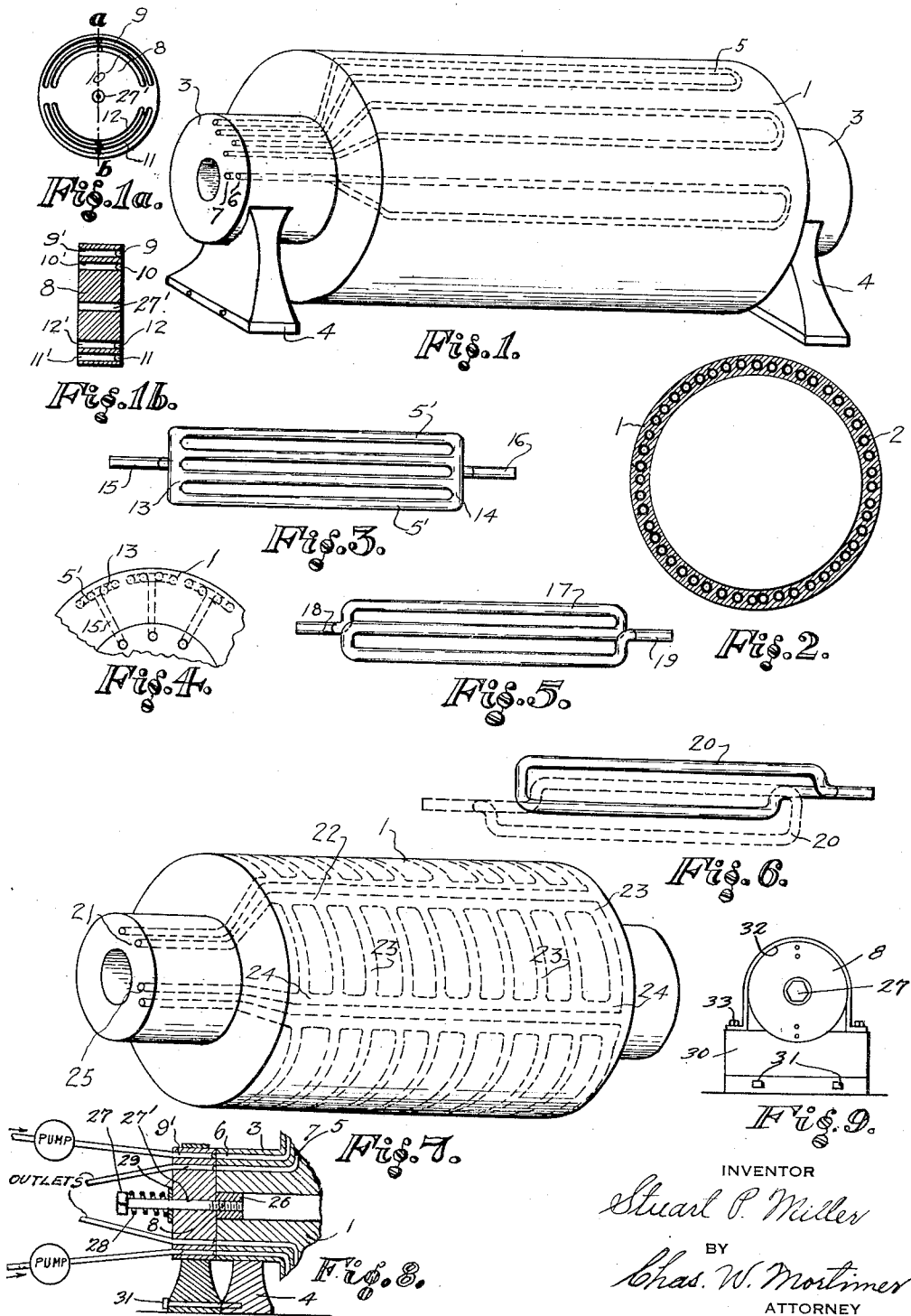


June 26, 1928.

1,675,274

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DRUM COOLER OR DRIER
Filed Aug. 15, 1921



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DRUM COOLER OR DRIER.

Application filed August 15, 1921. Serial No. 492,590.

This invention relates to a drum that may be used as a drier or as a cooler, or both, or different portions of which may be simultaneously used as a heater and as a cooler respectively. The drum may be made of material that is relatively cheap but that possesses good wearing qualities, such for example, as cast iron, brass, bronze, aluminum, copper, Monel metal, etc. The drum may also be made of acid-proof or alkali-proof material, if desirable. The pipes or tubes that are to be used for passing the heating or cooling medium therethrough may be made of material having high tensile strength, such as wrought iron or steel, and are imbedded or cast in the material out of which the drum itself is made, thus making the device more efficient for withstanding stresses and strains, and at the same time providing an easily controlled arrangement for rapidly transferring heat between the interior of the pipes and the outside of the drum.

