Oct. 25, 1932. M. J. KERMER 1,884,727

ROTARY DRUM DRIER

Filed Oct. 30, 1930

Fig. 1.

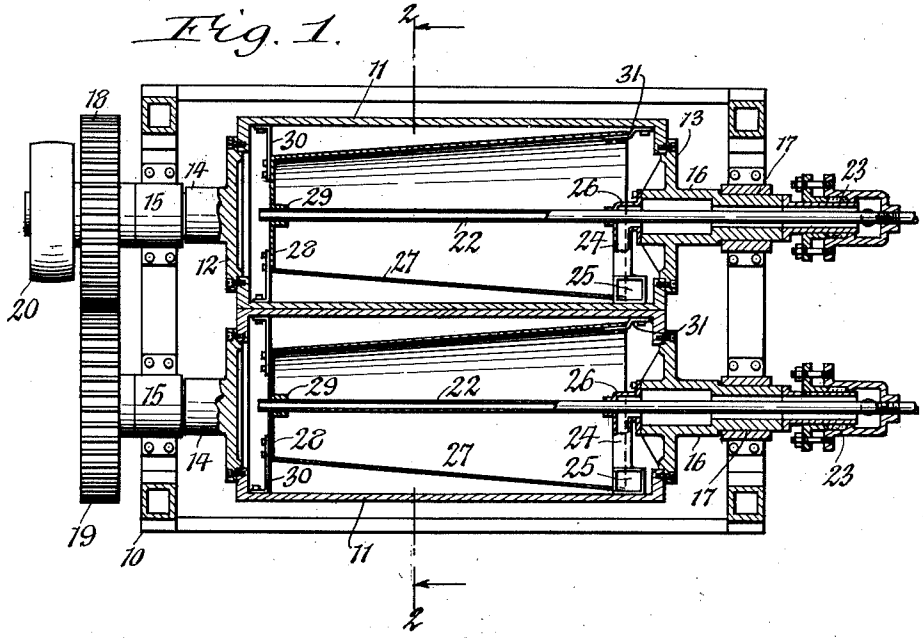


Fig. 2.

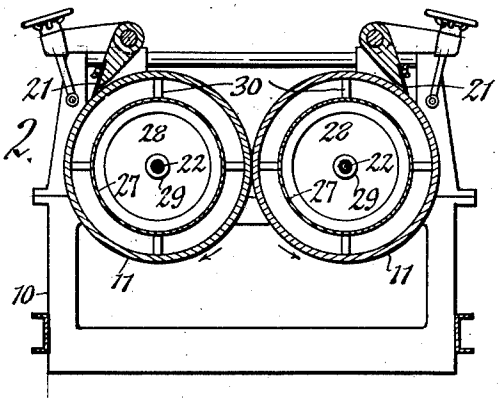
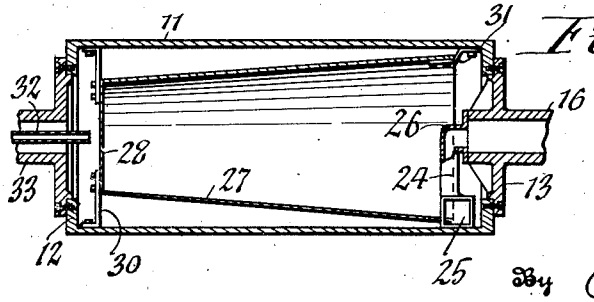


Fig. 3.



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UNITED STATES PATENT OFFICE

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ROTARY DRUM DRIER

Application filed October 30, 1930. Serial No. 492,157.

This invention relates to a rotary drier of the type in which the material to be dried is deposited in a thin film on the periphery of an internally heated drum and then scraped off the drum preparatory to being used.

In machines of this character as heretofore constructed the heating medium such as steam has usually been admitted at one end of the drum at the center thereof and the water of condensation was scooped from the inner side of the wall of the drum. This steam heretofore was not distributed or circulated uniformly over the entire inner surface of the drum nor did this steam move with any appreciable speed but instead was virtually stagnant so that the maximum heating effect of the steam and the maximum output of the machine was not obtained.

