A. WERTENBRUCH.

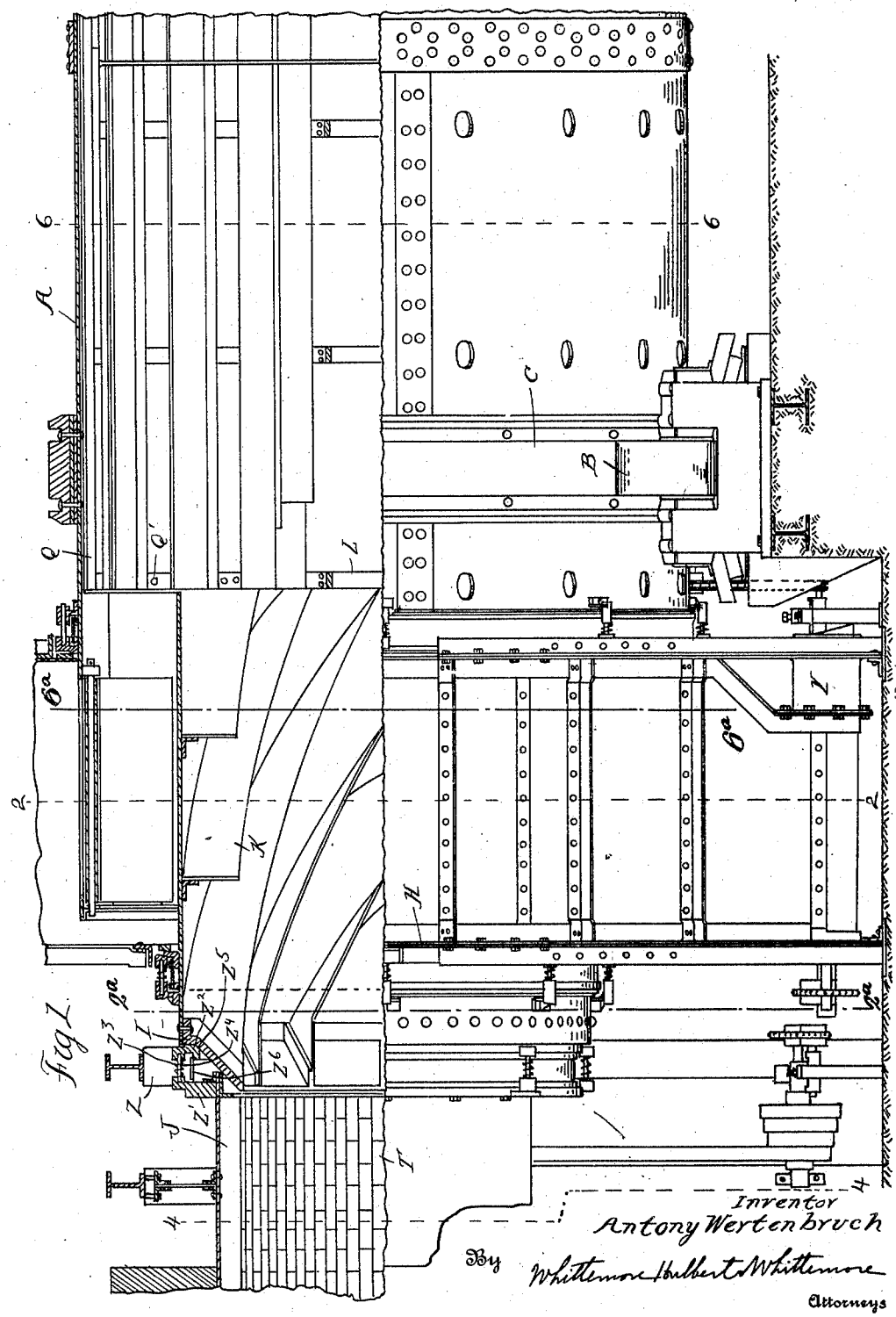
DRIER.

APPLICATION FILED JULY 16, 1917.

1,314,994.

Patented Sept. 2, 1919.

