

Sept. 8, 1931.

C. C. HERITAGE

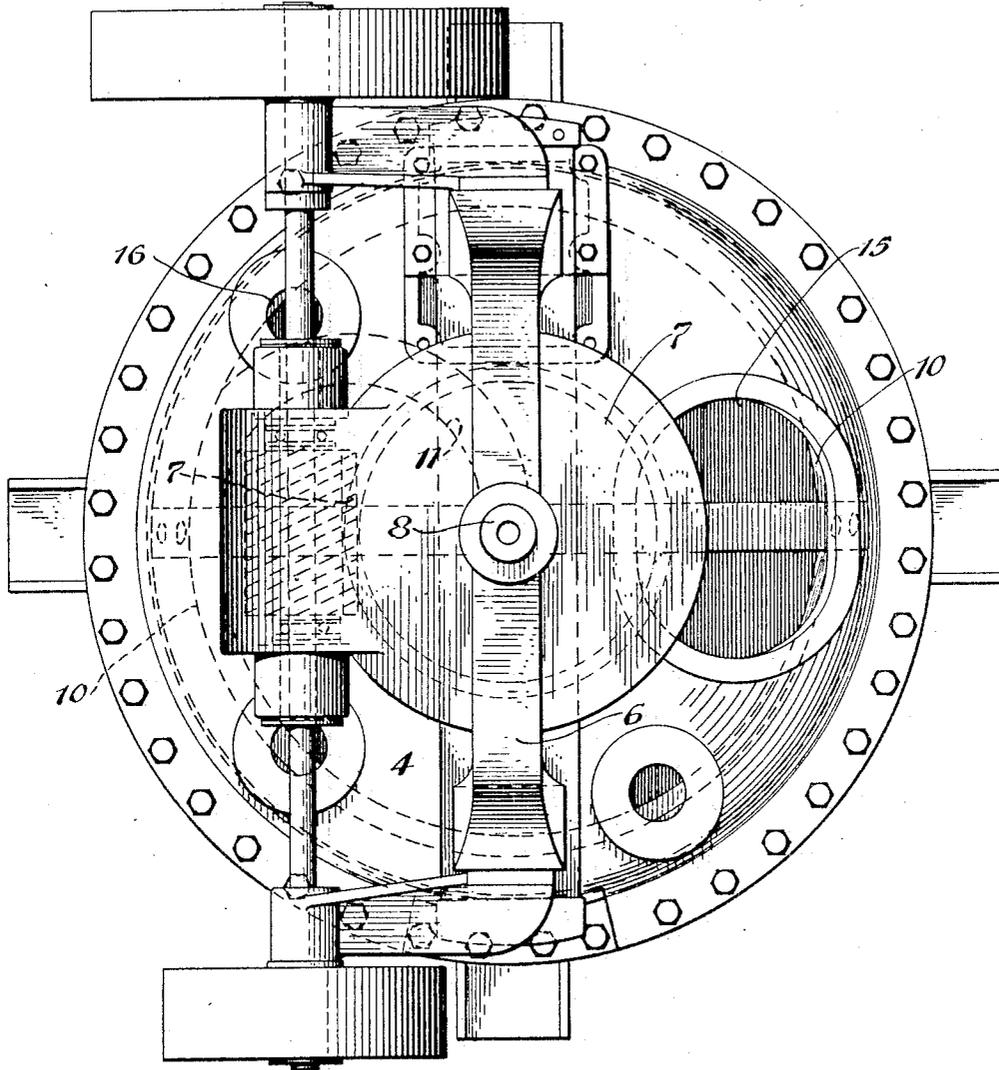
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DRIER

Filed Feb. 19, 1926

2 Sheets-Sheet 1

Fig. 1.



