

(No Model.)

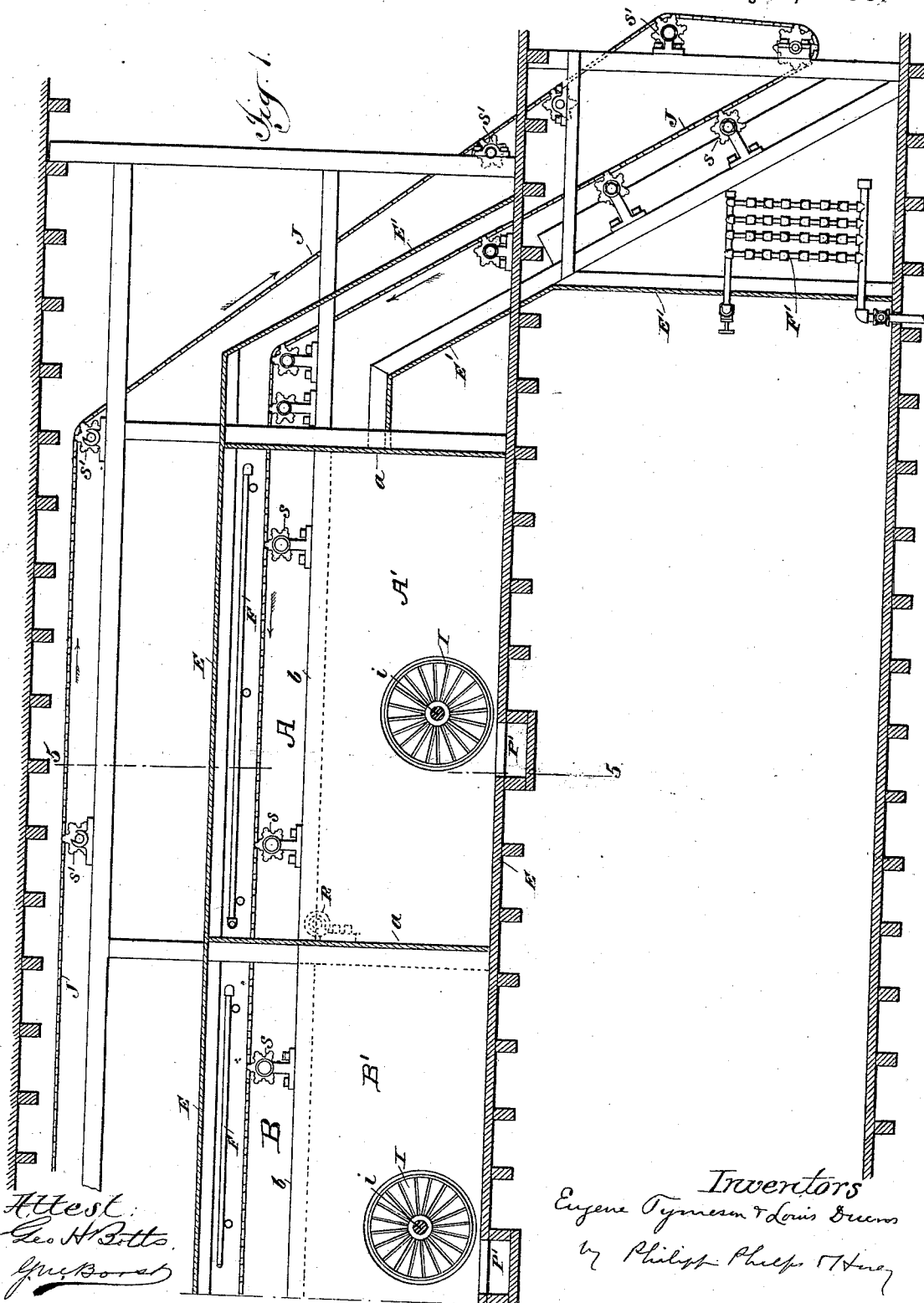
E. TYMESON & L. DUCROS.
YARN DRYING MACHINE.

4 Sheets—Sheet 1.

No. 500,634.