7 SHEETS—SHEET 1.



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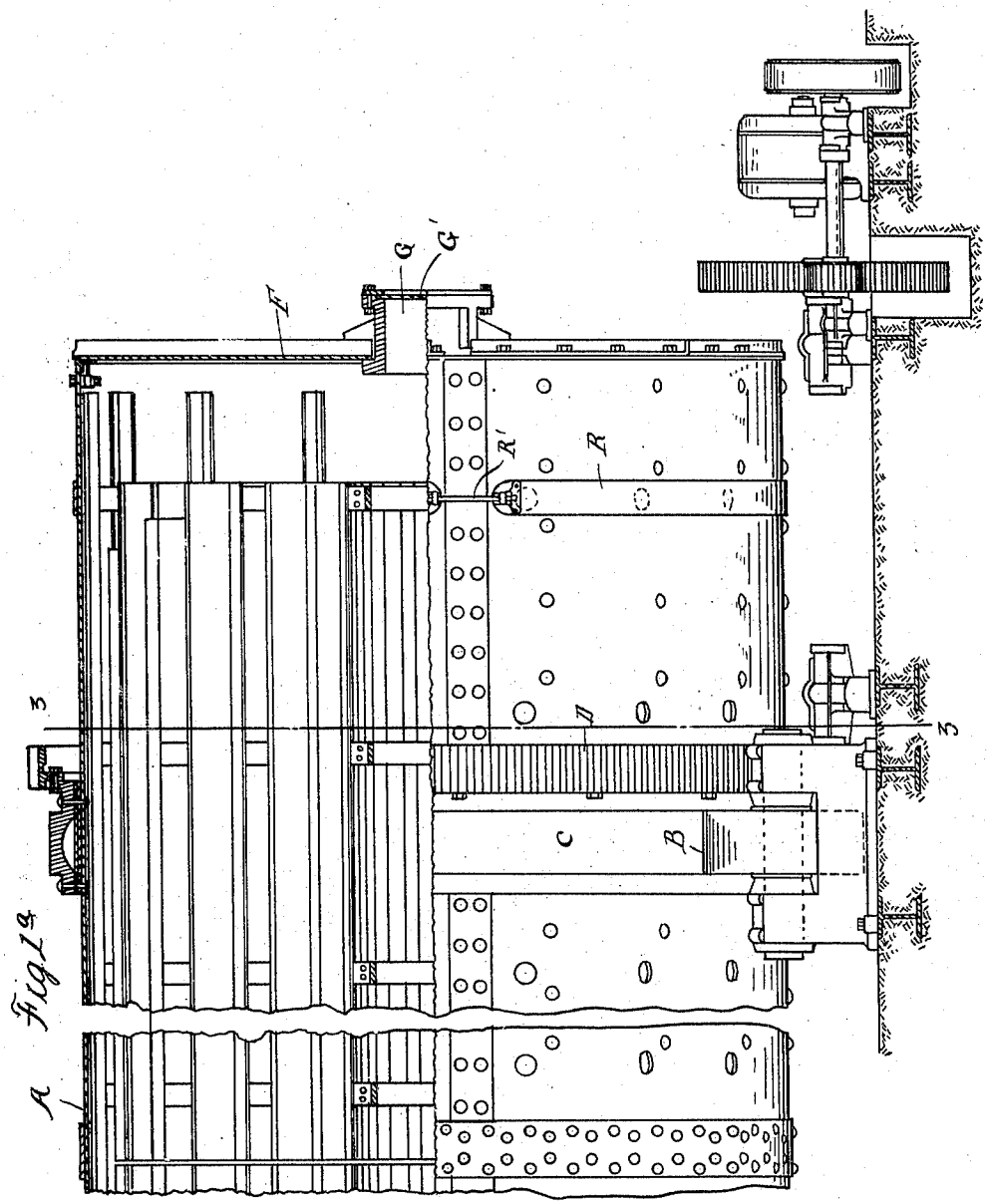


