No. 661,217. Patented Nov. 6, 1900.

P. O. VON KROTTNAURER.

ROTARY KILN.

(Application filed Apr. 25, 1899.)

(No Model.)

Fig. 1.

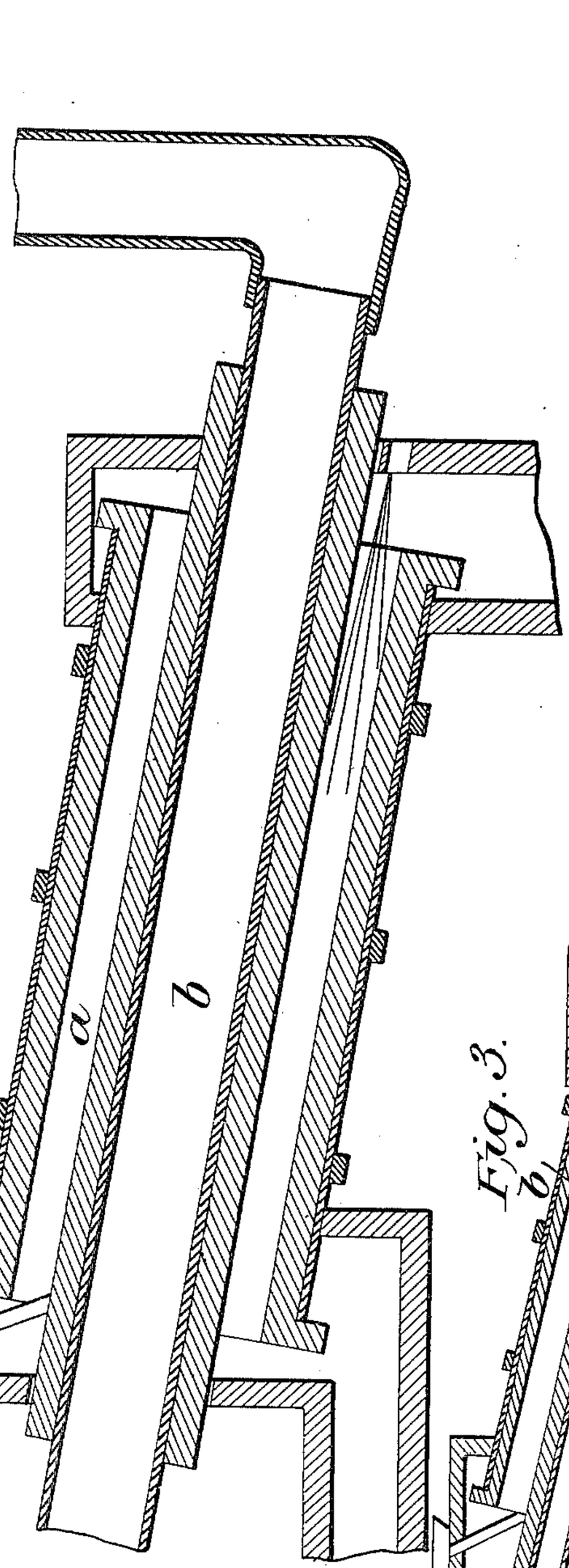

Fig. 2.

