L. P. ROSS.

KILN.

APPLICATION FILED OCT. 31, 1910.

1,004,085.

Patented Sept. 26, 1911.

2 SHEETS—SHEET 1.

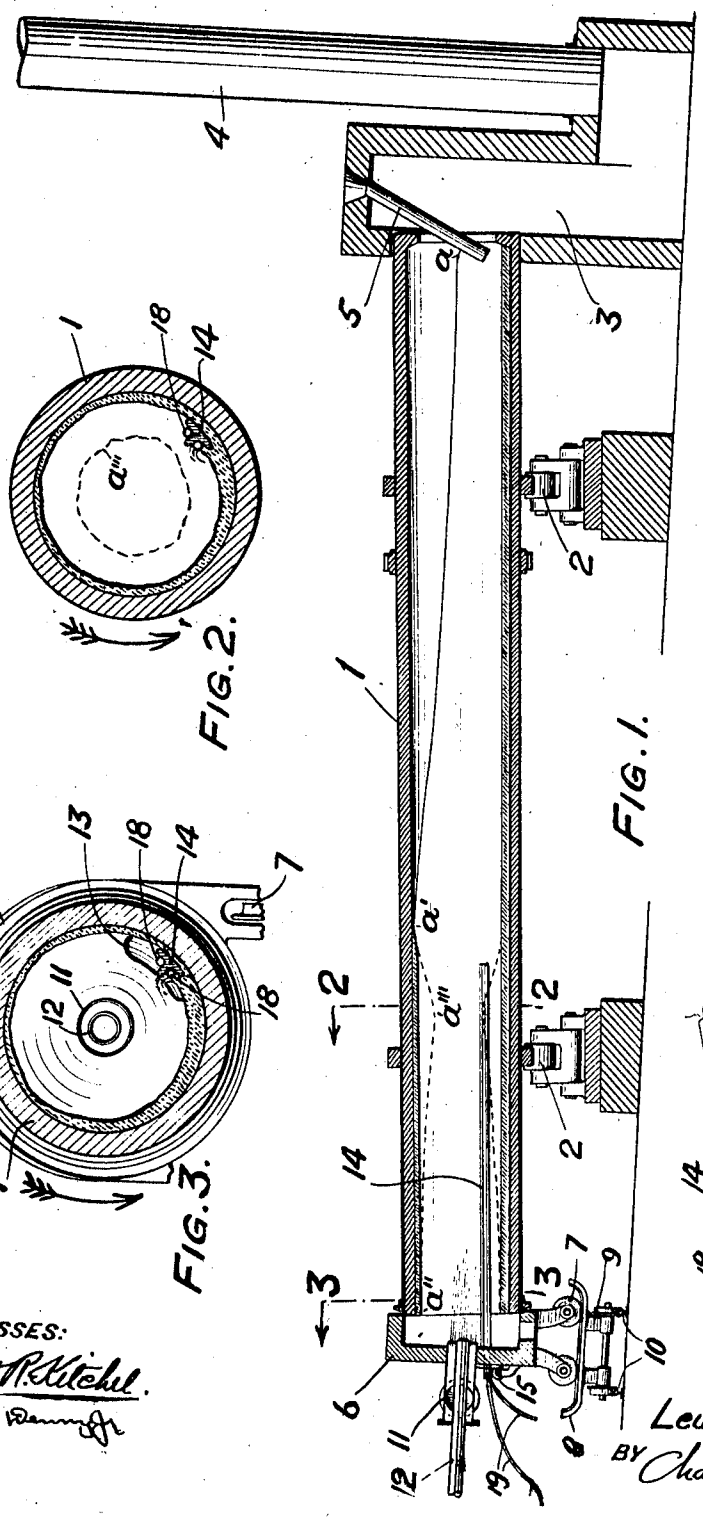

FIG. 1.

FIG. 2.

FIG. 3.

