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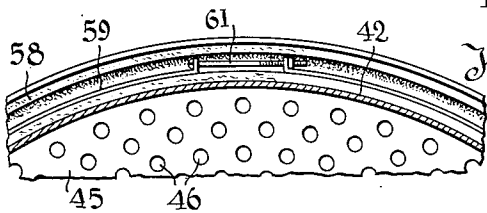
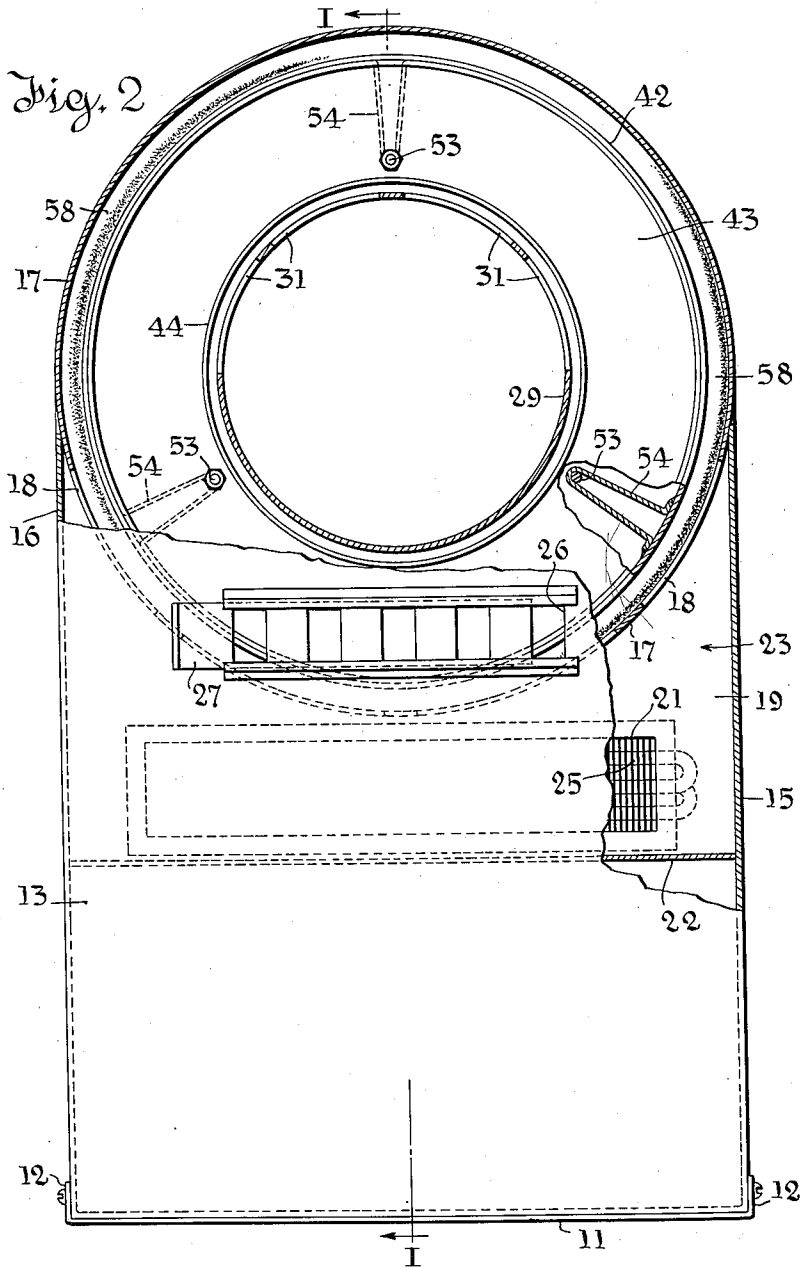
S. J. LOCKE

