March 10, 1931. C. O. LAVETT 1,795,495

CENTRIFUGAL DRIER

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Fig. 1.

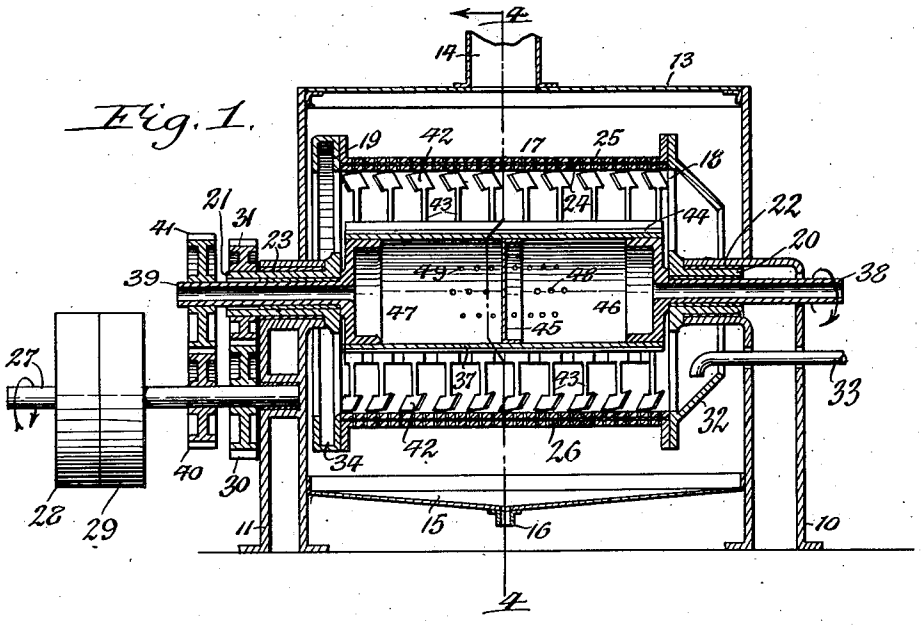
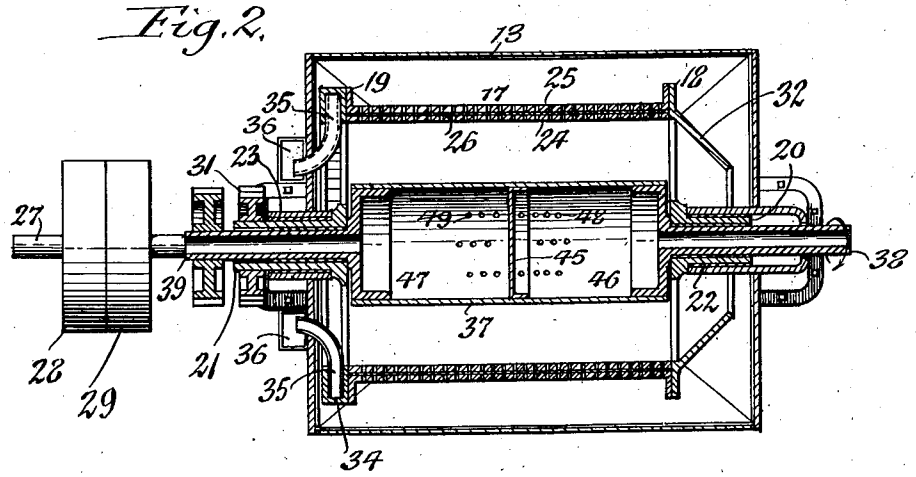


Fig. 2.



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Fig. 3.

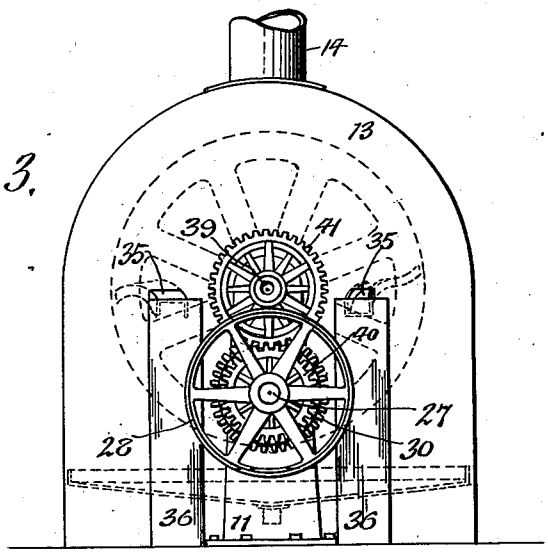
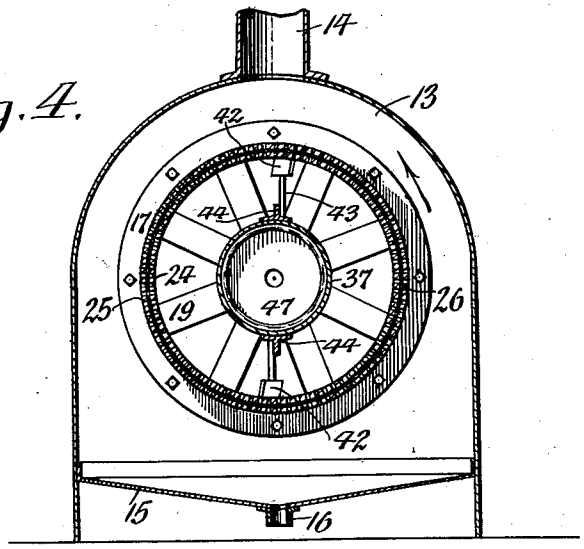


Fig. 4.



