April 3, 1928. 1,664,656

E. E. BERRY

DRIER CONSTRUCTION

Filed May 10, 1926

FIG 2

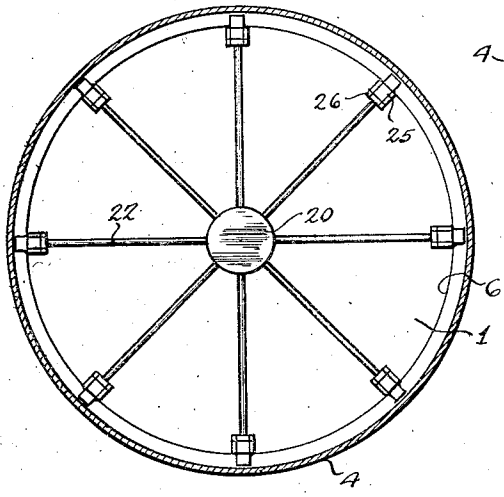


FIG 3

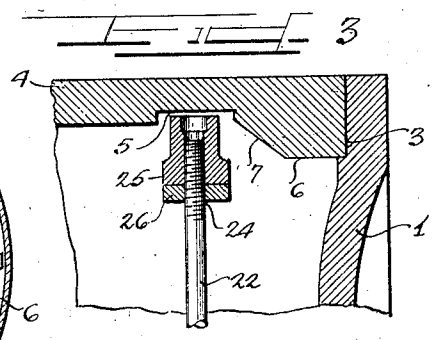
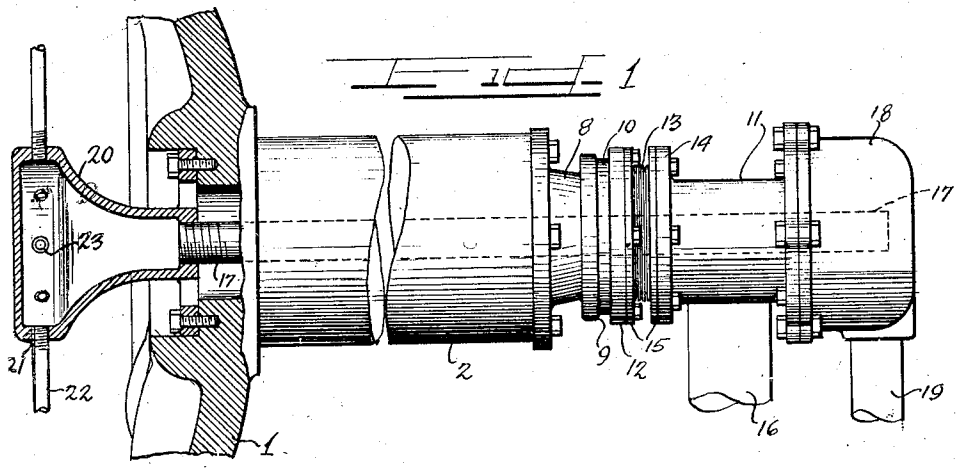


FIG 1



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UNITED STATES PATENT OFFICE.

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DRIER CONSTRUCTION.

Application filed May 10, 1926. Serial No. 107,851.

This invention relates to driers and more particularly to the construction of steam drum driers used in paper making machines.

In the usual type of drum drier construction either buckets or a siphon is used to remove the condensate from the inside of the drying cylinder. In the siphon type, which is the more commonly used form, one of the principle disadvantages is that the siphon pipes become rusted away at the elbow inside of the drying cylinder, often causing leaks in the siphon line and sometimes causing the siphon pipe to fall off completely.

As inspection of the siphon line inside of the drum requires considerable time and labor, defective siphon lines are frequently allowed to exist for long periods of time, during which the efficiency of the drum driers is greatly reduced.

It is therefore an object of this invention to provide means for removing condensate from drying drums that may readily be inspected and repaired with very little effort.

It is a futher object of this invention to provide siphon means for removing condensate from the inside of the drying cylinders and to provide means for adjusting the ends of the siphons with relation to the inner surface of the drying cylinder in order more efficiently to remove the condensate.

A further object of this invention is to provide a drying cylinder having an inner peripheral groove for collecting the condensate formed therein and to provide a plurality of easily removable and adjustable siphon pipes adapted to cooperate with the groove to remove the condensate from the inside of the drying cylinder.

Other and important objects of this invention will be apparent from the disclosures in the specifications and the accompanying drawings.

On the drawings:

Figure 1 is a broken side elevational view partly in section of the rear end of a steam drying cylinder showing the steam fitting construction.

Figure 2 is a transverse sectional view of a drying cylinder looking toward the inside of the rear end thereof.

Figure 3 is an enlarged fragmentary sectional view with parts in elevation of one of the siphon ends.

The reference numeral 1 indicates the head on the rear end of a cylindrical drier drum such as is commonly used on paper making machines. Said head 1 is provided with an outwardly extending hollow trunnion 2 adapted to be journaled in suitable bearings to rotatably support the drying cylinder. The outer periphery of the head 1 is recessed as at 3 to receive the end of a cylindrical shell 4 to which said head is secured by suitable means.