2,219,233

DRYING TUMBLER

Filed April 10, 1939

4 Sheets-Sheet 2



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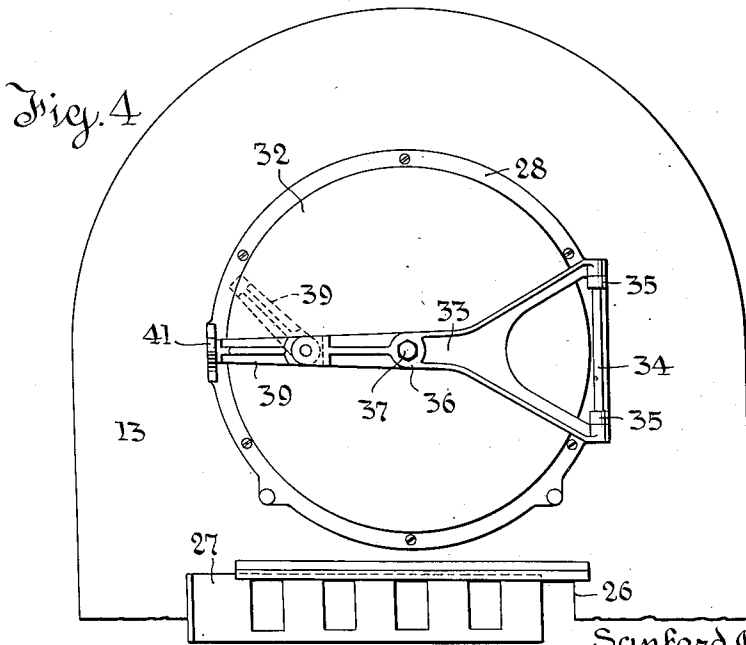
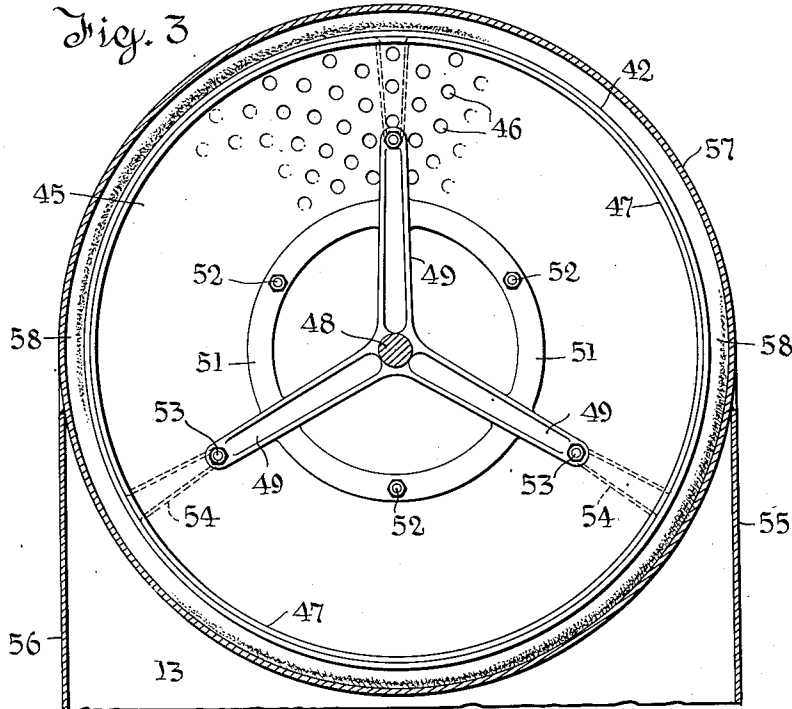
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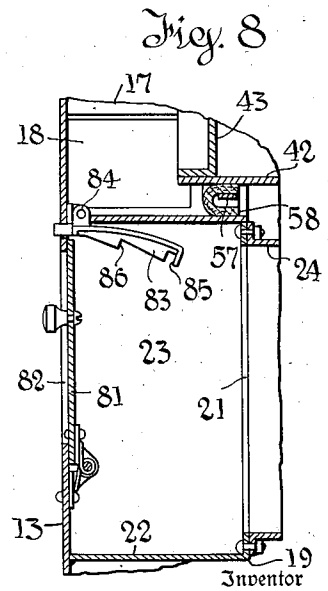
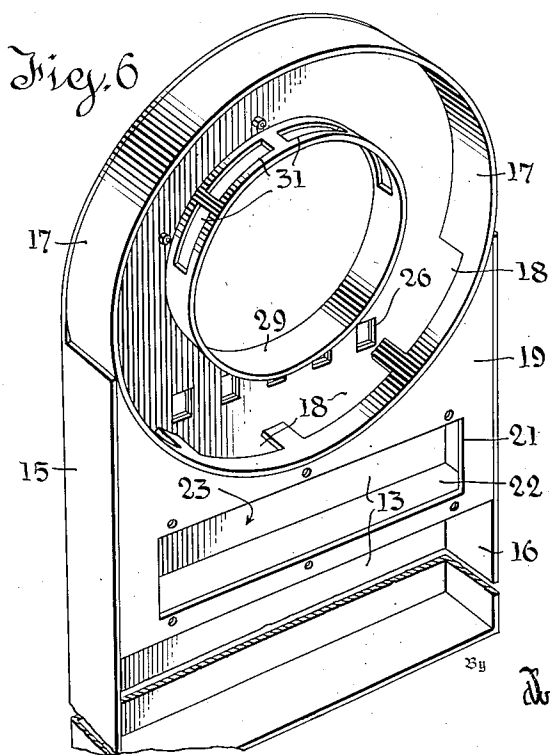
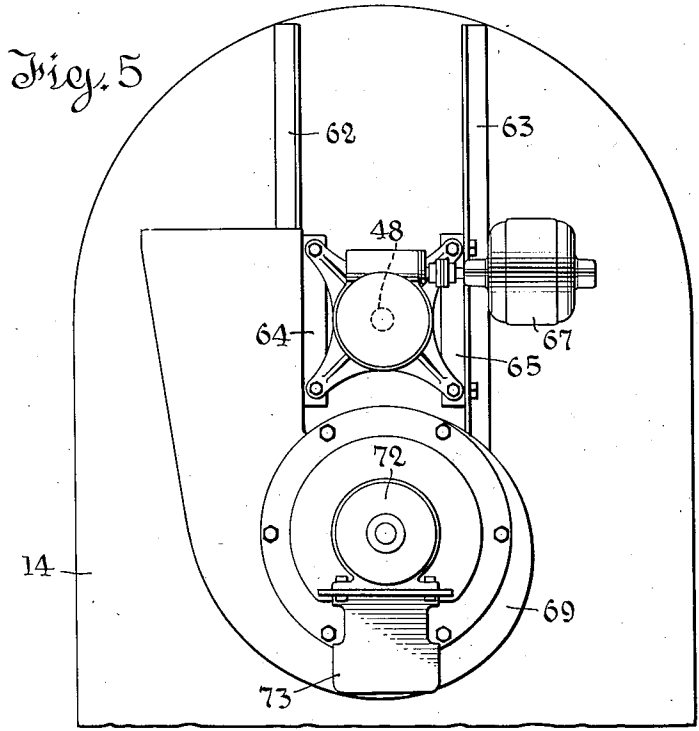
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S. J. LOCKE
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Sanford Jay Locke