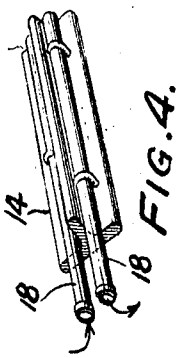

FIG. 4.

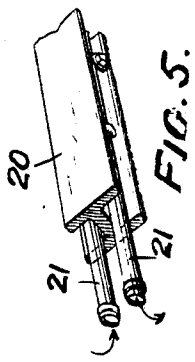

FIG. 5.

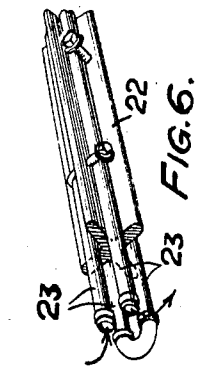

FIG. 6.

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2 SHEETS—SHEET 2.

FIG. 7.

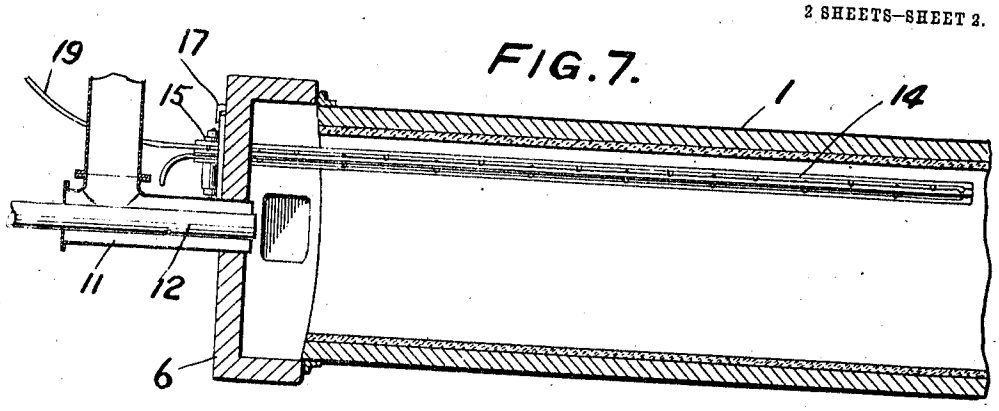
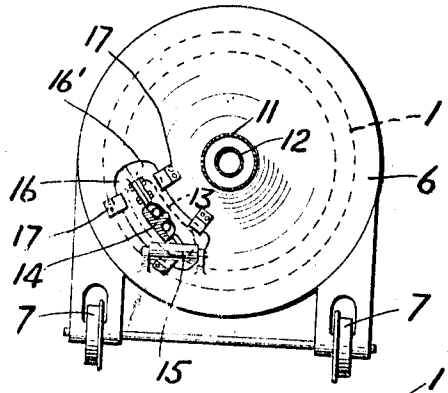


FIG. 8.



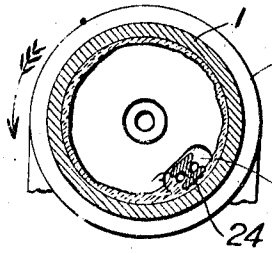


FIG. 10.

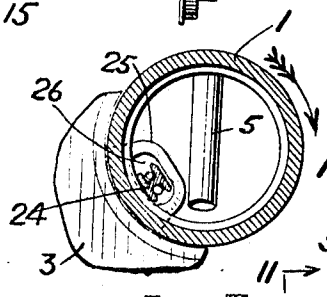


FIG. 11.

