A. S. DWIGHT & R. L. LLOYD.

APPARATUS FOR ROASTING AND SINTERING ORES.

APPLICATION FILED JUNE 19, 1907. RENEWED FEB. 23, 1909.

916,394. Patented Mar. 23, 1909.

2 SHEETS—SHEET 1.

Fig. 1.

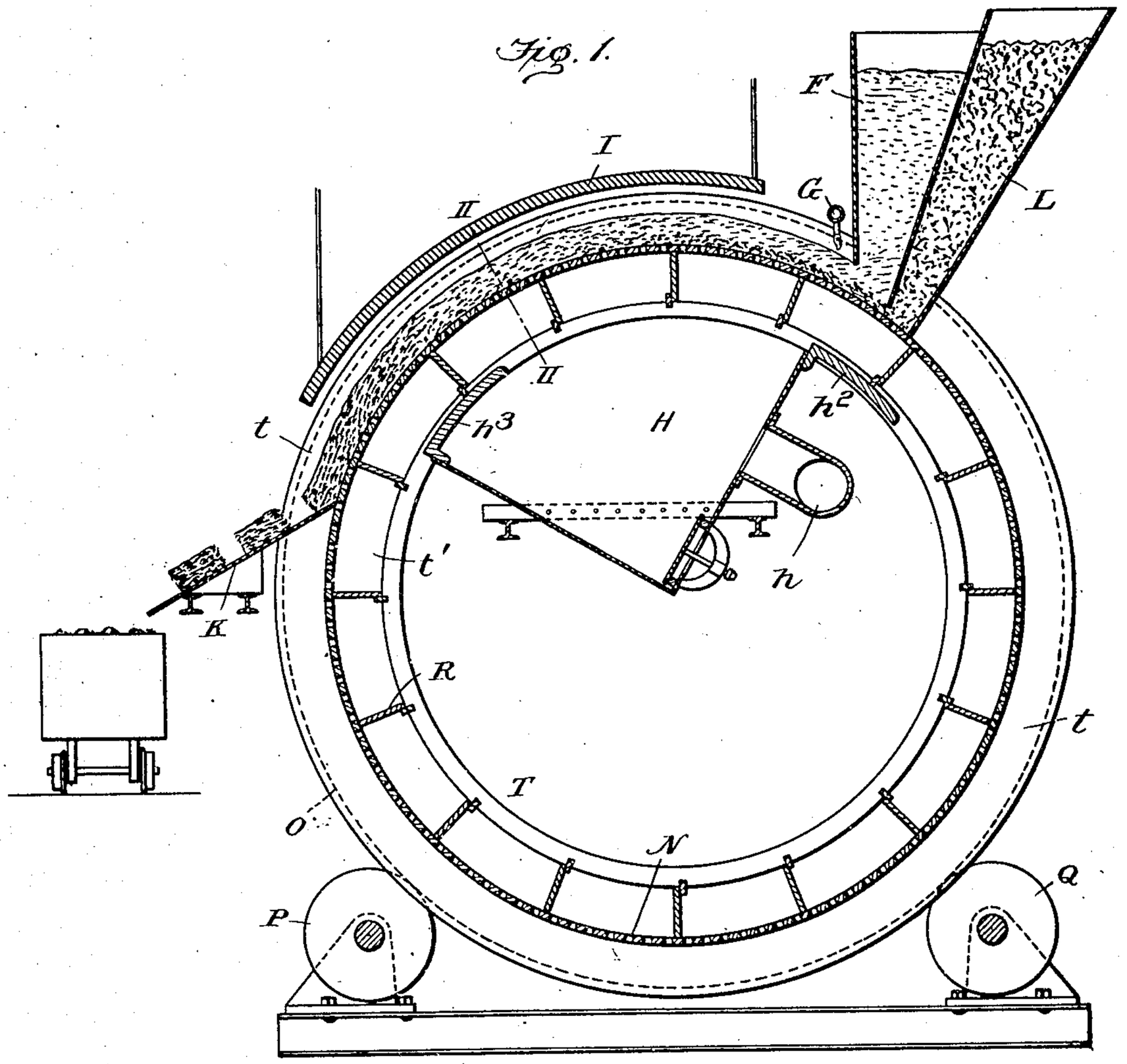
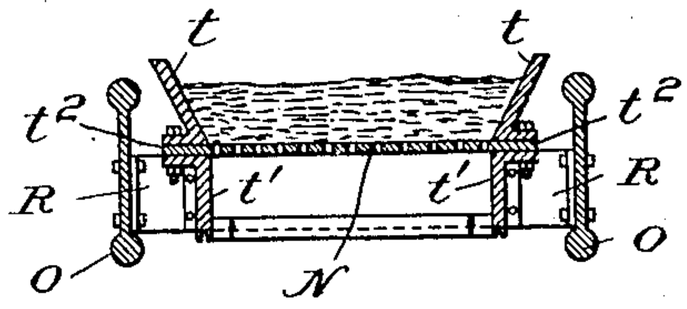