Design and Draw.

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UNITED STATES PATENT OFFICE

2,219,233

DRYING TUMBLER

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Application April 10, 1939, Serial No. 267,080

5 Claims. (Cl. 34—5)

This invention pertains to driers or tumblers, and more particularly to those of the rotary drum type wherein air, preferably heated, is caused to pass longitudinally of the drum and into direct contact with the goods which are cascaded therein due to the rotary movement of the drum.

One object of the invention is to produce a simple, efficient and relatively inexpensive structure, and one which calls for but a small expenditure of power to operate the same.

A further object is to produce an air circulation within the drum which guarantees intimate contact between the heated air and the goods being treated.

These objects are attained mainly by utilizing a drum, preferably of sheet metal, provided at one end with a head having a centrally disposed opening for the introduction of the goods to be treated, and, likewise, forming a passage for indrawn heated air; a head at the opposite end having openings therein for the egress of spent air; means for withdrawing such air; a framework for supporting the drum and motors for rotating the same and exhausting the air therefrom; and sealing means located at each end of the drum, said means cooperating with elements of the supporting frame structure to ensure the desired path of flow of air through the drum. Such a structure does away with the necessity of a surrounding shell or casing, and thereby materially reduces the cost of production.

Again, the structure is such that the air passes inwardly of the drum at the center of the front head and is withdrawn at the periphery of the opposite head, thus causing a fanning out of the air as it travels through the cylinder. This ensures the circulation and intimate contact between the heated air and goods being treated, as above adverted to.

