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YARN DRYING MACHINE.
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FIG. 1.
3. UNITED STATES PATENT OFFICE.

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YARN-DRYING MACHINE.

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To all whom it may concern:

Be it known that we, THOMAS ALLSOP and WALTER W. SIDSON, of the city and county of Philadelphia and State of Pennsylvania, and RUSSELL B. LOWE and RALPH E. THOMSON, of the city of Fitchburg, county of Worcester, State of Massachusetts, have invented certain new and useful Improvements in Yarn-Drying Machines, of which the following is a specification, reference being had to the accompanying drawings.

It is the object of our invention to provide a device for drying warps or similar yarns, in which the said yarns are thoroughly subjected to the drying action of heated air. This we accomplish by providing a chamber in which heated air is circulated and passing the yarns through this chamber in a tortuous path, whereby the yarn is subjected for a comparatively long interval to the heated air, to effect the thorough drying of the same. We accomplish this with a maximum economy of space and heat.

Our invention also comprises tension devices whereby the yarn is delivered to the chamber subject to tension which may be accurately regulated. It also comprises a yarn feeding device whereby the yarn is drawn from the drier and delivered and folded in such a manner as to prevent entanglement, so that it may be readily transferred to the warp beams of looms.

In the accompanying drawings, Figure I, is a longitudinal section through a drying machine, conveniently illustrating our invention. Figure II, is a plan view of the same with the top cover removed. Figure III, is an enlarged detail view of the feeding and tension devices. Figure IV, is a detail section on line IV, IV, of Figure II.

The mechanism thus shown comprises four parts, which we will describe successively, to wit: 1. A heating chamber with means for continuously circulating therein dry hot air. 2. Means for accomplishing the tortuous progress of the warp threads through the heating chamber, under proper tension and with effective separation, so as to prevent entanglement even when the warp breaks. 3. A tension device for regulating the initial tension at which the yarn enters the chamber. 4. A delivery and folding device by which the dry yarn is properly placed preparatory to its use in the warping machine.

The heating chamber.—This comprises a structural framework 1, forming a rectangular chamber 2, through which the yarn progresses, and as seen in Figure II, also an offset chamber 3, within which are located a series of heating coils 5, which may be supplied with steam or any other suitable heat conducting fluid. Chambers 2 and 3 are separated by a partition 4, and communicate through openings 6 and 7, within which are respectively mounted a pair of blower fans 8 and 9. These blowers are mounted upon shafts 10 and 11, respectively, and may be simultaneously driven by means of a connecting belt 12 (Figure II). The power may be transmitted in any convenient manner to a pulley 13, mounted on the outer end of the blower shaft 11. The dividing partition 4 extends upward to the line indicated at 14, in Figure I, thus allowing a space between the top thereof and the cover of the drier. When the fans are in operation the air is sucked from the coil chamber 3, and blown into the yarn traversing chamber 2, and after circulating therethrough again enters the chamber 3, over the top of the dividing partition 4, a portion escaping at 15.

The structural framework 1, is completely inclosed by sectional panels 15, which may be so constructed as to be readily removable to afford easy access to the interior of the drier. These panels are preferably constructed of double walls of sheet metal packed in between with heat insulating material. In order to render the yarn visible as it repeatedly traverses the chamber 2, we have provided its end walls 16, with windows 17, provided with glass panes. Thus in the event of the breaking of the yarn, the operator may readily locate the fault and repair the break. We thus secure a thoroughly insulated, compact heating chamber, within which the yarn is to be continuously progressed in a tortuous fashion so as to effect its thorough drying before it emerges from the chamber.

Yarn progressing means.—Upon the upper rights 20, and 21, directly adjacent the ends...
of the chamber 2, are mounted the series of horizontal rollers 22 and 23, respectively. The rollers 22, are mounted upon shafts 25, which extend through the side walls of the drier and carry gear wheels 26, on their outer ends. By means of idlers 27, the shafts 25, are all driven simultaneously at the same speed and in the same direction. The shafts 28, upon which rollers 23, are mounted are similarly provided at their outer ends with gear wheels 29, which are all operated in unison through the idlers 30, as indicated in dash and dot lines in Fig. 1. The gear trains 26, and 29, at the ends of the machine receive their motion from the main or driving shaft 31. The said shaft 31, may be conveniently driven by means of a pulley 32, thereon from any suitable over- head shaft. Shaft 31, transmits its motion through its gear wheel 33, (Fig. III) to a similar gear wheel 34, of a parallel shaft 35. Shaft 35, also carries a gear 36, which through an idler 37, drives the train of gear wheels 26, for the rollers 22. A sprocket wheel 38, is mounted upon the end of the shaft 31, directly adjacent to the gear 36, and transmits its motion to a similar sprocket 39, on the uppermost shaft 28, of the series of rollers 22, through a chain 40. Shafts 31, and 33, are also provided with rollers 41, and 42, respectively over which the yarn passes while being treated in the drier.