Fig 2

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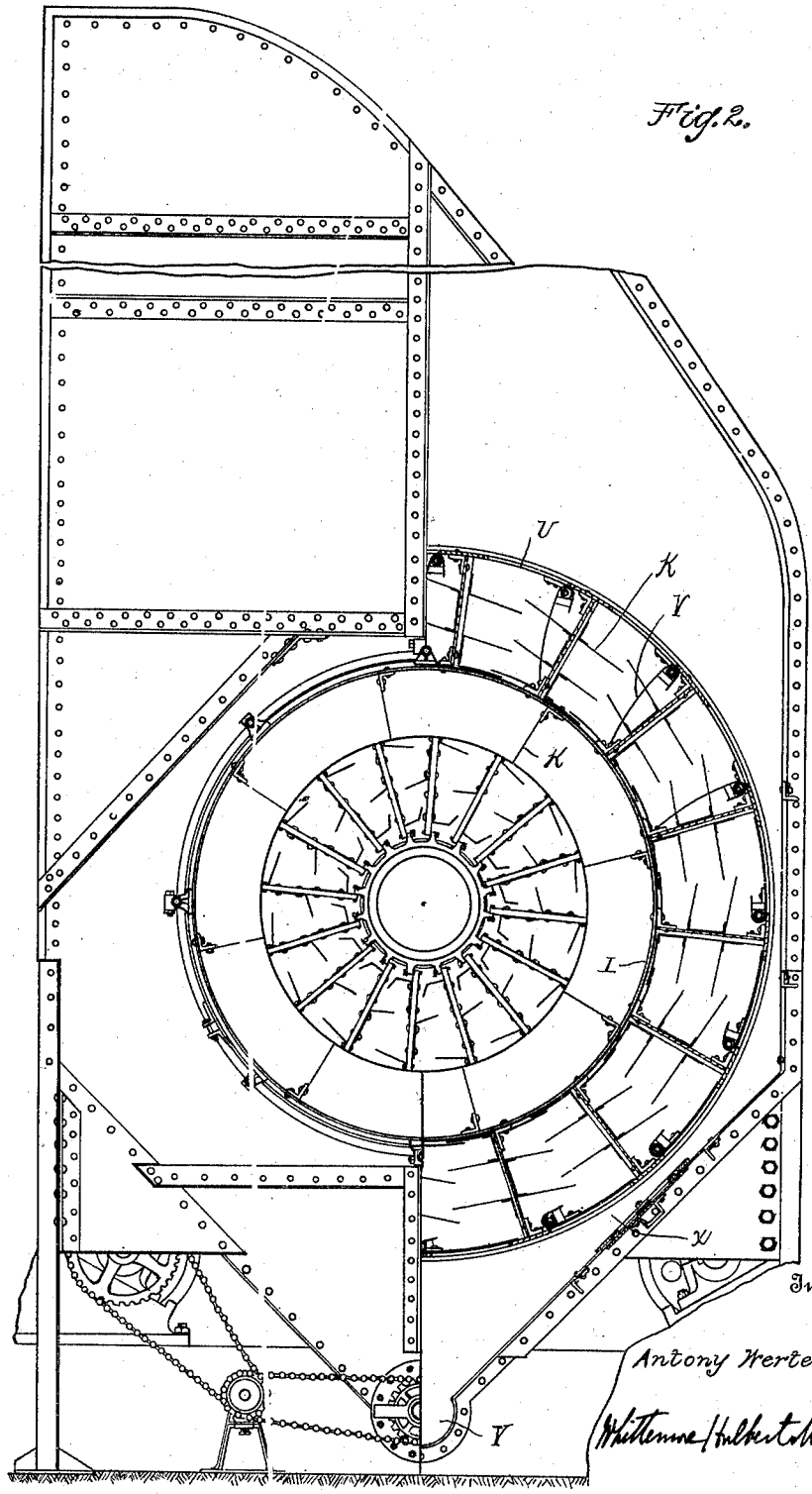
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7 SHEETS—SHEET 3.

Fig. 2.



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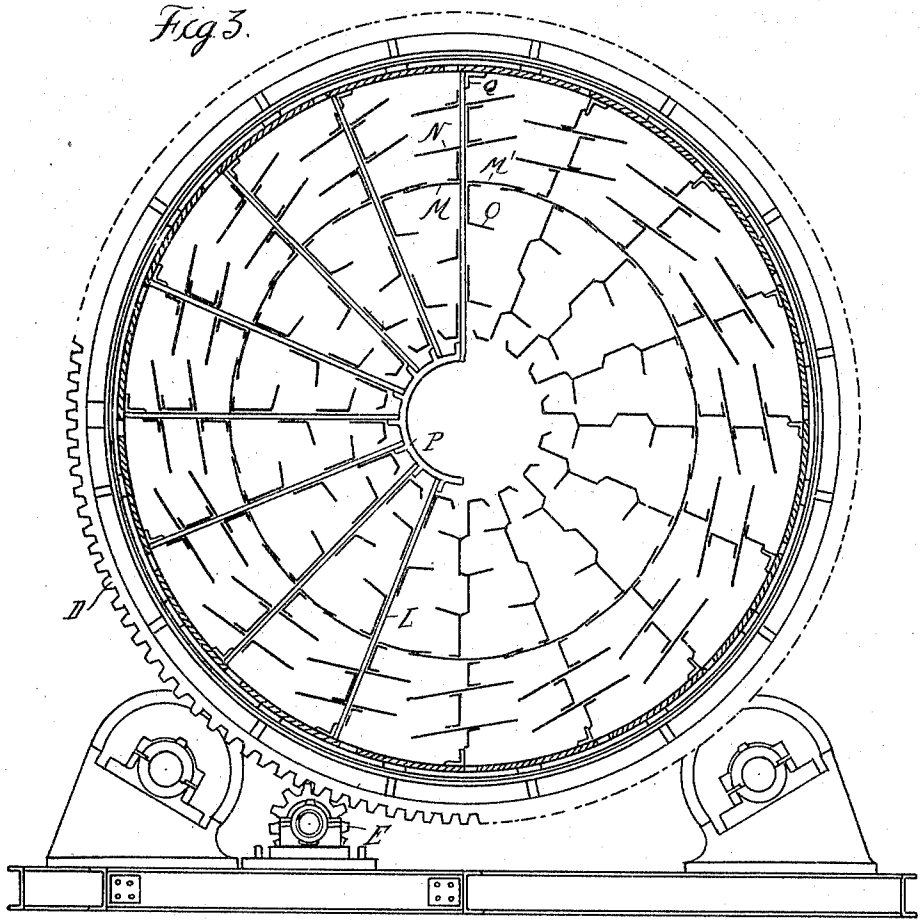
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Fig 3.