The machine is illustrated in the annexed drawings, wherein—

Figure 1 is a vertical sectional view taken on the line I—I of Fig. 2, or longitudinally of the drum;

Fig. 2, a front elevation of the machine, portions being broken away and in section;

Fig. 3, a vertical sectional view on the line III—III of Fig. 1, showing more particularly the rear head of the drum and the combined supporting frame and air current deflector or control plate;

Fig. 4, an end elevation of the upper portion of the front end of the machine, showing the door employed to close the opening affording in-

gress to and egress from the tumbler, and also illustrating a damper employed to modify the temperature of the indrawn heated air which passes to the tumbler;

Fig. 5, an elevation of the upper portion of the rear end of the machine, showing particularly the mounting of the suction fan, its driving motor and the motor for driving the rotatable shell or drum;

Fig. 6, a perspective view of the front frame member and associated elements;

Fig. 7, a detail view showing the means employed to secure one of the sealing strips to the outer face of the drum; and

Fig. 8, a detail sectional view showing a modified form of damper or valve controlling the inlet of air from without the structure for modifying the temperature of the indrawn heated air.

In the drawings, it will be seen that the major portion of the machine is produced from sheet metal, the various fixed elements whereof may be welded or otherwise secured throughout to ensure stability.

The base of the frame comprises a sheet 11 having upturned flanges, as at 12, which are fastened to vertically disposed front and rear members 13 and 14, respectively. At each edge of the front plate 13 there is provided an inwardly extending vertical flange, denoted by 15 and 16, respectively (Figs. 2 and 6), said flanges being of the same height and terminating at their upper ends parallel with the axis of the drum, hereinafter referred to. The forward face of the plate 13 extends the full height of the machine and at its upper edge is formed upon a radius coincident with the axis of the drum.

An annular member 17 has its forward edge secured to the inner face of the plate 13 and is welded to the upper edge of each of the flanges 15 and 16. The forward edge of the member 17 is cut out, forming a series of notches which, together with the front plate, produce openings 18 through which air is drawn in a manner later to be described. Secured to the flanges 15 and 16 and to the lower face of the annular member 17 is a plate 19 having an elongated opening 21 formed therein. Extending inwardly from the lower portion of the plate 19 is a horizontally disposed wall 22 (Figs. 1 and 6), the forward edge whereof is welded to the inner face of the plate 13. There is thus produced a chamber 23 which is in direct communication with the openings 18.

The plate 19 has secured to its inner face a heating unit comprising an open-ended trunk or box 24 in which is mounted a heating unit 25

of the coil and fin type, or any other suitable air heating element. In order to temper the air which is drawn into the drum from the chamber 23, that is, to add cold air in regulated quantities to the air passing from the heating unit 25, the front plate 13 is provided with a plurality of openings 26 controllable by a slide damper 27 or the like (see more particularly Fig. 2).

The plate 13 has formed therein a circular opening, the axis whereof is coincident with the axis of the drum, and a combined door frame and air deflector is mounted in the opening and secured to the plate. It may be said to comprise an outer flange 28 (Fig. 4) which is bolted or otherwise secured to the outer face of the member 13, and an inwardly extending collar 29 which is provided in its upper portion with inlet openings 31 for the indrawn heated air.

To close the outer end of the collar 29 through which the articles to be treated are introduced and withdrawn, a door 32 is provided which is of such dimension as to overlie the flange 28 (see Fig. 1) and to make close contact therewith when the door is closed and secured in position. The door is a hinged one and in the form illustrated, the supporting element comprises a Y-shaped casting 33 (Fig. 4) the outer ends of which cooperate with a pintle 34 which is supported by gudgeons or lugs 35 extending outwardly from the flange 28. The casting 33 is provided with a hollow element 36 which stands in line with the center of the door, and a bolt 37 extends through the door and through the outer wall of the element 36. A spring 38 (Fig. 1) encircles the bolt, and acting against the door and the inner face of the member 36, tends to force the door tightly against the flange 28.

When the door is closed, with the parts in the position indicated in full lines in Fig. 4, a latch 39 pivoted to the free end of the casting 33 is designed to be thrown downwardly into engagement with a fixed keeper 41 which extends outwardly from the door frame. By throwing the latch upwardly, the door may be readily unlocked and swung clear of the opening which it normally closes, and may thus afford full access to the drum which stands in line with the opening.

The rotatable drum is mounted between the frame members 13 and 14. It comprises an imperforate cylindrical shell 42 having a forward head 43 which is provided with a circular opening defined by an outwardly extending flange 44, the opening being slightly larger than the diameter of the collar 29 which is in axial alignment therewith. The opposite head is denoted by 45 and a series of openings 46 are formed therein adjacent the periphery thereof. In other words, there are several annular series of openings located between the outturned flange 47 of the head 45 which is secured to the cylindrical shell and to a frame member. Said frame member has formed integrally therewith a stub shaft 48 extending outwardly from a series of radiating arms 49 interconnected with a ring 51 which is directly bolted as at 52 against the head 45 of the drum.