Patented July 4, 1893.

Fig. 1.



Attest:
Geo. H. Betts.
Notary Public

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by Philip Phelps & Henry

Attys

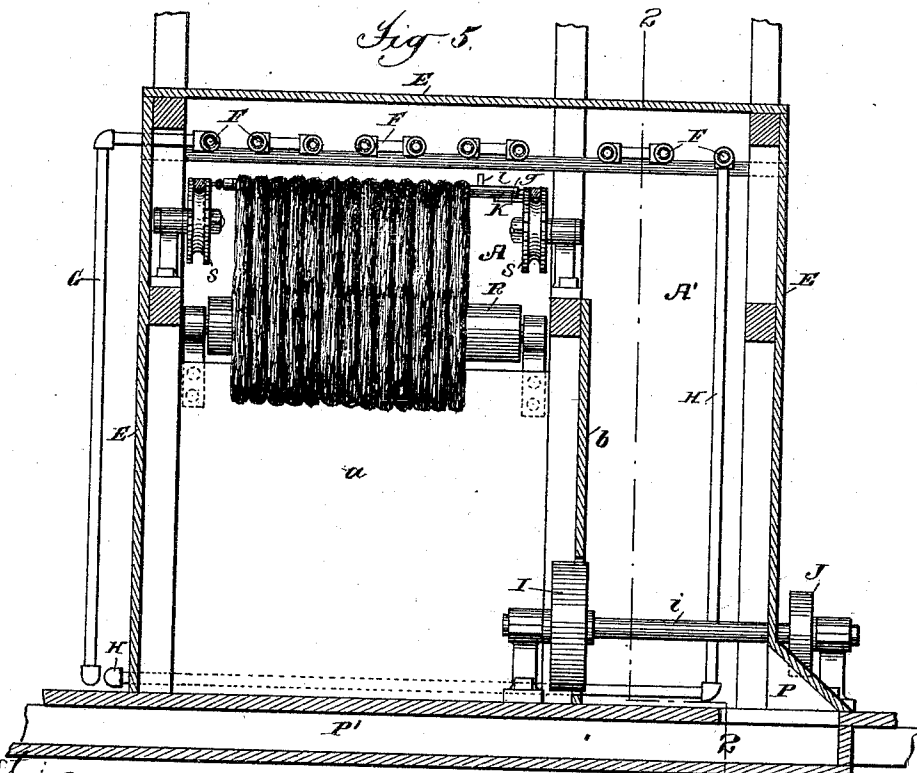
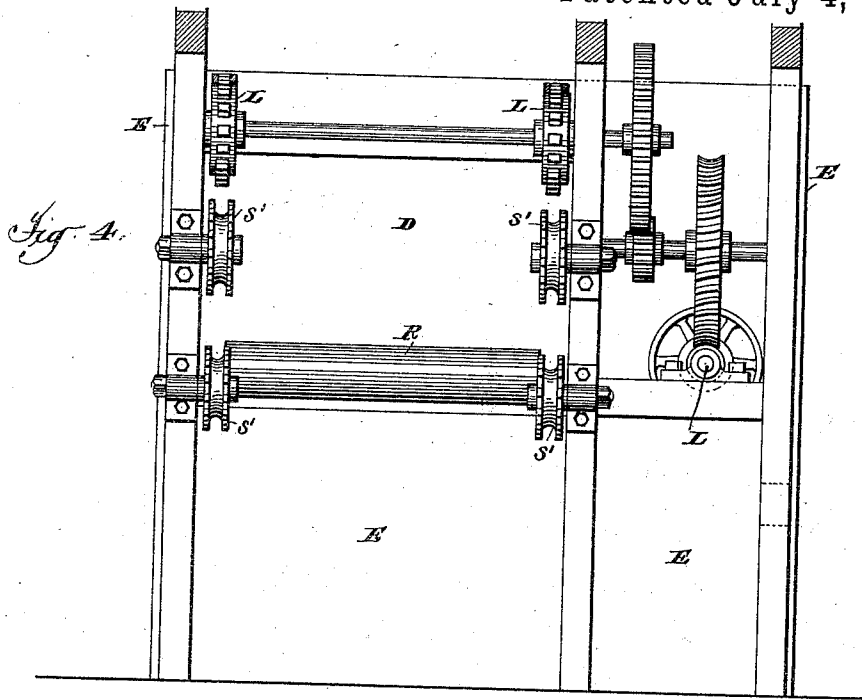
(No Model.)

