No. 877,938. PATENTED FEB. 4, 1908.

A. N. MARR.

APPARATUS FOR DRYING FABRICS OR FIBROUS MATERIAL.

APPLICATION FILED SEPT. 6, 1906.

9 SHEETS—SHEET 1.

Fig. 2.

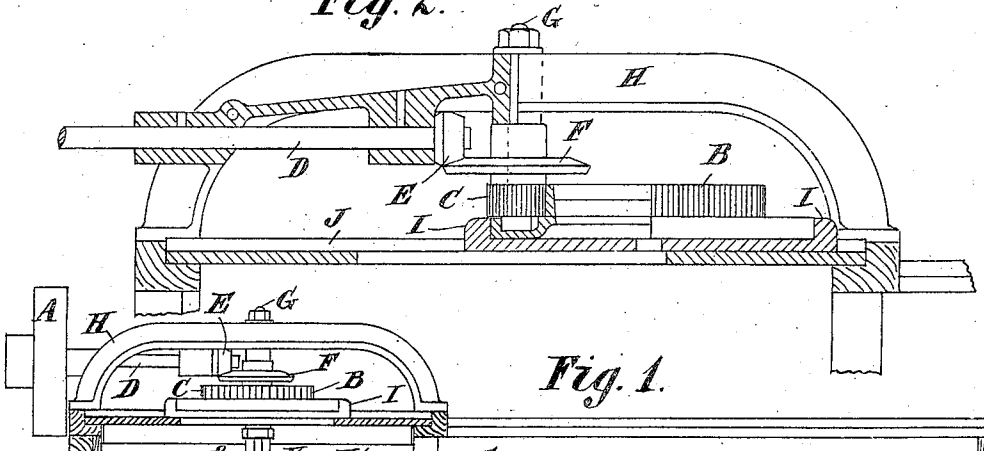
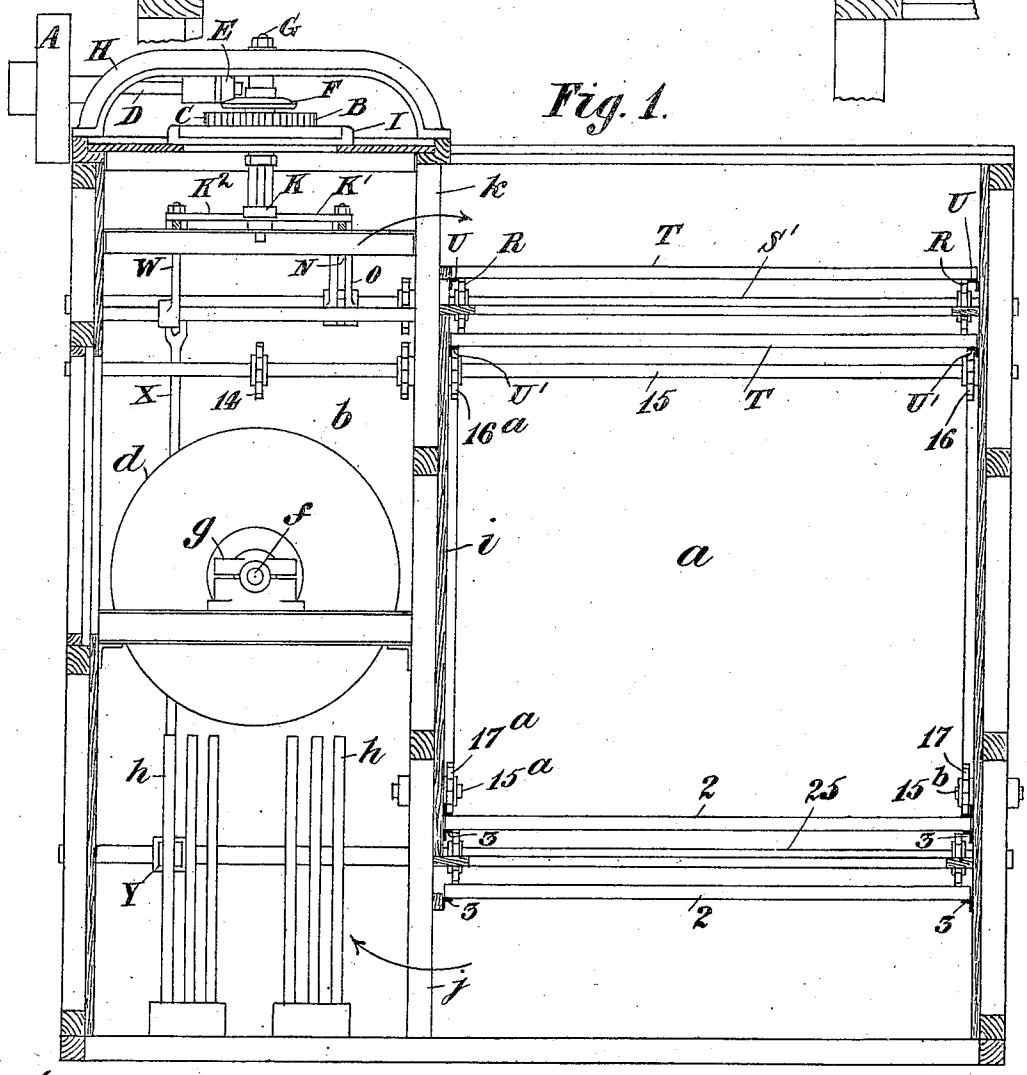


Fig. 1.



