Dec. 4, 1928.

1,693,934

W. H. MILLSPAUGH

WATER EVACUATOR FOR DRIER DRUMS

Filed Jan. 19, 1922

2 Sheets-Sheet 1

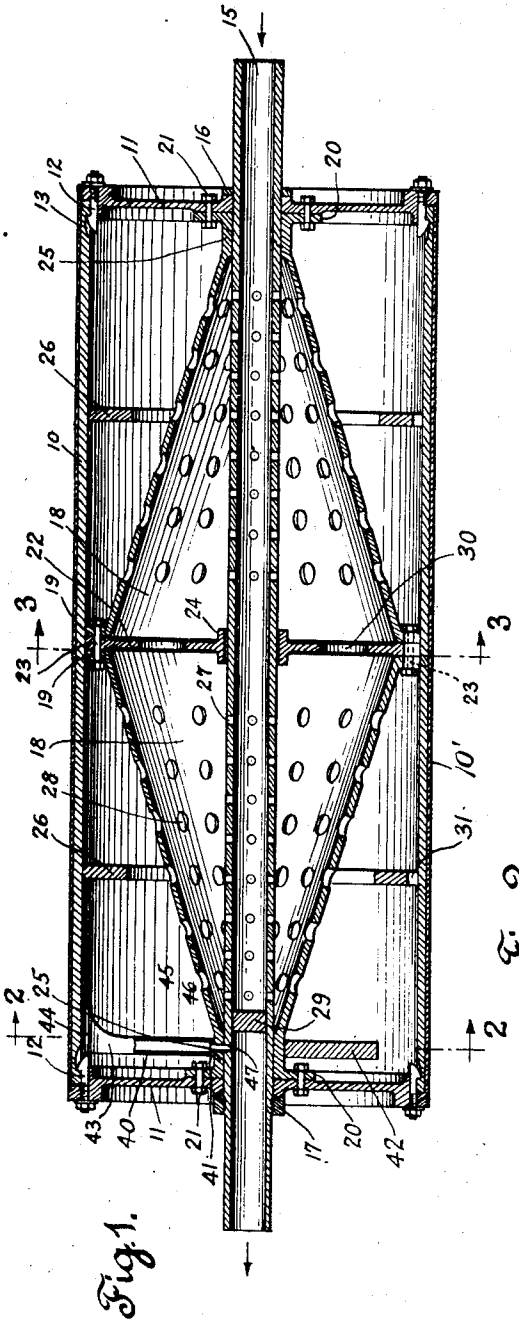


Fig. 1.

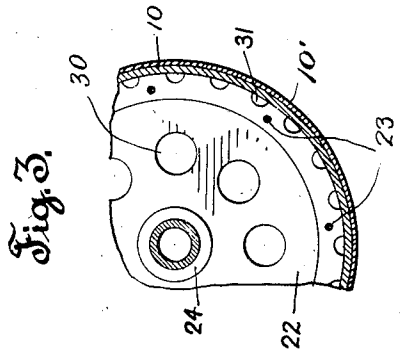


Fig. 3.

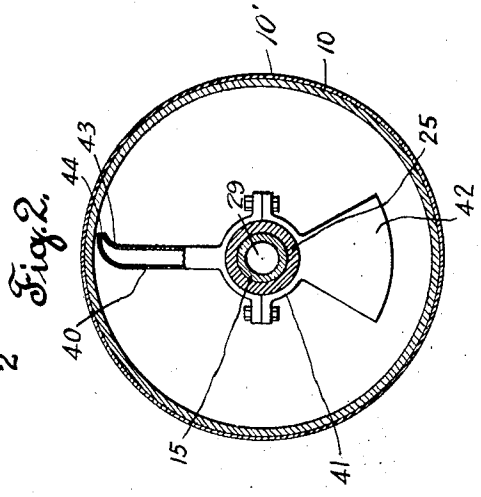


Fig. 2.

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2 Sheets-Sheet 2

Fig. 4.