In addition to fastening said frame member by the bolts 52, longer bolts 53 extend through the outer ends of the members 49, through the head 45, and through the opposite head 43. Not only do these through bolts 53 tie the head together, but they form the support for a series of inwardly or radially extending elements or flights 54 formed of sheet metal or other suitable material. These flights assist in the cascading move-

ments above referred to. Where sheet metal is employed, the inner edges or those which contact the shell 42 of the drum, are welded thereto or otherwise suitably secured in place.

Plate 14 has inwardly projecting flanges 55 and 56 which extend upwardly to the same height and terminate parallel with the axis of the drum. Secured to the inner face of the plate and to the upper edges of said flanges 55 and 56 is an annular member 57, and the upper portion of the plate 14 is contoured similarly to the upper portion of the forward plate 13, to receive this annular member.

The members 17 and 57 form, in effect, fixed annular ways or tracks against which sealing elements carried by the drum bear. Said elements may take various forms, but in the instant case each one is produced from a strip 58 of heavy felt bent in U-form (Figs. 1 and 7) and held fixedly to the outer face of the drum adjacent the heads thereof by a metallic band 59, the adjacent ends whereof are upturned and a bolt 61 is passed therethrough, whereby the band may be placed under tension, forcing the innermost portion of the felt strip tightly against the drum. The felt employed is quite thick and has a tendency after it is once bent into U-form, to assume its straight or flat condition, hence close contact will be maintained at all times between the annular tracks 17 and 57, whether the drum be stationary or rotating.

Secured to the outermost face of the rear wall 14 are two vertically disposed angle plates 62 and 63, standing in parallelism (Fig. 5). Secured to the opposed faces of these plates are short length angle plates, 64 and 65, respectively, which latter form the support for a spider frame in which is mounted the bearing for the stub shaft 48. The shaft extends outwardly of the bearing, as indicated in dotted lines in Fig. 1, and an electric motor 67 drives the shaft through a worm and worm gear. Any suitable mounting may be employed, but the presence of the relatively long angle irons 62 and 63, together with the shorter members 64, 65, tends to stiffen the rear plate so as to properly support the weight of the drum and the goods which may be placed therein.

The rear plate 14, in line with the lower portion of the drum, is provided with an outwardly extending neck or flange 68 (Fig. 1), to which is secured a fan housing 69 having a suction fan 71 located therein. The fan is driven by an electric motor 72 mounted on a bracket 73 secured to a rigid plate which forms a part of the fan housing.

By employing two motors, the drum may be rotated at the desired speed, independently of the action of the fan, or the drum may be allowed to remain stationary while the fan is operating. It is thought that the operation of the machine will be evident from the foregoing description, but a brief résumé will be given.

The door 32 being open, the goods impregnated with water or cleansing fluid are introduced through the collar 29 and into the opening defined by the flange 44 in the forward head of the drum. When the apparatus is sufficiently charged, the door is closed and locked, and if the fan be started, suction will be set up through the box-like element 24. The air becoming heated by the unit 25, passes into the chamber 23, and thence upwardly through the openings 18 and around and about the collar 29. It then passes into the drum between the periphery of the collar 29 and the inturned flange 44, which are spaced apart, (Fig. 1), and also through the

openings 31 in the upper portion of the collar 29 and thence directly into the drum.

It will thus be seen that the air is brought into direct contact with the articles or goods being treated adjacent the center of the drum, and comes into contact therewith throughout the length of the drum and finally passes toward the outer portion of the drum through the openings 46 in the head 45. Air is thus precluded from taking a direct short course through the drum longitudinally thereof but, on the other hand, is caused to fan out from the central opening at the head end of the machine toward and through the openings in the rear head of the drum, which are located adjacent the periphery thereof, thereby bringing the heated air into intimate contact with the articles as they are cascaded from the radial elements or flights 54. In other words, the fanning out of the air takes place and maximum contact between the heated air and the cascading articles inheres.

The packing interposed between the outer surface of the drum adjacent each end and the annular tracks 17 and 57 shuts off any ingress of air exteriorly of the drum at the forward end of the machine, and prevents the indrawing of air about the rear end of the drum and into the space or chamber formed between the drum head 45, the rear wall 14 and the annular track 57.

