Sept. 13, 1927. 1,642,361

C. H. CROWELL

CYLINDRICAL DRIER

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Fig. 1.

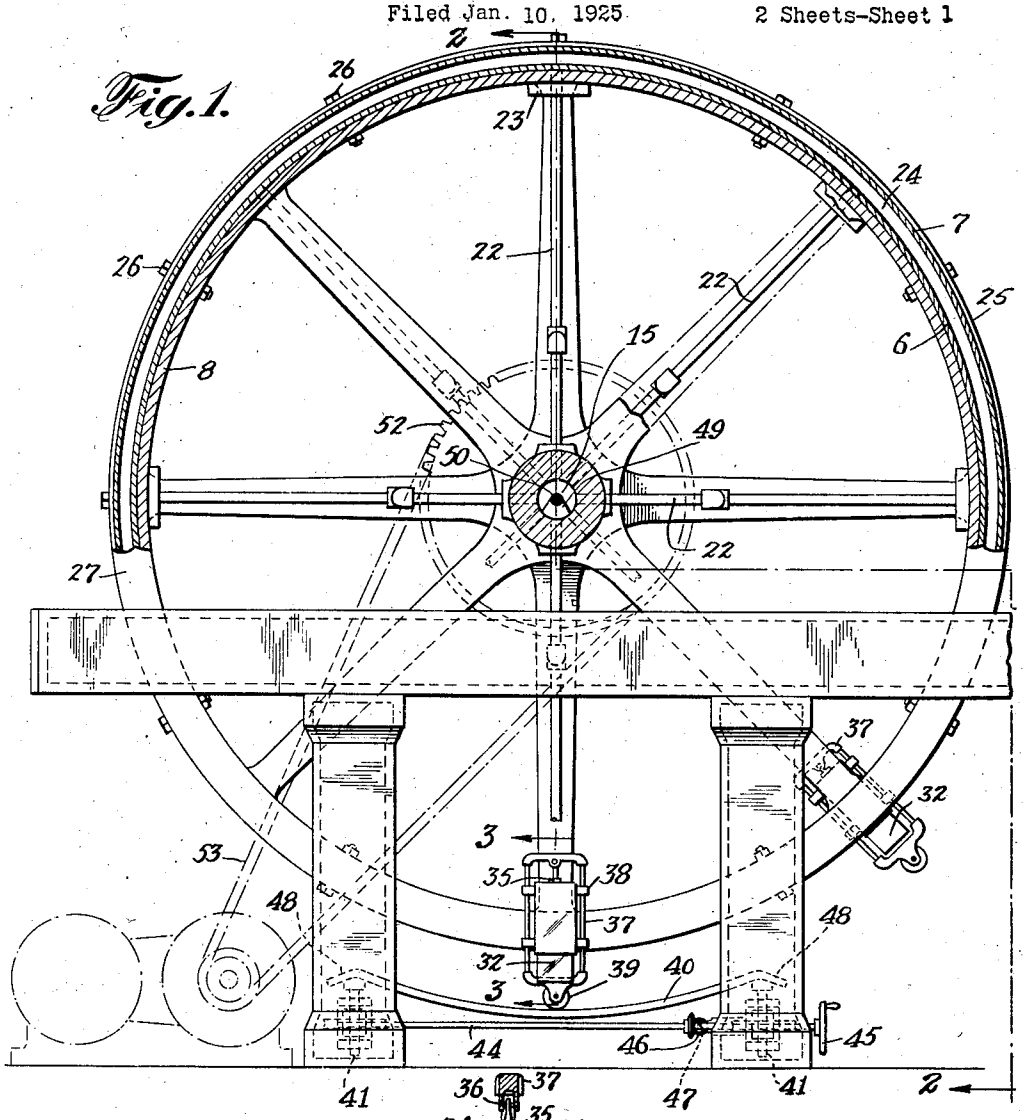
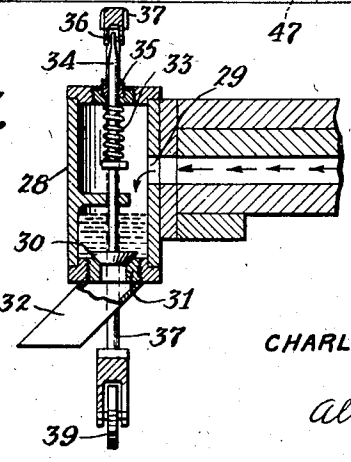


Fig. 3.