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No. 877,938. PATENTED FEB. 4, 1908.

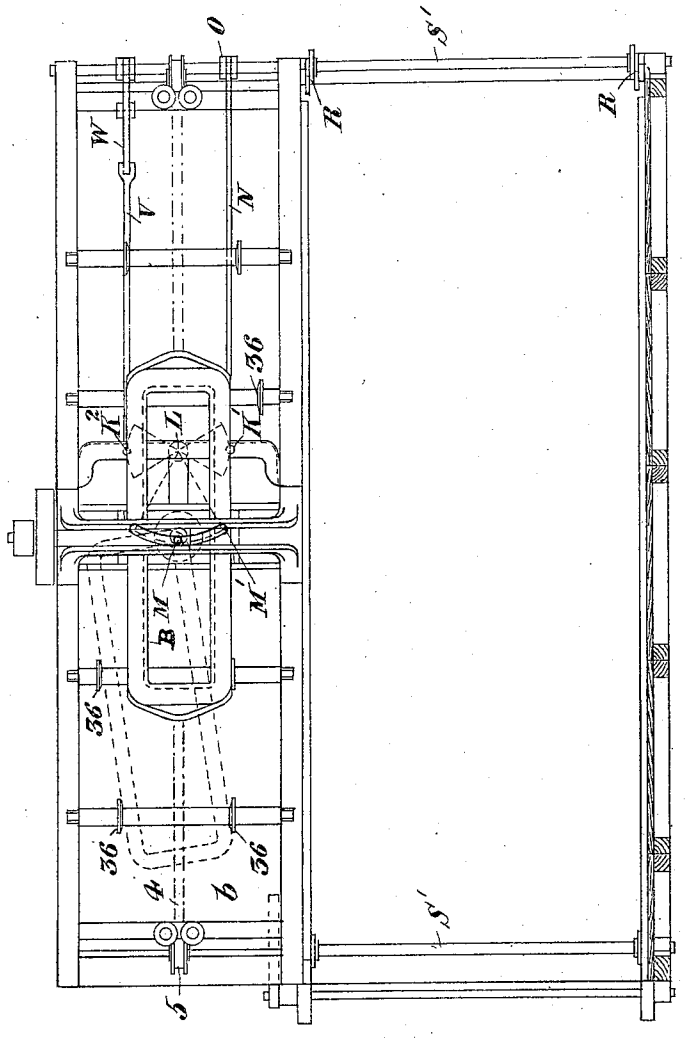
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9 SHEETS—SHEET 2.

Fig. 3.



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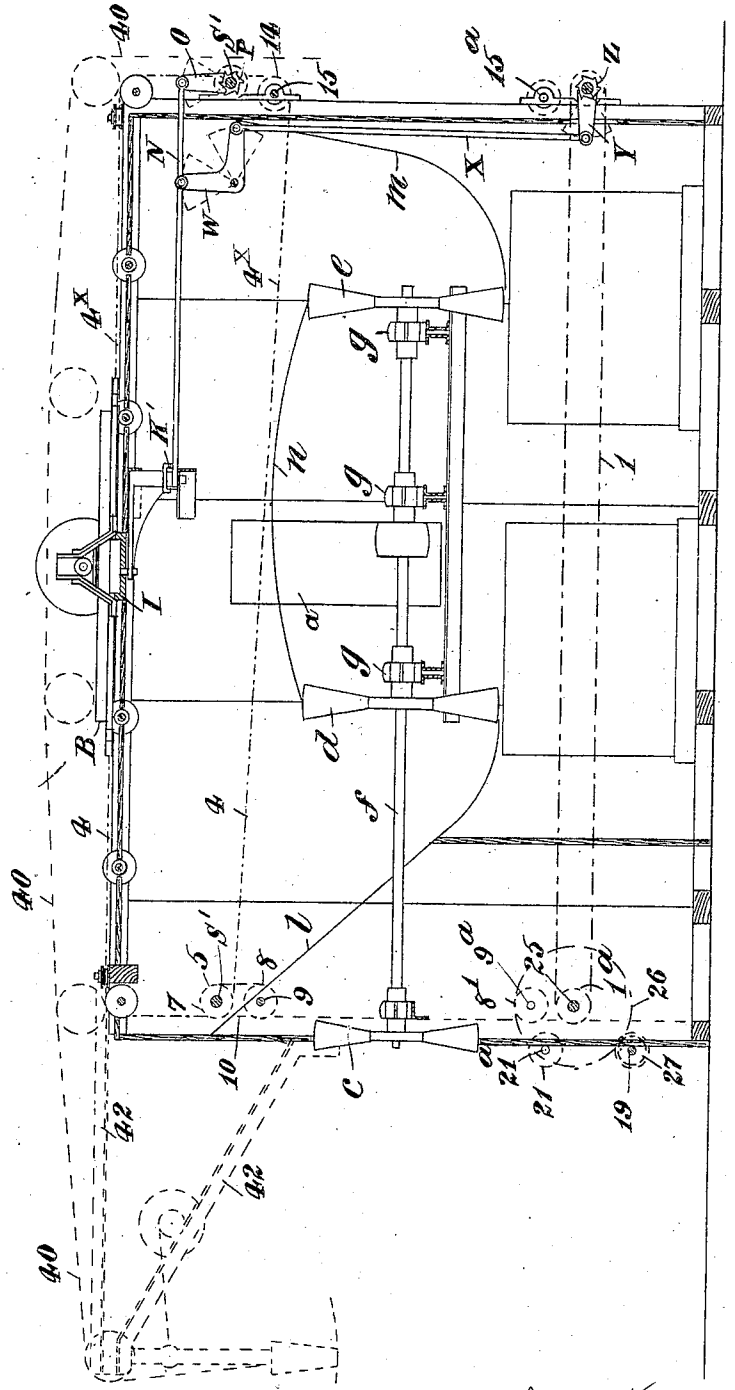
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9 SHEETS—SHEET 3.