4 Sheets—Sheet 3.

E. TYMESON & L. DUCROS.
YARN DRYING MACHINE.

No. 500,634.

Patented July 4, 1893.



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(No Model.)

E. TYMESON & L. DUCROS.
YARN DRYING MACHINE.

4 Sheets—Sheet 4.

No. 500,634.

Patented July 4, 1893.

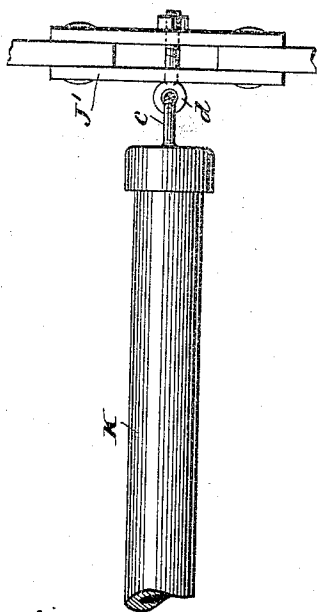


Fig. 6.

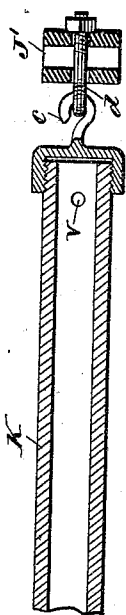


Fig. 7.

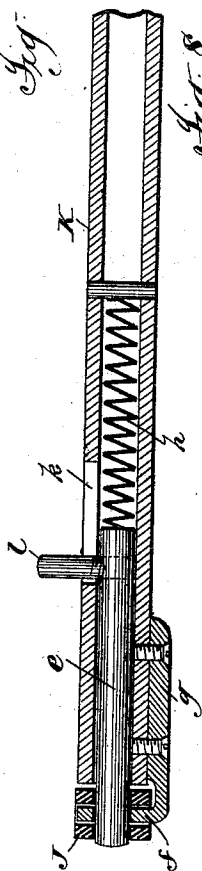
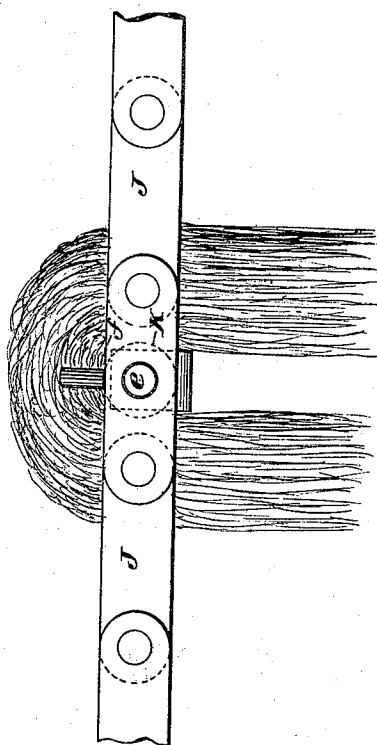


Fig. 8.



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UNITED STATES PATENT OFFICE.

EUGENE TYMESON AND LOUIS DUCROS, OF YONKERS, NEW YORK, ASSIGNORS
TO THE ALEXANDER SMITH & SONS CARPET COMPANY, OF SAME PLACE.

YARN-DRYING MACHINE.

SPECIFICATION forming part of Letters Patent No. 500,634, dated July 4, 1893.

Application filed January 30, 1891. Serial No, 379,629. (No model.)

To all whom it may concern:

Be it known that we, EUGENE TYMESON and LOUIS DUCROS, citizens of the United States, residing at Yonkers, county of Westchester, State of New York, have invented certain new and useful Improvements in Yarn-Drying Machines, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

This invention relates to improvements in apparatus for drying yarn and other materials.