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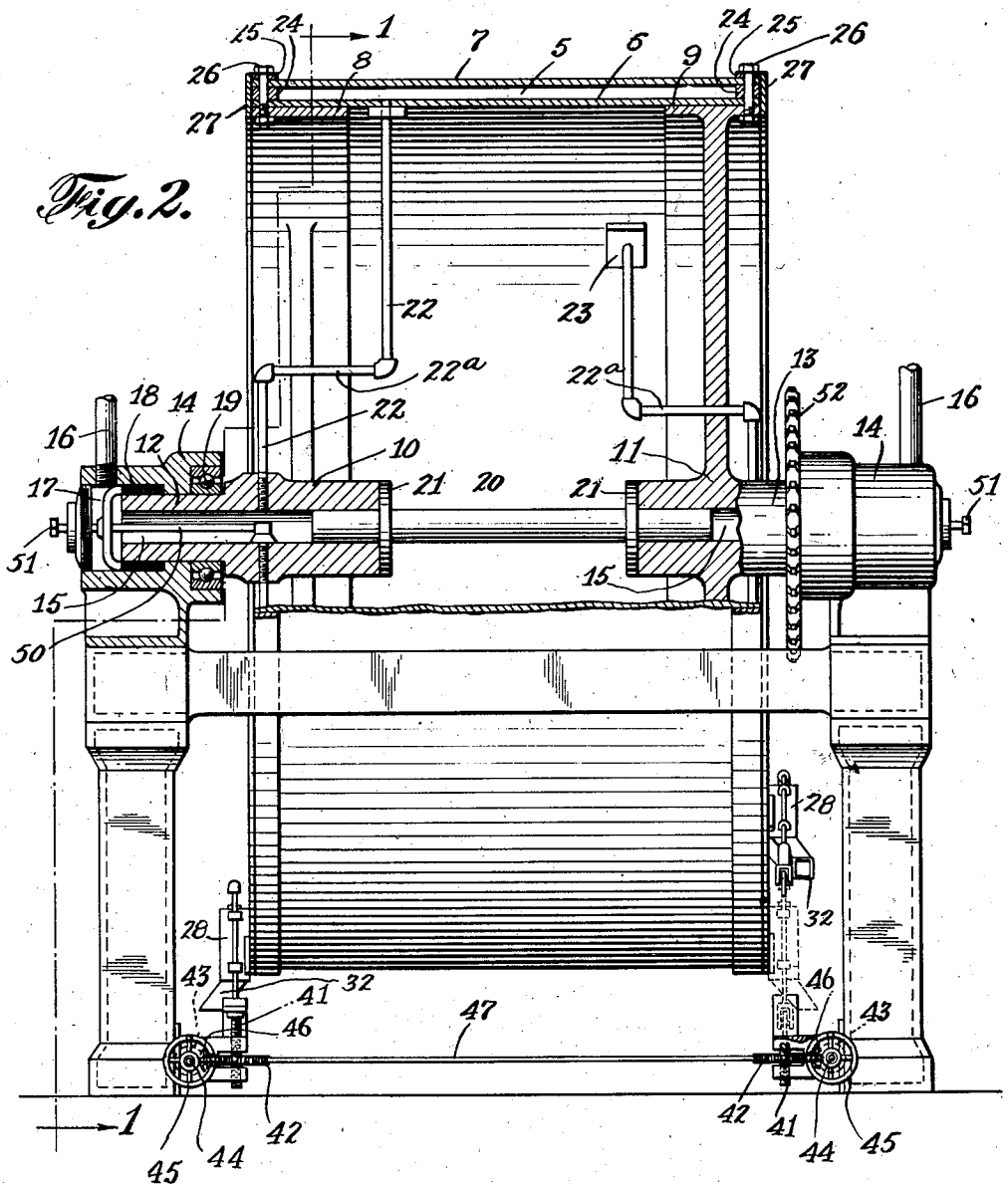
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Fig. 2.



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UNITED STATES PATENT OFFICE.

CHARLES H. CROWELL, OF WHITE PLAINS, NEW YORK.

CYLINDRICAL DRIER.

Application filed January 10, 1925. Serial No. 1,519.

