

W. R. FILES.
 DRYING MACHINE.
 APPLICATION FILED JULY 14, 1913.

1,109,977.

Patented Sept. 8, 1914.

2 SHEETS-SHEET 1.

Fig. 1.

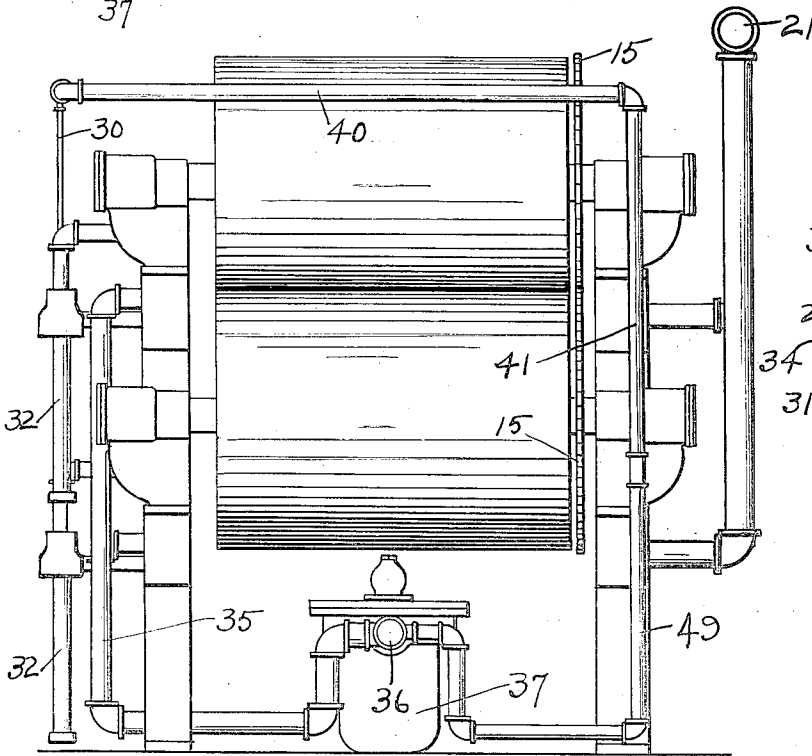
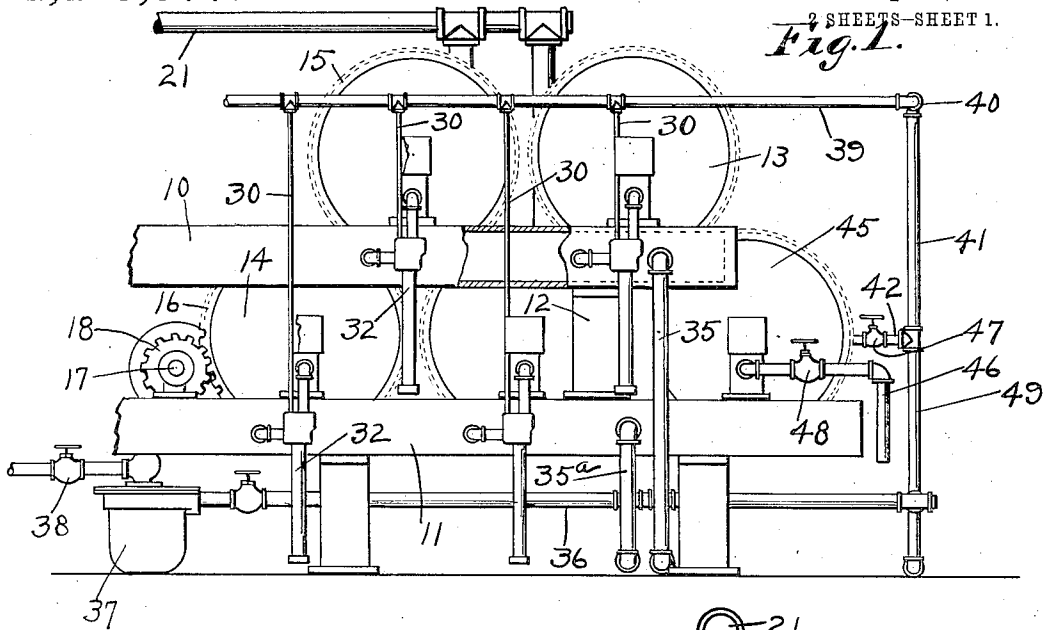


Fig. 3.

