

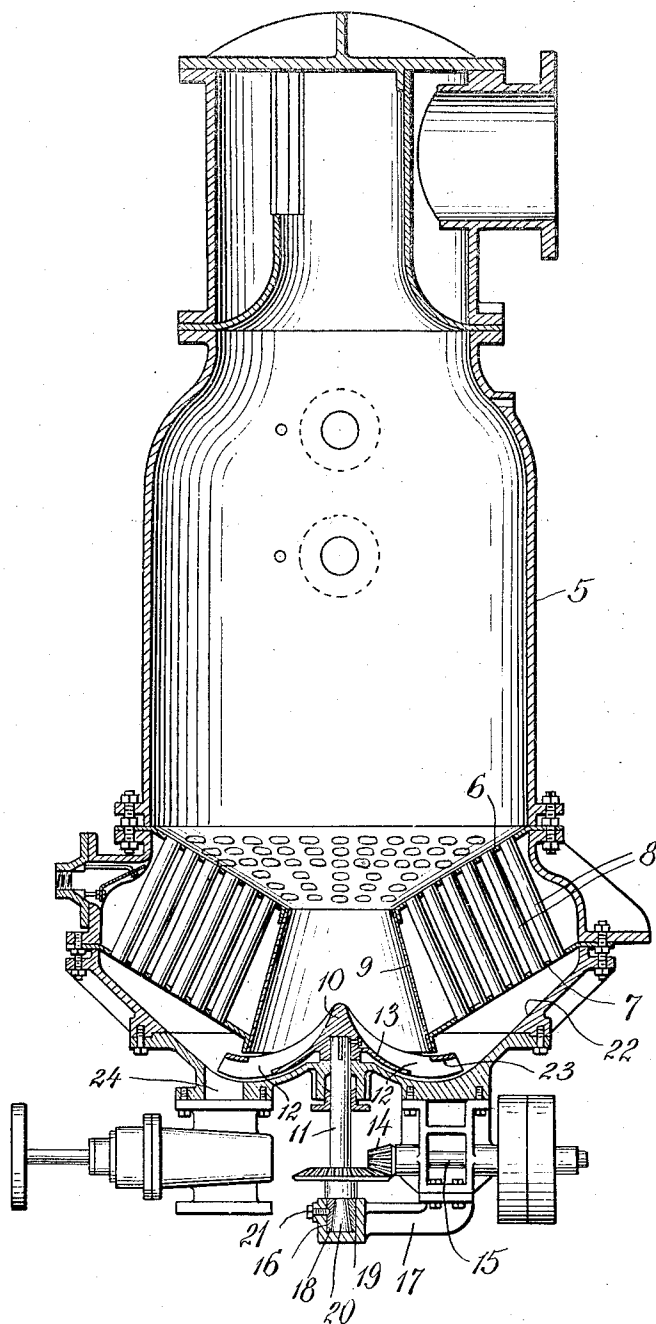
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G. ENGEL, SR

VACUUM PAN

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Inventor
Godfrey Engel Sr.,
By his Attorney
E. W. Marshall

UNITED STATES PATENT OFFICE.

GODFREY ENGEL, SR., OF BROOKLYN, NEW YORK, ASSIGNOR TO BUFFALO FOUNDRY & MACHINE CO., OF BUFFALO, NEW YORK, A CORPORATION OF NEW YORK.

VACUUM PAN.

Application filed September 13, 1920. Serial No. 409,762.

To all whom it may concern:

Be it known that I, GODFREY ENGEL, Sr., a citizen of the United States, and a resident of Brooklyn, Kings County, and State of New York, have invented certain new and useful Improvements in Vacuum Pans, of which the following is a specification.

My invention relates to apparatus in the nature of vacuum pans, used for evaporating and for heating and cooling purposes.

An important object of the invention is to secure an effective circulation of the material under treatment, and to accomplish this by relatively simple and entirely practical mechanism.

The invention involves certain novel features of construction, combinations and relations of parts, of which a typical embodiment is disclosed in the accompanying drawing, the single view representing a vertical section of the apparatus.

The casing or shell of the apparatus is designated 5, the same being made of a size and shape to best suit the purposes for which it is intended.

In the bottom portion of the pan, there is provided a calandria, the same being shown as of the novel construction disclosed in my co-pending application, Serial No. 374,659, and consisting of upper and lower inverted conical tube sheets 6 and 7, connected by the downwardly and outwardly inclined tubes 8. The lower tube sheet 7 is shown as of larger internal and external diameter and the two sheets are shown as connected together at the center by a conical wall 9, forming an upwardly converging central passage.