Near the bottom of the drier, and adjacent to the lowest roller of the series 22, is a roller 43, which is mounted upon a shaft 46, having a gear wheel 47, receiving motion from a similar wheel 48, mounted on the lowest roller shaft 25. The yarn is guided upon the roller 43, by a series of fingers 50, secured to a bar 51, extending transversely across the machine directly above the said roller. About midway of the height of the drier and adjacent to the rollers 23, a similar bar 52, having guide fingers 53, is provided for directing and spacing the yarn. In order to facilitate the spacing of the thread at the top of the drier, we have provided a grooved roller 55, and a guide comb 56. As a means for separating the yarn vertically the intermediate uprights 57, of the frame 1, each support a series of rods or rollers 58, of brass or other suitable material, whereby the yarn is prevented from sagging and hence from entangling during its passage through the drier.

The yarn is fed to the drier from the intake tension device 61, through an eye 70, in the right hand end wall of the chamber 2, as seen in Fig. I. It then passes over the roller 42, and proceeds downward and through the guide comb 31, by which it is directed to the roller 45. It then passes horizontally across the bottom of the chamber 2, over the separating rods or rollers 58, to the lowermost roller of the series 23. It then traverses the chamber 2, back and forth, alternately passing over the rollers of the series 22 and 23, the several convolutions of the yarn being separated by means of the rods or rollers 58, supported by the intermediate uprights 57, of the frame 1. These convolutions all occur in the same vertical plane, and are maintained therein by the spacing comb 52, and also the grooved roller 55. After the yarn passes over the uppermost roller of the series 23, it is guided by means of the comb 56, to the roller 41, and thence on the roller 42, and then finally again through the guide comb 51, to the roller 45. Thereupon the passage is then again repeated back and forth over the rollers 22 and 23, in a similar manner to that just explained. This second series of convolutions of the yarn over the rollers 22 and 23, is, however, in a different vertical plane from that first described. The shifting of the yarn is accomplished by means of the guide comb 56, to which it passes after having completed a series of convolutions in one plane. It will, therefore, be seen that the purpose of the comb 56, in addition to that of guiding the yarn, is to successively shift the plane of the convolutions from one side of the chamber to the other, until it is ready to be discharged through the eye 75. It will thus be seen that by this method the yarn is subjected to the drying action of heated air, for a comparatively long period, which results in thorough drying. This method of passing the thread through several convolutions in different planes enables us to secure a maximum drying action in a minimum space. After thus passing through the chamber 2, the yarn finally emerges therefrom through an eye 75, near the top of the drier as shown in Fig. II.

Tension device.—This has for its object to accurately regulate the initial tension by which the yarn is fed to the heated chamber, which tension tends to distribute itself throughout the length of the yarn progressing through the heating chamber.

To the right hand end of the drier is secured a bracket 60, which may be conveniently formed of structural iron for supporting the tension device 61, through which the yarn passes before its entry into the drier. This comprises three bars 62, 63, and 64, which are adjutably mounted on a series of parallel channel beams 63, supported by the bracket 60. To the ends of these bars are secured blocks 66, which are adapted to fit and slide in the troughs of the channel beams 65. These beams are each provided with a series of apertures 67, to allow the horizontal adjustment of the bars 62, 63, and 64. When the desired adjustment has been obtained, the bars are locked in place.
by pins 69, which register with the apertures 67.

It will be seen that the tension on the yarn may be increased by spacing bar 68, with relation to the bars 62, and 64, and decreased by bringing these bars closer together. It will be, of course, understood that the number of bars employed may be increased or decreased to suit the various conditions to which the drier is adapted.

The delivery and folding device.—After emerging from the eye 75, the dried yarn is led to the fingers of a sliding guide 76, which is mounted to reciprocate horizontally upon a rod 77, extending laterally across the top of the bracket 60, and secured thereto. The guide 76, is attached by means of a connecting rod 78, to one of the links of an endless chain 79, which passes over the sprocket wheels 80, and 81. The sprocket 81, is mounted for free rotation in a bearing 82, mounted upon the beam 83, comprised by the bracket 60. The sprocket 80, is similarly mounted in a bearing 85 mounted on the beam 83, and its shaft carries at its other end a bevel pinion 86, which meshes with a similar pinion 87, mounted on a shaft 88, journalled in a bearing 89. At its other end shaft 88, carries a gear wheel 90, which is driven by a pinion 91, on a cross shaft 92, which is suspended from the bracket 60, in bearings 93. The shaft 92, receives its motion through a sprocket 93, thereon, which is driven by means of a chain 94, with a sprocket wheel 95, mounted on the roller-shaft 98, upon which are mounted the bearings 99, and 100, respectively. Between the bearings 99, shafts 98, and 100, are roller shafts 105, and 106, respectively, over which the yarn is guided by means of the reciprocating finger guide 76. After leaving the roller-shaft 105, the yarn finally passes over tension rollers 107, and 108, mounted on shafts 109, and 110, respectively, which are suspended in links 112. The upper ends of the links are loosely mounted upon the ends of the shaft 98, and are adapted to be oscillated by means of a link 113, pivotally attached to a roller 114, on the outer end of shaft 98, as best seen in Fig. 11.