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7 SHEETS—SHEET 5.

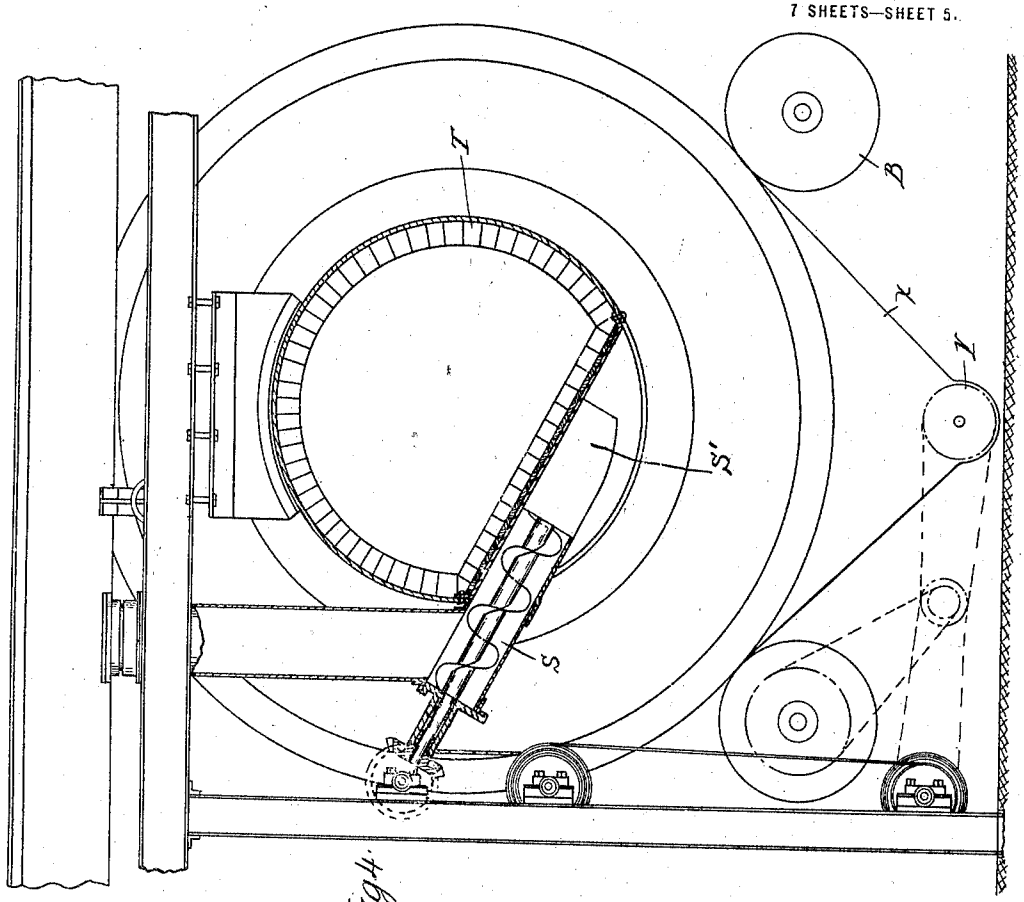


Fig 4.

