

Aug. 2, 1927.

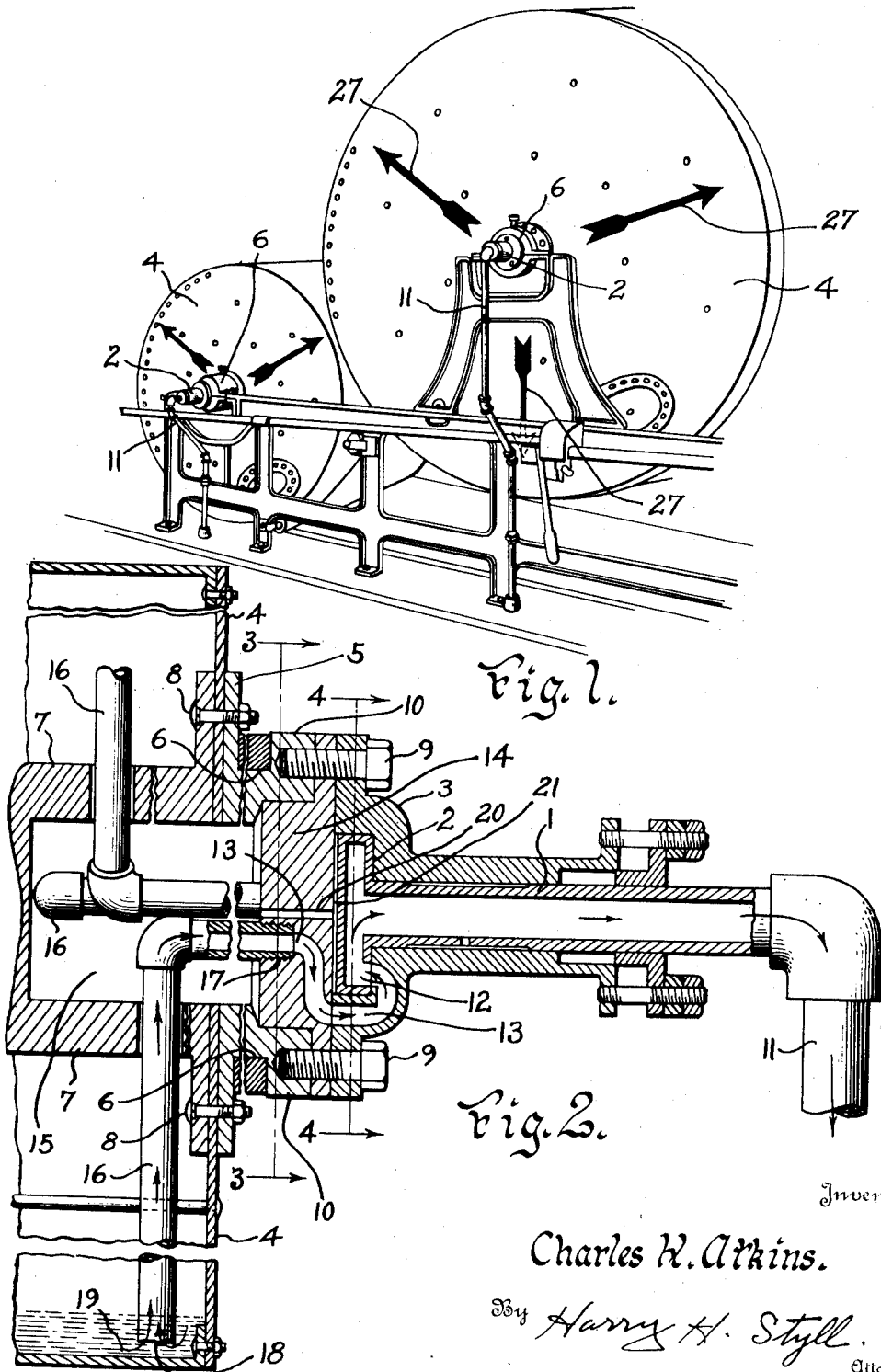
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1,637,327