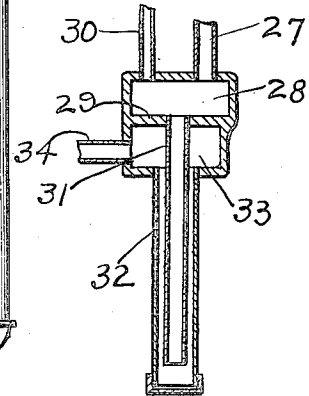


Fig. 2.

Witnesses

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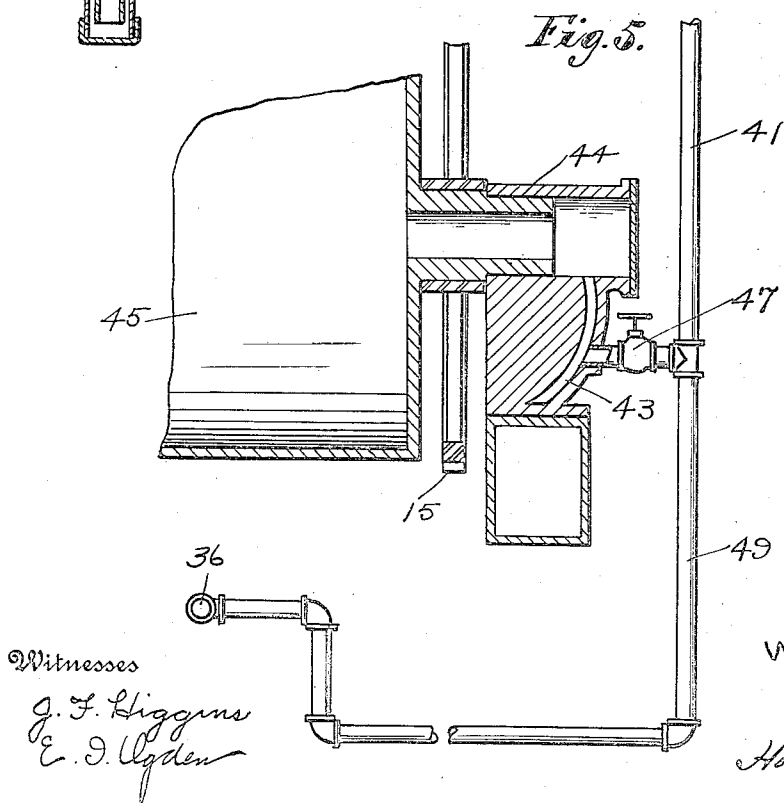
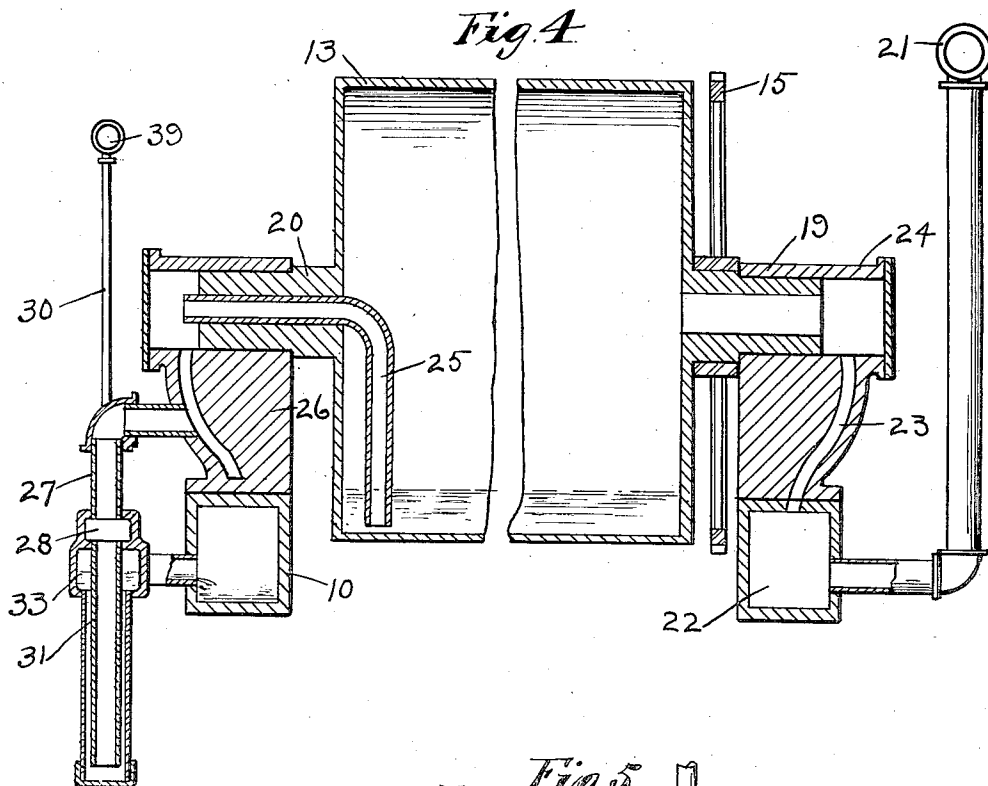
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UNITED STATES PATENT OFFICE.