It is the object of the present improvements to provide an apparatus of this character in which the operation of drying may be more thoroughly and more quickly performed than in those machines and processes which have heretofore been used for this purpose, and in which, in addition, there will be a capacity for work which will be in excess of that which such machines heretofore in use have been capable of performing.

The improvements of the present invention briefly stated consist in a machine composed of a plurality of drying chambers, a circulating chamber or chambers communicating with said drying chambers, means for circulating the heated air from said drying chambers into the circulating chamber or chambers and thence back to said drying chambers, conveying mechanism, with yarn carriers, passing through said drying chambers, and locking devices for said carriers whereby the same are rendered detachable at will without interrupting the travel of the conveying mechanism either for the purpose of removing yarn which has already been dried or for the purpose of placing undried yarn upon said carriers; and the invention further consists in certain details of construction and combinations of parts, all of which will be hereinafter more particularly described in connection with the accompanying drawings, in which—

Figure 1 is a sectional elevation of the feeding end of a machine embodying the present invention, or that end at which the yarn to be dried is introduced. Fig. 2 is a similar view of the delivery end of the machine, or that end at which the dried yarn emerges. Fig. 3 is a horizontal section on the line 3—3 of Fig. 2. Fig. 4 is an end elevation looking

toward the right of Fig. 2. Fig. 5 is a vertical section on the line 5—5 of Fig. 1. Figs. 6, 7 and 8 are detail views upon an enlarged scale of the yarn carriers and conveying mechanism.

Referring to said drawings it will be seen that the machine therein illustrated consists of a plurality of drying chambers A, B, C, D and a corresponding number of what will be hereinafter termed circulating chambers A', B', C', D' formed in a casing E, by transverse partitions *a* and a longitudinal partition *b*. The drying chambers A, B, &c., are open at each end—at the top thereof—thus establishing communication between the several chambers and forming a way for the yarn conveying mechanism hereinafter described, to provide which openings the transverse partitions *a* extend upward to within a short distance only of the top of each of these drying chambers. Within the circulating chambers A', B', &c., these partitions extend entirely to the top of said chambers, so that there is no direct communication between the circulating chambers. The longitudinal partition *b* is of a height about equal to the height of those portions of the partitions *a* within the drying chambers, which latter chambers thus communicate with their respective circulating chambers.

Each of the drying chambers A, B, &c., is suitably heated—preferably in the manner indicated in the drawings in connection with the chamber lettered D. As shown therein the chamber D is provided with a coil or coils of steam pipes F, connected to an inlet supply pipe G upon the exterior of the casing E and to an outlet pipe H also upon the exterior of the casing. The coil F is, as shown, located in the top of the drying chamber, a portion of the coil extending into and down through the circulating chamber D' and along the bottom of said chamber and the drying chamber D and there connecting with the outlet pipe H.

The heating apparatus just described is duplicated in each of the other drying chambers, although for convenience and clearness this heating apparatus has been shown in connection with the chamber D only.

The mechanism for causing the circulation

of air between the drying chambers and their respective circulating chambers will now be described in connection with the chamber D, it being understood that this mechanism is duplicated in each of these chambers. As shown in the drawings the partition *b* between the chambers D and D' is provided with a blower I located near the bottom of the partition and preferably, as shown, midway between the partitions *a* at the ends of the chambers D D'. The blower I is mounted upon one end of a shaft *i* extending through the circulating chamber D' to the exterior of the casing E, upon the other end of which is provided a pulley *j*, connected to any suitable source of power, through which the blower I is rotated. The blower I may be rotated in either direction, but preferably in a direction which will induce a current downward through the drying chamber and the coil F, into and upward through the circulating chamber D' and over the partition *b* and again through the coil F for reuse, the yarn conveying mechanism, which will now be described, being located between the coil F and the bottom of the chamber D and the hot air thus passing through its yarn immediately after leaving the coil F, when its heat is greatest.