DRAINAGE OF STEAM CHAMBERS

Filed May 2, 1927

2 Sheets-Sheet 1.



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2 Sheets-Sheet 2

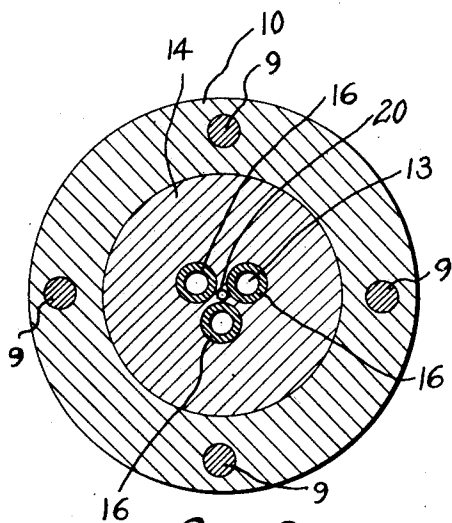


Fig. 3.

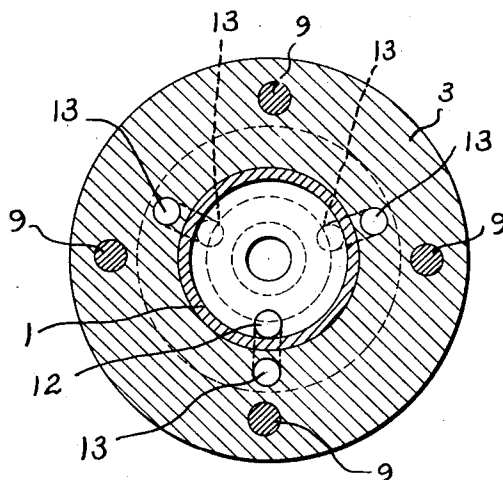


Fig. 4.

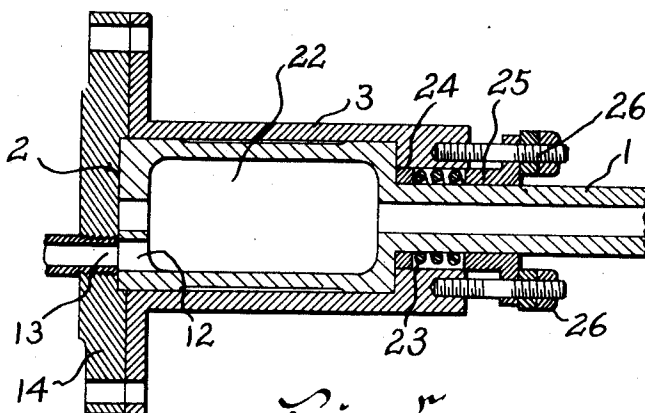


Fig. 5.

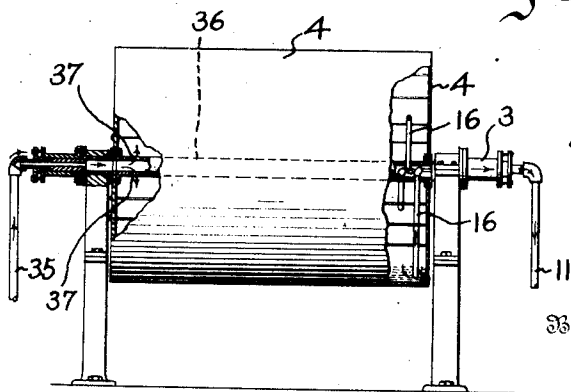


Fig. 6.

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UNITED STATES PATENT OFFICE.

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DRAINAGE OF STEAM CHAMBERS.

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This invention relates to an improved apparatus and process for the drainage of steam chambers and the like, and has particular reference to improved means for removing by the steam pressure in the drum the condensed steam, water, air and other non-condensable gases. The invention is particularly applicable to steam chambers or drums, such as the drying cylinders of slasher and similar machines.

The principal object of the invention is to provide improved means for exhausting by its own steam pressure the condensed steam, water, air and other non-condensable gases from a rotary steam chamber without the undue loss of steam therefrom.

Another object of the invention is to provide automatic exhaust means that will exhaust the water, air and other non-condensable gases from steam drums which at the same time will prevent the loss of steam from the drum.

Another object of the invention is to provide steam tight water and air exhausting means in a machine of this character.

Another object of the invention is to provide improved means for insuring a uniform and higher temperature throughout the steam chamber of such a machine.

A further object is to provide an improved revolving exhaust joint or valve that is steam tight, simple, efficient and economical in construction and which may be easily taken apart for inspection or repair.

