opposite ends and exhaust-pipes at the upper end, substantially
as and for the purposes set forth.

In testimony whereof I affix my signature in
50 presence of two witnesses.

HANS HAUENSCHILD.

Witnesses:

PAUL SCHÜTZ,
ADOLPH DEMELIUS.