This invention relates to driers of the drum type and particularly to those of large size, such as six feet or more in diameter. These large driers are advantageous, par- sure fluid. A shallow annular steam passage 5 is therefore provided in the peripheral portion of the drier between inner and outer annular walls 6, 7.

flanges of the heads. Packing rings 27 which may be of sectional or continuous construction may then be bolted on over the joints at the sides of the drum.

The inside shell may be made of steel shrunk onto the heads, but the outside shell is preferably made of a material such as copper, zinc or the like having good heat radiating characteristics, non-corrosive and possessing all the strength necessary to withstand the high pressure. The skeletonized construction of the drum enables the lining of the inner wall and the covering of the piping with heat insulating material, if that be found desirable, and the non-corrosive character of the outer wall assures continuance of efficient heat radiation.

Because of the efficient transfer of heat provided from the drum to the material under treatment, it is only necessary to provide for escape of the water of condensation. Accordingly, one or a number of outlet valves are provided, these consisting in the illustration, in each instance of a valve normally held closed, but adapted to open automatically at the lowest point in the revolution of the drum, to drain the water contents.

In Figure 3 a preferred construction of such valves is illustrated, the same being shown as consisting of a valve casing or chamber 28 fixed to the end of the drum and open to the peripheral steam chamber by a passage 29, said casing containing a valve 30 cooperating with a valve seat 31 screwed into the bottom of the casing and opening to an outwardly angled discharge spout 32.

The valve is normally held closed by a spring 33 surrounding the stem 34 of the valve, which stem passes up through a suitable stuffing box 35 and is connected at 36 with a yoke 37 slidably guided in bearings 38 at the sides of the valve casing and carrying at the lower end of the same, a roller 39 for cooperation with a track 40. This valve opening track is shown as supported at opposite ends on screw posts 41 which can be turned by worm gears 42 engaged by worms 43 on shaft 44. This shaft is shown as equipped with a suitable hand wheel 45 conveniently accessible at the front of the machine and in order that the valve opening tracks at both sides of the machine may be simultaneously adjusted, the shafts 44 are shown as connected to turn in unison by bevel gearing 46 and a cross connecting shaft 47.

The valve opening cams or tracks 40 are so shaped as to open and hold the valves open for a sufficient time for complete drainage of the condensation and the adjustment provided enables the valves being set to close in time to prevent any loss of live steam. At each end the tracks may be beveled or inclined as indicated at 48 to insure positive opening and closing of the valves. As shown in Figure 3 the valve casing, as it reaches the lowest point of travel, forms in effect a well to collect the drainage from the chamber and as the passage 29 is of the full depth of the chamber, the liquid contents drain out without any obstruction. Only two of the outlet valves are indicated and it is to be understood from this that as many of these may be provided as is found necessary, located at one or both ends of the cylinder and disposed either directly opposite or in staggered relation.

To prevent the entry of live steam from interfering with the drainage action, means are shown in the form of a shut-off valve 49 for closing the entrances to the steam supply pipes 22 as these approach and travel through the lower arc of movement. Where the steam is entered at both hubs, as in the illustration, two of such valves are provided, each shown as having an arcuate valve face and supported in stationary relation within the hollow hub by a rod 50 having a head 51 exposed outside the end cap of the bearing for adjustment purposes.

One hub of the drying cylinder is shown equipped with a sprocket gear 52 engaged by a driving chain 53. The drying operations may be governed by varying the speed of rotation, the pressure and the volume of steam admitted. A certain amount of control also is given by regulating the opening of the outlet valves. The apparatus is quick to respond to these various controls, particularly so because of the fact that the high pressure steam is confined in a thin or shallow layer and therefore most effective to give up all its heat. Because of the relatively small volume of steam carried and the simple, sturdy construction, practically all danger is eliminated. The automatic closing of the steam inlets as they approach the downward arc, prevents live steam from blowing out with the water of condensation, but the pressure in the upper portion of the cylinder is effective to flush out all condensation each time one of the valves opens.

Injury of sudden expansion or contraction is avoided in the construction disclosed. The supply pipes with the angular portions therein can yield one way or the other and the automatically opening exhaust valves save the walls of the drum from injury which might otherwise result from sudden expansion or contraction following admission or cutting off the high pressure steam.

While I have shown and described and have pointed out in the annexed claims certain novel features of my invention, it will be understood that various omissions, substitutions and changes in the forms and details of the device illustrated and in its operation may be made by those skilled in the

art without departing from the spirit of my invention.