It is the object of this invention to provide baffle means for the interior of the drum which will produce a better circulation and distribution of the steam over the entire inner side of the drum and also increase the speed of the steam so as to increase the heat transference to the drum and the drying effect of the same accordingly.

In the accompanying drawing:—

Figure 1 is a horizontal section of a rotary drum drier embodying one form of my invention.

Figure 2 is a vertical transverse section of the same taken on line 2—2 of Figure 1.

Figure 3 is a fragmentary longitudinal section showing a drying drum provided with a modified form of my invention.

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

Referring to Figures 1 and 2 the numeral 10 represents the main frame of the machine which may be of any suitable construction to support the working parts.

On this frame the means are mounted whereby the liquid material is dried which means in the present case include two hollow drums having their axes arranged parallel and horizontal and provided with cylindrical bodies 11, 11 which have their opposing sides spaced close together but still far enough apart by a gap to permit thin films of liquid to pass from a bath on opposing upper parts of these bodies to pass through this gap to the underside of these drums and thence upwardly on the lateral outer sides thereof.

Each of these drums is provided at its opposite ends with heads 12, 13, the former being provided with a central outwardly projecting trunnion 14 which is journaled in a bearing 15 on the frame and the latter having a central outwardly projecting trunnion 16 which is journaled in a bearing 17 on the frame.

These drums are turned in unison so that the opposing sides of their cylindrical bodies move downwardly, this being accomplished in the present instance by intermeshing gear wheels 18, 19 connected respectively with the companion trunnions 14, and a driving pulley 20 mounted on one of the trunnions and adapted to receive a driving belt. Each of these drums is internally heated so that the film of liquid deposited on the exterior thereof will be dried and as this dried film passes upwardly on the laterally outer side of the drum the same is removed therefrom by a scraper or knife 21 preparatory to receiving another fresh coat of wet film.

The heating device for each drum includes a supply pipe 22 for the heating medium such as steam which extends lengthwise through the trunnion 16 of the respective drum from the exterior to the interior thereof and terminates at its inner end adjacent to the head 12 at the opposite end of the drum. The outer end of the steam pipe 22 is connected by a rotary pipe coupling 23 with the adjacent tubular trunnion 16 so that the latter can turn while the steam pipe remains stationary.

The steam issuing from the inner end of the steam supply pipe heats the cylindrical body or wall of the drum and causes the film of material deposited thereon to dry. As the steam condenses the water of condensation descends to the lowermost part of the drum and from this place the same is picked up by a scoop 24 having its inlet 25 arranged close to the inner side of the cylindrical wall of the drum adjacent to the head 13 and having its outlet 26 communicating with the inner

end of the tubular trunnion 16 and connected thereto so as to turn therewith.

In the absence of any provision to prevent it a considerable part of the steam forms a core in the central part of the drum and does not act promptly on the cylindrical wall of the drum and therefore reduces the efficiency of the machine. Some steam issuing from the supply pipe 22 at one end thereof is also liable to pass directly through the shortest path from the inner end of the steam pipe at one end of the drum to the inlet 25 of the condensate scoop at the other end of the drum thereby losing some of the heating effect and sacrificing some of the capacity of the machine.

In order to obtain the maximum efficiency of the steam and increase the output of the machine means are provided which causes the steam to be held close to the cylindrical wall of the drum and away from axial zone therein from the time the steam enters the drum until it has condensed, thereby utilizing the steam more efficiently and economically.

Satisfactory means for accomplishing this purpose include a baffle having a tubular conical body 27 which is arranged lengthwise within the drum and terminates at its opposite ends short of the heads of the drum, the small end of the baffle body being arranged adjacent to the inner end of the steam supply pipe and the large end thereof arranged adjacent to the inlet of the condensate removing scoop, thereby forming an annular space between the inner side of the cylindrical wall of the drum and the conical body of the baffle which is comparatively large in area adjacent to the steam inlet and gradually reduces in area toward the condensate outlet.