Fig. 4.



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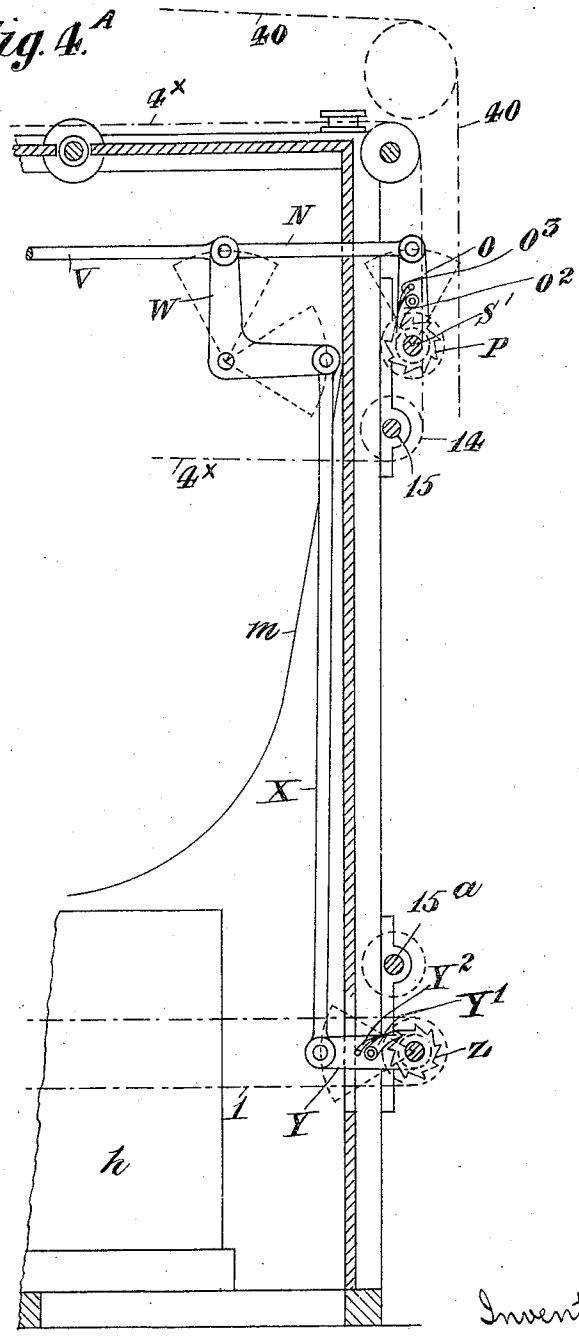
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APPARATUS FOR DRYING FABRICS OR FIBROUS MATERIAL.

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Fig. 4.A



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No. 877,938. PATENTED FEB. 4, 1908.

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APPARATUS FOR DRYING FABRICS OR FIBROUS MATERIAL.

APPLICATION FILED SEPT. 6, 1906.

9 SHEETS—SHEET 5.

Fig. 5.