Other objects and advantages of the invention will become apparent from the following description taken in connection with the accompanying drawings. It is apparent that many changes in the details of construction and arrangement of parts may be made without departing from the spirit of the invention as expressed in the accompanying claims. I, therefore, do not wish to be limited to the exact details of construction and arrangements shown, the preferred forms having been shown by way of illustration only.

Referring to the drawings:

Fig. 1 is a fragmentary perspective view of a slasher machine embodying the invention.

Fig. 2 is a longitudinal cross section

through the central shaft of the said machine.

Fig. 3 is a cross section on line 3—3 of Fig. 2.

Fig. 4 is a cross section on line 4—4 of Fig. 2.

Fig. 5 is a view similar to Fig. 2 showing a modified form of the invention.

Fig. 6 is a front elevation partially in section showing steam supply and moisture exhaust.

This invention is particularly designed for large rotary steam drying cylinders of drums for slashing machines in which the end walls of the cylinders or drums are reinforced by tie rods or the like running longitudinally of the cylinder from one side wall to the other to prevent bursting of the cylinder when under steam pressure.

These tie rods have proved annoying as they prevented the use of stationary drain or exhaust pipes within the steam chamber and in most cases required the use of buckets or the like to dip up the condensed steam or water as the cylinders rotated. The discharge from the steam chamber was through a hollow shaft. These buckets did not furnish an escape for air and other undesirable non-condensable gases and were very unsatisfactory as the water, air and other non-condensable gases constantly decreased the heat at the base of the cylinder and thereby prevented a uniform temperature in the chamber and decreased production by reason of the decreased temperature. This construction also required a great amount of time in reheating the cylinders when starting the machine as the buckets would not function until the cylinders were rotated and thereby required an excessive amount of time in removing the water formed by the condensed steam in the drums when the machine was stopped.

The present invention overcomes these difficulties by providing drain or exhaust pipes within the steam chamber having connection with a steam tight joint or valve outlet that may be rotated with the cylinder or drum, and which intermittently allows the escape or exhaust from the steam chamber of water, air and other non-condensable gases through the force of steam which is constantly forced

into the chamber when each drain or exhaust pipe is rotated to a downward position. In this downward position the valve opens and allows the free passage of the water, air and gas from the drum.

Referring more particularly to the drawings wherein similar reference characters denote corresponding parts throughout, the invention consists of a stationary steam slide valve 1 having the valve seat 2 in the housing 3 located on the outside of the cylinder or drum 4 and secured to the flange 5 on the bearing 6 mounted on the end of the cylinder support shaft 7 by the bolts or the like 8. Suitable bolts 9 are used to secure the housing 3 to the outer shouldered portion 10 of the bearings 6 so that it will rotate about the steam slide valve 1 when the cylinder is rotated. The steam slide valve 1 is held against rotation by the exhaust drain pipe 11 to which it is secured and is formed with a single port or opening 12 adapted to communicate with the openings 13 formed in the housing 3 and in the head or diaphragm plate 14 which is positioned in the end of the bearing 6 and adapted to seal the hollowed end 15 of the shaft 7 in which the drain or exhaust pipes 15 are positioned. The drain or exhaust pipes 15 are threadedly connected at 17 in alignment with the openings 13 and terminate at 18 near the inside circumference or periphery 19 of the drum, there being three of these pipes 16 and consequently three openings 13 as shown in Figs. 3 and 4.

The head or diaphragm plate 14 is provided with a central opening 20 terminating in the chamber 21 in which steam may pass to provide continual pressure of the steam slide valve 1 on the valve seat 2 so as to prevent the escape of steam around the valve seat during the use of the machine. Steam is admitted to the drum 4 from a suitable source of supply by means of the pipe 35 which communicates with the hollow shaft 36 on which the drum 4 rotates and which has the openings 37 for admission of the steam to the interior of the drum.

