T. F. DEXTER.

DRYING MACHINE.

APPLICATION FILED FEB. 17, 1910.

971.176. Patented Sept. 27, 1910.

FIG. 1.

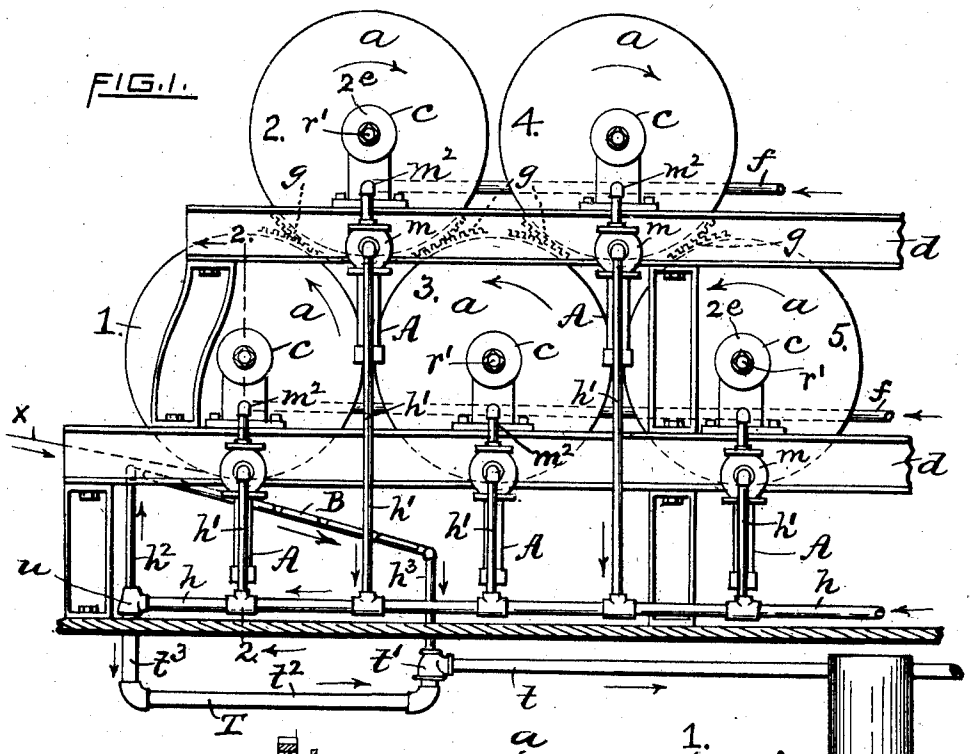
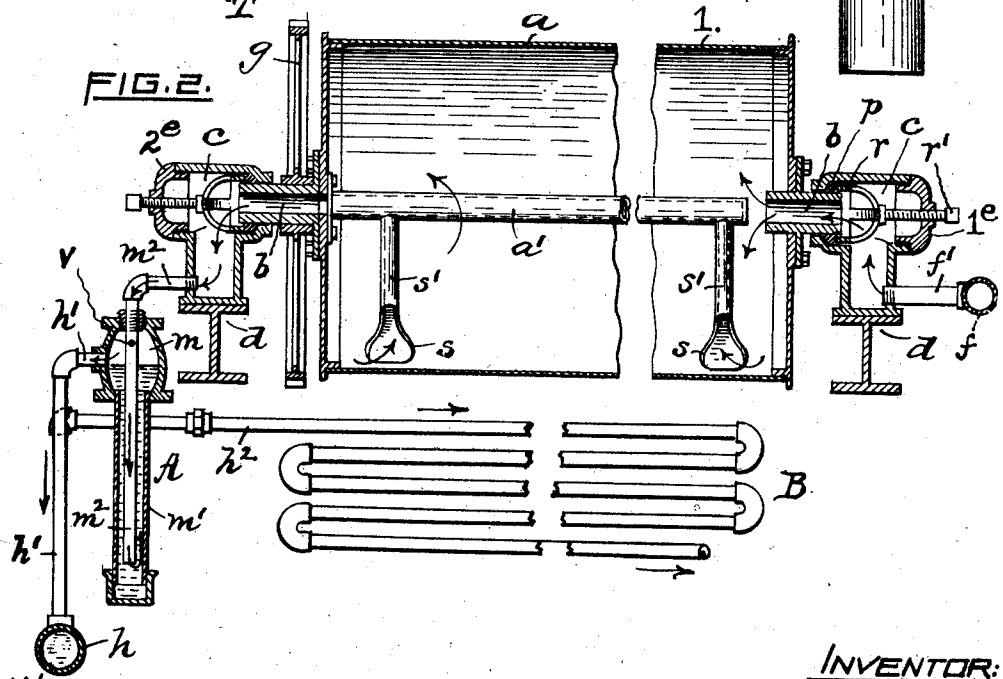


FIG. 2.