At its small end the baffle body is closed by a head 28 which has a central collar 29 turning on the adjacent inner part of the steam pipe and opposite a large end of this baffle body is open. Any suitable means may be employed for holding the baffle in its central position within the drum, for example brackets 30, 31 connecting the small and large ends of the baffle with the adjacent parts of the drum.

As the steam issues from the inner end of the steam pipe the same is deflected radially away from the axis of the drum by the baffle to the inner side of the cylindrical wall of the drum and then passes lengthwise through the annular passage between the baffle body and the drum cylinder to the outlet of the latter at the opposite end of the same whereby the steam acts promptly and efficiently on the drum instead of lying idle to a large degree in the form of a core in the center of the drum.

By making the baffle body of conical form the annular space between the baffle and the cylindrical wall of the drum permits the steam upon issuing from the pipe 22 to expand fully due to the available space within the respective end of the drum being largest, and as the volume of steam gradually decreases in passing from the steam inlet of the drum to the condensate outlet thereof due to progressive condensation of the steam the latter is nevertheless held close to the cylindrical wall of the drum to the conical form of the baffle which causes the annular space between the baffle and drum to decrease in area toward the condensate outlet in the same measure as the volume of steam decreases. No idle steam is, therefore, present in the drum but instead all the steam is compelled to give up its heat promptly and completely thus utilizing the steam to better advantage and increasing the drying capacity of the machine.

This invention can be embodied in forms other than that shown in Figures 1 and 2. For example, as shown in Figure 3 the steam may be supplied to the drum adjacent to the small end of the baffle by a steam pipe 32 passing through the trunnion 33 on the adjacent end of the drum which trunnion is made hollow for this purpose.

The advantage of the present improvement consists in using a baffle arrangement which compels all the steam entering the drum to pass along the inner surface of the latter, thereby insuring a greater heat transfer and a greater drying capacity per unit of surface, without affecting the thermal efficiency of the machine. In either case it requires approximately one pound of steam to evaporate one pound of water but the baffle plate arrangement such as shown in this application will result in increased drying capacity.

Moreover, in the old method of introducing the steam, the same was merely blown in the drum and no velocity of any kind resulted from this action. By introducing the baffle into the drum the steam passes over the inner surface of the same with a considerable velocity which can be controlled by the clearance between the drum and the baffle and thereby increase the speed of the heat transference and increase the drying capacity of the machine accordingly.

I claim as my invention:—

1. A drier comprising a horizontal rotary hollow drum which is adapted to receive on its periphery the material which is to be dried, means for introducing steam into the interior of the drum at one end thereof, means for discharging the condensate from the drum at the opposite end thereof, and a horizontal conical baffle arranged lengthwise within the drum and spaced from the inner side thereof and forming an annular passage for the steam of comparatively large area adjacent to the inlet and of gradually reduced area toward the condensate discharging means.

2. A drier comprising a horizontal rotary

hollow drum which is adapted to receive on its periphery the material which is to be dried, means for introducing steam into the interior of the drum at one end thereof, means for discharging the condensate from the drum at the opposite end thereof, and a horizontal conical tubular baffle arranged lengthwise within the drum and spaced from the side thereof by an annular passage and having its small end adjacent to the steam inlet and its large end adjacent to the condensate discharging means.

3. A drier comprising a horizontal rotary hollow drying drum turning about a horizontal axis and adapted to receive on its exterior the material to be dried and provided at its opposite ends with trunnions which are journaled on a frame and one of said trunnions being tubular and forming an outlet for the condensate from the interior of the drum, a condensate scoop mounted on the drum and having its inlet arranged close to the inner side of the peripheral wall of said drum, a steam supply pipe extending through said tubular trunnion and terminating adjacent to the opposite end of said drum, and a baffle of conical tubular form arranged horizontally and lengthwise within the drum and having its small end arranged adjacent to the inner end of said steam supply pipe and connected therewith by a head while its large end is arranged adjacent to said condensate scoop.

In testimony whereof I hereby affix my signature.

MARTIN J. KERMER.