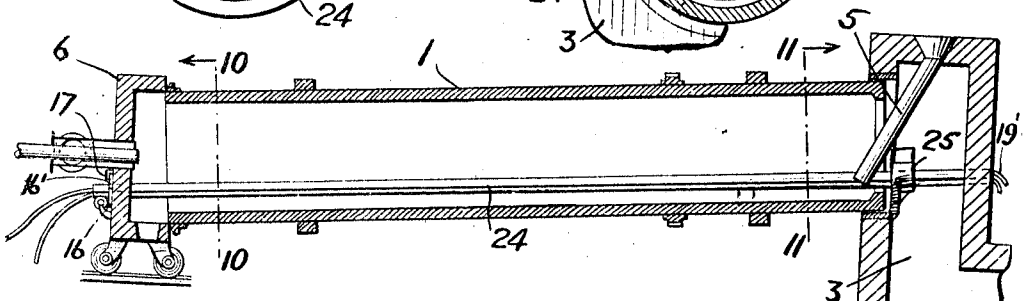


FIG. 9.

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UNITED STATES PATENT OFFICE.

LEWIS P. ROSS, OF STANDISH, NEW YORK, ASSIGNOR OF ONE-HALF TO NORTHERN IRON COMPANY, A CORPORATION OF NEW YORK.

KILN.

1,004,085. Specification of Letters Patent. Patented Sept. 26, 1911.

Application filed October 31, 1910. Serial No. 589,854.

To all whom it may concern:

Be it known that I, LEWIS P. ROSS, a citizen of the United States, residing at Standish, in the county of Clinton and State of New York, have invented certain Improvements in Kilns, of which the following is a specification.

My invention relates particularly to rotary kilns for treating fine ore, flue dust, cement and like materials which it is desired to nodulate or clinker by a heating and rolling operation.

The primary object of my invention is to prevent the "ringing" of kilns or the undesirable adhesion to the kiln lining of the material in process of treatment.

It is also an object to effect a regulated detachment of material from the kiln lining so that a lamination may remain to protect such lining from the erosive action of the traveling material, the cutting action of the flame and wear generally.

In the operation of inclined rotary kilns now in use for nodulating fine iron bearing material, cement and the like by feeding it through from one end and subjecting it to the action of a flame introduced at the other end, there is great less in time and efficiency due to the adhesion of the heated material to the kiln with the formation of an annulus, rapidly increasing in thickness, whereby the kiln is choked, the travel of the material is obstructed, the heating action is affected and the operation must be stopped to remove the obstruction.

The very considerable kiln lengths required in nodulating and clinkering operations has been a difficulty in the way of finding practicable means for preventing "ringing", and drags which have been tried injure the kiln linings, are expensive because they are destroyed by the heat to which they are subjected, and do not produce satisfactory results. I have succeeded in preventing this objectionable ring formation, while permitting the formation of a limited protecting lamination upon the lining, by the simple means of a scraping device, such as a railway rail, acting under control so that it shall ride within the kiln upon the desired lamination adhering to the lining and scrape therefrom the material which would otherwise build up the objectionable annulus. The scraping device is preferably supported so that it floats, but it may be held rigidly at one or both ends, and it may be protected by any desired refractory material or cooling means.

The characteristic features of my improvements are more specifically disclosed in the following description and the accompanying drawings in illustration thereof.

In the drawings, Figure 1 is a longitudinal sectional elevation of a rotary kiln having my improvements applied thereto; Fig. 2 is an enlarged sectional view taken on the line 2—2 of Fig. 1; Fig. 3 is an enlarged sectional view taken on the line 3—3 of Fig. 1; Fig. 4 is a perspective view of a section of a scraping bar having pipes for carrying a cooling fluid connected therewith; Fig. 5 is a perspective view of a section of a second form of scraping bar; Fig. 6 is a perspective view of a section of a third form of scraping bar; Fig. 7 is a sectional plan representing an enlarged view of the lower end of the kiln shown in Fig. 1; Fig. 8 is an end elevation of the structure shown in Fig. 7 showing the scraping bar in section and the burner removed; Fig. 9 is a longitudinal sectional elevation having a second form of my improvements applied thereto; Fig. 10 is an enlarged sectional view taken on the line 10—10 of Fig. 9; and Fig. 11 is an enlarged sectional view taken on the line 11—11 of Fig. 9.

