

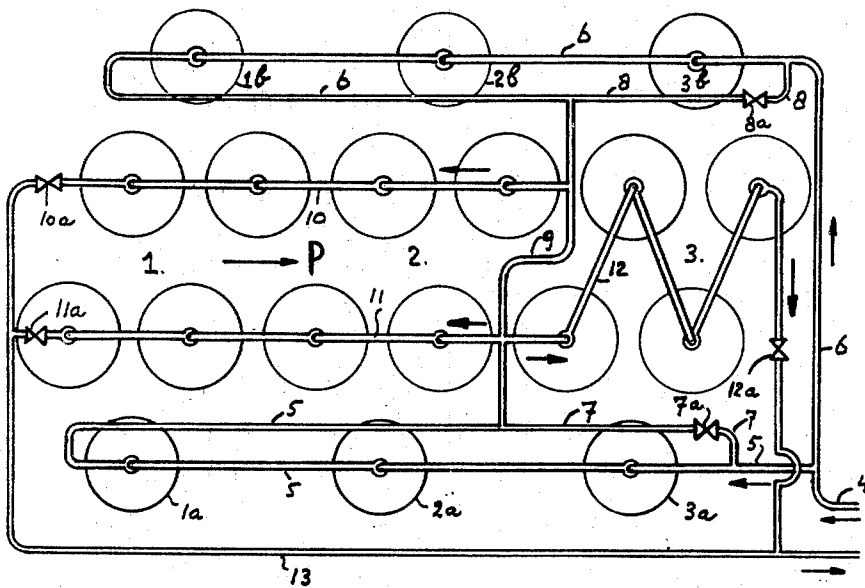
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PAPER MACHINE

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PAPER MACHINE

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This invention relates to a machine for making paper and like substances, and more particularly to the portion of such machine in which the sheet of paper is dried by passing it over substantially synchronously rotating heated cylinders.

Hitherto it was customary to apply steam as a heating fluid, and to provide, from the main steam pipe, a separate steam conduit to each drying drum. The steam entered into the hollow drums, where it partially condensed. Water and steam from the cylinders were allowed to flow into steam traps. There was provided a steam trap for each cylinder or set of cylinders. In each of the aforesaid separate conduits a control valve was provided to regulate the quantity of steam, and thus the temperature of each cylinder, for it is necessary to maintain, in the direction of the travel of the paper web, a definite temperature gradient. This regulation always offered difficulties. It is an object of the present invention to prevent this drawback, and with this and other objects in view, this invention consists, in short, in the application of hot water, instead of steam, as a heating fluid. With hot water, the regulation of the temperature is much easier and more accurate.

For a more complete understanding of this invention, and of further features thereof, it will now be described with reference to the drawing which diagrammatically shows the drying cylinders of a paper machine.

There are provided three sections 1, 2 and 3 each composed of four drying drums or cylinders, with corresponding felt dryers 1a—1b, 2a—2b, 3a—3b. For the sake of clearness, the paper web and the felt sheets are omitted in the drawing. The direction of travel of the web is indicated by arrow P. Hot water is supplied by conduit 4, and flows through two conduits 5 and 6 passing through the felt dryers, and through two further conduits 7 and 8. In these conduits control valves 7a and 8a, respectively, are provided. Both flows of water 5 and 7 emerge into a pipe 9, as well as the flows 6 and 8. Pipe 9 is situated at about $\frac{2}{3}$ of the extent of the series of aligned drying cylinders, reckoned in the direction of travel of the paper web. From pipe 9 are branched three conduits 10, 11, 12. Conduit 10 passes through the upper cylinders of the sections 2 and 1, and conduit 11 passes through the lower cylinders of said sections. Conduit 12 passes through all the cylinders of section 3. Conduits 10, 11 and 12 are provided at their remote or outlet ends with respect to the aligned and directly connected upper and lower series 1 and 2, and all of alternate up-

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per and lower series of section 3, in opposed staggered relation, with control valves 10a, 11a, 12a, and emerge into discharge pipe 13. With this arrangement, only the inlet and the outlet temperature of each conduit need to be controlled to ensure the correct temperature gradient throughout the cylinders fed by this conduit. In the embodiment shown, the temperature will be slowly increasing through the sections 1 and 2, will be constant through the 3 cylinders adjacent to pipe 9, and will be slowly decreasing through the last 3 cylinders.