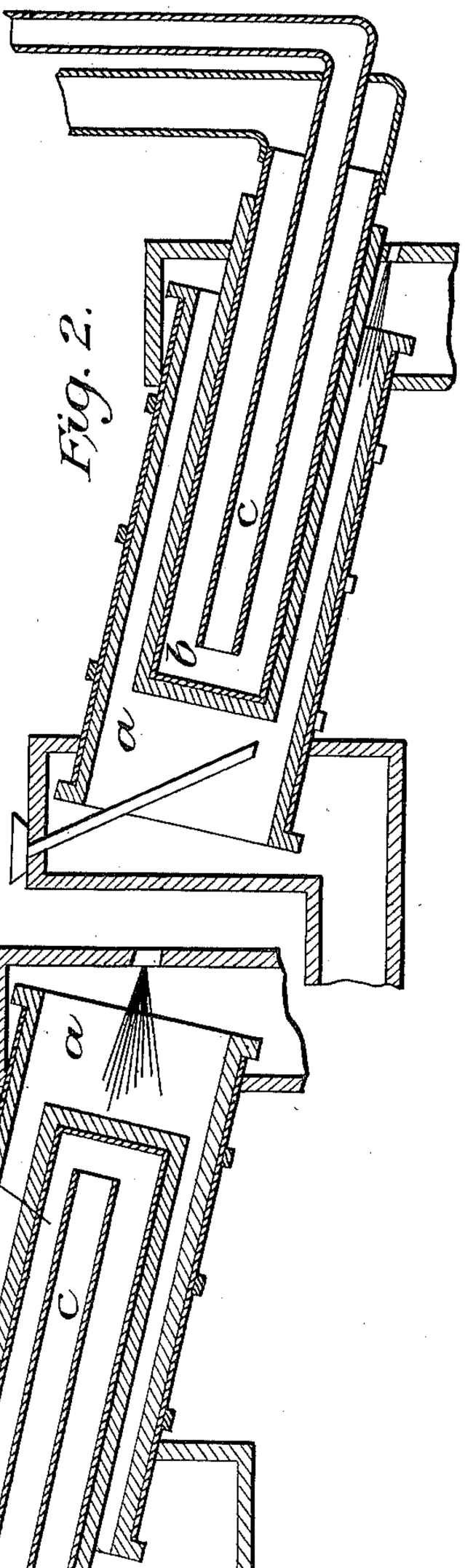

Fig. 3.

Witnesses:
A. C. Hall
F. L. Halsted

Inventor:
Paul O. Von Krottnaurer
By their Attorneys
John J. Halsted & Son

UNITED STATES PATENT OFFICE.

PAUL OTTO VON KROTTNAURER, OF BERLIN, GERMANY.

ROTARY KILN.

SPECIFICATION forming part of Letters Patent No. 661,217, dated November 6, 1900.

Application filed April 25, 1899. Serial No. 714,417. (No model.)

To all whom it may concern:

Be it known that I, PAUL OTTO VON KROTTNAURER, a citizen of the United States of America, residing at Berlin, Germany, have invented a new and useful Rotary Kiln or Oven, (for which I have applied for a patent in Germany, filed March 2, 1899,) of which the following is a specification.

Rotary kilns or ovens are largely used for burning Portland cement, lime, or gypsum. Such kilns consist of tubular ovens arranged at a slight inclination and which during the burning operation are continually rotated, the fine granular material to be burned being introduced at the upper end thereof. The fire passes through the oven from the lower end to the higher end thereof and gives off its heat partially to the material lying upon the bottom and partially to the fireproof lining of the kiln, which is not covered by the charge. During the burning operation the rotation of the kiln causes the charge to automatically pass from the upper to the lower end thereof. It is thus continually turned and comes into contact with the highly-heated walls of the kiln and receives heat both from the said walls and from the flame which passes over it. As obviously only a small thin layer of the fine granular material can be introduced into such a kiln if the said material is to be well burned, the utilization of the burning-chamber is very inefficient on account of the lack of obstruction to the spread of the flame. The proportion of charge to free space is the more unfavorable the larger the cross-sectional area of the tubular burning-chamber. The utilization of the flame and of the fuel is just as inefficient. Experience has shown that a flame after its full development will transmit heat the better the more said flame is retarded in its course by heat-absorbing and heat-refracting bodies—as, for example, by those of fireproof material; and this invention relates to means for effecting this object.

The invention consists of the different devices and combination of devices hereinafter described.

In the accompanying drawings, Figures 1, 2, and 3 show vertical longitudinal sections of three constructions of the improved kiln or oven.