Fig. 5 shows a modification in which the steam slide valve 1 is formed with the enlarged hollow chamber 22 positioned in the housing 3 which is secured as in Fig. 2 on the outside of the cylinder 4. The enlarged chamber 22 is provided with the port or opening 12 communicating with the openings 13 in the head or diaphragm plate 14 which in this instance forms the seat 2 for the slide valve 1. A coil spring 23 exerts pressure on the enlarged shoulder of the chamber 22 to urge the end of the chamber against the valve seat 2 to prevent the escape of steam from the joint while at the same time provision is made for free rotation of the cylinder and parts carried thereby. A suitable packing ring 24 may also be used

to prevent the escape of steam at the outer end of the chamber member 22. Increased pressure of the spring may be obtained by adjustment of the sleeve 25 by means of the bolts or the like 26.

In operation live steam is forced into the continuously rotating cylinder or drum 4 so that a temperature of approximately say 240 degrees may be maintained. During the rotation of the cylinder or drum 4 the diaphragm plate 14 and the pipes 16 which are in fixed relation thereto are carried about and rotated with the cylinder. At each revolution of the cylinder a passageway or opening 13 for the outward flow or exhaust of water, air and other non-condensable gases from the interior of the drum to the drain pipe 11 is opened through the registering of one of the openings 13 with the port or opening 12. It will be noted that the exhaust passageway from the interior of the drum to the drain pipe 11 is opened when one of the inner ends 18 of the pipes 16 is at its lowermost position in the drum by reason of which the water of condensation, air and other non-condensable gases will surround the end 18 and while in this position the pressure of the steam from within the cylinder or drum will force the water, air and other non-condensable gases which have collected at the bottom of the drum up through the pipe 16 and through the openings 13 and 12 into the drain 11. It will be noted that the presence of the passageway 12 in alignment with the path of rotation of the three openings 13 is formed so that there will be three distinct exhaust discharges of water, etc., at each revolution of the drum. The timing and extent of exhaustion is controlled by the size of openings that are used and the speed at which the cylinder is rotated.

The arrows 27 indicate the position or location of the drain pipes 16 and when pointing downward indicate that the valve is opened so as to allow exhaustion of water, etc., from the steam chamber of the cylinder. When adjusted to this position with an arrow pointing downward the cylinders may be heated within a few minutes prior to starting the machine through the direct and continuous exhaustion of cold air, water, etc., from the steam chamber.

Slasher machines are used for drying the warp used for weaving cloth after it is starched. In the old machines, as stated hereinabove, the water has been removed by buckets, but the air and other non-condensable gases being heavier than the steam remain at the bottom of the drum, preventing it from reaching the maximum temperature of the steam in the interior. In the present invention my stationary steam slide valve 1 is located on the outside of the drum and coacts with a valve seat 2 secured to the

end of the shaft having ports leading into the drum using pipes that terminate close to the inside circumference or periphery of the drum. The steam slide valve 1 is held stationary while all the other parts revolve with the drum. The steam slide valve has only one port which is permanently held in a fixed position on its lowest side by the outside connecting pipe 11. As the ports in the revolving diaphragm plate pass in succession the single port in the stationary steam slide valve free communication is opened between the interior of the drum and the outside atmosphere, no traps being used. It is clear that this communication can only be made when the connecting ports and pipes are at the lowest point in the drum, the continuous revolution of which cuts off and closes one port, cuts in and opens the next successively. Fig. 2 shows the stationary steam slide valve held against the face of the revolving valve seat by steam pressure and Fig. 5 by spring pressure.

From the foregoing it will be seen that I have provided simple, efficient and economical means well adapted to carry out the objects of the invention.

Having described my invention, I claim:

1. In a device of the character described, a shaft having a chamber adjacent one end thereof, a steam drum on and revolvable with the shaft, means for introducing steam into the drum, a diaphragm plate closing the end of the chamber in the shaft and having a plurality of openings therethrough, a pipe secured in each opening of the diaphragm plate and terminating in an open end adjacent the periphery of the drum, a tubular slide valve having an opening aligned with the openings in the diaphragm plate, a valve seat for the tubular valve and means for pressing the valve against the valve seat to prevent escape of steam from around the valve.

2. In a device of the character described, a shaft having a chamber adjacent one end thereof, a steam drum on and revolvable with the shaft, means for introducing steam into the drum, a diaphragm plate closing the end of the chamber in the shaft and having a central opening and a plurality of openings therethrough intermediate the edge and center, a pipe secured in each of the intermediate openings of the diaphragm plate and terminating in an open end adjacent the periphery of the drum, a tubular slide valve having an opening aligned with the intermediate openings of the diaphragm plate, and a valve seat for the tubular valve, said valve being pressed against the valve seat by means of the steam from the drum acting on the valve through the central opening in the diaphragm plate.