The conveying mechanism just referred to consists of a pair of endless sprocket chains J J'—one for each side of the drying chambers—between which are suspended a number of yarn carriers K—preferably of the construction shown, which will presently be described. The chains J J' which are preferably endless, are supported in their travel through the drying chambers and upon the exterior of the casing E upon sprocket wheels *s s'* respectively, those within the drying chambers being secured to the upper edge of the longitudinal partition *b* and those upon the exterior thereof upon any suitable frame work, as shown. The chains J J' may be driven from any suitable source of power and through any suitable connections. The driving mechanism shown consists of a sprocket wheel L connected through a train of gearing, with a shaft L' and driving belt *m*.

As shown in Fig. 1 the conveying mechanism is led down to the floor below that upon which the drying chambers are located, this downwardly led portion of this mechanism forming an elevator for raising the yarn from the lower floor containing the scouring, dyeing or other apparatus in which the yarn receives the moisture of which it is to be rid in the drying chamber. With such an arrangement a casing E' will preferably be provided inclosing the elevator or downwardly led portion of the conveying mechanism and the yarn thereon, which casing will also be heated by a coil or coils of steam pipes F', as shown in Fig. 1, and in which the drying of the yarn is commenced. This arrangement of the chambers and conveying mechanism is not essential and any other may be adopted.

The direction of movement of the convey-

ing mechanism is indicated by the arrow in Fig. 1.

The operation of the apparatus thus far described is as follows:—The conveying mechanism is first set in motion—with a speed slow enough to permit a sufficient exposure of the yarn with which it is laden to the hot air within the drying chambers to thoroughly dry the same, and as a yarn carrier reaches the attendant at the feeding end of the machine he places thereon the proper quantity of yarn which is then carried by the conveying mechanism upward through the casing E' and then through the drying chambers, beginning with the chamber A, in its passage through which it is thoroughly and evenly dried. As a carrier emerges at the delivery end of the machine the attendant stationed at that end will remove the dried yarn therefrom, the carrier being returned then to the feeding end for a new supply of yarn to be dried.

During the passage of the conveying mechanism and its yarn through the drying chambers the air therein is constantly circulating, the air which has become more or less damp by its contact with the yarn being withdrawn from the yarn and circulated through the chambers A' B', &c., and before again coming into contact with the yarn it is passed through the coil F and by it thoroughly re-heated. This circulation of air is produced by the blowers I which induce a downward current through the chambers A B, &c., forcing the air from these chambers outward through the partition *b* into the circulating chambers, whence it passes upward over the top of the partition *b*, through the coil F, and downward again into contact with the yarn. In this way the air about the yarn is kept highly heated and the operation of drying thus quickly and thoroughly performed.

As before remarked by reversing the direction of rotation of the blowers the circulation of the air may be reversed, that is downward through the circulating chambers into the drying chambers, thence upward through the yarn and again into the circulating chambers, and it is to be understood that such a change is included in the present invention.

The yarn carriers, while they may be of any suitable construction, will preferably be of the construction shown and provided with the locking devices of the present invention, which will now be described.

Referring now particularly to Figs. 6 to 8 it will be seen that each yarn carrier is made of rigid material and has a swinging connection at one end to one of the chains of the conveying mechanism and is provided at its other end with mechanism for engaging and locking the carrier to the opposite chain of the conveying mechanism. The swinging connection of the one end of the carrier is secured by the provision in that end of a hook *c* engaging an eye *d* in the chain of the conveying mechanism with which that end is to