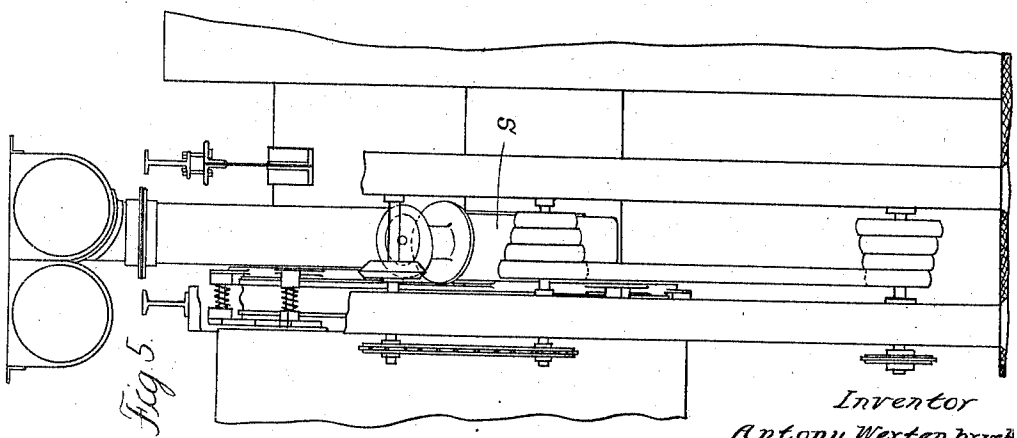


Fig 5.

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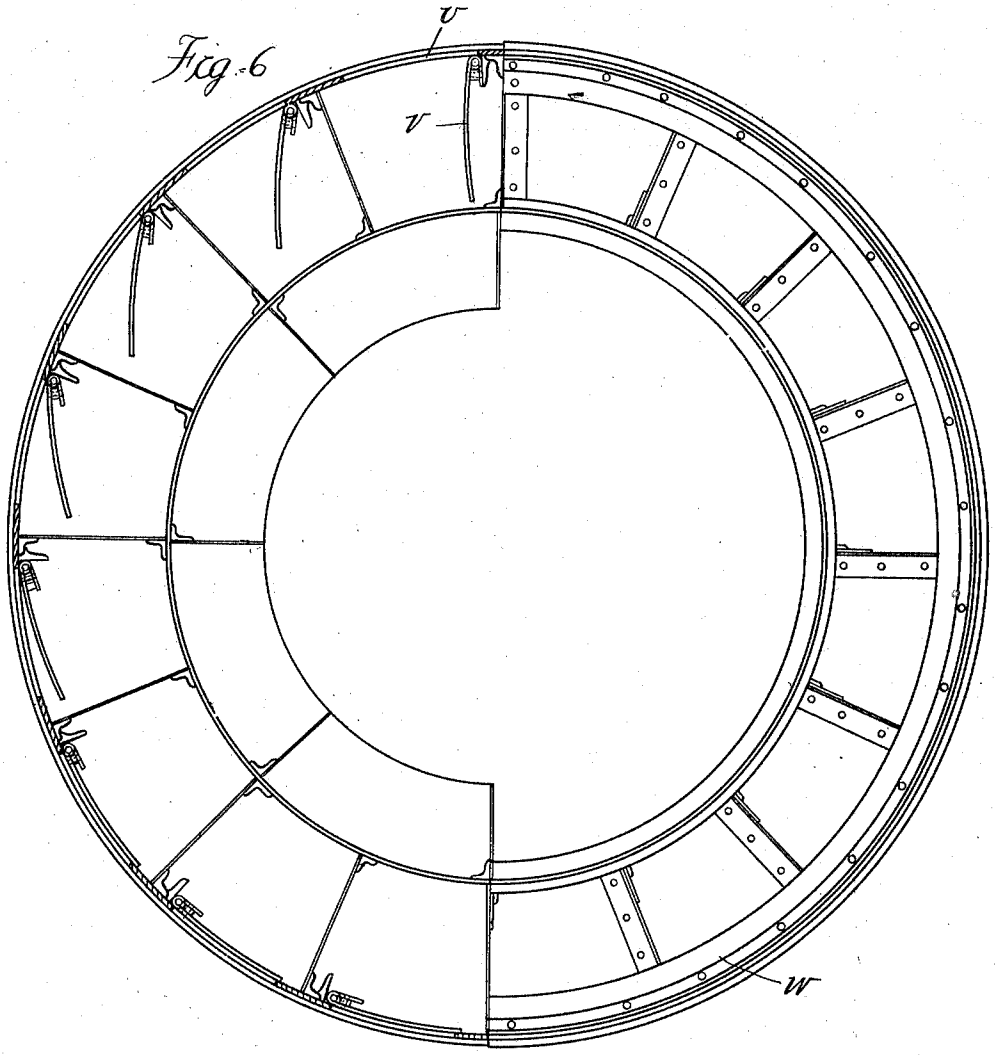
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7 SHEETS—SHEET 6.