As is well known, the web of paper to be dried is adapted to pass over the surface of the cylindrical shell 4, which is suitably heated by steam introduced under varying amounts of pressure through the hollow journal 2.

During the drying process a considerable amount of condensate is formed, which must of course be removed from the inside of the drying cylinder, the removal being accomplished in the siphon system by the steam pressure within the cylinder forcing the condensate out. Due to the centrifugal force exerted on the condensate by the revolving movement of the drying cylinder the condensate forms as a film on the inner surface of the cylindrical shell 4. According to the present construction an angular inner groove 5 is provided in said shell 4 adjacent the rear end thereof to collect the condensate. Between the groove 5 and the cylinder head 1 the inner surface of the cylindrical shell 4 is offset inwardly as at 6 to provide a sloping surface 7 leading to the groove 5 and aiding in the collection of the condensate in said groove 5.

At the rear end of the trunnion 2 there is bolted to said trunnion a tapered hollow sleeve 8, said sleeve 8 being provided with a recessed bearing edge 9 adapted to receive a compressed carbon bearing disc 10. On the other side of said bearing disc 10 there is positioned a stationary flanged steam fitting 11 having a bearing plate 12 held firmly against the carbon disc 10 by means of an expansible sylphon 13. Said sylphon 13 comprises a deeply corrugated sleeve preferably formed of heavy sheet cooper. The ends of said sylphon 13 are secured to the plate 12 and to one flanged end 14 of the steam fitting 11 by means of rings 15, securely bolted to said plate 12 and said flanged end 14, over each end respectively of said sylphon 13. A steam intake pipe 16 enters the steam fitting 11 and communicates through the passage formed by the steam

fitting 11, the sylphon 13 and the hollow journal 2 with the inside of the drying cylinder to furnish steam thereto.

The means for removing the condensate from the inside of the drying cylinder by utilizing the steam pressure within the cylinder comprises a straight piece of piping 17 extending through the hollow journal 2 and the steam fitting 11 and projecting beyond the rear end of said steam fitting 11.

A cap 18 is adapted to be bolted to the outer flanged end of said steam fitting 11 to form a closed compartment separate from said steam fitting 11 and including the projecting end of the piping 17. A discharge pipe 19 threaded through the bottom of said cap 18 serves to remove the condensate from the compartment formed by the cap 18. The inner end of said piping 17 is threaded to receive the restricted end of a header or manifold 20 positioned just inside of the head 1. Said manifold 20 is enlarged at its other end to form a cylindrical head 21 having spaced apertures 23 about its periphery. A plurality of siphon pipes 22 are threaded into said equally spaced threaded apertures 23 and extend radially toward the inner surface of the cylindrical shell 4, but are adapted to terminate short of the bottom of the groove 5. Each outer end of said siphon pipes 22 is threaded as at 24 to receive an interiorly threaded nipple 25. Each of said nipples 25 is accordingly adjustable on the respective ends of the pipes 22 and may be adjusted so as to leave the desired space between the bottom of the groove 5 and the outer end of each nipple 25. A check nut 26 is provided to hold each nipple 25 in the desired position.

It will be apparent that in my construction the siphon pipes 22 are easily adjustable by means of the nipples 25 to obtain the proper spacing from the bottom of the groove 5. This is very essential to the efficient removal of the condensate, since if the space is too great an unnecessarily thick film of condensate will form on the inside surface of the drying shell, resulting in a much lower efficiency of heat transfer therethrough. Furthermore, too great a space will allow large quantities of uncondensed steam to escape during the periods when the ends of the siphons 22 are not covered by the film of condensate. On the other hand if the end of the siphon is brought too close to the inner surface of the drying shell it may easily become stopped up and prevent the free removal of condensate. Another feature of my construction is the multiplicity of siphon pipes, which results in greater continuous efficiency of condensate removal for a longer period of time than would be the case were only one siphon pipe employed. It should further be noted that the siphon pipes 22 may be readily removed and replaced by new ones when such removal becomes necessary.

I am aware that many changes may be made, and numerous details of construction may be varied through a wide range without departing from the principles of this invention, and I therefore do not purpose limiting the patent granted hereon, otherwise than necessitated by the prior art.

I claim as my invention:

1. A steam heated drying cylinder having an inner peripheral groove and a hollow trunnion formed on one end thereof, a condensate removal conduit separately mounted in said hollow trunnion and extending through the end of said cylinder, a manifold mounted on the inner end of said conduit and a plurality of condensate conducting means removably secured to said manifold and adjustably extending into said groove.

2. In a paper drying machine, an internally grooved drying cylinder having a hollow trunnion forming an inlet for steam, a condensate removal conduit extending through said trunnion independently of said steam inlet, a manifold secured to the inner end of said condensate removal conduit and a plurality of radially directed pipes removably threaded into said manifold and extending into said groove.

In testimony whereof I have hereunto subscribed my name.

EARL E. BERRY.