The oven comprises an iron or other metal rotary inclosing chamber *a*, which is arranged at an inclination and is lined with some refractory material, as chamotte or the like. The material or goods (cement, lime, or the like) to be burned are introduced into the said chamber from above at the higher end through a funnel-like feeding device or hopper *d*, while the flame enters, preferably, at the bottom of the opposite end *e* of the kiln from the burner *f*, outside the pipe *a*, and flows in the opposite direction to that in which the goods move. The heating-gases are, after they have left the kiln conveyed into a chimney or are otherwise utilized. The burned goods fall out of the lower end of the rotating oven into a storage-receptacle, from which they are taken for further treatment. A second body *b* is arranged inside the chamber *a*. The said body *b* is made of steel or of another metal or substance which easily absorbs heat and is jacketed or covered with a fire-proof or highly heat-refractive material. As the internal body *b* is strongly heated by the gases of combustion, its resistance and durability are increased by introducing into it a cooling medium. The cooling medium (water, air, or the like) which is conveyed to the body *b* is in the arrangement illustrated in Fig. 1 introduced into the higher-lying end of the body, flows through the said body in the opposite direction to that in which the flame passes, and is, after it has passed through the body, further utilized for heating the drying or manufacturing rooms. The cooling medium for the pipe *b* can, however, be also conveyed into the inside of the kiln. When, for example, air is employed in said pipe as its cooling medium, a portion of this air can be conveyed through suitable openings in said pipe into the inside of the burning-chamber *a* as strongly-heated secondary air to supply oxygen for increasing the heating effect in this chamber.

The iron pipe *b* can, as illustrated in Fig. 1, pass completely through the kiln or, as illustrated in Figs. 2 and 3, only partly therethrough, and it can be fixed or arranged to rotate. In the construction illustrated in Fig. 2 the pipe *b*, which is covered with fireproof material, is passed into the kiln from the lower end, while in the arrangement illustrated in Fig. 3 it is introduced from the up-

per end thereof. In order to apply the water or air cooling in these two latter constructions, it is necessary to provide the metal body *b* with a smaller body *c*, through which the cooling medium can be introduced. The body *b* can be arranged either concentrically or eccentrically to the outer jacket or body *a*.

From the above it will be seen that the pipe *a* has throughout its entire length a refractory core or body materially filling up the space within said tube and presenting to the action of the flame and heat a great heat-absorbing surface and which will be near the material to be treated and able to readily refract the heat to said material wherever it may be in the tube *a*. By making the interior core or body tubular or hollow and passing the cooling medium through it its durability is greatly enhanced.

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

1. In rotary kilns or ovens, the combination with the inclined rotary burning-chamber, of means for the admission of the material to be burned situated at the higher end of said chamber, and the lower end of the same being open for the discharge of said material, a flame-inlet situated at said lower end of the chamber, and a heat-refracting body extending longitudinally within said chamber, all as set forth.

2. In rotary kilns or ovens, the combination with the inclined rotary burning-chamber, of means for the admission of the material to be burned, situated at the higher end of said chamber, and the lower end of the same being open for the discharge of said material, a flame-inlet situated at said lower end of the chamber, and a heat-refracting pipe extending longitudinally within said chamber, all as set forth.

3. In rotary kilns or ovens, the combination with the inclined rotary burning-chamber, of means for the admission of the material to be burned situated at the higher end of said chamber, and the lower end of the same being open for the discharge of said material, a flame-inlet situated at said lower end of the chamber, and a body, having a heat-refracting surface, extending longitudinally within said chamber, all as set forth.

4. In rotary kilns or ovens the combination with the inclined rotary burning-chamber, of means for the admission of the material to be burned situated at the higher end of said chamber, and the lower end of the same being open for the discharge of said material, a flame-inlet situated at said lower end of the chamber, and a heat-refracting pipe extending longitudinally within said chamber, and means for cooling the same, all as set forth.

5. In rotary kilns or ovens the combination with the inclined rotary burning-chamber, of means for the admission of the material to be burned situated at the higher end of said chamber, and the lower end of the same being open for the discharge of said material, a flame-inlet situated at said lower end of the chamber, and a heat-refracting body extending completely through said chamber, all as set forth.

6. In rotary kilns or ovens the combination with the inclined rotary burning-chamber, of means for the admission of the material to be burned situated at the higher end of said chamber, and the lower end of same being open for the discharge of said material a flame-inlet situated at said lower end of the chamber, and a heat-refracting pipe extending longitudinally within said chamber, and closed at its inner end, all as set forth.

7. In a rotary kiln or oven, the combination with the rotary burning-chamber of an internal body passing into the said chamber from one end thereof and closed at its inner end, and of a body inside the second body for introducing a cooling medium into the said second body, substantially as hereinbefore described.

PAUL OTTO VON KROTTNAURER.

Witnesses:
WOLDEMAR HAUPT,
HENRY HASPER.