The mechanism, as illustrated in the drawings, comprises the inclined kiln 1 revolubly supported on the rollers 2, the flue 3 connecting the higher end of the kiln with the stack 4, the feed spout 5 passing through the flue into the upper end of the kiln, and the hood 6 for closing the lower end of the kiln, the hood being carried by wheels 7 having a limited movement longitudinally of the kiln on the track 8 carried by the truck 9 movable on the track 10. A burner, comprising the gas pipe 11 and the pulverized fuel pipe 12 therein, extends through the hood and projects a flame through the lower end of the kiln, in the reverse direction to the movement of the materials fed therethrough from the spout 5, the materials being gradually heated as they are rolled in passing through the revolving kiln. As the materials approach incipient fusion and their adhesion increases, they tend to rise along the lining of the kiln to the line a—a' and from the point a' to the point a'' the adhesion is such that in the usual opera-

tion an annulus a'—a'''—a'' rapidly forms and chokes the kiln.

As illustrated in Figs. 1–8, the hood 6 is provided with a slot 13 concentric with the kiln and a T-bar 14 is passed therethrough into the kiln, the bar terminating in the kiln at a point adjacent to the section at which the ring begins to form. The supported end of the bar is disposed suitably at approximately 45 degrees from the bottoms of the hood and kiln, at the side toward which the revolving material rises, and is free to ride up the side of the kiln lining approximately parallel to the axis of revolution, the bar floating and detaching adhering material. But the bar may be fixed and its weight, character and disposition are subject to regulation, so that in its action a layer of the material may be left adhering to the kiln lining for its protection or the adhering matter may be wholly removed and the kiln may be scraped throughout its length.

The bar is movable through the hood on a roller 15 journaled thereon and is held against longitudinal movement after it has been placed, suitably by plate sections 16 and 16′ clamped thereon over the slot 13 and engaged by the clips 17 fixed to the hood, the plate being free to move so that the bar shall have a limited movement of revolution and oscillation.

The bar may employ a refractory material in its composition to enable it to withstand the heat to which it is subjected. But it is suitably a usual rolled metal shape, as the T-bar 14, cooled by water conduits or pipes 18 fixed thereto and connected beyond the hood with flexible hose 19. The iron I-bar 20, cooled by the water pipes 21, and the iron X-bar 22, cooled by the water pipes 23, are further examples of suitable scraping devices.

As illustrated in Figs. 9–11, the bar 24 extends entirely through the kiln. This form is suitable where the usual kiln length is shortened as it may be with the provision hereof for scraping down and removing the adhering material. This bar is passed through the slot 13 of the hood 6 and through the kiln to the bearing 25 provided with the slot 26 within which the forward end of the bar is supported and adapted to move. The bar is held by the slots at the desired distance from the lining of the kiln and so that it is permitted a limited floating movement, while it may be held, if desired against longitudinal movement by any suitable means, as the plate sections 16 and 16′ engaged by the clips 17. Ducts 19′ carry water through the bar, the bar being longitudinally movable when the plate is detached and may be so moved in practicing the operation.

It will be evident that the foregoing apparatus may be variously changed to accommodate different conditions of use, as the matter of the length of the kiln to be scraped, the manner of supporting the scraper and the method of cooling or protecting the scraping apparatus.

Having described my invention I claim:—

1. The combination of a rotary kiln, with a floating scraping bar therein, and means for controlling the movement of said bar.

2. The combination of a rotary kiln, with a floating scraping bar therein, and means for supporting said bar so that it is movable up the side thereof by the rotation of said kiln.

3. The combination of an inclined rotary kiln, means for introducing materials at the higher end thereof, means for introducing a flame at the lower end thereof, a floating scraping bar disposed within the lower end of said kiln, and means for loosely supporting said bar so that it shall bear against the revolving interior surface of said kiln above the bottom thereof.

In witness whereof I have hereunto set my name this 21st day of October, A. D. 1910, in the presence of the subscribing witnesses.

LEWIS P. ROSS.

Witnesses:
D. S. Lawson,
L. H. McClellan.