WILLIAM R. FILES, OF PROVIDENCE, RHODE ISLAND.

DRYING-MACHINE.

1,109,977.

Specification of Letters Patent.

Patented Sept. 8, 1914.

Application filed July 14, 1913. Serial No. 778,881.

To all whom it may concern:

Be it known that I, WILLIAM R. FILES, a citizen of the United States, and resident of the city of 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 drying machines of the class adapted to dry long strips of cloth, paper or yarn upon being run there-through.

The object of the invention is to provide an improved construction whereby low pressure steam may be used with great efficiency and increased economy for drying the goods, the same comprising a plurality of rotatable heating cans or cylinders with means for admitting steam thereto, and to provide a separating chamber for separating the steam, air and vapor from the entrained water immediately upon being discharged from said cylinders, also to provide one or more modifying cylinders in which the temperature may be varied at will independent of the other cylinders to suit the varying conditions under which the machine is operated, and to provide a draft pipe for stimulating the action of the steam through the cylinders and for receiving the separated steam, air and vapor from the exhaust of said other cylinders and conduct the same to said modifying cylinder.

The invention further consists in the provision of an equalizing drain pipe connecting said draft pipe to the exhaust main for equalizing the pressure throughout the whole system, thereby permitting as high a pressure as desired to be carried in the first-mentioned cans without the liability of blowing out the seal and destroying the action or effect of the separating chamber upon the steam. I have also provided a drop leg in said connecting pipe to form a water seal and act as a trap to prevent the wet steam from flowing back from the exhaust main into said draft pipe and modifying cylinder.

A further object of the invention is to provide valves either automatic or hand operated, for controlling both the inlet and exhaust to and from said modifying cylinder to regulate the temperature in said cylinder and also to control the passage of steam through said cylinder whereby the whole

may be condensed before being discharged therefrom, if desired.

With these and other objects in view, the invention consists of certain novel features of construction, as will be more fully described and particularly pointed out in the appended claims.

Of the accompanying drawings: Figure 1— is a side elevation showing a portion of my improved drying machine and illustrating the exhaust side of the piping system. Fig. 2— is a view from the right end of the machine. Fig. 3— is an enlarged detail in section of my improved water seal and showing the separating chamber therein. Fig. 4— is an enlarged sectional view through one of the cylinders and its bearings showing the main steam supply, and also the seal connected to the discharge end. Fig. 5— is a view partially in section, illustrating the draft pipe connection to the modifying cylinder, also the equalizing pipe connecting said draft pipe through a water seal to the exhaust main.