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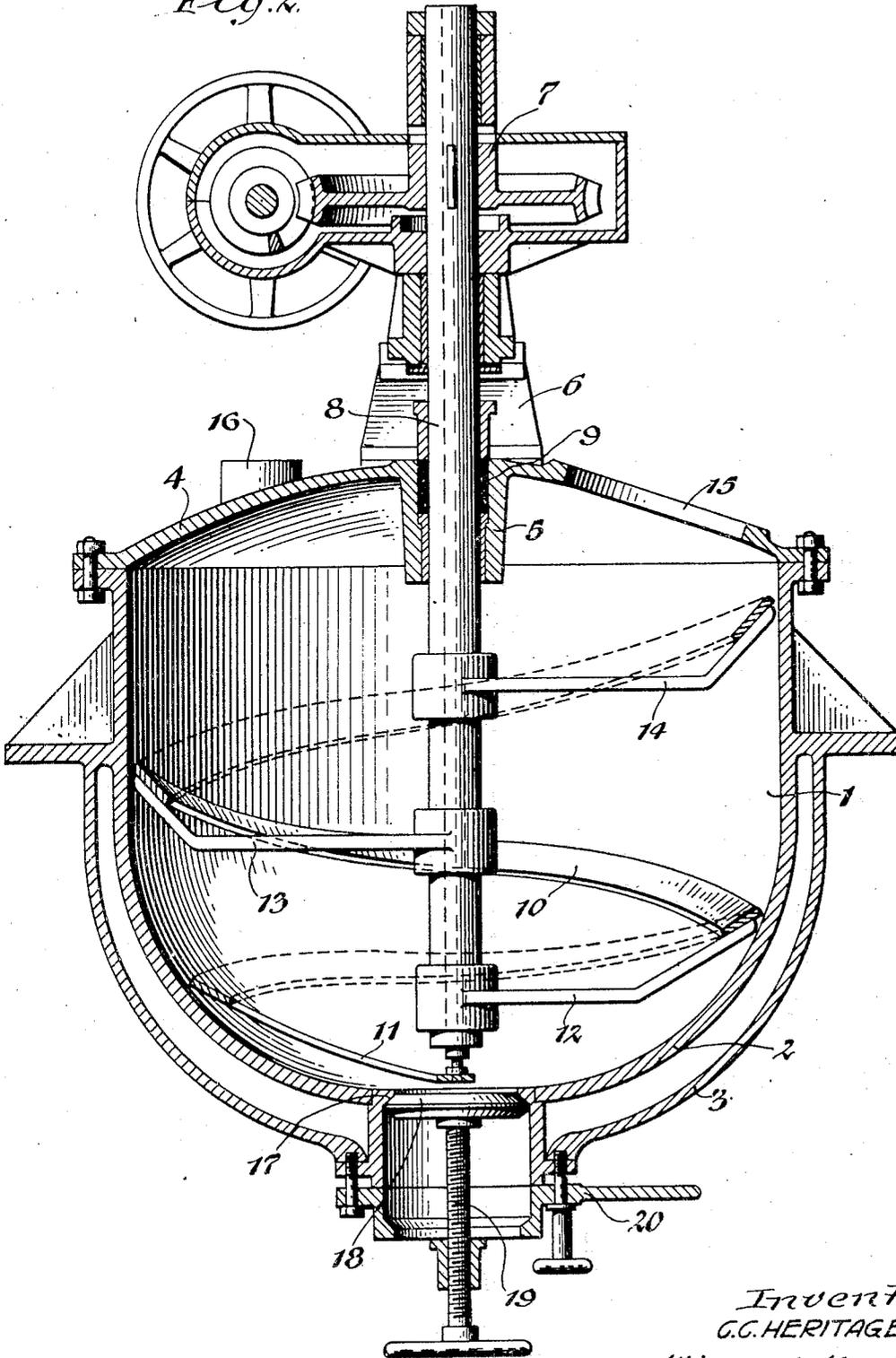
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Fig. 2.



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DRIER

Application filed February 19, 1926. Serial No. 89,317.

This invention relates to the drying of wet or moist material by the removal of liquid therefrom with the aid of heat. It relates more particularly to improvements in processes and apparatus for the vacuum drying of such material, and is especially concerned with the treatment of relatively small quantities of material.

For small tonnage production, the usual vacuum drier of the horizontal rotary type has the objections of high initial cost and inefficient operation. These objections arise from the fact that such a drier in a small size requires the same equipment and end construction as one built for large scale operations, and the further fact that a large proportion of its heated surface is not utilized in the drying operation. Consequently it is customary to employ drier pans when the quantity of material to be dried is too small for economical handling in rotary driers; but these are attended by high labor costs, high losses in handling and slow operation.

According to the present invention, relatively small batches are dried with comparatively short time cycles, low labor cost and freedom from handling losses. The invention presents the further features of inexpensive installation, long life with low maintenance, operation under any condition of pressure or vacuum, and capability of performing the additional operations of grinding, mixing and standardizing.

In brief, the process forming a part of the invention comprises elevating the material to be dried while in contact with a substantially vertical surface, scraping the dried material from contact with the surface, and removing vapor formed in the drying of the material.

The apparatus forming a part of the invention consists of a vertical jacketed vessel with a rounded or sloping bottom, and a removable agitator suspended within the vessel, the agitator being of a type that shears dried material from the wall to afford an efficient heat transfer to fresh material. With the vertical arrangement, the weight of the agitator is carried by the cover, its coaction with

the vessel wall is uniform for the whole periphery, and the entire vessel circumference is utilized for the drying operation. This also permits the use of a cast iron construction with its attendant advantages.

In the accompanying drawings
Fig. 1 is a top view of the drier; and
Fig. 2 is a vertical axial section.