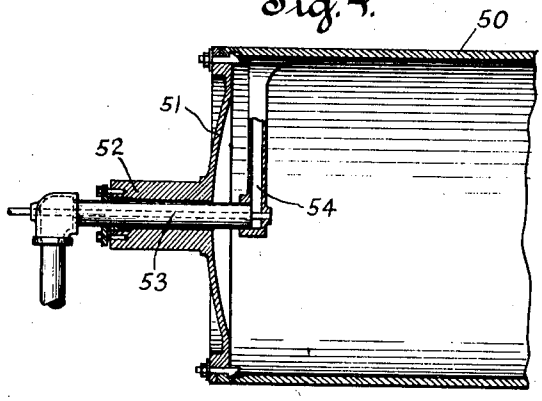


Fig. 5.

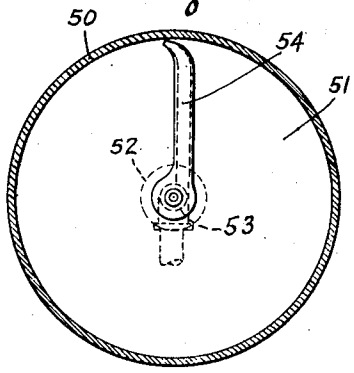


Fig. 6.

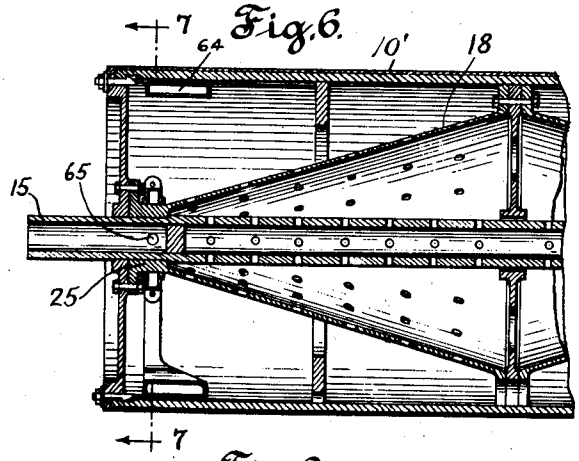


Fig. 7.

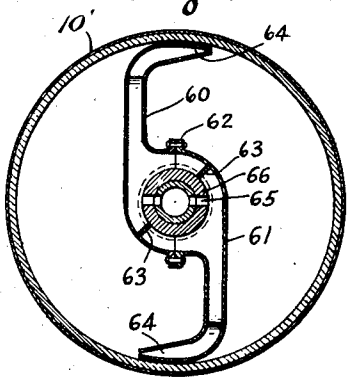


Fig. 8.

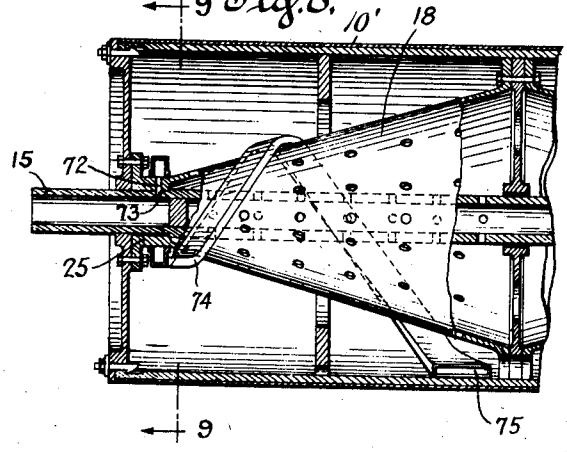
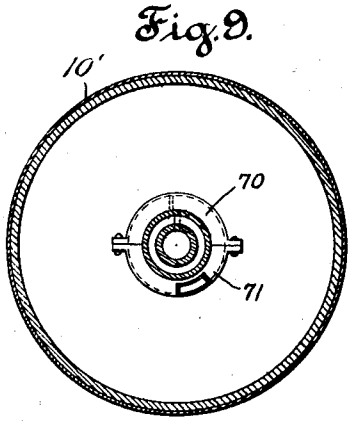


Fig. 9.



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Patented Dec. 4, 1928. 1,693,934

UNITED STATES PATENT OFFICE.

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WATER EVACUATOR FOR DRIER DRUMS.

Application filed January 19, 1922. Serial No. 530,484.