What is claimed is:

1. A drying cylinder having a shallow annular chamber for high pressure steam in the peripheral portion of the same and provided with a valve automatically opening at the lowest point in the travel of the cylinder to drain the condensation from the shallow peripheral steam chamber and means for shutting off supply of steam to the lower portion of the cylinder during the period that the drain valve is open.

2. A drying cylinder having a shallow annular chamber for high pressure steam in the peripheral portion of the same and provided with a valve automatically opening at the lowest point in the travel of the cylinder to drain the condensation from the shallow peripheral steam chamber and adjustable means for regulating the opening of the drainage valve.

3. A rotary drier comprising end heads, an annular shell supported on said heads, an outer annular shell, spacer rings interposed between the two shells, clamp rings engaged about the outer shell and end plates secured in position covering the joints between the end heads, inner shell, spacer rings, outer shell and clamp rings.

4. A rotary drier comprising end heads with hollow hubs, a stub shaft entered in the opposed ends of the hollow hubs, closing the inner ends of the same and supporting the heads in spaced relation, an annular peripheral steam chamber carried by the heads and connected with the open portions of the hollow hubs and bearings for the hubs having steam chambers open to the same.

5. A drier having a peripheral steam chamber provided with a valve for venting condensation, said valve having an exposed operating member and a track for engagment by said member adjustably supported in the lower arc of travel of the drier.

6. A rotary drier having a peripheral steam chamber provided with a drainage valve, adjustable means for automatically opening said valve in the rotation of the drier, live steam inlets to the peripheral chamber and means for automatically closing said steam inlets as they approach the lower arc of travel in the rotation of the drier.

7. A rotary drier having a shallow peripheral steam chamber with a port opening through the side of the same, a valve chest in communication with said port, a valve and valve seat in said chest and means for automatically operating said valve in the rotation of the drier, including an adjustable abutment and a connection from the valve engageable with said abutment.

8. A rotary drier having a shallow peripheral steam chamber with a port opening through the side of the same, a valve chest in communication with said port, a valve and valve seat in said chest and means for automatically operating said valve in the rotation of the drier, said valve having a stem projecting up through the top of the valve chest, a yoke connected with said stem and slidably supported at the side of the chest and an abutment engageable by said yoke in the rotation of the drier.

9. A rotary drier having a shallow peripheral steam chamber with a port opening through the side of the same, a valve chest in communication with said port, a valve and valve seat in said chest and means for automatically operating said valve in the rotation of the drier, said valve having a stem projecting up through the top of the valve chest, a yoke connected with said stem and slidably supported at the side of the chest and an abutment engageable by said yoke in the rotation of the drier and consisting of a track, the yoke carrying a pivoted roller to ride on said track.

10. A rotary drier having a shallow peripheral steam chamber with a port opening through the side of the same, a valve chest in communication with said port, a valve and valve seat in said chest and means for automatically operating said valve in the rotation of the drier, said valve chest having a laterally extending discharge outlet angled away from the side of the drier and adapted to receive the discharge through the valve seat.

11. A rotary drier having a shallow peripheral steam chamber with a port opening through the side of the same, a valve chest in communication with said port, a valve and valve seat in said chest and means for automatically operating said valve in the rotation of the drier, the valve seat being carried by a member removably seated in the bottom of the valve chest.

12. A rotary drier provided with a shallow peripheral high pressure steam chamber, an axial steam inlet having radial members connecting said chamber, a peripheral condensation discharge valve connecting with said chamber and automatically opening in the rotation of the drier and means for shutting off the steam supply to certain of said radial members during the open period of said valve.

13. A rotary drier having a shallow peripheral high pressure steam chamber, steam supply connections thereto, a condensation discharge valve connected with said chamber, means for automatically opening said valve in the rotation of said chamber and means for automatically shutting off the steam supply in the rotation of said chamber during the open period of said valve.

14. A rotary drier comprising an annular

peripheral fluid chamber, a hollow hub for supporting said chamber, a bearing for rotatably supporting said hub and having a fluid chamber communicating with the opening in said hub, supply pipes leading from said hub to said chamber, a valve positioned in said hollow hub for opening and closing said pipes by the rotation of said hub, said valve being mounted on said bearing.

In testimony whereof I have hereunto set my hand.

CHARLES H. CROWELL.