

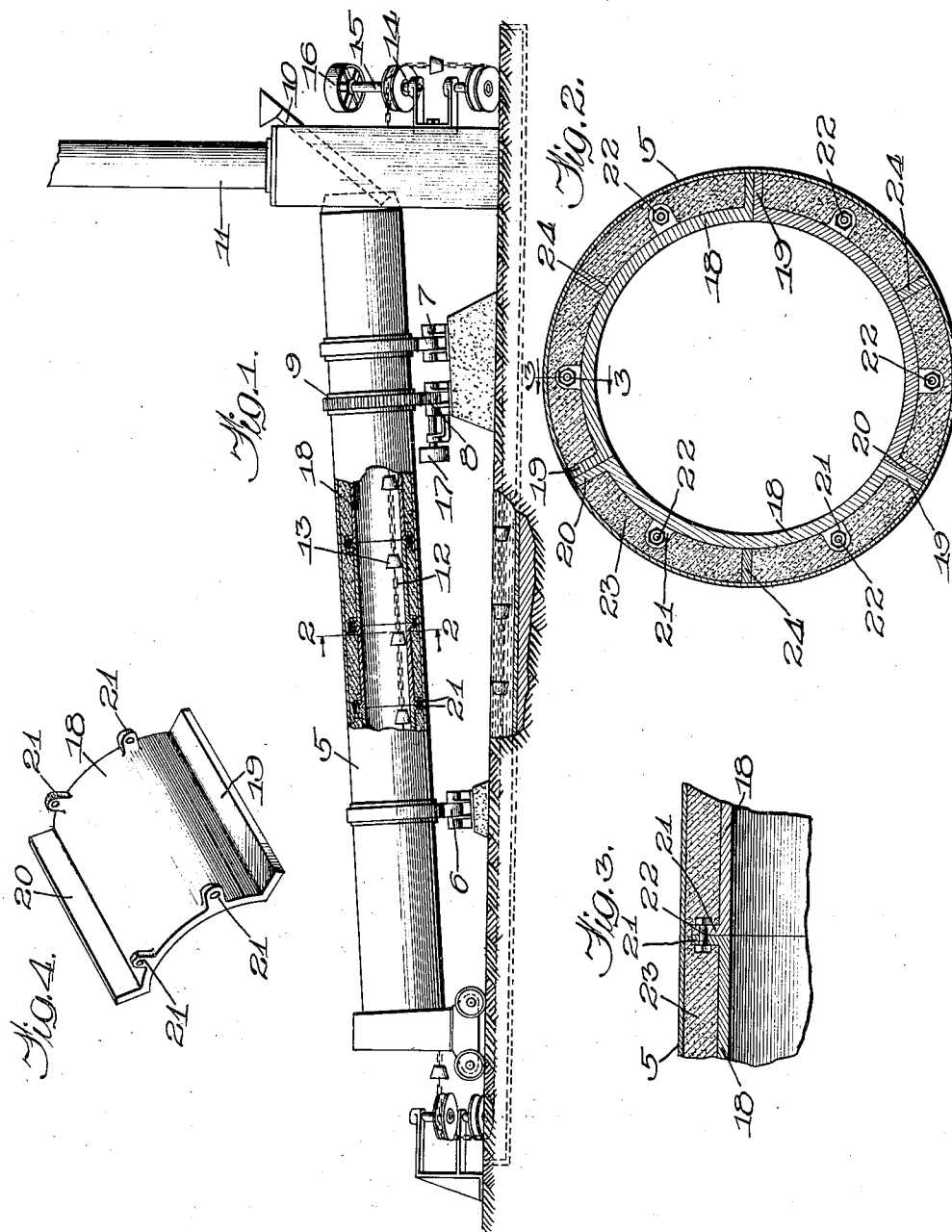
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SINTERING APPARATUS.

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UNITED STATES PATENT OFFICE.

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SINTERING APPARATUS.

No. 891,327.

Specification of Letters Patent.

Patented June 23, 1908.

Application filed March 30, 1908. Serial No. 424,207.

To all whom it may concern:

Be it known that we, EUGENE B. CLARK and CHARLES H. FETTEL, citizens of the United States, and residing at Chicago, in the county of Cook and State of Illinois, and at Hubbard, in the county of Trumbull and State of Ohio, respectively, have invented certain new and useful Improvements in Sintering Apparatus, of which the following is a specification, reference being had to the accompanying drawings.