This invention relates to drier drums or rolls such as are used in paper or textile manufacture and more particularly to steam heated drums or cylinders.

One of the objects of the invention is to provide a reinforced drier drum or roll so constructed as to prevent deflection or distortion of the drum.

Another object of the invention is to provide a steam drier drum with simple, practical and effective means for removing the water of condensation therefrom.

Another object of the invention is to provide a reinforced drier roll with means for removing the water of condensation therefrom while the roll is in operation.

Further objects of the invention will appear from the following specification taken in connection with the drawings which form a part of this application and in which

Fig. 1 is a sectional elevation of a reinforced steam drum or cylinder having means for removing the condensed water therefrom.

Fig. 2 is a sectional elevation of the ejector construction shown in Fig. 1, the parts beyond the section line being omitted for the sake of clarity, taken substantially on line 2—2 of Fig. 1.

Fig. 3 is a sectional elevation, partly broken away, and taken substantially on line 3—3 of Fig. 1.

Fig. 4 is a sectional elevation of a portion of a steam drum showing another form of ejector evacuator for removing the water of condensation.

Fig. 5 is a sectional elevation of the construction shown in Fig. 4 and taken at right angles thereto.

Fig. 6 is a sectional elevation of a steam drum having another form of ejector for removing the condensed water.

Fig. 7 is a transverse sectional elevation taken substantially on line 7—7 of Fig. 6.

Fig. 8 is a sectional elevation showing another form of water ejector mounted in a reinforced steam drum and

Fig. 9 is a transverse sectional elevation taken substantially on line 9—9 of Fig. 8.

I will first outline the structure of the reinforced steam drum and will then describe the various forms of ejectors for removing the water of condensation from the drum.

Referring to the drawings and particularly to Figs. 1–3 and 6–9 inclusive the drum comprises a shell 10 preferably consisting of a plain hollow cylinder with no internal projections, such as may be conveniently cast in a centrifugal casting machine although, of course, any other form of cylinder may be used if desired.

The cylinder 10 has a pair of heads 11 secured thereto by means of a plurality of hooked bolts 12 carried by lugs on the heads adjacent their peripheries and engaging notches or recesses 13 formed in the bore of the shell 10 adjacent the ends thereof. The particular manner of securing the heads to the shell just described is clearly shown in my Patent 1,092,847 and need not be described in further detail in this application. It will, of course, be understood that any other method of securing the heads to the shell may be employed if desired and that the method shown was selected merely to illustrate one practical embodiment of the invention.

The shell 10 may if desired have an outer covering 10′ such as are commonly used on calender rolls.

The shell 10 and heads 11 are mounted on a shaft 15 between a collar 16 secured to or formed on the shaft adjacent the end thereof and a nut 17 carried by the shaft at the other end thereof.

The truss means for reinforcing the drum comprises a pair of conical truss members 18 having laterally extending flanges 19 on their bases and laterally extending flanges 20 at their apexes.

The flanges 19 engage the bore of the shell 10 at substantially the longitudinal center thereof and the flanges 20 engage the inner surface of the heads 11 at the portions of these heads adjacent the shaft 15. The flanges may be secured to the heads in any suitable manner as by bolts 21. The central portion of the shell 10 is further braced by means of a spider 22 positioned between the flanges 19 of the conical truss members and the flanges and

spider are secured together by means of bolts 23. The spider 22 has a hub 24 mounted on the shaft 15 and the truss members 18 have sleeve portions 25 at their apexes, these sleeve portions being also mounted on the shaft 15. Additional reinforcing rings 26 may be mounted in the shell 10 if desired for the purpose of forming additional bracing means.

To adapt the reinforced roll for use as a steam drier roll means must be provided for conducting the steam to the inside of the roll and in Fig. 1 I have shown the shaft 15 as hollow and provided with perforations 27 and the truss members 18 as provided with perforations 28. A plug 29 is positioned in the shaft adjacent the end opposite the admission end thereof. The spider 22 is also provided with openings 30 to permit the passage of the heating medium therethrough and the spider 22, flanges 19 and rings 26 are notched or grooved at their peripheries as shown at 31 in Fig. 2, thereby permitting the passage of the heating medium along the bore of the shell 10.