3. In a device of the character described, a shaft having a chamber adjacent one end thereof, a steam drum on and revolvable with

the shaft, means for introducing steam into the drum, a diaphragm plate closing the end of the chamber in the shaft and having a plurality of openings therethrough, a pipe secured in each of the openings in the diaphragm plate and terminating in an open end adjacent the periphery of the drum, a tubular slide valve having an opening aligned with the openings in the diaphragm plate, a valve seat for the tubular valve, an exhaust pipe communicating with the tubular valve, and means for pressing the tubular valve against the valve seat to prevent escape of steam around the valve.

4. In a device of the character described, a shaft having a chamber adjacent one end thereof, a steam drum on and revolvable with the shaft, means for introducing steam into the drum, a diaphragm plate closing the end of the chamber in the shaft and having a plurality of openings therethrough, a pipe secured in each opening of the diaphragm plate and terminating in an open end adjacent the periphery of the drum and a tubular slide valve having an opening aligned with the openings in the diaphragm plate, said opening in the valve being so located that when the open end of a pipe is in its lowest position in the drum it will align with one of the openings in the diaphragm plate whereby the pressure of the steam in the drum will force the water in the lower part of the drum through the pipe having the lowest position in the drum and thence through the aligned openings in the diaphragm plate and the valve to exhaust the water through the valve.

5. In a device of the character described, a shaft having a chamber adjacent one end thereof, a steam drum on and revolvable with the shaft, means for introducing steam into the drum, a diaphragm plate closing one end of the chamber in the shaft and having a plurality of openings therethrough, a pipe secured in each opening in the diaphragm plate and terminating in an open end adjacent the periphery of the drum, a tubular slide valve having an opening aligned with the openings in the diaphragm plate, a valve seat, means for pressing the valve against the valve seat, and an exhaust pipe communicating with the tube of the tubular valve whereby there will be an open communication from the open end of the lowest pipe in the drum, through the pipe, and aligned openings of the diaphragm plate and the tubular space in the valve to the exhaust pipe, the steam pressure in the drum forcing the water through the pipe and its communicating openings.

6. In a device of the character described, a shaft, a steam drum on and revolvable with the shaft, means for introducing steam into the drum, a diaphragm plate aligned with the shaft and having a plurality of openings

therethrough, a pipe in each opening of the diaphragm plate and having an open end adjacent the periphery of the drum, and a valve having a single opening aligned with the openings in the diaphragm plate and so positioned that when one of the pipes is in its lowest position in the drum the valve opening will align with one of the diaphragm openings and allow the steam in the drum to force the water in the lower part of the drum up through the pipe and out through the aligned openings of the valve and diaphragm plate.

7. In a device of the character described, a shaft, a steam drum on and revolvable with the shaft, means for introducing steam into the drum, a diaphragm plate aligned with the end of the shaft, revolvable therewith and having a plurality of openings therethrough, a pipe in each opening of the diaphragm plate and having an open end adjacent the periphery of the drum, a tubular valve having a single opening aligned with the openings in the diaphragm plate and so positioned that when one of the pipes is in its lowest position in the drum the valve opening will align with one of the diaphragm openings and allow the steam in the drum to force the water at the bottom of the drum

up through the pipe and out of the aligned openings of the valve and diaphragm plate, a valve seat for the valve, and means to press the valve on the seat to prevent escape of steam around the valve.

8. In a device of the character described, a shaft, a steam drum on and revolvable with the shaft, means for introducing steam into the drum, a diaphragm plate aligned with the end of the shaft, revolvable therewith and having a plurality of openings therethrough, a pipe in each opening of the diaphragm plate and having an open end adjacent the periphery of the drum, a tubular valve having a single opening aligned with the openings in the diaphragm plate and so positioned that when one of the pipes is in its lowest position in the drum the valve opening will align with one of the diaphragm openings and allow the steam in the drum to force the water at the bottom of the drum up through the pipe and out of the aligned openings of the valve and diaphragm plate, a valve seat for the valve, means to press the valve on the seat to prevent escape of steam around the valve, and an exhaust pipe communicating with the tube in the tubular valve.

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