Our invention relates to apparatus for sintering various materials, such as iron ores, and has for its object to provide certain improvements in such apparatus by which certain objections incident to the apparatus heretofore employed may be avoided, as will hereinafter appear.

One of the principal forms of apparatus heretofore employed for sintering consists of a rotary kiln through which the material is passed from end to end, the kiln being set in an inclined position and the material being fed into its upper end and passing out of its lower end, the kiln being meanwhile rotated and the material being subjected to a high temperature, resulting in the agglomeration of the particles into small masses suitable for use in manufacturing steel. An apparatus of this character is illustrated and described in the application of Eugene B. Clark, Serial No. 401,713, filed November 11, 1907.

The materials treated differ in their qualities or characteristics, most of such materials being basic in character while others are acid. The high temperature employed in the sintering process makes necessary the use of a lining of refractory material in the kiln, and prior to our invention it has been the practice to line the kiln with brick or similar material. This, however, is objectionable for the reason that while a large part of the materials treated—such, for example, as iron oxides—are basic in character, it is sometimes necessary or desirable to treat acid material. The temperature reached in the process of sintering is high enough so that basic materials would react upon an acid lining, and acid materials would react upon a basic lining, and therefore a kiln cannot be changed from basic materials to acid materials without relining, which is costly and involves serious delay. Furthermore, most of the materials sintered in a rotary kiln at

the present time are basic, whereas most of the materials available for lining kilns are acid. In fact, practically the only basic lining available is one made of magnesite or chrome brick, which is extremely expensive by reason of the very high price of such brick, and furthermore is very unsatisfactory by reason of its great sensitiveness to temperature changes, as such bricks disintegrate rapidly and are therefore unsuited for use in a process such as that of sintering which necessitates more or less frequent and severe changes in temperature.

It is, of course, essential that the shell or casing of the kiln be protected against the extreme heat to which the materials are subjected in the kiln, and also that loss of heat by radiation should be guarded against; and to provide a lining which will meet all the requirements of the situation is the object of our present invention.

We have discovered that the objections to the devices heretofore employed may be avoided and the desired advantages may be secured by employing a lining of cast-iron. The cast-iron lining is in the form of plates which fit together to form a tubular shell between which and the kiln casing or shell is packed suitable non-conducting and heat-resisting material, such as fire clay or gansister. The cast-iron plates are made in sections and are secured together so that when the lining is completely installed it forms practically a continuous tube which is fixedly supported within the kiln proper. Suitable standards or supports are provided in the form of flanges, which bear against the inner face of the kiln shell and aid in preventing displacement of the lining.

In the accompanying drawings, which illustrate a kiln embodying our improvements,—Figure 1 is a side elevation of a sintering apparatus similar in general to the apparatus described in the said Clark application hereinbefore referred to, part of the kiln being broken away to show the interior thereof; Fig. 2 is a cross-section on line 2—2 of Fig. 1; Fig. 3 is a detail, being a partial longitudinal section on line 3—3 of Fig. 2; and Fig. 4 is a perspective view of one of the lining plates.

Referring to the drawings,—5 indicates the kiln proper, which is in the form of a cylinder mounted on rollers 6—7 and driven by a pinion 8 engaging an annular rack 9 carried by the kiln. The kiln is inclined, as shown

in Fig. 1, receiving its charge through a chute 10, or other suitable feeding means, at its upper end which connects with a stack 11.

12 indicates an endless chain, which moves through the kiln from end to end and is provided with scrapers 13 which act to scrape the inner surface of the kiln to loosen up the material which adheres thereto. It will be understood that the interior of the kiln is heated to the requisite temperature by suitable means, the flames and hot gases passing up through the kiln to the stack 11. The endless chain 12 is caused to travel through the kiln in a downward direction by any suitable mechanism, such, for example, as a pulley 14 mounted on a shaft 15 and driven by a pulley 16 which, in turn, is driven from any suitable source of power.

17 indicates a pulley for driving the pinion 8.

The devices for operating the endless chain and for rotating the kiln, as well as the means for supplying heat for the kiln, form no part of our invention and may be of any approved form.