Fig. 6



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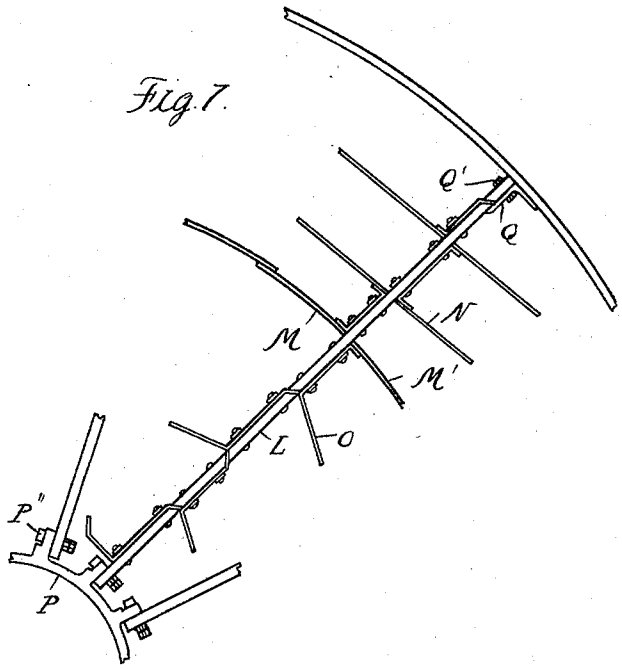
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7 SHEETS—SHEET 7.

Fig. 7.



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UNITED STATES PATENT OFFICE.

ANTONY WERTENBRUCH, OF DETROIT, MICHIGAN, ASSIGNOR TO THE LARROWE MILLING COMPANY, OF COHOCTON, NEW YORK, A CORPORATION OF NEW YORK.

DRIER.

1,314,994. Specification of Letters Patent. Patented Sept. 2, 1919.

Application filed July 16, 1917. Serial No. 180,696.

To all whom it may concern:

Be it known that I, ANTONY WERTENBRUCH, formerly a subject of the Emperor of Germany, having applied for U. S. citizenship papers, residing at Detroit, in the county of Wayne and State of Michigan, have invented certain new and useful Improvements in Driers, of which the following is a specification, reference being had therein to the accompanying drawings.

The invention relates to driers of that type comprising a revolving drum having its interior divided by partitions into small compartments through which the material to be dried is fed in contact with the hot gases and heated surfaces. It is the object of the present invention to obtain various advantages and in particular to obtain a simple construction to manufacture, to facilitate assembly and repair and to obtain a more uniform and complete drying of the material. With these objects in view the invention comprises the construction as hereinafter set forth.

In the drawings:

Figures 1 and 1ª together show a side elevation partly in longitudinal section through the drier;

Fig. 2 is a cross section on lines 2—2 and 2ª—2ª Fig. 1;

Fig. 3 is a section on line 3—3 Fig. 1ª;

Fig. 4 is a section on line 4—4 Fig. 1;

Fig. 5 is an elevation thereof;

Fig. 6 is a section on line 6—6 and 6ª—6ª Fig. 1;

Fig. 7 is an end elevation of one of the removable shelf-supporting sections within the drum.

With driers of the type to which my improvement belongs the drying of the material is accomplished, first, by breaking it up into relatively small masses which are subjected to the action of the hot gases; and second, by feeding the material over hot surfaces. It is therefore essential to provide a large amount of heating surface within the drum and to arrange this surface so that it will during the rotation of the drum properly subdivide the mass of material. As the heating surface is subjected to the corrosive action of gaseous products of combustion and moisture, it is frequently necessary to remove and replace portions thereof. I have therefore devised a construction in which the interior heating surface is formed in units which are separately removable from and replaceable within the outer drum. I have further provided means of access to all of these units. Another feature of my improvement is the construction in which the material and hot gases are first fed through the central portion of the drum and then returned through the outer portion thereof, this being accomplished without the necessity of providing two complete drums in concentric relation.