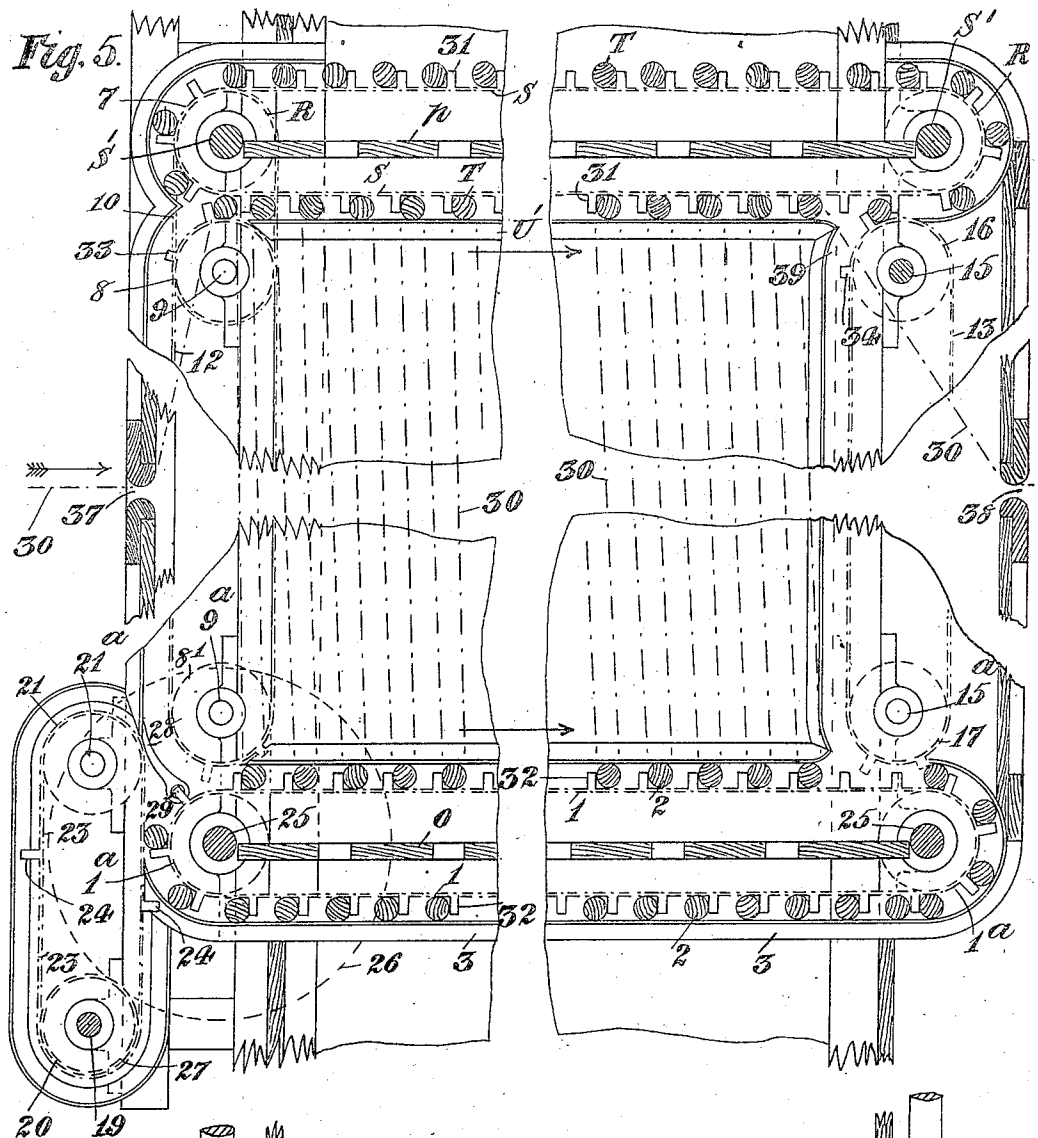
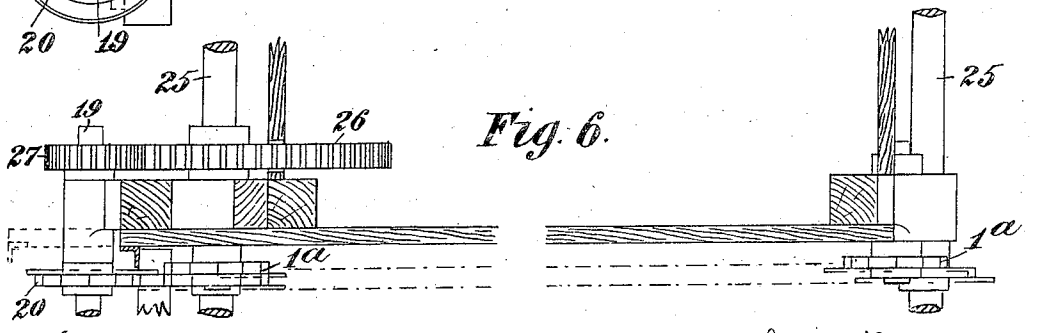


Fig. 6.