18 indicates one of the lining plates, which, as best shown in Fig. 4, are curved plates having at their straight margins flanges 19—20 which are radially disposed so that when the several sections are fitted together the flanges 19—20 of any plate will register with the corresponding flanges of the adjoining plate. Preferably each of the plates 18 subtends an arc of one hundred and twenty degrees, so that three of such plates together form a complete ring. The several plates also fit together at their ends or curved edges where they are provided with lugs 21 for joining the adjoining plates, bolts 22 preferably being employed to connect the lugs of adjacent plates, as shown in Figs. 2 and 3. It will be noted that the lining 18 is somewhat smaller in diameter than the shell of the kiln 5, and the width of the flanges 19—20 is equal to the difference between the external diameter of the lining and the internal diameter of the shell of the kiln, as shown in Fig. 2. The lining plates are made of cast-iron, which not only adequately resists the heat of the kiln and the chemical action of the materials treated, but also the wear occasioned by the movement of the scrapers through the kiln, and, moreover, a lining constructed as described may be used with much less expense than the materials heretofore used.

23 indicates a non-conducting and heat-resisting material with which the space between the lining and the shell of the kiln is filled, as shown in the drawings. Such filler may be fire clay; or any other suitable material, which may be rammed between the segments of the lining and the kiln casing.

24 indicates supports placed intermediately between the flanges 19—20 of any segment to support the intermediate portion

thereof in substantially the same manner as the flanges 19—20 support the end portions of the lining plates. Said supports 24 are disconnected from the segmental lining plates so that they are not affected by the expansion or contraction of said plates.

So far as we are aware, no one has heretofore employed a cast-iron lining in a sintering kiln, or such a lining formed of segmental plates fitted together but disconnected from the shell of the kiln. Nor has it heretofore been proposed, so far as we are aware, to employ a cast-iron lining in connection with non-conducting material separating such lining from the casing of the kiln, and the claims hereinafter made are therefore to be construed accordingly.

That which we claim as our invention, and desire to secure by Letters Patent, is,—

1. A sintering apparatus, comprising a rotary cylindrical kiln having a cast-iron lining.

2. A sintering apparatus, comprising a rotary cylindrical kiln having a cast-iron lining, in combination with scraping means operating in said kiln for scraping off the material adhering to the lining.

3. A sintering apparatus, comprising a rotary cylindrical kiln having a lining composed of segmental cast-iron plates fitted in the kiln but disconnected therefrom.

4. A sintering apparatus, comprising a rotary cylindrical kiln having a lining composed of segmental cast-iron plates fitted in the kiln but disconnected therefrom, said plates being connected together to form a continuous cylinder.

5. A sintering apparatus, comprising a rotary cylindrical kiln having a lining composed of segmental cast-iron plates fitted in the kiln but disconnected therefrom, said plates being connected together to form a continuous cylinder, said plates having supports which engage the inner wall of the kiln.

6. A sintering apparatus, comprising a rotary cylindrical kiln having a lining composed of segmental cast-iron plates fitted in the kiln but disconnected therefrom, said plates being connected together to form a continuous cylinder, said plates having radial flanges which engage the inner wall of the kiln and support said plates therein.

7. A sintering apparatus, comprising a rotary cylindrical kiln, a cast-iron lining therein, and a non-conducting filler between said lining and the kiln shell.

8. A sintering apparatus, comprising a rotary cylindrical kiln, a cast-iron lining therein, and a non-conducting filler between said lining and the kiln shell, said lining being disconnected from the kiln.

9. A sintering apparatus, comprising a rotary cylindrical kiln, a cast-iron lining therein, and a non-conducting filler between said lining and the kiln shell, said lining being dis-

connected from the kiln and having supports which bear against the inner wall of the kiln.

10. A sintering apparatus, comprising a rotary cylindrical shell having a lining composed of segmental cast-iron plates having radial flanges, the flanges of adjoining plates being secured together.

11. A sintering apparatus, comprising a rotary cylindrical shell having a lining composed of segmental cast-iron plates having radial flanges, the flanges of adjoining plates being secured together, and a non-conducting filler between the lining and the shell.

12. A sintering apparatus, comprising a

rotary cylindrical shell having a lining composed of segmental cast-iron plates having radial flanges and lugs for securing adjoining plates together to form a continuous tube.

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