Referring to the drawings, 10 and 11 designate the two horizontal beams or rails in the frame of the machine, the same being preferably hollow to serve as conduits for the exhaust steam discharged from the different sets of cylinders, said beams being supported in spaced apart position by the uprights 12. Mounted on these frames are two rows of cylinders 13 and 14, each cylinder being provided with suitable intermeshing gears 15 and 16 through which they are driven from the main shaft 17 and pinion 18. These cylinders are hollow and are each provided with a hollow trunnion 19 through which the steam enters, and a corresponding trunnion 20 on the opposite side through which the same is discharged. The steam is admitted from the steam main 21 into the hollow rail 22 and thence into the various cylinders through the passageways 23 in the bearings 24. A portion of this steam condenses in the cylinders and the pressure on the surface of the water forces it to rise through the discharge tube 25 and pass out into the bearing 26, thence down through the pipe 27 into the chamber 28 of each seal where it is forced against the baffle plate 29 and caused to separate, the comparatively dry steam, air and vapor passing upward through the small pipe 30, while the water of condensation passes downward through

the drop leg 31 in the seal 32, thence it passes up through the space between the inner and outer pipes into the chamber 33 and out through the pipe 34 into the hollow rails 10. From here the water is discharged through the pipes 35 and 35^a from the different rails and is carried over into the exhaust main 36 and conducted to the trap 37, thence, out through the valve 38 to the sewer or to be pumped back again to the boiler to be used over again.

The comparatively dry steam, air and vapor which has risen from the separating chambers 28 of the water seals through the pipes 30 are all connected to a main draft pipe 39 which leads forward and across through pipe 40 to the opposite side of the machine, thence down through pipe 41 and back through pipe 42 to communicate through the channel 43 in the bearing 44 to the modifying cylinder 45, the discharge from this cylinder passing out through the open-ended pipe 46 to the waste.

It will be noted that a valve 47 is located in the in-take pipe 42 and another valve 48 in the discharge pipe of this cylinder 45, whereby both the in-take and discharge may be nicely regulated to adjust the heat in the cylinder to meet conditions under which the machine is operating.

Another feature of my invention is that I have provided a drop leg 49 on the draft pipe which leads over to the exhaust main 36, the pressures in these two pipes to act against each other, and equalize the pressure throughout the whole system, by which construction a pressure as high as may be desired can be carried on the main set of cans without the liability of blowing out the seals at the discharge end thereof and destroying the action or effect of the separating chamber upon the steam and vapor which is drawn therefrom for use in the modifying cylinder. It will also be noted that I have carried this drop leg 49 down below the level of the exhaust main so as to form a water seal to act as a trap and prevent the water and wet steam from flowing back from the exhaust main into the draft pipe and into the modifying cylinder.

In the practical operation of my improved drying system it is found necessary in order that the best results may be obtained, to provide one or more modifying cans or cylinders, preferably at the entering end of the drier, in which cylinders the heat may be modified, reduced and regulated so as to act with the best possible effect upon the entering goods. In some cases it is found that the heat should be considerably reduced below that carried in the main cylinders. It is found that this result can best be obtained in this modifying cylinder, in the most effective and economical manner, by subjecting the exhaust steam from the main

cylinders to a separating process immediately upon being discharged from said cylinders and to convey or conduct the comparatively dry steam, air and vapor thus obtained from the separator through the draft pipe 39 into the said modifying cylinder where its entrance and discharge can be so controlled by means of the valves 47 and 48 as to utilize nearly all of the latent heat in the fluid, so that only water will be discharged from the modifying cylinder, the water of condensation in said draft pipe passing downward to fill the seal below, the excess being carried over into the exhaust main 36.

By the use of my improved separating chamber and its connection therefrom direct to the draft pipe 39 I am enabled to separate the air, which may have accumulated in the cylinders while the system is at rest, and conduct it through to the modifying cylinder and out through its discharge pipe.