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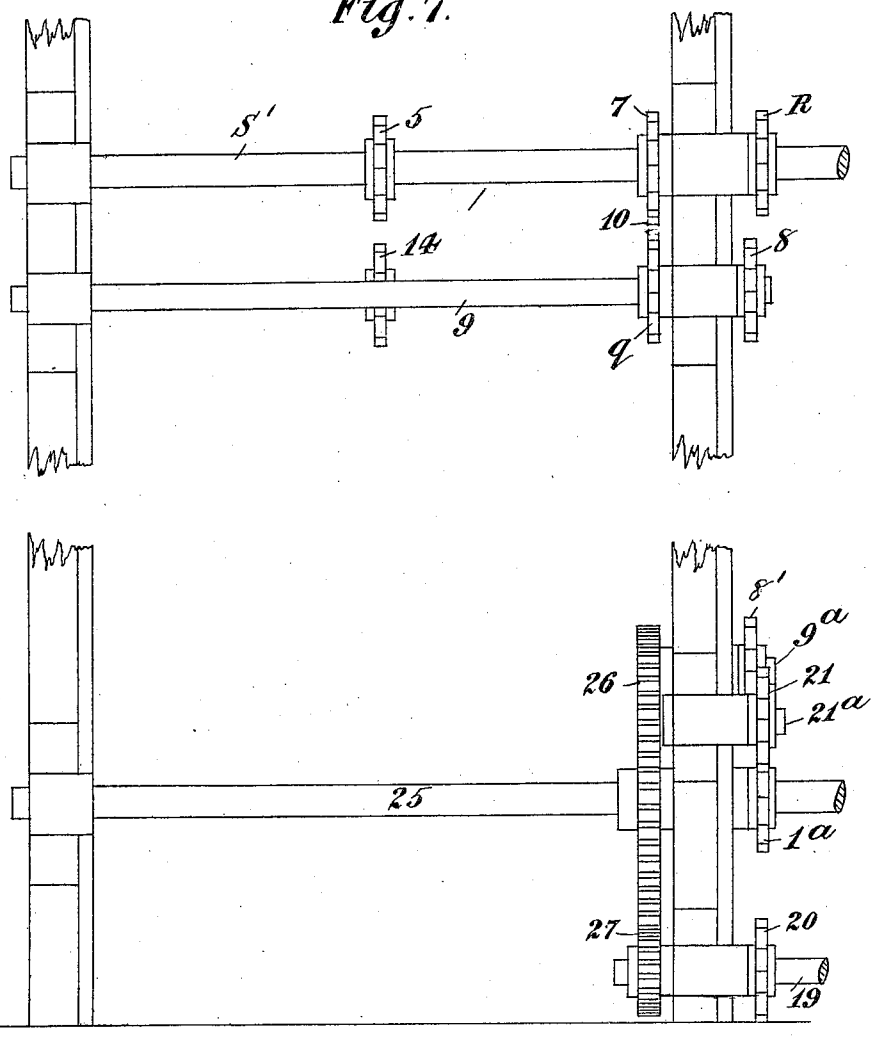
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APPARATUS FOR DRYING FABRICS OR FIBROUS MATERIAL.

APPLICATION FILED SEPT. 6, 1906.

9 SHEETS—SHEET 6.

Fig. 7.



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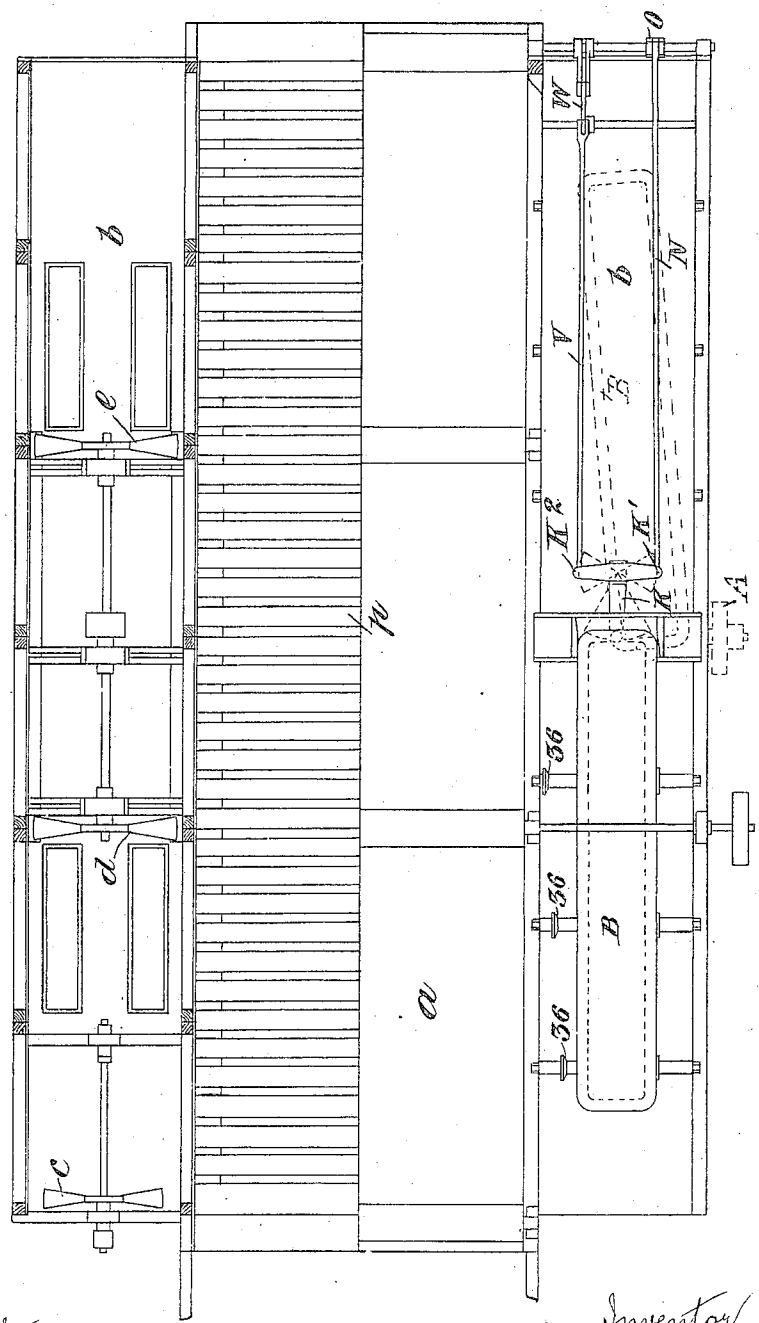
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9 SHEETS—SHEET 7.