By way of example, it has been found that with a 36" diameter machine, the cylinder must have a rotative speed of between 41 R. P. M. and 43 R. P. M., and this is more or less true regardless of the nature of the goods undergoing treatment. At such speed, the goods fall away from the cylinder ribs and wall at about the "10 or 11 o'clock" position and fall downwardly toward the center. In other words, at the speed just mentioned as near perfect loosening or cascading of the load inheres as is possible.

The temperature of the air which passes through the goods is controlled by opening the cold air damper, be it of the form shown in Figs. 1, 2 and 4, or Fig. 8.

The modified form of the inlet valve for controlling the temperature of the heated air passing through the structure is illustrated in Fig. 8. Instead of employing a slide, as heretofore described, controlling the openings leading into the casing, a spring hinged door 81 is employed to close a single opening 82 formed in the wall 13. A gravitating latch 83 pivoted at 84 is provided in its lower edge with a series of notches 85, 86, adapted to engage the upper edge of the door as the same is moved inwardly against the tension of the spring hinge. The forward end of the latch extends outwardly of the wall 13 to a slight extent so that it may be manipulated to release the door and allow it to close under the action of the spring.

From the foregoing description it will be seen that there is produced at one end of the rotatable drum a chamber into which heated air is drawn and caused to pass into the drum adjacent the axis thereof, or in other words remote from the cylindrical wall of the drum, then longitudinally through the drum and through the openings in what may be termed the exhaust end or head of the drum and into the chamber formed outwardly thereof and thence to the exhaust fan. The articles being treated are of course cascaded through the stream or streams of heated air and maximum exposure obtains between the goods and the moving air streams.

What is claimed is:

1. In a shell-less drier, the combination of two oppositely disposed vertical frames; a drum having an imperforate cylindrical wall and two perforate heads, said drum being located between said frames, said heads together with the respective frames forming chambers one adjacent each end of the drum which chambers are in communication with the interior of the drum through the perforations in the heads; means associated with one chamber for withdrawing air therefrom; means for heating air, said means being in communication with the other chamber aforesaid; means located exteriorly of the drum adjacent each end thereof for sealing the chambers against the ingress of air from without; and means for rotating the drum.

2. In a shell-less drier, the combination of a pair of supporting frames standing in spaced relation; a drum having an imperforate cylindrical wall and two heads, said drum being mounted intermediate said frames; means for rotating said drum; a pair of annular tracks, one standing adjacent each end of the drum in spaced relation thereto; sealing means interposed between the drum and said tracks closing the space between said elements against the passage of air; means for causing a flow of air through said drum, one head of said drum being provided with at least one opening adjacent its center for the inflow of air while the opposite head is provided with a series of openings adjacent its periphery whereby the air stream is caused to diverge as it is passed through the drum in contact with the goods being cascaded therein.

3. In a shell-less drier, the combination of a pair of frames standing in spaced relation; a cylindrical drum mounted therebetween, the cylindrical portion whereof is imperforate; means for sealing said drum with respect to the frames to prevent the inflowing of air therebetween; a head at one end of the drum having at least a central opening therein; a head at the opposite end of the drum provided with a series of openings adjacent the periphery thereof; and means for drawing air through the opening in the first named head and outwardly through the openings in the second named head, whereby the air is caused in its passage to spread or diverge and be brought into direct contact with the goods cascaded within the drum as the latter is rotated.

4. A drying apparatus comprising a frame having a drum rotatably mounted in overhung relation thereto, said drum having an imperforate periphery, and two perforate heads, the head remote from the drum mounting having its perforation in the form of a central door opening; air heating means in communication with the door opening in the drum; stationary means for enclosing the ends of the drum, said means forming a part of said frame and including a door carried by said frame in alignment with the door opening in the drum; means for rotating the drum; means for circulating heated air axially through said drum; and air sealing means between the drum and frame to prevent the heated air from passing around the outside of said drum.

5. Drying apparatus comprising relatively spaced front and rear frame members, said front member having a door opening therein; a drum including a cylindrical wall and forward and rear heads, said drum being located between said members, the cylindrical wall of the drum being imperforate, the front drum head having a cen-

tral opening in alignment with the door opening
in said front frame member, and the rear drum
head having a series of openings in proximity to
the periphery of the head; means for supporting
5 the drum from the rear frame member in over-
hung relation thereto; means for rotating the
drum; sealing means interposed between said

drum and one of said frame members to isolate
one end of the drum from the other exteriorly;
means for circulating air axially through the
drum; and means for heating at least a portion
of the air before it passes through the drum.

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