connect. The locking mechanism for the other end of the carrier consists of a bolt *e* recessed in the carrier and in its projected position entering a socket *f* in a bracket *g* secured to the carrier. When the carrier is to be locked to the chain *J* the bracket *g* is passed upward between the links of the chain and the bolt projected through openings in the link and through the socket *f* as best shown in Fig. 7. The bolt *e* is normally projected into its locking position by a spring *h* within the carrier and is provided with a pin *l* projecting through the carrier through a longitudinal slot *k* therein, by moving which pin inwardly on the carrier the bolt *e* is withdrawn from the socket *f* and this end of the carrier unlocked from the chain *J* and the carrier thus permitted to swing upon the opposite chain *J'*. The bolt *e* instead of being spring-pressed into locking position may be positively moved by hand to that position, the spring *h* being dispensed with. From the foregoing it will be seen that as each carrier arrives at the feeding or delivery end of the machine the attendants there stationed are not under the necessity of moving the carrier from the conveying mechanism to supply or remove the yarn but need only withdraw the bolt *e*, thereby unlocking one end of the carrier, which can then be swung outward from the chain to receive a supply of yarn or to permit the removal of the yarn which has passed through the drying chambers. To again secure the freed end of the carrier all that is necessary to be done is to hold the bolt *e* in its retracted position and insert the bracket *g* between the links of the chain and then release the bolt when it will be projected by its spring *h* into the openings in the links and the socket *f* in the bracket. This locking and unlocking can be accomplished very quickly—sufficiently so as not to interfere with the travel of the chains.

The carriers *K* as before stated are made of rigid material, preferably metal, and are of tubular form and provided at their ends, as shown, with openings *v* through which heated air from the drying chambers can pass to the interior of the carriers to aid in the drying of those portions of the yarn hung therein which lie directly upon the surface of the carriers. This construction of carriers has been found most advantageous because of the assistance rendered by the hot air within the carrier in the drying of this portion of the yarn which is ordinarily the most difficult to dry properly.

As before remarked the drying and circulating chambers at the feeding end of the machine (*A B* and *A' B'* respectively) differ somewhat in construction from those at the delivery end, which difference will now be described. The yarn upon its entrance into the machine is, of course, in a very moist condition and as a result the air coming in contact with this yarn becomes so thoroughly impregnated with moisture as to become very

quickly unfit for use; and as the process of circulation is too rapid to insure a redrying and reheating of this damp air before reuse, it becomes necessary to provide a means whereby the drying chambers may be rid of this useless air. In the case of the chambers referred to this is accomplished in the following manner: Upon reference to Fig. 5 it will be seen that each circulating chamber *A' B'* is provided with a port *P* in its bottom communicating with a discharge passage *P'* passing beneath the drying chamber. As before described the rotation of the blower *I* draws the air about the yarn downward through the drying chamber and forces it thence into and upward in the circulating chamber. As the air is thus forced into the latter chamber the dry or comparatively dry air naturally rises more quickly than the heavy, damp air therein and upon reaching the top thereof re-enters the drying chamber for reuse, the heavy damp air escaping from the circulating chamber into the discharge passage *P'* and passing thence into the open air or to some other suitable point. In this way the drying chamber is supplied with dry air only, the air which has become damp by one contact with the yarn, (which if again brought into contact with the yarn would be useless and would only deter the drying operation,) being drawn off as described and prevented from such second contact.

In addition to the mechanism described in connection with the drying chambers each of said chambers is provided with a roller *R* arranged transversely thereto and mounted in bearings in the partition *a* at the end of each of said chambers at which the yarn makes its exit, over which the yarn passes on leaving the chambers and by which the yarn is prevented from making contact with the edge of the partitions *a*, which, if such contact were permitted might tear or otherwise damage or disarrange the yarn.

It is to be understood that the present invention is not limited to the particular constructions of drying or circulating chambers, conveying mechanism, or current producing mechanism illustrated or described. These have been illustrated and described in their preferable forms, but it is obvious that many modifications may be made in their construction or arrangement. For example, the drying and circulating chambers need not, as before remarked, be arranged as shown in Fig. 1, with the conveying mechanism led downward to the floor beneath the drying chambers and forming an elevator for raising the yarn from said lower floor; the conveying mechanism need not be endless, but may consist of chains or equivalents wound upon drums at each end of the machine; the current producing mechanism may consist of pumps or equivalents or the circulating chamber *A' B'* may be each replaced by a pipe or pipes. All such changes or modifications it is to be understood are included in the present

invention. It will also be noticed that in the foregoing description and in the following claims we designate the material dried in the drying machine of the present invention as "yarn." This term is, however, used for convenience merely and is intended to embrace all other similar materials, such as cloth, cotton, thread, &c., and it is also to be understood, therefore, that the application of this drying machine to the drying of such other materials is included in the present invention.