Fig. 8.



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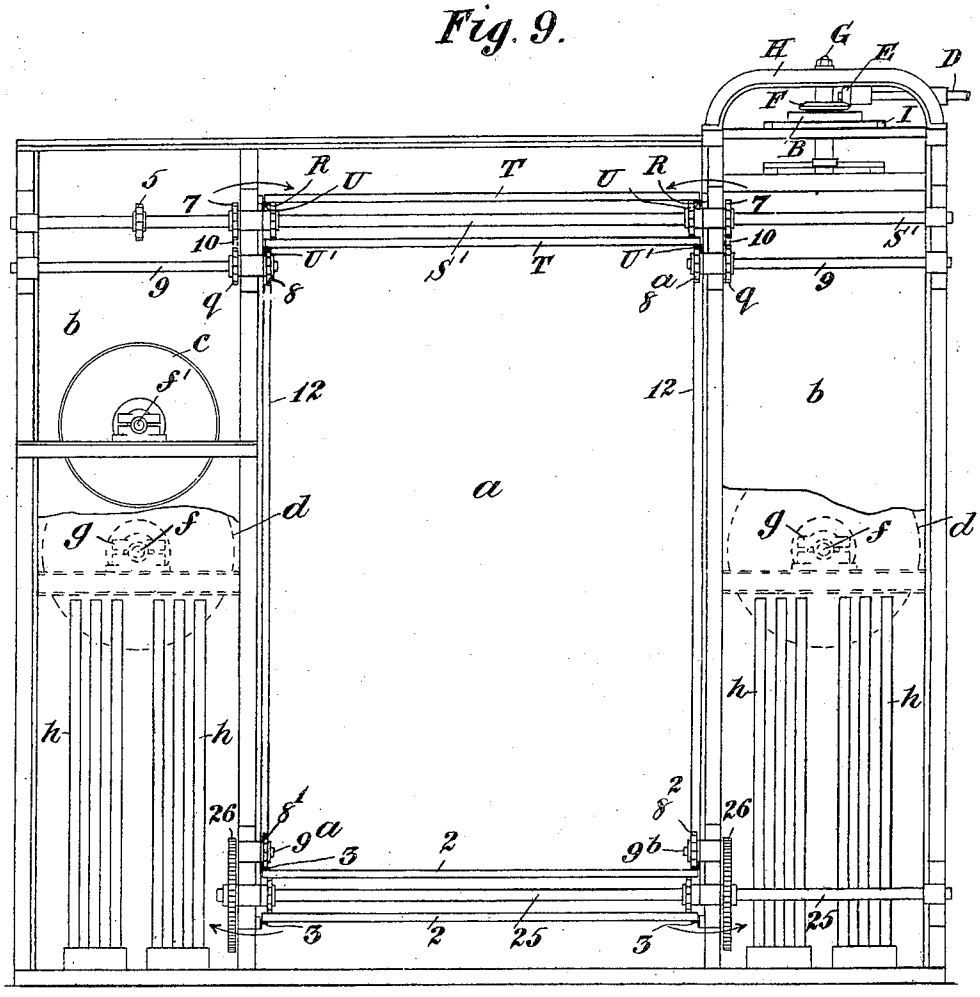
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APPARATUS FOR DRYING FABRICS OR FIBROUS MATERIAL.

APPLICATION FILED SEPT. 6, 1906.

9 SHEETS—SHEET 8.

Fig. 9.



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APPARATUS FOR DRYING FABRICS OR FIBROUS MATERIAL.

APPLICATION FILED SEPT. 6, 1906.