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DRYING-MACHINE.

971,176. Specification of Letters Patent. Patented Sept. 27, 1910.

Application filed February 17, 1910. Serial No. 544,417.

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.

This invention relates to improvements in drying-machines, so-called; that is, machines of the class having a plurality of intergearing, revoluble, 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. It may be added that usually machines of this type are devised and constructed so that the steam used, having a pressure of several pounds, is supplied to the cans from branch pipes leading from a steam-main located at the front side of the machine and being in continuous open communication with the front ends of the cans; similar means being employed for discharging into an exhaust or return-main the water of condensation as well as uncondensed steam and vapor from the opposite ends of the cans, being the back side of the machine. An objection to such former machines is that they require the use of steam having considerable pressure, and that more or less of it will flow through the individual cans directly into the return-main without first having given off the number of heat units which should have been utilized for heating the cans, thereby correspondingly reducing the efficiency of the machine. A further disadvantage is that such escaping steam and water passes directly into the atmosphere, or to waste.

The object I have in view is to provide drying-machines with means for materially increasing their efficiency, and in which said advantageous results are attained or effected in a comparatively inexpensive way. To this end low pressure steam is employed, having say a fraction of a pound, or even minus pressure. The water of condensation and vapor discharged from each can first flows into an independent air-vented water-seal device. The water then overflows or passes from the seal by gravity into a horizontally disposed exhaust pipe, common to all the seals. At the front or "wet" end of the machine and below the lower cans is located a combined heating and condensing-coil or barometric condenser having its upper or intake end connected with the upper portion of a head or fitting, constituting a separating chamber, into which the said exhaust pipe freely discharges. The said pipe, it may be observed, is disposed below the condenser. The return-main proper is in turn located below the exhaust-pipe and condenser and connected with them so that the water flows therefrom into the main by gravity action. The main is also provided with a water-seal and separator, arranged to prevent the entrance of steam or vapor into the main from the condenser and exhaust-pipe.

A drying-machine embodying my improvements may be successfully operated with greater efficiency and economy, since steam having materially lower or even atmospheric pressure may be used, and also owing to the fact that any steam or vapor discharged from the cans is condensed in the coil and its heat utilized. Or, in other words, by means of this arrangement, any steam or vapor freed from the water flows into the coil, where it is condensed, while the water itself falls by gravity into the return-main, into which the water condensed from the said steam or vapor in the coil also flows. The water may then be discharged from the return-main directly into the atmosphere, or into a hot-well, as desired. As thus devised, each steam-heated can or cylinder is, as it were, wholly independent of the other cylinders in the matter of exhaust action; the construction and arrangement of the parts or elements constituting the present improvement being disposed or combined and connected with the exhaust end of the cylinders so that any discharged steam or vapor, as well as vapor reëvaporated from the water of condensation discharged from the cylinders, is prevented from returning and flows into and along an exhaust-pipe common to all and enters a combined radiator and condenser located above said pipe where the latent heat from said steam or vapor is utilized as an auxiliary drying means; the water resulting or precipitated therefrom, as well as the main volume of

water of condensation is trapped and passes by gravity action into the return-main proper.

In the accompanying sheet of drawings, Figure 1 represents a partial rear side elevation of the front or "wet" end of a drying-machine embodying my improvements, and Fig. 2 is an enlarged transverse sectional view, taken substantially on line 2 2 of Fig. 1.