One of the advantages of this invention is that it permits the use of very much higher pressures in the fluid circulating pipes than would be permissible if the cast iron drum itself were merely provided with corresponding holes therethrough for the circulation of the fluid. Another advantage is that, due to the strength of the wrought iron or steel tubes, the cylinder wall itself can be made relatively thin, thus avoiding long distances through which heat must be transmitted from the heating or cooling medium to the batch of material into which the drum dips. Another advantage is that by circulating the medium through the tubes it is unnecessary to have the drum itself even partially filled with the heating or cooling fluid, thus eliminating the necessity of a pump for this purpose. Another advantage is that the different portions of the drum itself may be respectively heated or cooled at the proper moments for producing results not otherwise attainable. Other advantages will be obvious as the description proceeds.

The invention will be understood from the description in connection with the accompanying drawings, in which

Fig. 1 is a perspective view of an embodiment of the invention.

Fig. 1^a is a side elevation of a valve for feeding fluid to the drum.

Fig. 1^b is a vertical section along the line *a-b* of Fig. 1^a.

Fig. 2 is a section through the drum perpendicular to its axis.

Fig. 3 is a plan view of a group of pipes that may be used in the drum.

Fig. 4 is an end view of a drum partly broken away, showing one arrangement of the pipes therein.

Figs. 5 and 6 are modifications showing different arrangements of pipe coils.

Fig. 7 is a perspective view showing a different modification.

Fig. 8 is a sectional view showing the valve applied to the end of the drum.

Fig. 9 is an end elevation of the valve as applied to the end of the drum.

In the drawings reference character 1 indicates a hollow drum having a smooth outside periphery 2 and being provided with an enlarged shaft 3 mounted to rotate in bearings 4 and driven by any convenient means, not shown. The drum 1 may be made of cast iron, and the circumferentially disposed pipes or tubes 5 of steel or wrought iron may be cast therein. The pipes 5 being made of material of high tensile strength will withstand the strains, which may be caused by introducing fluids therein under high pressure, without subjecting the cast iron of the drum itself to undue stresses. The pipes 5 are each provided with an inlet 6 and an outlet 7, through which fluid is admitted and withdrawn.

It is sometimes desirable to have portions of a rotating drum, which dips into a bath of liquid or plastic material, heated while the respective portions of the drum are immersed in the material, and to have the same cooled as the drum turns and the respective portions are outside of the bath. In such cases provision will be made for introducing a heating fluid into the pipes 5 just before the portion of the drum containing them is immersed in the bath and for introducing cooling fluid into the same just after this portion emerges from the bath, thereby assuring that a film of the material will be picked up or collected by the drum from the bath and will be cooled sufficiently, so that the

same can be removed by a scraper or doctor before this portion of the drum again enters the bath while revolving. From the foregoing it will be apparent that any given portion of the drum surface during the course of one revolution passes through two cycles: first, a collecting cycle in which an adherent coating of the plastic or liquid material is formed, and secondly, a cooling cycle in which the coating or film is cooled to a condition adapting it for removal by a scraper or doctor. Devices for effecting operations of this character are commonly termed "drum flakers". Different sorts of valves may be arranged so as to carry out this effect, one of which valves 8 is shown in Figs. 1^a and 1^b having semi-circular channels or grooves 9, 10, 11 and 12 which register with the ends 6 and 7 of the pipes 5 when the valve 8 is placed upon the end of the shaft 3. The channels 9, 10, 11 and 12 are fed through inlet openings 9', 10', 11', and 12' respectively, so that as the drum itself is revolved and the valve 8 is held in place by any suitable arrangement such as that shown in Figs. 8 and 9 and is prevented from turning during the rotation of the drum, the pipes 5 are fed with fluids of the proper sort depending upon the relative positions of the ends 6 and 7 of the pipes 5 with respect to the channels 9, 10, 11 and 12, as will be obvious. In operation, the valve 8, which is disc-shaped and has its face in which the channels 9, 10, 11 and 12 are formed machined to a smooth surface, is placed against the smooth flat end 3 of the drum 1 and is prevented from rotating in any convenient way while the drum is slowly turned. The inlet ends 6 of each one of the tubes 5 register respectively with the channels 9 and 11 and the outlet ends 7 register with the channels 10 and 12 in the course of a revolution of the drum. The channel 9 may be fed through the opening 9' (see Fig. 1^b) with a cooling fluid from a source not shown from which channel the fluid flows into all the tubes 5 whose inlets 6 are at that moment registering therewith. After flowing through the tubes 5 the fluid emerges from the outlets 7 into the channel 10 from whence it passes out through the opening 10'. In a similar manner heating fluid may be introduced through opening 11' to channel 11 from whence it flows through tubes 5 and back out through channel 12 and opening 12' as long as the inlet and outlet ends of the tubes 5 are registering with the channels 11 and 12. It will be understood that by shifting the valve 8 circumferentially and keeping it pressed firmly against the end 3 of the shaft one may determine the position any tube 5 must reach in its travel before it will begin to receive hot and cold fluids respectively, thus making all of the desired portions of the drum 1 hot while they are in one position and cold while

they are in the opposite position as the drum revolves.