9 SHEETS—SHEET 9.

Fig. 10

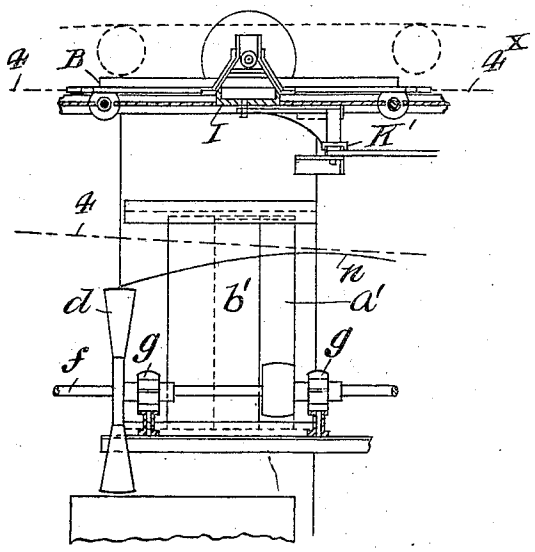


Fig. 11

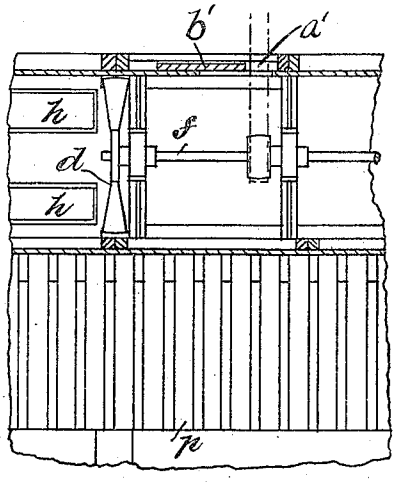
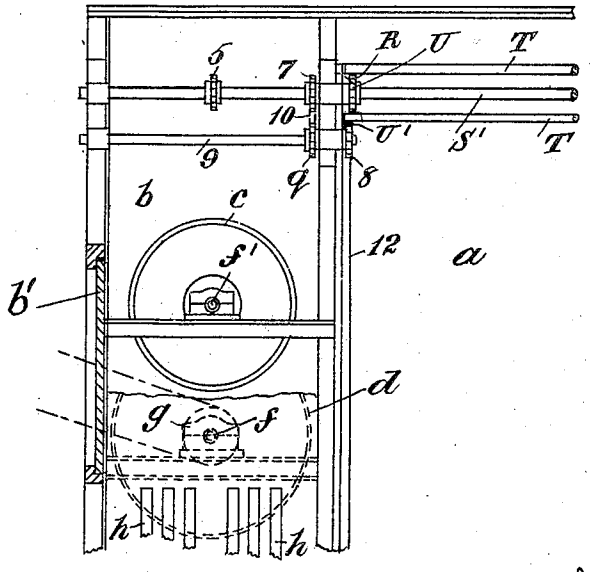


Fig. 12



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APPARATUS FOR DRYING FABRICS OR FIBROUS MATERIAL.

No. 877,938. Specification of Letters Patent. Patented Feb. 4, 1908.

Application filed September 6, 1906. Serial No. 333,565.

To all whom it may concern:

Be it known that I, ARTHUR NORRISON MARR, a subject of the King of Great Britain and Ireland, residing at "Rangiora" Thorner, near Leeds, in the county of York and Kingdom of England, have invented new and useful Improvements in Apparatus for Drying Fabrics or Fibrous Material, of which the following is a specification.

This invention has reference to improvements in machinery or apparatus employed for drying warps of yarn or other fibrous material or products which may, or may not, be arranged either in continuous lengths in the form of festoons or in hanks, or otherwise.

The apparatus is also applicable for drying woven or felted fabrics whether arranged in continuous lengths in the form of loops or festoons, or otherwise.

The above mentioned yarn or woven fibrous or felted fabrics are hereinafter termed and included in the term "material."

This apparatus or machine is intended to receive the moist material which has been folded or wound in any usual and ordinary way, to automatically arrange and pass it through the machine in separate hanks or loops, or in festoons formed out of one or more continuous lengths and while so arranged to maintain a regular movement or travel of it through the machine and to subject it there continually to the action of an abundant current of heated air, thereby providing a more effective, expeditious, and economical means of forming such festoons, and of drying material in that form than has been previously obtained, requiring less space, time, and labor.

The mechanism for carrying this invention into practice is illustrated in the accompanying drawings, in which:—

Figure 1. is a transverse section of the feed end of a single machine looking in the direction of the travel of the material. Fig. 2. is an enlarged part sectional elevation of the mangle motion. Fig. 3. is a plan looking at the top of the rack mechanism arranged over the fan chamber, in which the rack is shown in its central and also in its extreme position, and also a part sectional plan of the drying chamber of a single machine. Fig. 4. a longitudinal section of a single machine through the fan chamber and with the folding apparatus shown in dotted lines. Fig. 4^A is an enlarged part sectional elevation of the delivery end of the machine shown in Fig. 4. Fig. 5. an enlarged part longitudinal and sectional elevation of a double machine showing portions of the upper and lower and also of the feed and delivery ends of the drying chamber. Fig. 6. an enlarged part sectional plan of same. Fig. 7. is an enlarged part elevation of the feed end of the machine. Fig. 8. is a part sectional plan of the top of one of the fan chambers of a double machine and half of the drying space with bracket removed, also a half plan of drying space and a fan chamber with the cover removed. Fig. 9. an elevation of the feed end of a double machine with the greater portion of the boarding and also the lifting gear for the lower tier of poles removed. Figs. 10, 11 and 12, are fragmentary views, corresponding to Figs. 4, 8 and 9, respectively, and showing a slightly different construction.