Fig. 2.



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2 SHEETS—SHEET 2.

Fig. 3.

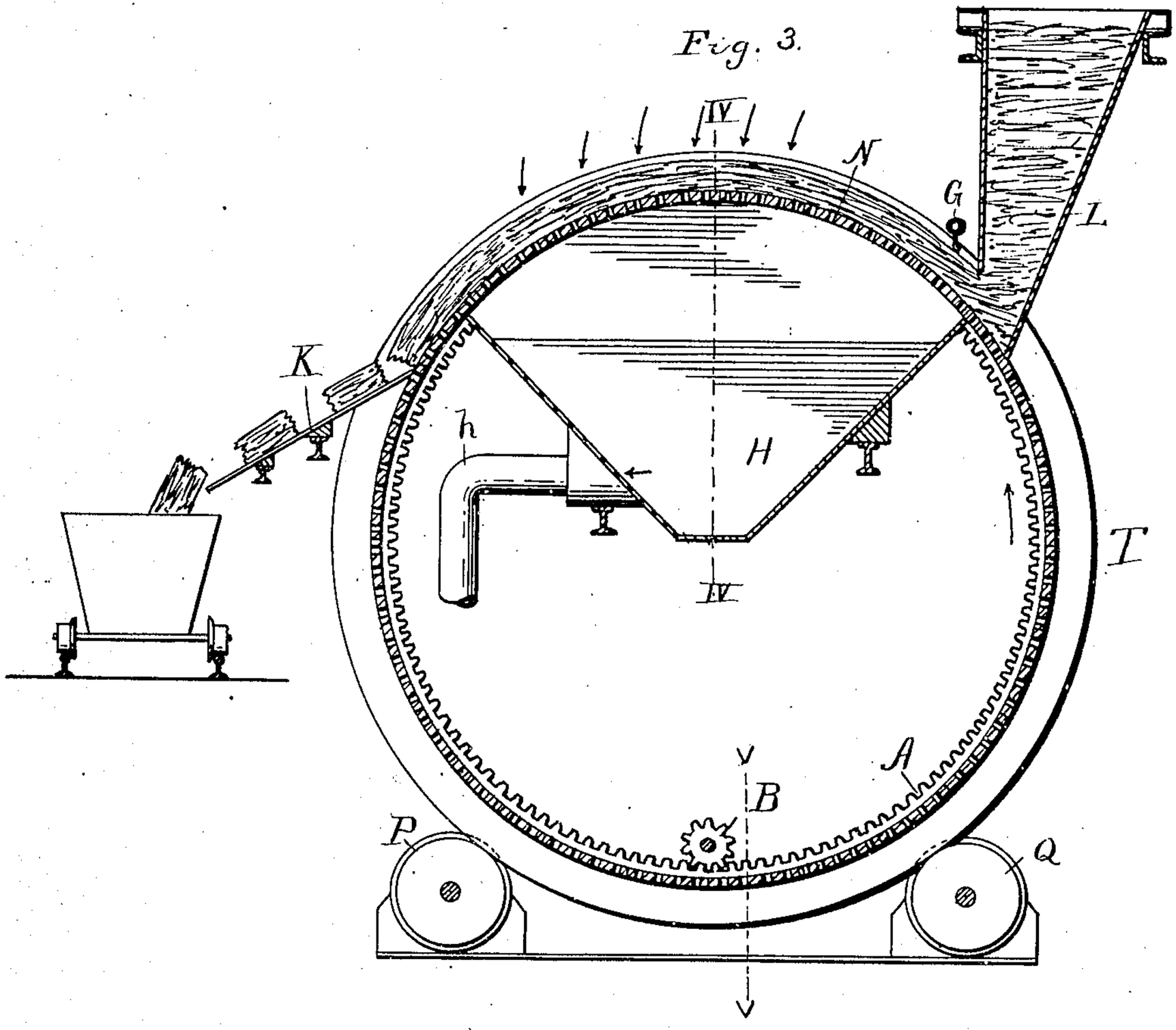


Fig. 5

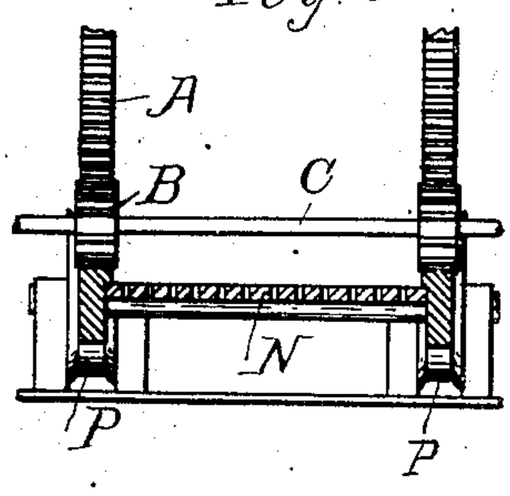
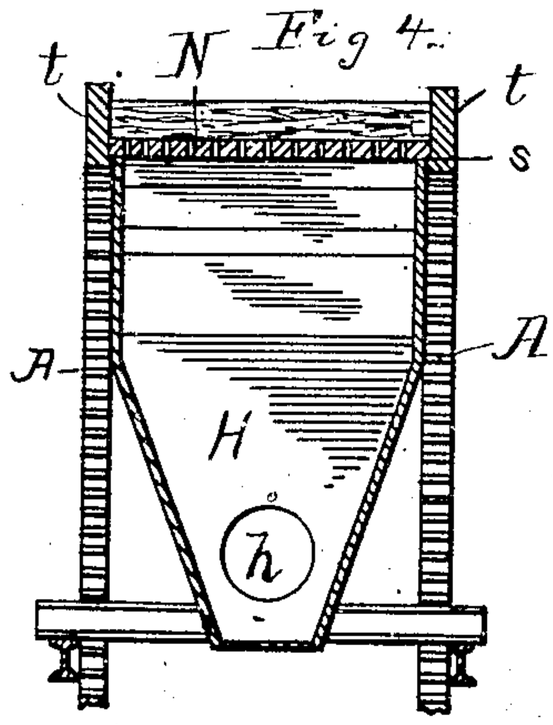


Fig 4.



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APPARATUS FOR ROASTING AND SINTERING ORES.

No. 916,394. Specification of Letters Patent. Patented March 23, 1909.

Application filed June 19, 1907, Serial No. 379,809. Renewed February 23, 1909. Serial No. 479,495.

To all whom it may concern:

Be it known that we, ARTHUR S. DWIGHT and RICHARD L. LLOYD, citizens of the United States, formerly residing at Cananea, Sonora, Republic of Mexico, the said ARTHUR S. DWIGHT now residing at Joliet, in the county of Will, State of Illinois, and the said RICHARD L. LLOYD now residing in the city, county, and State of New York, have invented certain new and useful Improvements in Apparatus for Roasting and Sintering Ores, of which the following is a specification, reference being had to the accompanying drawing.

This invention relates to improvements in the art of treating ores, particularly those which require roasting and sintering, such as sulfur-carrying copper ores, and are of such nature that once being ignited an internal combustion of some of the contents of the ore mass can be maintained, provided a suitable oxidizing atmosphere be supplied.

The invention has for its object to produce apparatus that may be worked automatically and economically in the treatment of ores for the purpose of reducing them to sintered masses of convenient form and nature for subsequent treatment where necessary, as for example in a blast furnace.