The tension rollers 107, and 108, are geared to each other by their meshing pinions 120, and 121, respectively. Shaft 110, is positively driven by means of a sprocket 122, thereon, which is connected through a chain 123, to a sprocket 124, on the shaft 98.

It will be seen that the yarn as it leaves the drier is guided back and forth, over the roller 106, and by means of the swinging links 112, it is simultaneously oscillated, thereby causing the yarn to be delivered in folds upon suitable trucks which may be employed to receive it. This method of stacking the dried yarn obviates any entangling thereof and allows the yarn to be readily unraveled preparatory to its final warping.

In drying warps by this method, they come out of the machine in a very much softer condition and with a better feel, and they are also very much easier to handle and not subject to the breaking and loss, as compared with the old system of drying them on metal "cans."

Having thus described our invention, we claim:

1. In a yarn drying machine, the combination of a heating chamber, and means for moving the yarn through the chamber in a series of spaced planes, and backward and forward in a continuous series in each plane.

2. In a yarn drying machine, the combination of a heating chamber, means for moving the yarn through the chamber in a series of vertical planes, and backward and forward in a continuous series in each plane, and means for guiding the yarn to dispose said planes in parallel relation.

3. In a yarn drying machine the combination of a closed chamber; means for continuously supplying dry heated air thereto; series of rollers arranged one above another at each end of the chamber; means for driving all of said rollers at uniform speed; means for guiding the yarn in a tortuous path within said chamber about all of said rollers, and guiding means cooperating with said rollers, whereby the yarn is caused to pass back and forth between said series of rollers in a single vertical plane, and is then shifted to an adjacent vertical plane, wherein in the same back and forth motion is continued.

4. In a yarn drying machine the combination of a closed chamber; means for continuously supplying dry heated air thereto; series of rollers arranged one above another at each end of the chamber; means for driving all of said rollers at uniform speed; means for guiding the yarn in a tortuous path within said chamber about all of said rollers, and intermediate supporting bars between the series of rollers, whereby the yarn as it passes from one roller to another passes over and is supported by said bars.

5. In a yarn drying machine the combination of a closed chamber; means for continuously supplying dry heated air thereto; series of rollers arranged one above another at each end of the chamber; means for driving all of said rollers at uniform speed; means for guiding the yarn in a tortuous path within said chamber about all of said rollers.
rollers; guiding means cooperating with said rollers, whereby the yarn is caused to pass back and forth between said series of rollers in a single vertical plane, and is then shifted to an adjacent vertical plane, where-in the same back and forth motion is continued, and yarn spaced combs interposed at suitable intervals within the path of the yarn around the rollers.

6. In a yarn drying device, the combination of a rectangular heating chamber; series of rollers arranged one above another at both ends thereof; means for driving all of said rollers at uniform speed; guiding means, whereby the yarn is caused to pass back and forth between said series of rollers in a single vertical plane and then shifted to an adjacent vertical plane, where the same back and forth motion is continued.

7. In a yarn drying device, the combination of a heating chamber; guide rollers in series one above the other at either end of the chamber; means whereby the yarn entering near one side thereof is guided back and forth over said rollers in the same vertical plane; and a yarn comb, whereby the yarn having completed its travel in said plane is shifted to the next adjacent vertical plane, whereby it similarly passes back and forth around said rollers in said second plane, and so on.

8. In a yarn drying device, the combination of a drying chamber; series of driving rollers situated one above the other near either end of said chamber, with means for passing the yarn continuously back and forth between said rollers, said means including a grooved free roller 55, and a yarn comb 56, whereby the yarn after having traversed said rollers in one vertical plane is led to an adjacent vertical plane.

9. In a yarn drying machine the combination of a closed chamber; means for continuously supplying dry heated air thereto; a series of rollers arranged one above another at each end of the chamber; means for driving all of said rollers at uniform speed; means for guiding the yarn in a tortuous path within said chamber about all of said rollers, and a tension device from which the yarn is led into the heating chamber at a predetermined and regulated tension.

In testimony whereof, we have hereunto signed our names at Philadelphia, Pennsylvania, this sixteenth day of December, 1911.

THOMAS ALLSOP.
WALTER W. SIBSON.

Witnesses:
Ralph M. Erwin,
L. V. Dale.

In testimony whereof, we have hereunto signed our names at Fitchburg, Massachusetts, this eighteenth day of December, 1911.

RUSSELL B. LOWE.
RALPH E. THOMSON.

Witnesses:
J. P. Fisher,
E. L. Smith.