What is claimed is—

1. The combination with a plurality of drying chambers arranged horizontally end to end and communicating with each other at their upper portions, of heating apparatus arranged along the upper portions of said chambers, conveying mechanism passing through the upper portions of said chambers, yarn carriers connected to said conveying mechanism and extending beneath said heating apparatus, current producing mechanism beneath said carriers for producing a downward current of heated air through the material suspended thereon, and a circulating chamber for each of said drying chambers communicating with the upper and lower portions thereof, substantially as described.

2. The combination with a plurality of drying chambers arranged horizontally end to end and communicating with each other at their upper portions, of heating apparatus arranged along the upper portions of said chambers, conveying mechanism passing through the upper portions of said chambers, yarn carriers connected to said conveying mechanism and extending beneath said heating apparatus, current producing mechanism beneath said carriers for producing a downward current of heated air through the material suspended thereon, a circulating chamber for each of said drying chambers communicating with the upper and lower portions thereof, and exhaust ports in the bases of said circulating chambers for the escape therefrom of the more humid and heavier portions of the air admitted thereto, substantially as described.

3. The combination with a plurality of drying chambers arranged horizontally end to end and communicating with each other at their upper portions, of heating apparatus arranged along the upper portions of said chambers, conveying mechanism passing through the upper portions of said chambers, yarn carriers connected to said conveying mechanism and extending beneath said heating apparatus, current producing mechanism beneath said carriers for producing a downward current of heated air through the material suspended thereon, a circulating chamber for each of said drying chambers communicating with the upper and lower portions thereof, and heating apparatus in said circulating chambers for re-heating the air circulating through the same before its re-entry to the drying chambers, substantially as described.

4. The combination with a plurality of drying chambers arranged horizontally end to end and communicating with each other at their upper portions, of heating apparatus arranged along the upper portions of said chambers, conveying mechanism passing through the upper portions of said chambers, yarn carriers connected to said conveying mechanism and extending beneath said heating apparatus, current producing mechanism beneath said carriers for producing a downward current of heated air through the material suspended thereon, a circulating chamber for each of said drying chambers communicating with the upper and lower portions thereof, heating apparatus in said circulating chambers for re-heating the air circulating through the same before its re-entry to the drying chambers, and exhaust ports in the bases of said circulating chambers for the escape therefrom of the more humid and heavier portions of the air admitted thereto, substantially as described.

5. The combination with a plurality of drying chambers arranged horizontally end to end and communicating with each other at their upper portions, of heating apparatus arranged along the upper portions of said chambers, conveying mechanism passing through the upper portions of said chambers, tubular metallic yarn carriers connected to said conveying mechanism and extending across said chambers, each of said carriers being provided with openings for the admission of heated air from said chambers to its interior, and current producing mechanism beneath said carriers for producing a downward current of heated air through the material suspended thereon, substantially as described.

6. The combination with a plurality of drying chambers arranged horizontally end to end and communicating with each other at their upper portions, of heating apparatus arranged along the upper portions of said chambers, conveying mechanism passing through the upper portions of said chambers, tubular metallic yarn carriers connected to said conveying mechanism and extending across said chambers, each of said carriers being provided with openings for the admission of heated air from said chambers to its interior, current producing mechanism beneath said carriers for producing a downward current of heated air through the material suspended thereon, and a circulating chamber for each of said drying chambers communicating with the upper and lower portions thereof, substantially as described.

7. The combination with a drying chamber or chambers, of the sprocket chains J, J' traveling along opposite sides thereof and yarn carriers suspended between said chains, each of said carriers having a hook and eye connection at one end to one chain and a detachable connection at its other end to the other of said chains, substantially as described.

8. The combination with a drying chamber

or chambers, of the sprocket chains J, J' traveling along opposite sides thereof and yarn carriers suspended between said chains, each of said carriers having a hook and eye connection at one end to one chain and a locking device at its other end for attaching it to the other of said chains, substantially as described.