Figure 1 is a vertical sectional view of a mechanism embodying our present improvements. Fig. 2 is a cross-sectional view on the line II—II of Fig. 1. Fig. 3 is a vertical sectional view of another form of apparatus embodying our invention. Fig. 4 is a transverse vertical section taken on the line IV—IV of Fig. 3. Fig. 5 is a transverse vertical section on the line V—V of Fig. 3.

In an application for patent filed by us, we illustrated and described a mechanism for sintering and treating ores, which comprised an endless ore support composed of sections or elements, flexibly connected together or articulated in such way that said sections or elements could successively be brought to a place of ore supply and then taken successively through or across the region where the firing commences, then through or across the region where the combustion supporting gas or air is supplied, and finally to the place of discharge of the sintered ore; and in said application have elected to present the claims for the broader features of structure and operation incident both to a mechanism of the kind therein set forth and also incident to an apparatus of the sort herein presented. We discovered that under many circumstances the different sections of the carrier or ore support could, to advantage, be rigidly connected together, and that in such case the structure could be arranged so as to have all of its movable parts rotate around a common center. When the parts are constructed and related in the way now presented the carrier becomes of the nature of a drum to the successive parts of which the material to be treated can be fed. As an entirety, this ore-carrying and supporting element is indicated by T. There can be modifications in many respects as concerns the details of the structure. As shown in Figs. 1 and 2, it is formed of external flange walls t with the inward projecting ring sections t' and the ore supporting part at N. The latter preferably consists of perforated or barred sections which are suitably clamped in place.

The support for the drum structure consists of the rings O which are either continuous around the circle or formed in sections secured together. These rest upon and are actuated by rollers P and Q, which are grooved or flanged to hold them in place.

R, R indicate girder bars which extend from one of the supporting rings O to the other, and to which they are firmly bolted. The aforesaid ring sections t' are respectively placed between these cross girders R and secured to them. They have outwardly extending flanges by means of which the flanges of the outer wall pieces t are bolted in place. Between the inner drum skeleton formed of the parts R and t' and the outer walls or flanges t are clamped the sections N which serve as a grating or bottom support for the ore. At t^2 spacers are introduced which relieve the parts N from undue weight and pressure.

It will be seen that an ore-carrying structure made and supported in the way described can be utilized in a manner similar to that in which is used the endless carrier formed of separate sections, flexibly hinged together and described in our said other application.

At L there is a hopper for refractory material, and at F a hopper for the ore. These are supplied with their respective materials and supply the same to the apertured sup-

port in a manner substantially similar to that above described.

I indicates a hood or shield suspended above the forward traveling ore mass, it conforming to the curved path of the material instead of lying in a plane as in the other mechanism.

G indicates a gas or oil pipe provided with burners or jet orifices and arranged transversely across the apparatus and just above the exposed surface of the ore mass and a little in front of the ore box or hopper F. The flame or flames produced by the burning oil or gas playing upon the upper surface of the ore ignites it uniformly and across the whole surface. The air which is drawn through the ore is collected in a box or trunk at H situated in the chamber or space in the interior of the drum. The inwardly extending cross plates or bars R are utilized as cut-offs for the air. They successively rotate over the air box, or trunk, and as they approach it move in close proximity to a plate h^2. As they recede from it they move in proximity to the plate h^3 at the other edge of the trunk, there being at all times one of these cross bars or girts close to each of these plates; and consequently the entrances for air are cut off in all directions except through the mass of ore. The air is withdrawn from the box H′ by a suction apparatus connected with the duct h.

With the present mechanism the ore, after treatment, can be removed in any suitable way. Preferably there is a chute at K arranged to come close to the bottom of the ore receptacle. As the different parts of the latter reach this chute, the ore is taken off automatically and guided by the chute to any suitable place of deposit, or to a suitable vehicle.

As is above remarked, numerous modifications will suggest themselves to those skilled in the art. An endless ore support or carrier can be made in either of several ways, having its successive sections rigidly secured together. Thus, a horizontally rotated table-like or ring-like carrier can be used, the table part or ring part of which constitutes the ore receptacle, it having an apertured bottom rotating in horizontal planes, instead of in vertical planes as above described.