What I claim is:

1. In a drying apparatus for a paper making or like machine comprising a plurality of series of drying cylinders, means for feeding a continuous web over the cylinders in series, a heating water inlet disposed in the rear portion of the apparatus in the direction of movement of the web, and means for passing a heating water flow continuously through the respective series of cylinders in countercurrent with the travel of the web through the cylinders lying before the heating water inlet, and opposite thereto in others.

2. In a drying apparatus for a paper making or like machine comprising a plurality of series of drying cylinders; means for feeding a continuous web over the cylinders in series; duct means for passing a heating water through said cylinders, the said duct means connecting to each of said series of cylinders; and an inlet to said duct means, the said inlet being so disposed relative to each of said series of cylinders and duct means that the majority of said cylinders is disposed ahead of said inlet in the direction of movement of said web so that the heating water is passed through said majority of cylinders in a direction opposite to that of the movement of the web and in the same direction through the minority thereof.

3. In a drying apparatus for a paper making or like machine comprising a plurality of series of drying cylinders; means for feeding a continuous web over the cylinders in series; duct means for passing a heating water through said cylinders, the said duct means connecting the majority of said cylinders successively in each series; and an inlet to said duct means, the said inlet being so arranged relative to said cylinders and duct means that the majority of said cylinders in certain of said series is disposed ahead of said inlet in the direction of movement of said web so that the heating water is passed through said majority of cylinders in a direction opposite to that of the movement of the web, and through the others in

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the same direction as the direction of movement of the web.

4. In a drying apparatus for a paper making or like machine comprising a plurality of series of drying cylinders; means for feeding a continuous web over the cylinders in series in one direction, duct means for passing a heating liquid through said cylinders, the said duct means connecting the majority of said cylinders in series; a common inlet; pipe connections branching from said inlet to said duct means, the said pipe connections being so arranged that the majority of said cylinders in a plurality of said series is disposed ahead of said inlet in the direction of movement of said web so that the heating liquid is passed through said majority of cylinders in each series in a direction opposite to that of the movement of the web and through the minority of said cylinders in each series in a direction corresponding to that of the movement of the web, and valve means in the pipe connections leading to the inlet and outlet ends of each series of cylinders, whereby control of the inlet and outlet temperatures will insure correct temperature gradient throughout the series of cylinders.

5. In a paper making or like machine, a drying apparatus having a number of heated cylinders for drying a paper web and over which the web travels in one direction, said cylinders being arranged in a plurality of series certain of which have separate inlets and outlets, means for conducting hot water to said inlets, the inlets of certain of said series of cylinders feeding the hot water successively through a majority of the cylinders thereof in a direction opposite to the direction of travel of the web thereover, and successively through the other cylinders in the same direction as the direction of travel of the web, and means for carrying off the water after passing through the cylinders and outlets.

6. In a paper making or like machine, a drying apparatus as set forth in claim 5, wherein the series of cylinders are arranged in horizontal upper and lower rows, certain of said rows having inlets leading to approximately two-thirds of the cylinders of said rows for supplying the hot water thereto to successively flow through two-thirds in a direction opposite to the direction of travel of the web and through the other cylinders of said rows successively in the same direction as the

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web travel, all in three flows, certain of said rows having valved inlets and outlets, and a discharge for said outlets.

7. In a paper making or like machine, a drying apparatus as set forth in claim 5, wherein the series of cylinders are arranged in horizontal upper and lower rows, constituting felt dryers having inlets and outlets, other cylinders arranged in horizontal upper and lower rows therebetween having divided inlets with valved connections to the last-named inlets and connections with said last-named outlets, said divided inlets leading to approximately two-thirds of the cylinders of the last-named rows for supplying hot water thereto in a direction opposite to the direction of travel of the web to flow successively there-through, and to the other cylinders of both of said last-named rows successively in staggered relation to flow therethrough in such relation in the same direction as the web travel, certain of said rows having valved inlets and outlets to control the inlet and outlet temperature of each plurality of successively connected cylinders to ensure the correct temperature gradients throughout the cylinders thereof with the temperature slowly increasing through certain of said two-thirds of the in-between horizontal rows, relatively constant through the cylinders of in-between rows connected immediately adjacent said divided inlets, and slowly decreasing through the remaining other cylinders in staggered relation, certain of said rows having valved inlets and outlets, the inlets being connected to the hot water conducting means, and a discharge to which said valved outlets are connected.

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