In the drying-machine represented the steam-heated cylindrical cans *a* have the front and back heads thereof provided each with a hollow center trunnion or journal *b* mounted in a screw-capped chambered bearing *c* in a well-known manner (see Fig. 2, 1^e designating the front and 2^e the rear bearing). That is to say, the outer end portion of each journal extends through and is supported in the adjacent part of the bearing, the latter having a packing *p* engaged by a follower-ring or gland *r* backed by a center adjusting-screw r^1. The bearings in turn are secured to and supported by the longitudinal frames or girders *d*. The cans are geared together and driven by gears intermeshing at *g* and secured, say to the rear journals; the arrangement being such that all the lower cans rotate in one direction, the upper cans rotating in a contrary direction,—see arrows in Fig. 1. The cans 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^e. 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 from the fabric. The water or condensed steam produced in each cylinder enters the scoops or buckets *s* connected with the outer or bottom ends of the tubes s^1 and flows into the center tube a^1, which is in open communication with the rear trunnion, and into the corresponding bearing, as usual, and as represented in Fig. 2. It may be stated that the continuous web of wet cloth *x*, or other fibrous material to be operated upon, is conducted to the lower side of and partly around the barrel of the first can 1 and around the other cans, 2, 3, 4, 5, etc., in a well-known manner. In lieu of discharging the said water and uncondensed steam and vapor direct from the rear bearings 2^e into the return-main proper, as heretofore, I provide each of them with a depending seal or trap device A, comprising a casing m^1 and a vertical central inner tube n^2, open at its lower end and vented at *v*, if desired; said tube extending upward through the enlarged head *m* and into the lower portion of the bearing's chamber. A continuously open lateral and downwardly extending pipe h^1 leads from said head member into the horizontal exhaust-pipe *h*. This latter pipe extends to or nearly to the front or "wet" end of the machine and terminates in a fitting or tee *u*, constituting a separating chamber, from which a pipe h^2 extends upward and is coupled to a suitable coil or barometric-condenser B located contiguous to, but below the fabric *x*, see Fig. 1. The opposite or lower outlet end of the element B discharges via vertical pipe h^3 into a casting t^1 having a separating-chamber located below said pipe *h*. The last-named chamber discharges directly into the horizontal return-main *t* and is also in open communication with said chamber *u*, the latter connection being produced by means of the horizontal pipe t^2 and the short vertical pipe t^3, thus forming a water-seal T to prevent the entrance of steam or vapor from the exhaust-pipe *h* and element B, since the pipe t^2 is lower than the plane of pipe *t*, as clearly represented in Fig. 1.

By means of my invention the efficiency of drying-machines is increased at a comparatively small cost. The traps or seals A render the cylinders wholly independent of one another at the discharge end. All the water of condensation overflowing from the said seals passes into the exhaust-main *h* by gravity, and from the latter, via separating-chamber *u* and water-seal T into the open return-main *t*. At the same time any uncondensed steam or vapor discharged from the traps A flows via pipes h^1, *h*, chamber *u* and pipe h^2 into the barometric-condenser B, where it is condensed, its thus freed latent heat being radiated through the walls of element B and utilized as auxiliary heating means for drying the fabric as it is fed to the surface of the revolving adjacent cylinder. The water produced by condensation in the element B flows by gravity therefrom, via pipe h^3, and separating-chamber t^1 into the return-main *t*.

I claim as my invention:—

1. In a drying-machine of the character described, provided with revolubly mounted hollow heating cans or cylinders, constructed and adapted for the admission and discharge of steam, the combination therewith of an exhaust-main, a combined steam and water-trap interposed between the discharge end portion of each cylinder and the exhaust-main and communicating with both, a return-main proper, and a barometric-condenser element, located with relation to the cylinders and connected with both the said mains, adapted and arranged to receive uncondensed steam or vapor from the exhaust-main for the purpose hereinbefore set forth.

2. In a drying-machine having a plurality of revolubly mounted intergearing cans or cylinders arranged to be steam-heated, the combination of an exhaust-main located below the cylinders, adapted to receive the water of condensation from the latter by grav-

ity, a heating and condensing element, constituting auxiliary heating means, connected with and adapted to receive and condense therein steam and vapor from the exhaust-main, a return-main connected with the lower or discharge end of said condensing element, and a water-seal device communicating with the latter and with the said exhaust and return-mains.

3. In a drying-machine of the character described, provided with revoluble cans adapted to be steam-heated, the combination therewith of a suitably located auxiliary heating device, a main for receiving steam or vapor and water of condensation from the cans, means for introducing said steam or vapor, and also any vapor reëvaporated from the water, into the heating device, and a return-main adapted to receive the water separated from the steam or vapor in the first-named main and also the water condensed from the steam and vapor in the said heating device.

4. In a drying-machine of the character described, a revoluble can or drying-cylinder adapted to be steam-heated and provided with a discharge-outlet, in combination with an exhaust-main and a valveless trap or seal connected with said discharge-outlet and exhaust-main, arranged whereby steam or vapor having a relatively low pressure is prevented from escaping into the exhaust-main.

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

THOMAS F. DEXTER.

Witnesses:
GEO. H. REMINGTON,
CALVIN H. BROWN.