In Figs. 3, 4, and 5 we have illustrated a form of apparatus somewhat different from that illustrated in the other views. In the apparatus here illustrated the grate surface N of the drum T travels close to the edges of the air box H. The rings t, t, that constitute the side walls or flanges for retaining the ore while under treatment are rabbeted along their inner faces to constitute seats upon which rest the edges of the grate or perforated ore support. These side walls t, t are of ring-like construction and rest upon the supporting wheels or rollers P, Q. Their inner edges are toothed or formed into annular racks A, A with which engage pinions B mounted upon a driving shaft C which receives its power from any suitable source.

In order to clearly set forth features of our invention, we have in the drawings illustrated and have described two forms of structure. That presented in Figs. 1 and 2 embodies a number of details and structural matters supplemental to the main features of the invention which have been made the subject of claims in application Ser. No. 347,872, filed solely by A. S. Dwight, and such details or additional matters of improvements are not herein claimed jointly by us.

What we claim is:

1. In an apparatus for roasting and sintering ore, the combination of an endless ore support or carrier, having its successive ore-receiving sections rigidly secured together and all said sections being adapted to simultaneously move through a pre-determined path, means for moving the said support, means for supplying air to permit it to pass through the ore mass in a direction transverse to the movement of the support, substantially as set forth.

2. In an apparatus for roasting and sintering ore by combustion in the ore mass, the combination of an endless ore support or carrier, having its successive sections rigidly secured together, means for moving said support, means for supplying a current of air to maintain combustion in the ore mass and means for discharging the sintered ore therefrom, substantially as set forth.

3. In an apparatus for roasting and sintering ore by combustion in the ore mass, the combination of an endless ore support or carrier having its successive sections rigidly secured together and supported to turn about a horizontal axis, means for supplying air to maintain combustion in the ore while supported upon the said support or carrier, and means for removing the sintered ore from the carrier, substantially as set forth.

4. In an apparatus for roasting and sintering ore by combustion in the ore mass, the combination of an endless ore support of ring-like or drum-like construction, means for supporting the carrier so it is free to turn about a horizontal axis, means for feeding ore to the carrier, and means for causing air to pass through a restricted portion of the mass of ore situated above the axis of the support, substantially as set forth.

5. In an apparatus for roasting and sintering ore by combustion in the ore mass, the combination of an endless ore support

or carrier arranged substantially cylindrically and to turn about a horizontal axis, and an air chamber arranged within the said cylindrical support for causing air to support combustion to pass through the ore resting upon the support, substantially as set forth.

6. In an apparatus for roasting and sintering ore, the combination of a cylindrical ore support, means for feeding the ore to the support, means for supplying air to support combustion in the ore while upon the support, and anti-friction rollers upon which the support rests, substantially as set forth.

7. In an apparatus for roasting and sintering ore, the combination of a rotating ore support, means for confining a mass of ore upon the support while it is rotating, and means for causing currents of air or gas to pass through the ore mass, substantially as set forth.

8. In an apparatus for roasting and sintering ore, the combination of an endless ore support arranged to rotate in a circular path, and an air duct arranged adjacent to the circular path of the ore and adapted to cause air to pass through the ore mass, substantially as set forth.

9. In an apparatus for roasting and sintering ore, the combination of a rotatable ore support having side walls for retaining a mass of ore thereupon, and a perforated support adapted to permit currents of combustion-supporting gas to pass therethrough and through the ore mass, substantially as set forth.

10. In an apparatus for roasting and sintering ore, the combination of a rotatable ore support of cylindrical form having walls projecting beyond the support for confining the ore mass at the sides, the support being pervious to air and gas, means at the periphery of the holder for supporting it so it is free to rotate, and means for causing air or combustion-supporting gas to pass through the pervious support and the ore mass thereon, substantially as set forth.

In testimony whereof, we affix our signatures each in the presence of two witnesses.

ARTHUR S. DWIGHT.
RICHARD L. LLOYD.

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G. E. SEYMOUR.
Witnesses as to Richard L. Lloyd:
W. J. KINGSBURY,
JOHN N. JUDSON.