It will be noted that the discharge from my modifying cylinder is left open whereby it may be readily determined whether or not the valves 47 and 48 are properly adjusted so that only water and no steam will issue from this cylinder.

The valves 47 and 48 are herein illustrated as being hand-operated, but automatically operable reducing valves of any of the well known types may be employed in place of said hand valves to control this flow both into and out of said cylinder automatically, if desired.

Another advantage in my improved system is that the trap 37, which is connected to the main return, permits any desired pressure to be employed in the system, whereas if a water seal alone were employed for controlling the flow therethrough a low pressure only could be used. In other words, by the use of a trap in the system a much higher pressure and consequently higher temperature may be used whereby the goods may be more rapidly treated, acted upon and dried than when a low pressure is employed.

I claim:

1. A drying machine comprising a plurality of rotatable heating cans, means for admitting steam thereto, an exhaust main communicating with the discharge end of said cans, means for separating the steam and vapor from the entrained water as it is exhausted from each of said cans, a modifying can arranged to cooperate with the other cans, and a draft pipe for receiving the separated steam and vapor and conducting it into said modifying can.

2. A drying machine comprising a plurality of rotatable heating cans, means for admitting steam thereto, an exhaust main communicating with the discharge end of

said cans, means for separating the steam and vapor from the entrained water as it is exhausted from each of said cans, a modifying can arranged to cooperate with the other cans, a draft pipe for receiving the separated steam and vapor and conducting it into said modifying can, an open ended discharge pipe leading from said latter can, and valves in said inlet and discharge for controlling the temperature in said latter can.

3. A drying machine comprising a plurality of rotatable heating cans, means for admitting steam thereto, an exhaust main communicating with the discharge end of said cans, means for separating the steam, air and vapor from the entrained water immediately upon being exhausted from each of said cans, a modifying can arranged to cooperate with the other cans, a draft pipe for receiving the separated steam, air and vapor and conducting it into said modifying can, and means whereby the temperature in said last-mentioned can may be controlled.

4. A drying machine comprising a plurality of rotatable heating cans, means for admitting steam thereto, an exhaust main communicating with the discharge end of said cans, a separating chamber connected direct to the discharge from each of said cylinders for separating the steam, air and vapor from the entrained water, a modifying can arranged to cooperate with the other cans, a draft pipe for receiving the separate steam, air and vapor from all of said chambers and conducting it into said modifying can, and valves controlling both the inlet and discharge to and from said modifying cylinder.

5. A drying machine comprising a plurality of rotatable heating cans, means for admitting steam thereto, an exhaust main communicating with the discharge end of said cans, a separating chamber connected direct to the discharge from each of said cylinders for separating the steam, air and vapor from the entrained water, a modifying can ar-

ranged to cooperate with the other cans, a draft pipe for receiving the separated steam, air and vapor from all of said chambers and conducting it into said modifying can, valves controlling both the inlet and discharge to and from said modifying cylinder, and an open ended discharge pipe leading from said latter cylinder.

6. A drying machine comprising a plurality of rotatable heating cans, means for admitting steam thereto, an exhaust main communicating with the discharge end of said cans, a separating chamber connected direct to the discharge from each of said cylinders for separating the steam, air and vapor from the entrained water, a modifying can arranged to cooperate with the other cans, a draft pipe for receiving the separated steam, air and vapor from all of said chambers and conducting it into said modifying can, valves controlling both the inlet and discharge to and from said modifying cylinder, said draft pipe being connected through a water seal to said main exhaust.

7. A drying machine comprising a plurality of rotatable heating cans, means for admitting steam thereto, an exhaust main communicating with the discharge end of said cans, a trap for controlling the flow through said exhaust main, a separating chamber connected direct to the discharge from each of said cylinders for separating the steam, air and vapor from the entrained water, a modifying can arranged to cooperate with the other cans, a draft pipe for receiving the separate steam, air and vapor from all of said chambers and conducting it into said modifying can, and valves controlling both the inlet and discharge to and from said modifying cylinder.

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

WILLIAM R. FILES.

Witnesses:

HOWARD E. BARLOW,
E. I. OGDEN.