The valve 8 is held in position by any suitable means such as that shown in Figs. 8 and 9. An insert 26 is driven into the center hole at the left end of the drum and is held in place by a driving fit or by a key or set screw not shown. The valve 8 is placed in position upon the valve support 30 which is secured to the bearing support 4 by means of bolts 31. Thru a helical spring 28, a wear plate 29 and a hole 27' in the valve 8 is inserted a bolt 27 which is threaded into the insert 26. By this means the valve is firmly held against the end of the drum. The valve is then clamped in position upon the valve support by a strap 32 placed about the valve and secured to the valve support by means of bolts 33. Thus the valve is held in a stationary position and firmly against the end of the drum, allowing the drum at the same time to rotate. When it is desired to do so, the valve 8 may be shifted by slightly loosening the band 32 and thereafter reclamping it in position.

Instead of having the pipes 5 cast in the cylinder walls, as indicated in Fig. 1, groups of pipes 5' may be assembled as indicated in Fig. 3, said pipes terminating in headers 13 and 14 provided with an inlet pipe 15 and an outlet pipe 16. It is evident that in an arrangement of this sort the fluid is caused to enter at one end of the drum and to be withdrawn at the other end, suitable valve arrangements (not shown) being provided for producing the desired heating and cooling effect. The number of pipes 5' may be varied or only one pipe may be used corresponding to each inlet 15 and outlet 16.

In Fig. 5 a coil of pipes 17 is used having the inlet 18 and outlet 19, this coil 17 to be embedded in a manner similar to that illustrated in Fig. 1 for the pipes 5.

In Fig. 6 is shown another arrangement of two coils 20, one of which is shown in dotted lines, these coils being similarly embedded in the walls of the drum, as already pointed out above.

In Fig. 7 is shown a drum in which the pipes or coils for circulating the heating or cooling medium are circumferentially disposed as are those shown in Fig. 1 but differ therefrom in that they are fed from headers longitudinally disposed in the drum. In this figure the inlet 21 leads to a header 22 which header is joined by a series of circumferential pipes 23 to the header 24, from which header 24 the outlet pipe 25 leads.

I claim:—

1. In a device of the class described, a rotatable drum, said drum being provided with means for heating a longitudinal section thereof, and means for simultaneously cooling another longitudinal section thereof.

2. In a device of the class described, a ro-

tatable drum, pipes near the surface of said drum, and means for introducing hot fluid into said pipes while they are in one position and for introducing cold fluid therein while they are in another position.

3. In a device of the class described, a rotatable drum, fluid-conducting units circumferentially disposed in the drum in heat transferring association with the peripheral shell thereof, means for forcing fluids thru the fluid-conducting units and a valve disposed in the line of fluid flow to and from said drum.

4. In a device of the class described a rotatable drum, fluid-conducting units circumferentially disposed in the drum in heat transferring association with the peripheral shell thereof, means for forcing fluids thru the fluid-conducting units and a valve disposed in the line of fluid flow to and from said drum for permitting one sort of fluid to pass thru the units in one portion of the drum simultaneously with the passage of another sort of fluid thru the units in another portion of the drum.

5. In an apparatus for cooling or drying liquid or plastic materials, a hollow rotatable metal drum having fluid-conducting channels disposed wholly within the wall thereof, said channels being provided with inlet and outlet openings located at the same end of the drum, and means for circulating fluid through said channels by way of said openings.

6. In an apparatus for cooling or drying liquid or plastic materials, a hollow rotatable metal drum having fluid-conducting channels disposed wholly within the wall thereof, the entire path of each of said channels together with the inlet and outlet openings thereto being disposed on the same side of the drum with respect to a diametrical plane through the longitudinal axis thereof, and means for circulating fluid through said channels from one end of said drum.

7. In an apparatus for cooling or drying

liquid or plastic materials, a rotatable metal drum having fluid-conducting channels disposed wholly within the wall thereof and a fixed valve associated with one end of the drum in a fluid-tight relationship and having a fluid-inlet and a fluid-outlet passageway provided therein, said fluid-inlet and outlet passageways being disposed so as to register respectively with the inlet and outlet ends of said channels in the course of the revolution of the drum for the purpose of circulating fluid through said channels.

8. A drum flaker, comprising a rotatable drum having a system of fluid-conducting channels provided therein in heat-transfer relationship to the peripheral surface thereof, and means for passing heating fluid only through part of said system of channels in a given period of rotation of said drum, thereby heating a selected portion of the drum surface.

9. A drum flaker, comprising a rotatable drum having a system of fluid channels provided therein in heat-transfer relationship to the peripheral surface thereof, and means for passing heating fluid during the rotation of said drum only through that part of the said system of channels which is in heat-transfer relationship to the portion of the drum surface passing through a collecting cycle.

10. A drum flaker, comprising a rotatable drum having a system of fluid-conducting channels provided therein in heat-transfer relationship to the peripheral surface thereof, and means for simultaneously passing during the rotation of said drum heating fluid to that part of said system of channels which is in heat-transfer relationship to the portion of the drum passing through a collecting cycle and cooling fluid to that part of said system of channels which is in heat-transfer relationship to the portion of the drum surface passing through a cooling cycle.

In testimony whereof I affix my signature.
STUART P. MILLER.