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UNITED STATES PATENT OFFICE

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CENTRIFUGAL DRIER

Application filed October 31, 1928. Serial No. 316,139.

This invention relates to a centrifugal drier, whereby the operation of drying crystal laden liquids may proceed continuously and has for its object the provision of a machine for this purpose whereby the draining of the liquid from the solids may not only be effected expeditiously but the crystals may be also throughly washed and heated, if required, during the operation of separating the same from the liquid.

In the accompanying drawings:—

Figure 1 is a vertical longitudinal section of a centrifugal drier embodying my invention. Figure 2 is a horizontal section of the same. Figure 3 is an end elevation of the machine. Figure 4 is a vertical cross section of the same taken on line 4—4 Figure 1.

In the following description similar characters of reference indicate like parts in the several figures of the drawings.

The numerals 10 and 11 represents standards forming parts of the main frame of the machine and which are arranged at the front and rear ends of the same, respectively. Between these standards is arranged an enclosing casing 13 the upper part of which is provided with an outlet 14 for the escape of obnoxious or dangerous gases or vapors separated from the mother liquor and crystals, while the lower part of the casing contains a pan 15 which catches the liquid separated from the crystals and conducts them to a discharge pipe 16 leading to the exterior of the machine.

Arranged within the casing and preferably turning about a horizontal axis is a separating drum which in the particular form shown in the drawings comprises a cylindrical body 17, front and rear heads 18, 19 mounted on the front and rear ends of the body, and front and rear trunnions 20, 21 extending forwardly and rearwardly from the front and rear heads and journaled, respectively, in bearings 22, 23 on the front and rear standards of the frame, as shown in Figure 1.

The body of the separating drum is made to serve as a screen for separating solid matter or crystals such as sodium sulphate, sodium chlorid, sugar and salt, from the mother liquid. In its preferred form this screen consists of inner and outer shells 24, 25 of perforated sheet metal, and a filter cloth 26 of finer mesh interposed between said shells.

Each of the heads 18, 19 of the separating drum is of skeleton or openwork form to permit passage of material through the same and each of the trunnions 20, 21 is of tubular form.

Rotation of the drum may be effected by any suitable means, for example, by the means shown in the drawings which comprise a horizontal driving shaft 27 journaled on the rear part of the main frame and having a tight pulley 28 and a loose pulley 29, and a pair of intermeshing gear wheels 30, 31 secured, respectively, to the driving shaft and the rear trunnion of the drum.

The front head of the drum has a conical annular deflector or distributor 32 projecting forwardly therefrom into which the full, raw or crystal laden mother liquor is introduced by a feed pipe 33 which receives it from a suitable source.

An annular trough, channel or gutter 34 is arranged on the rear head of the separating drum and adapted to receive the crystals which have been dried or deprived of their free moisture by the centrifugal action of the screen in passing lengthwise through the drum from the front to the rear end of the same.

As the drum rotates the crystal or dried material is removed from the rear or delivery channel by one or more scoops or doctors 35 which are mounted on the rear part of the frame or casing and have their inner ends projecting into the rear channel and their

outer ends projecting into delivery spots 36 on the exterior of the machine.

Within the drum are arranged means for propelling the material under treatment from the front to the rear end of the screen and also washing the same and heating the same if this is desired. In the preferred form this propelling washing and heating means comprise a hollow conveyor shaft 37 arranged lengthwise on the drum and concentrically therewith and provided at its front and rear ends with tubular or hollow trunnions 38, 39 which turn in bearings formed by the front and rear trunnions of the separating drums and extend to the exterior of the machine. Rotary motion is imparted to this hollow shaft by means consisting preferably of intermeshing gear wheels 40, 41, secured, respectively, to the driving shaft and the rear trunnion of the hollow shaft, as shown in Fig. 1.

Arranged close to or engaging with the bore of the screen of the drum are means for propelling the crystals or solid material from the front to the rear end of the drum which means rotate with the hollow shaft. In their preferred form these propelling means consist of two longitudinal rows of propeller blades or paddles 42 arranged close to or engaging with the inner side of said screen and each blade being of helical form or inclined lengthwise of the axis of the conveyor shaft and also preferably inclined circumferentially forward relative to a radial line, as shown in Fig. 4. The blades of each row are connected by reduced supporting arms 43 with a longitudinal bar 44 mounted on the adjacent part of the hollow shaft.

By thus making the blade wide and short and connecting the same by narrow arms with the narrow support the crystals or solid materials can be readily scraped from the screen, even though the same has the form of a thin layer, and pass over the inner edge of the blade and readjust itself before being acted upon by the next following blade due to the fact that the narrow blade arms intermittently interrupt the conveying action on the crystals, thereby permitting of thorough washing of the crystals and more complete extraction of the excess moisture therefrom before the crystals leave the machine.