In dealing with the more heavy liquids, I have found that the action is retarded by the viscosity of the material and that under certain circumstances, the difference in temperature is not sufficient to effect a proper circulation through and about the calandria tubes.

To overcome this difficulty, I mount in the bottom of the pan below the central calandria passage, a forced circulation creating device shown in the form of a propeller 10 carried by the shaft 11 and consisting of a series of curved impeller blades 12. This propeller is shown as of generally conical shape, arranged with the apex thereof projecting up into the conical calandria pas-

sage and the lower edges of the blades are shown as connected for the greater portion of their length by a web 13.

The propeller shaft is shown as driven through bevel gearing 14 from a power shaft 15 and a step bearing of novel construction is illustrated as provided for the lower end of the vertical propeller shaft. This step bearing consists of a socket 16 provided in a suitable supporting bracket 17, for receiving the lower end of the propeller shaft and forming the seat for the two bearing segments 18, 19 which surround the lower end of the shaft and are formed with an upwardly convergent bore to receive the correspondingly shaped upwardly convergent lower end portion 20 of the shaft. The bearing segments are indicated as secured against removal from or shifting in their seat by a set screw 21. This relatively simple construction, it will be observed, provides a thrust bearing in which a part of the bearing members serve to prevent the shaft from being lifted out of its seat.

The bottom wall of the pan beneath the calandria is indicated as of generally inverted conical shape, inclined inwardly and downwardly toward the ends of the propeller blades, as shown at 22, and that portion of the bottom of the pan which is located beneath the body of the propeller is shown as inclined upwardly. This promotes the flow to the propeller and up through the central calandria passage.

The propeller is driven at the proper speed to effect the desired rate of circulation. For heating and evaporating purposes, the propeller is rotated to produce a downward circulation through the center of the calandria and up through the tubes, heat being supplied to the calandria as by means of steam in the usual way. Where the apparatus is to be used for cooling purposes, the propeller is driven in the reverse direction, or designed to effect a reverse flow, that is, down through the tubes and up through the center of the calandria. In either event, the fluid is positively circulated through the inclined tubes and across the inclined tube sheets and the material is prevented from lodging on either the sheets or in the tubes, both by reason of the inclination of these parts and because of the positive circulation produced by the propeller. With this ap-

paratus relatively rapid and uniform evaporation and cooling effects are readily accomplished.

5 The blades of the propeller in the illustration are shown connected at the rim by a flange 23 which stands substantially in line with the central circulating passage of the calandria, which serves to promote the circulation. The propeller furthermore is
10 shown as having its blades extending over the outlet passage 24. This is an important improvement in that it causes the blades to expel the material during discharge of the pan.

15 What I claim is:

1. In apparatus of the character disclosed, a casing, a calandria therein having an upright circulating passage with downwardly and outwardly inclined tubes grouped there-
20 about and a propeller in the bottom of the casing in line with the circulating passage for positively circulating fluid in the casing through said passage and through the inclined tubes.

25 2. In apparatus of the character disclosed, a casing provided with an outlet in the bottom thereof, a calandria in the casing having an upright circulating passage therethrough with inclined tubes grouped about
30 the same and a propeller in the lower portion of the casing in line with the circulating passage for positively circulating fluid through the passage and inclined tubes and having blades directly over and traversing
35 the outlet in the bottom of the casing to assist in the discharge of the contents of the casing.

3. In apparatus of the character described, a casing, a calandria in said casing having an upwardly convergent circulating passage
40 therethrough and a propeller in the bottom of the casing beneath the calandria and having a conical portion projecting up into the convergent passage aforesaid.

4. In apparatus of the character disclosed, 45 a casing, a calandria in said casing having upper and lower tube sheets inclined downwardly toward the center thereof and connected at the center by a down-take, with downwardly and outwardly inclined tubes
50 connecting said sheets, the bottom of the casing below the calandria being inclined downwardly toward the center thereof and being closed beneath the down-take and a bladed propeller journaled in the bottom of
55 the casing over the closed central portion and in line with the down-take for positively circulating liquid in the casing downwardly through the down-take, radially outward and upwardly over the inclined bot-
60 tom, up through the tubes and inwardly and downwardly over the upper inclined tube sheet to the upper end of the down-take.

5. In apparatus of the character described, a casing, a calandria therein having inclined
65 tube sheets connected by inclined tubes, said calandria having a central circulating passage therethrough and a propeller in the casing for forcing a circulation of fluid through the inclined tubes and through the
70 central calandria passage.

In witness whereof, I have hereunto set my hand this 8th day of September, 1920.

GODFREY ENGEL, SR.