A container 1 having a round bottom 2 is provided with a jacket 3 inclosing the operative portion of the container, and containing a suitable medium for heating it. A cover 4 carries a central bearing 5 and a superstructure 6 on which is mounted a drive mechanism 7 for a shaft 8 that extends within the container. A stuffing box 9 in the cover provides a tight joint about the shaft. The end of the shaft within the container carries an agitator 10, preferably of the spiral ribbon type, formed to follow closely the container configuration and with the broad surface of the ribbon disposed at an angle to the axis of the agitator, thus providing an improved lifting and shearing action. The lower end 11 of the ribbon is attached to the shaft, and arms 12, 13 and 14 extending from the shaft, support remaining portions of the agitator ribbon.

The container has a charging opening 15, suitably closed and a vapor outlet 16 in the cover. A bottom discharge 17 is closed by a valve 18 whose stem 19 is threaded in a swiveled arm 20.

In the operation of the drier, press cake or other material to be dried is charged through the opening 15, and the opening is closed. The agitator is started, and as it revolves, it first forces upwardly, or elevates, into contact with the inner surface of the vertical wall of the container the material to be dried lying near the wall. As the revolution of the agitator continues, the material is further elevated while in contact with said surface until the upper end of the agitator ribbon is reached, and then it falls back into the container. The wall is heated to a temperature suitable for drying the material, and the heat transmitted by the wall of the container to the material, while it is being elevated in contact with the inner surface of said

wall, causes liquid or moisture contained in it to vaporize. Vapor formed in the drying of the material is removed through the outlet 16 in any well known manner. The agitator blade, by reason of its angular disposition relative to the vessel wall, shears and scrapes off any moist or dried material which tends to adhere to the wall; it also forces said material toward its inner edge, from which said material drops back into the lower central portion of the container.

By this process there is effected a constant stirring and turning over of material, and the whole of the heating surface of the container is utilized in the drying action, thus giving a short drying cycle.

The close contact of the agitator ribbon and the container wall prevents encrustations on the wall which check the transfer of heat. It also serves to cause a grinding or pulverizing of the material as the paste or press cake approaches dryness, and results in a product of considerable fineness. This action and the completeness of the agitation render the invention useful for mixing other materials with the press cake by grinding them together as, for example, for mixing common salt or Glauber's salt with dye-stuffs.

The vertically arranged agitator and the bottom discharge in axial alignment combine in providing a drier that is quickly and completely emptied when the drying action is finished. It furthermore affords a construction that is readily cleaned for changing from one product to another. Obviously, the container and agitator axis need not be truly vertical as the structure is operable with various inclinations of the axis and the term "substantially vertical" is intended to include such an angular disposition. With an inclined arrangement it may be desirable to offset the discharge opening from the axial line.

I claim:

1. In an apparatus for drying wet or moist material by the removal of liquid therefrom with the aid of heat, the combination of a vertical cylindrical wall, means for heating said wall to a drying temperature, means for elevating material to be dried into contact with said wall, and means for removing vapors formed in the drying of said material.

2. In an apparatus for drying wet or moist material by the removal of liquid therefrom with the aid of heat, the combination of a heated vertical cylindrical wall, a rotary spiral agitator in close contact with said wall for elevating material to be dried in contact with said wall, and means for removing vapors formed in the drying of said material.

3. In an apparatus for drying wet or moist material by the removal of liquid therefrom

with the aid of heat, the combination of a heated vertical cylindrical wall, a rotary spiral agitator in close contact with said wall for elevating material to be dried in contact with said wall and for shearing dried material from contact with said wall, and means for removing vapors formed in the drying of said material.

4. In an apparatus for drying wet or moist material by the removal of liquid therefrom with the aid of heat, the combination of a closed container for the material to be dried having a vertical cylindrical wall, means for heating said wall to a drying temperature, a rotary spiral agitator for elevating the material while in contact with said wall, and an outlet in said cover for removing vapor formed in the drying of said material.

5. In an apparatus for drying wet or moist material by the removal of liquid therefrom with the aid of heat, the combination of a closed container for the material to be dried having a vertical cylindrical wall, a heating jacket for heating said wall to a drying temperature, a cover for said container, a rotatable shaft suspended from said cover axially of said container, a spiral ribbon agitator mounted on said shaft in close contact with said wall for elevating said material while in contact with said wall, and an outlet in said cover for removing vapor formed in the drying of said material.

6. In an apparatus for drying wet or moist material by the removal of liquid therefrom with the aid of heat, the combination of a closed container for the material to be dried having a vertical cylindrical wall and a valve controlled bottom outlet, a heating jacket for heating said wall to a drying temperature, a cover for said container, a rotary spiral ribbon agitator for elevating said material while in contact with said wall mounted in close contact with said wall and having the broad surface of said ribbon angularly disposed with respect to said wall, and an outlet in said cover for removing vapor formed in the drying of said material.

7. In an apparatus for drying wet or moist material by the removal of liquid therefrom with the aid of heat, the combination of a heated vertical cylindrical wall, a rotary spiral ribbon agitator in close contact with said wall for elevating the material to be dried in contact with the wall and having the broad surface of said ribbon angularly disposed with respect to the wall.

In testimony whereof I affix my signature.
CLARK C. HERITAGE.