The inclination of the blades is such that upon moving the hollow shaft and the drum relatively to one another, circumferentially the blades will cause the material on the inner side to be gradually shifted lengthwise of the screen from the front end thereof to the rear outlet end of the same, whereby the screen is always kept clear due to making room on the front end of the screen for raw or crystal laden mother liquor and constantly discharging drained crystals at the rear end of the screen. During the passage of the crystal laden liquid lengthwise of the screen in the manner described the liquid or mother liquor in the crystals or solid materials is separated from the crystals by centrifugal force and driven radially outward through the screen where it is caught by the casing and directed into the pan preparatory to being discharged to the exterior of the machine.

When the machine is in operation, supplying of crystal laden liquor, moving the same lengthwise of the screen and separating them, and discharging the liquid and crystals separately proceeds continuously instead of effecting this work in batches.

In the preferred manner of operating the machine the hollow shaft carrying the blades and the drum carrying the screen are turned in the same direction but the drum turns somewhat faster than the hollow shaft due to the relative size of the pairs of gear wheels which transmit motion from the driving shaft to the drum and the conveyor which in this instance consists in making the gear wheel 30 larger than the gear wheel 31, and making the gear wheel 40 smaller than the gear wheel 41, as shown in Fig. 1. If desired this organization of gearing may be reversed so that the drum turns slower than the conveyor in which case the inclination of the conveyor blades or paddles must also be reversed for causing the material on the screen to flow in the proper direction.

Obviously the same results can be secured by turning the drum and conveyor in opposite directions by a suitable driving mechanism and inclining the blades in the appropriate manner for causing the trend of the material under treatment to be lengthwise from the front to the rear of the machine.

It sometimes is necessary or desirable to wash the crystals or solid materials during the draining operation, and at times the character of the materials necessitate the application of heat to get the best results. To accomplish this in the present machine a diaphragm or partition 45 is arranged across the interior of the hollow conveyor shaft so as to divide the interior of the same into a front wash chamber 46 and a rear heating chamber 47, and the central part of this shaft is provided in front of this partition with a plurality of radial perforations 48 and in rear of said partition with a plurality of perforations 49.

If, during the operation of drying or draining the liquid from the crystals it is desired to add water thereto for cleaning them, or to add some other liquid thereto for producing some particular result, this can be done by introducing such wash water or other liquid to the front chamber 46 through the front hollow trunnion of the conveyor shaft whereby this auxiliary liquid is supplied to the crystals after the latter have been partially or wholly drained of liquid on the front end

portion of the screen, whereby this added liquid again wets the crystals and either washes them or otherwise affects them during the subsquent operation of draining the liquid from the crystals. The auxiliary liquid is thus added to the crystals by making the front part of the conveyor shaft imperforate and providing that part of the auxiliary liquid supply chamber of the conveyor shaft with perforations, thereby enabling the screen to either wholly dry or partially dry the crystals before adding further liquid thereto.

If for any reason it is desirable to heat the material under treatment, as for example, when impurities will separate therefrom and escape with the wash water, such heating may be effected by introducing steam, hot water or other heating agent into the rear chamber 47 through the hollow rear trunnion of the conveyor shaft and discharging the same through the perforations 49 against the crystals or solid material at a distance from the rear end of screen so that the crystals will be heated and therefore yield more readily to the cleansing or other treatment to which they are subjected, before escaping from the rear end of the machine.

This action of the heating medium is possible by providing only the front part of the chamber 47 with perforations 49 leaving the rear part of the same imperforate, as shown in Figs. 1 and 2.

By the use of this machine it is possible to dry or drain to separate the crystals and like matter from liquids containing the same by centrifugal force continuously and expeditiously, and also subject the same during such separation to a washing as well as a heating action as best suits the particular material in hand.

Moreover, this machine is comparatively simple and compact in construction, the same is strong and durable and not liable to get out of order, and all of the parts are readily accessible for inspection, repairs and cleaning.

Furthermore when the crystal laden liquid is introduced by the feed pipe into the conical distributor the same is quickly spread out by this distributor to the screen and brought under the influence of the blades so that the drying operation begins immediately and permits a larger amount of material to be handled by the expenditure of a smaller amount of power.

I claim as my invention:—

1. A centrifugal drier comprising a rotary drum having a cylindrical screen body, open work heads and trunnions arranged on said heads and journaled in bearings, means for supplying laden liquid to said screen, and means for propelling the material lengthwise of the screen.

2. A centrifugal drier comprising a rotary cylindrical screen having hollow trunnions, a hollow shaft having trunnions journaled in the trunnions of said screen and provided with an inlet in one of its trunnions for a cleansing fluid, an inlet in its other trunnion for a heating agent, a partition in said shaft and perforations on opposite sides of said partitions for discharging said cleansing fluid and heating agent toward said screen, and conveyor blades mounted on said shaft and arranged adjacent to said screen.

In testimony whereof I hereby affix my signature.

CHARLES O. LAVETT.