9. The combination of chambers A, B, &c., arranged horizontally end to end and communicating with each other at their upper portions, circulating chambers A' B' &c., communicating with the upper and lower portions of chambers A, B, &c., respectively, coils F in the upper portions of chambers A, B, &c., blowers I between chambers A, B, &c., and A' B' &c., sprocket chains J J' passing along opposite sides of the upper portions of chambers A, B and outside said chambers, carriers suspended between said chains and sprocket wheels *s* and *s'* within and without said chambers for supporting and guiding said chains, substantially as described.

10. The combination of chambers A, B, &c., arranged horizontally end to end and communicating with each other at their upper portions, circulating chambers A' B' &c. communicating with the upper and lower portions of chambers A, B, &c., respectively, coils F in the upper portions of chambers A, B, &c. blowers I between chambers A, B, &c., and A' B' &c., sprocket chains J J' passing along opposite sides of the upper portions of chambers A B and outside said chambers, carriers suspended between said chains, each of said carriers being detachably secured at one end to one of said chains and having a swinging connection at its other end to the other of said chains, and sprocket wheels *s* and *s'* within and without said chambers for supporting and guiding said chains, substantially as described.

11. The combination of chambers A, B &c. arranged horizontally end to end and communicating with each other at their upper portions, casing E' communicating with chamber A and extending downwardly therefrom, circulating chambers A' B' &c. communicating with the upper and lower portions of chambers A B &c. respectively, coils F in the upper portions of chambers A, B, &c., coils F' in the casing E', blowers I between chambers A B &c. and A' B' &c. sprocket chains J J' passing along opposite sides of the upper portions of chambers A, B &c. and the casing E' and outside said chambers and casing, carriers suspended between said chains, and sprocket wheels *s* and *s'* within and without said chambers and casing for supporting and guiding said chains, substantially as described.

12. The combination of chambers A, B &c. arranged horizontally end to end and communicating with each other at their upper portions, circulating chambers A' B' &c. commu-

nicating with the upper and lower portions of chambers A B &c., respectively, coils F in the upper portions of chambers A, B, &c., blowers I between chambers A, B &c. and A' B' &c., discharge ports P in the bases of chambers A', B', &c. sprocket chains J J' passing along opposite sides of the upper portions of chambers A, B &c. and outside said chambers, carriers suspended between said chains, and sprocket wheels *s* and *s'* within and without said chambers for supporting and guiding said chains, substantially as described.

13. The combination with a conveying mechanism traveling along opposite sides of a chamber, of a carrier having a swinging connection to one side of said conveying mechanism and provided with a locking device normally spring pressed into position for locking the carrier to the opposite side of the conveying mechanism, substantially as described.

14. The combination with the chains J J', of the carrier K, the sliding bolt *e* in one end thereof engaging the chain J, the bracket *f* connected to the carrier and passing between the links of said chain, and the socket *g* in said bracket registering with the bolt *e*, substantially as described.

15. The combination with the chains J J', of the carrier K, the sliding bolt *e* in one end thereof engaging the chain J, the bracket *f* connected to the carrier and passing between the links of said chain, the socket *g* in said bracket registering with the bolt *e*, and the spring *h* for normally projecting the bolt *e* into locking position, substantially as described.

16. The combination with the chains J J', of the carrier K, the sliding bolt *e* in one end thereof engaging the chain J, the bracket *f* connected to the carrier and passing between the links of said chain, the socket *g* in said bracket registering with the bolt *e*, the spring *h* for normally projecting the bolt *e* into locking position, and the pin *l* moving in the slot *k* in the carrier for retracting the bolt from its locking position, substantially as described.

17. The combination with a conveying mechanism traveling along opposite sides of a heated drying chamber, of a tubular metallic yarn carrier suspended between the opposite sides of said conveying mechanism, and provided with an opening or openings for the admission of heated air from the drying chamber through which it passes, substantially as described.

In testimony whereof we have hereunto set our hands in the presence of two subscribing witnesses.

EUGENE TYMESON.
LOUIS DUCROS.

Witnesses:

HAROLD BROWN,
CHAS. E. POWELL.