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THOMAS F. DEXTER, OF PROVIDENCE, RHODE ISLAND.

DRYING-MACHINE.

971,177.

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To all whom it may concern:

Be it known that I, THOMAS F. DEXTER, a citizen of the United States, residing at Providence, in the county of Providence and State of Rhode Island, have invented certain new and useful Improvements in Drying-Machines, of which the following is a specification.

In a co-pending application for patent filed in the U. S. Patent Office, I have illustrated and described certain new improvements in drying-machines of the type or class having a plurality of intergearing, revolvable, steam-heated, horizontally disposed drying-cans or cylinders, around the peripheries of which continuous lengths of cloth, paper or yarn in a wet or moist condition are carried from a source of supply at the front or "wet" end of the machine and longitudinally of it and delivered in a dry state at its other or rear end.

My present invention also relates to drying-machines, and it consists in providing the same with means devised and adapted to increase the efficiency and economical working of the machine, all as more fully herein-after set forth and claimed.

In the accompanying sheet of drawings, Figure 1 represents a partial rear side elevation of the front or "wet" end of a drying-machine provided with the invention forming the subject of this application for patent; Fig. 2 represents, in enlarged scale, a side elevation transversely of the machine, partly in section, corresponding with line 2 2 of Fig. 1; and Fig. 3 is a similar view, taken on line 3 3 of Fig. 1.

In the drawings are represented a plurality of intergearing, hollow cylindrical cans *a*, each having a journal or tubular central trunnion *b* secured to the respective heads of the can. These journals are revolvably mounted in steam-tight, chambered bearings *c*, supported by girder-like frames *d*. The front bearing is indicated by 1° and the rear one by 2°. Power may be transmitted from any suitable driving means to rotate the intermeshing gears *g* secured to the rear journals of the respective cans. All the cans (except, say the first one, 1, of the five cans represented) are adapted to be heated as usual, that is, by steam flowing from a source of supply into a horizontal steam-main, or mains, *f*, from which latter short branch pipes *f*¹ connect it with the respective front hollow bearings 1°.

The steam passes through the trunnions into the revolving, fabric-carrying cylinders *a*, the heat radiated through the walls acting at the same time to evaporate the moisture 60 from the fabric. The steam (water) condensed in the thus equipped cans flows through the rear journals and into the respective bearings 2°, and from the latter via open-ended discharge pipes *m*² leading into 65 the valveless traps *A*. Each trap has a head *m* and bottom capped casing *m*¹, constituting the trap-well. An open pipe *h*¹ connected with the head *m* and the horizontal exhaust-main *h* permits the said water to 70 overflow from the well and into the main, all as indicated in Figs. 1 and 3. As thus devised and arranged, the cylinders are practically independent of one another in respect to the exhaust, owing to the inter- 75 posed traps *A*. Moreover, little, if any, steam and vapor can flow from the cylinder into the main, but instead the device prevents the same from escaping, thereby causing a greater volume of the steam entering 80 the cylinder to be condensed, thus correspondingly increasing the heating efficiency by reason of the added liberated latent heat.

In order to utilize any of the steam or vapor that may enter the exhaust-main *h*, as 85 well as any vapor produced by reëvaporation from the hot water in the main, I provide means for separating such steam and vapor from the water, the latter then flowing by gravity into the return-main *t*. That is to 90 say, assuming that the first can 1 is not connected with the steam-main *f*, but that the said exhaust-main *h* extends transversely across the machine via horizontal pipe *h*⁴ and discharges into a front vertical tee or 95 chambered fitting *h*⁵, and from the latter via vertical pipe *h*⁶ into the can's front bearing 1°, as represented in Fig. 2. The water passes downward from said fitting and short pipe *t*² into U-bent piping arranged to form 100 a water-seal *r*, thence transversely and horizontally via pipe *t*¹ into the longitudinally extending return-main *t*. The exhaust or water condensed in the cylinder 1 flows from the rear bearing 2° by gravity through the 105 vertical pipe *m*², communicating directly with the latter and the return-main. See also Fig. 1. As thus devised, the volume of exhausted steam and vapor (which then may have a pressure of several pounds per inch) 110 as well as the water of condensation discharged from all the cans (except the first,

or can 1) enters the common exhaust-main h and flows forward into the said separating-chamber member h^s , at which point the heavier element, water, drops into the continuously filled seal r and flows therefrom via pipe t^1 into the return-main t and into a hot-well or reservoir, or even into the atmosphere, as desired. At the same time, the said steam and vapor having, say a temperature of 225° to 230° , and including also any reëvaporation from water in the exhaust-pipe, flows upward from the separating-chamber into can 1, located at the front end of the machine; the water of condensation produced in this can passes unobstructedly therefrom via its pipe m^2 into the return-main.