In detail, A is the outer drum or shell which is of sufficient diameter for the return feeding of the material therethrough. This drum is revolubly supported on suitable roller bearings B engaging annular tracks C and the drum is revolved by suitable means, such as the annular rack D engaging a drive pinion E. The rear end of the drum is closed by a head F having a central man-hole G with a closing cover G′ therefor. The forward end of the drum has as annular closure H with a cylindrical extension I which communicates at its forward end with the flue J from the furnace. The cylinder I also extends rearward beyond the closure H for a short distance within the outer drum A, and spiral blades K are arranged on the interior of the cylinder, being inclined in a direction with relation to the rotation of the drum which will oppose the advance of material therethrough. The interior of the drum A is divided into a central compartment in alinement with the cylinder I and through which the gases and material pass rearwardly, and surrounding this compartment is an annular passage through which the gases and material are returned to the forward end of the drum surrounding the cylinder I. Also the space within the central and outer compartments is subdivided by a series of partitions into relatively small channels. Both the subdividing partitions and the division between the central and outer compartment are formed by unit sections of the following construction:

L are radial bars to which are attached oppositely-extending segmental wings M M′ with a series of shelves N outside of said wings and a second series of shelves O inside of the wings. The bars L are of a length to extend from the periphery of the drum

to near the center thereof where they are attached to spider rings P. The outer ends of the bars L are attached to angle strips Q which are secured to the interior of the drum and extend longitudinally thereof. Units constructed as just described may be of any suitable length and any desired number may be arranged around the drum, but as shown the drum is two units in length and sixteen are arranged about the circumference. The segmental wings M and M′ of adjacent units will overlap each other and as these are arranged in alinement with the cylinder I they form in effect an inner drum extending from the forward to the rear end of the drum A. Within the inner drum the partitions O divide the space into small compartments and during the rotation of the drum the material will be dropped off from the partition from one compartment to another and across the path of the hot gases traveling through the drum. In the same manner the hot material after reaching the rear end of the drum A will be returned through the portion of the space outside of the segmental wings, the units terminating short of the head F so as to provide the proper area of connection between the outer and inner compartments. To facilitate placing of the units the outer shell A is provided with a series of hand-holes arranged circumferentially thereof in planes corresponding in position to the radial arms L, said hand-holes being also adjacent to the angle strips Q to which the radial arms are attached. This will provide access from the outside of the drum to the bolts Q′ which secure the arms to the strips Q, and after assembly the hand-holes are closed, preferably by a band R placed circumferentially about the drum and secured by the clam R′. The rings P are secured to radial arms L by bolts P′ which are accessible from the interior of the drum, the diameter of said rings being sufficient for a man to travel therethrough. The man-hole G provides an entrance to the rings and thus the work of assembling or removing the units is easily performed.

To introduce the material into the drum I have provided a conveyer S which extends into the flue J, preferably near the bottom thereof, the conveyer as well as the interior of the flue being protected by heat insulation such as brick-work T. The opening S′ from the conveyer casing into the flue faces rearward so as to be out of the path of the hot gases, in this way avoiding overheating of the conveyer mechanism. The material is taken out of the drum in the chamber at the forward end thereof which surrounds the cylindrical member I. It is essential to provide a sufficient area of opening for the passage of the hot gases without undue restriction thereof and, on the other hand, it is equally essential to retard the feeding of the material which is drying so as to retain it a sufficient length of time within the drum. This I have accomplished by forming a series of peripheral openings U in the end portion of the drum A and providing a series of hinged closures V for the respective openings. The arrangement is such that during rotation of the drum in the direction of the arrow the closures will cover the openings on the underside of the drum and will open them on the upper side thereof. Thus the gases are free to pass upward through the openings, while the material resting upon the bottom of the drum is compelled to move to the end thereof before it is discharged, and to further retard the discharging of the material the end of the drum is partially obstructed by suitable means, such as the rings W which will compel a rise to a predetermined height before the material can pass these obstructions and fall out of the drum. X is a hopper below the discharge end of the drum, and Y is a conveyer for removing the material dropping therein.

In operation, the hot gases from the furnace are drawn through the drum preferably by suction, which may be produced either by stack or fan (not shown). The velocity of movement of the gases through the drum is sufficient to carry along the material introduced through the conveyer S against the obstructing action of the spiral blades K and the frictional resistance of the partitions or subdivisions. The overlapping segments M and M′ of the different units will compel the material to pass to the rear end of the drum before it is permitted to return to the forward end thereof, and during this passage it will be moved in contact with the heated surface with a result that complete drying is effected.