Having described the structure whereby the steam is admitted into and circulated through the drum, the ejector or evacuator means for removing the water of condensation will now be described.

A drum of the character described is adapted to meet modern requirements in that it is light and stiff and therefore capable of being driven at high speeds. Such evacuators as have been known heretofore are arranged to remove the condensed water from the lower part of the drum. But when as now desired, the drum is driven at high speeds, centrifugal force carries the water around the inner surface of the drum instead of allowing it to collect at the bottom. To meet this condition I have invented a new type of evacuator and have illustrated embodiments thereof in the drawings.

Referring first to Fig. 1, I have shown an ejector 40 comprising a central portion 41 having a circular opening therein and mounted on the sleeve portion 25 of one of the conical truss members 18. The lower end of the ejector is enlarged and forms a weight 42 which maintains the ejector in upright position on the sleeve 25, it being understood that the sleeve may rotate in the opening 41 in the ejector. The upper portion 43 of the ejector is tubular in form and has a flaring mouth or scoop 44 formed at the upper end thereof. This scoop may be made wider if desired and in the form of the invention shown in Fig. 1 is limited in width only by the adjacent reinforcing ring 26. In order to permit the water collected by the ejector to flow out of the ejector and from the drum the inner wall of the ejector has formed therein an opening 45 which is adapted to register with an opening 46 in the sleeve and an opening 47 in the shaft 15. For convenience in assembling or mounting the ejector on the sleeve the ejector may be made in two parts as shown in Fig. 2.

The steam drum shown in Fig. 1 belongs to the high speed type wherein the water of condensation is carried around the inner periphery of the drum forming a film thereon and as the ejector does not rotate with the drum, this water is scooped into the mouth 44 and passes out through the openings 45, 46 and 47 when these openings go into registration with each other or once in each revolution of the drum.

In Figs. 4 and 5 another form of ejector, adapted for use with high speed drums, is shown. In Fig. 4 the drum 50 consists of a plain cylindrical shell and no reinforcing means is used. The head 51 of the drum is provided with an outwardly extending sleeve 52 which forms a bearing for a pipe 53 which extends through the sleeve and into the drum. The inner end of the pipe has secured thereto an ejector 54 similar in form and shape to the ejector 40 shown in Fig. 1. In this case, however, the water flows directly from the ejector into the pipe 53 and is carried by the pipe out of the drum.

In Figs. 6–9 inclusive I have shown ejector means adapted for use in connection with slower speed drums or drums in which the water of condensation collects in the lower portion of the drum.

Referring first to Figs. 6 and 7 the ejector comprises a pair of oppositely extending members 60 and 61 secured together as shown at 62, the interior portions of these casings being separated by partitions 63. The members 60 and 61 are clamped to the sleeve 25 of one of the conical truss members 18 and are adapted to revolve with the drum, truss members and shaft. At their outer ends the members 60 and 61 are provided with flaring mouths or scoops 64, the scoops of the two members extending in opposite directions. The sleeve 25 and the shaft 15 are provided respectively with registering openings 65 and 66 which communicate with the interior of the evacuators 60 and 61 and through which the water of condensation may pass from the evacuators to the interior of the hollow shaft 15.

As the drum and ejectors rotate in the direction of the arrow shown in Fig. 7, the water of condensation will pass into the scoops or mouths 64 and will pass from the ejector through the openings 65 and 66 into the hollow shaft and from the drum.

In Figs. 8 and 9 there is illustrated another form of ejector for slow speed drums and this form is particularly adapted for use in connection with drums provided with conical reinforcing means such as that shown in the drawings. The ejector in this instance comprises an upper casing member 70 and a lower casing member 71, these members being

clamped or secured to the sleeve 25 of one of the conical truss members 18. The two casings form an annular chamber surrounding the sleeve and communicating with the interior of the hollow shaft 15 through openings 72 and 73 formed respectively in the sleeve and in the shaft. A spiral tubular member 74 is connected at one end to the casing member 71 and this member extends around the truss member 18 forming a spiral tube and has formed on its free end a flaring mouth or scoop 75. In this case as with the construction shown in Figs. 6 and 7 the ejector rotates with the truss member drum and shaft and scoops up the condensed water which by the rotation is forced around the spiral portion of the tubular member and out through the openings 72 and 73.