By means of this invention a drying-machine, when provided with the same, is adapted to treat the wet material or fabric, in its passage around the cans, with greater efficiency and economy, because the thermal heat units in the steam and vapor exhausted from all the cans in drying-machines as heretofore devised and arranged, as well as any reëvaporation from the volume of discharged water, have been lost or not utilized, whereas in a drying-machine embodying my present improvement the initial steam introduced into the cans is, by reason of the traps A connected with the respective cans, prevented from escaping into the exhaust-main until it has thereby given out a greater percentage of its heat units, and even then the combined volume of exhaust products, minus the water itself, are next introduced from the exhaust-main into another can. The said products, steam and vapor, are then condensed in the last-named can, thereby liberating the latent heat which is radiated outward through its wall and utilized for evaporating moisture from the traveling fabric or goods x in contact with its surface. In the practical operation of thus equipped drying-machines, it has been clearly demonstrated that the efficiency of the can last referred to, which may be termed the "exhaust-can" is equal to one of the other cans employing direct steam. Therefore the relative resulting economy in the weight or number of pounds of initial steam used is as one to the total number of cans employed, assuming the machine to employ, say twenty-five cans.

What I claim as my invention is:—

1. In a drying-machine of the character described, provided with revolubly mounted hollow heating cans or cylinders arranged for the admission of steam, the combination therewith of a suitably disposed exhaust-main communicating with the discharge end of the cylinders and adapted to receive from the latter exhaust steam or vapor and water of condensation, a revolubly mounted auxiliary heating-cylinder, arranged and adapt-

ed to coöperate with the other cylinders and being in communication with said exhaust-main for receiving therein said steam and vapor, as well as vapor reëvaporated from the water of condensation, and a return-main located below the exhaust-main and being trap-connected with it and with the discharge end of the auxiliary cylinder, constructed and arranged for utilizing the direct and latent heat from the steam and vapor introduced into the last-named cylinder, substantially as described and for the purpose set forth.

2. In a drying-machine of the character described, the combination with a plurality of hollow drying-cylinders mounted for rotation, and means adapted for admitting steam into and exhausting it from the cylinders, of a revoluble coöperating or auxiliary drying-cylinder, means for introducing into the latter steam and vapor exhausted from the other cylinders, and a return-main connected with said auxiliary cylinder for receiving the water of condensation produced therein.

3. In a drying-machine of the character described, the combination of a plurality of revoluble drying-cylinders, a main communicating with the cylinders for admitting live or initial steam therein, a main connected with and common to all the cylinders for receiving steam, vapor and water exhausted therefrom, a revoluble auxiliary heating cylinder having its inlet end communicating with said exhaust-main, so as to receive from the latter the said steam and vapor exhausted from the other cylinders, and a return-main communicating with the said exhaust-main and with the discharge end of the auxiliary cylinder for conducting away the water of condensation from all the cylinders.

4. In a drying-machine of the character described, the combination of a plurality of revoluble drying-cylinders, a steam-main communicating with the inlet end of all the said cylinders, an exhaust-main common to all the said cylinders, a trapped connection interposed between and uniting the discharge end of each of said cylinders with the said exhaust-main, thereby preventing back-flow or exhaust intercommunication between the cylinders, a revoluble auxiliary heating cylinder having its inlet end communicating with the exhaust-main so as to receive therein steam and vapor discharged from the other cylinders, and a return-main trap-connected with said exhaust-main and also connected with the discharge end of the auxiliary cylinder, arranged for conducting away the water of condensation from all the cylinders.

5. In a machine of the character described, having revolubly mounted drying-cylinders or cans, means adapted for intro-

ducing steam into the same, and means connected with the discharge end of the cans for receiving steam, vapor, gases and water of condensation exhausted therefrom, the
5 combination therewith of a revolubly mounted auxiliary heating cylinder disposed with relation to the others, means for introducing into the auxiliary cylinder steam and vapor discharged from the first-named cans,
10 and means connected with the exhaust end

of the auxiliary cylinder for receiving the water of condensation produced in the last-named cylinder.

In testimony whereof I have affixed my signature in presence of two witnesses.

THOMAS F. DEXTER.

Witnesses:

GEO. H. REMINGTON,
CALVIN H. BROWN.