It is desirable to maintain the drum as nearly as possible air tight, so as to avoid drawing in of cooling air currents. I have therefore provided a sealing means for the various joints between the revolving and non-revolving parts, such as indicated at Z, and which sealing means comprises a pair of members Z' and Z^2, one of which is anchored while the other is in contact with a relatively movable member. Springs Z^3 upon slidable rods Z^4 serve to yieldably press the members Z' and Z^2 away from each other so that the movable member Z^2 will be held in contact with the coöperating bearing surface, such as Z^5. The members Z' and Z^2 are arranged surrounding the drum, and an air-tight joint is maintained between these members by a flexible band Z^6 surrounding the same but permitting of relative movement. Thus the member Z^2 being held yieldably in contact with the member Z^5 will seal the joint, while the

flexible band Z^6 will seal the joint between the members Z' and Z^2 and will permit relative longitudinal movement thereof.

In arranging the shelves upon the unit sections the angles thereof are selected with respect to the distance from the center and also with regard to the amount of moisture in the material supported thereby. Thus the material being introduced first in the center of the drum is in a very moist condition and the shelves at this point are angled to facilitate discharge from one shelf to another, while in the outer portion of the drum where the material is partly dried the shelves are angled to have a greater tension on the material. This differential arrangement is useful in securing the greatest efficiency with a given amount of shelf surface.

What I claim as my invention is:

1. In a drier, the combination with a revoluble drum, of a series of sections for subdividing said drum independently removable from and replaceable therein, and means mounted on said sections for separating the space in said drum into an inner and a surrounding compartment having communication at the end only of the drum.

2. In a drier, the combination with a drum, of a series of radially-arranged sections within said drum, means within the drum for attaching the outer ends of said sections to the periphery of the drum, and means of access to said attachment means comprising an annular band surrounding the drum and removable therefrom, said band covering a series of hand-holes adjacent to the several attachment means.

3. In a drier, the combination with a drum, of an interior structure therefor, comprising a series of unit sections each consisting of a plurality of radially-extending bars, longitudinal bars attached thereto, rings attachable to and connecting the inner ends of said units, means within the drum for attaching the outer ends of said units thereto, said means being accessible through hand-holes in the drum, and an annular closure for covering said hand-holes.

4. In a drier, the combination with a drum, means for introducing and taking out material from the same end of the drum at different distances from the center thereof, an interior structure formed in unit sections independently removable from and replaceable in said drum, and means mounted on said sections for separating the inner and outer portions of said drum to compel material introduced into the drum to move to the opposite end thereof before returning to the exit therefrom.

5. In a drier, the combination with a drum of an interior structure for said drum comprising a series of radially-arranged sections having longitudinally-extending shelves mounted thereon, and means also mounted on said sections for dividing the drum into concentric inner and outer compartments.

6. In a drier, the combination with a rotary drum, of means at one end of the drum for passing hot gases through said drum, and means at the same end of the drum for introducing material to be dried into the drum, said introducing means being out of the direct path of the hot gases and thermally insulated therefrom.

7. In a drier, the combination with a drum through which the material to be dried and drying gases are passed, the end portion of said drum being provided with peripheral openings, of means for automatically closing said openings in the lower portion of said drum to retain the material therein and for automatically uncovering the openings in the upper portion of the drum for the escape of the gases.

8. In a drier, the combination with a drum having peripheral openings in the discharge end thereof, of hinged members for closing said openings in the lower portion of the drum and automatically opening the same in the upper portion thereof.

9. In a drier, the combination with a rotary drum having peripheral openings in the discharge end thereof, of means for automatically closing said openings in the lower portion of the drum and opening the same in the upper portion thereof, and obstructing means in the end of the drum.

10. In a drier, the combination with a rotary drum having peripheral openings in the discharge end thereof for the escape of gases, of means for closing said openings in the lower portion of the drum to prevent discharge of the material to be dried therethrough, and a ring at the end of the drum forming an obstruction for retarding the discharge of the material therefrom.

11. In a drier, the combination with a rotary drum, of an interior structure for said drum comprising a series of radially-arranged unit sections, said sections having longitudinally-extending shelves carried thereby, the angle of said shelves being varied from the inner to the outer portion of the drum.

12. In a drier, the combination with a rotary drum, of a stationary member, and sealing means therebetween comprising a member anchored to said stationary member, a second member yieldably held in contact with said rotary drum, and a flexible band surrounding said sealing members.

In testimony whereof I affix my signature.

ANTONY WERTENBRUCH.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."