From the above specification it will be seen that simple and effective means has been provided for removing the water of condensation from the steam drums of both types, namely, the slow speed and high speed drums. Furthermore, in connection with the high speed drum evacuators shown in Figs. 1–4 it will be noted that the condensed water will be collected during the rotation of the drum by the scoops or mouths of the evacuators and will flow by gravity into the hollow shaft and from the drum. The evacuators shown in Figs. 6–9 inclusive because of their rotation scoop up the water of condensation and the rotary movement of the evacuator will cause this water to pass through the evacuator and into the hollow shaft. It will thus be seen that in neither case is a pump required to eject the water from the drums.

Although certain specific embodiments of the invention have been illustrated and described, it will be understood that the invention is capable of further modification and that further changes in the construction and in the arrangement of the various cooperating parts may be made without departing from the spirit or scope of the invention as expressed in the following claims.

What I claim is:—

1. In combination, a rotary drum, an evacuator carried thereby and comprising a non-rotating conduit having an inlet opening or mouth curved with reference to the axis of the drum and in a direction opposite to the rotation of the drum, said mouth being disposed in proximity to the upper portion of the drum and means for conducting water from said evacuator out of the drum.

2. In combination, a rotary steam drum, an evacuator journaled within said drum and having an inlet mouth disposed at the upper portion of said drum and means for maintaining said evacuator in upright position as the drum rotates.

3. In combination, a rotary steam drum, an evacuator journaled within said drum and having an inlet mouth disposed at the upper portion of said drum, said evacuator having a weighted portion disposed below the drum axis of rotation for maintaining the evacuator in upright position as the drum is rotated.

4. In combination, a hollow shaft, a rotary steam drum mounted thereon, said shaft having an opening to permit the passage of steam to the interior of the drum, an evacuator mounted for free rotation about the shaft axis and having an inlet disposed at the upper portion of the drum and an outlet through said shaft, and means for maintaining said evacuator in substantially vertical position.

5. In combination, a hollow shaft, a rotary steam drum mounted thereon, said shaft having an opening to permit the passage of steam to the interior of the drum, and an evacuator mounted for free rotation about the shaft axis and having an inlet disposed at the upper portion of the drum and an outlet through said shaft, said evacuator having a weighted portion disposed below the shaft axis for maintaining the evacuator in upright position.

6. In combination, a rotary drum, truss means in said drum for reinforcing the drum against distortion, said truss means being constructed and arranged to permit the passage of steam to the drum shell and to permit the passage of the water of condensation along the bore of the drum and means disposed within the drum for removing the water.

7. In combination, a rotary drum, truss means in said drum for reinforcing the drum against distortion, said truss means being constructed and arranged to permit the passage of steam to the drum shell and to permit the passage of the water of condensation along the bore of the drum and means disposed within the drum and mounted on a portion of said truss means for removing the water.

8. In combination, a rotary drum, truss means in said drum for reinforcing the drum against distortion, said truss means being constructed and arranged to permit the passage of steam to the drum shell and to permit the passage of the water of condensation along the bore of the drum and means disposed within the drum and mounted on a portion of said truss means for collecting the condensed water and conducting the water through the truss means and from the drum.

9. In combination, a rotary steam drum, truss structure within said drum for reinforcing the drum against distortion, an evacuator journaled on a portion of said truss structure and means for maintaining said evacuator in upright position as the drum rotates.

10. In combination, a rotary steam drum, truss structure within said drum for reinforcing the drum against distortion, an evacuator journaled on a portion of said truss structure and means for maintaining said evacuator

in upright position as the drum rotates, said evacuator and truss structure on which the evacuator is mounted having alined openings for permitting the passage of the water from the evacuator.

11. In combination, a hollow shaft, a steam drum mounted thereon, truss structure for said drum mounted on said shaft, an evacuator comprising a casing member mounted on said truss structure and having a discharge opening communicating with alined openings in said shaft and truss structure and a water inlet end disposed adjacent the inner periphery of the drum.

In witness whereof, I have hereunto set my hand this 16th day of January, 1922.

WILLIAM H. MILLSPAUGH.