Like parts in all the views are marked with similar letters of reference.

The fan chambers, fans, heating apparatus, and the means for circulating the warm air through the drying chamber may be of a similar construction and operate in a similar manner to those described in my U. S. application, filed 20th July 1906, Serial No. 327,040. The said parts are therefore only briefly referred to in this specification and are marked with small letters of reference in order to distinguish them from the other parts of this invention used in combination therewith, which are marked with capital letters and with numerals.

The machine consists of rectangular framework closed at the top and bottom, and made of any suitable material such as wood, or a combination of wood and iron; and it is preferably—but not necessarily so—of three contiguous chambers or compartments all placed parallel to the movement of the material, which passes longitudinally through the middle or larger compartment—when three compartments are employed—hereinafter referred to as the "drying chamber *a*."

The two lateral compartments, when such are employed, are alike intended to each accommodate a number of fans, say, three fans *c*, *d*, *e*, mounted upon a shaft *f* carried in bearings *g*, and the heating apparatus or surface *h*. At Figs. 8 and 9 the fan *c* is shown mounted on a separate shaft f^1.

In the drawings hereto annexed at Figs. 1 to 4 inclusive, only one lateral chamber *b* is shown, and it communicates with the drying chamber *a*. The said lateral compartment is hereinafter referred to as the "fan cham-

ber *b*." But at Figs. 5, 6, 8 and 9 two fan chambers are shown.

The drying chamber *a* has openings at both ends for the admission and exit of the material, while the fan chamber *b* is practically but not absolutely closed at its ends.

In the partition *i* (which separates the drying chamber *a* from the fan chamber *b*, are provided openings *j* of equal depth extending from the floor upwards through which moist air is drawn by the fans, also other and similar openings *k* extending from the ceiling downwards through which the same air after passing over the heating apparatus or surface *h* is blown by the fans again into the drying chamber *a*. Some of the air that is thus circulated repeatedly through the drying chamber *a* may escape through openings including those by which the material enters or leaves it, and one or more additional fans, such as the fan *c* in Fig. 8, may be used for the special purpose of exhausting the moist air from the drying chamber *a*. To replace the air so escaping or being removed, inlet openings *a'* are provided, adjustable at pleasure as to area, say, for example, at the points where the driving bands of the fans pass through the outer partition of the fan chamber *b*. These last named openings may, if desired, be provided with sliding doors, *b'*, as clearly shown in Figs. 10, 11 and 12, by means of which the area of the openings may be adjusted at pleasure.

l, *n*, *m*, are air direction plates.

The floors *o*, *p*, (Fig. 5) of boards with slits or intervals between them for distributing the air current equally over the material being dried are fixed across the drying chamber *a*. One of them may be arranged immediately above the line of openings near the floor, and the other, say, immediately below the line of openings near the ceiling. The space between these two distributing floors is hereinafter referred to as the "drying space."

All the above described parts are similar in construction and operate in a similar manner to those described in the said prior specification.

At each end of each of the two floors *o*, *p*, and at the ends of the drying chamber *a* are carried in suitable bearings a number of horizontal revolving shafts, namely, four through shafts in all, marked respectively S^1, S^1, and 25, 25. Each shaft is fitted with a number of sprocket wheels. The said wheels are respectively marked R, R, and 1^a, 1^a. As shown at Figs. 1 and 5 they are arranged to work in pairs, there being thus eight wheels employed. The sprocket wheels R at the feed end of the machine are mounted loosely on the shaft S^1. The said sprocket wheels are connected together by four horizontal endless chains marked S and 1, which pass through the drying space *a* in the same direction close to its sides. Two of the chains S are thus near the top of the space and they propel along with them a number of rods or poles T suitably supported at their ends upon angle iron paths U, U^1 or races, fixed to the framework of the machine. The other two chains 1 are near the bottom of the drying space and they also propel a like number of rods or poles 2 in a like manner.

The material to be dried is automatically passed over each rod of the upper tiers of rods or poles T in succession, and alternating with them, under each of the rods or poles 2 in the lower tier. Loops or festoons 30 are thus formed by the action of the machine itself—from a continuous length of material—which during its working occupy or are distributed throughout the whole of the drying space. This forming of the material into loops or festoons is effected and continually maintained by an arrangement of which the leading feature is the employment of two pairs of additional vertical endless chains 12 and 13 arranged respectively one pair at the feed end and one pair at the rear or delivery end of the drying chamber *a*. The two pairs of sprocket wheels,—marked 8 and 8^a and 8^1 and 8^2,—at the feed end, and the two pairs of sprocket wheels marked 16 and 16^a and 17 and 17^a at the delivery end, and which are mounted upon seven shafts or spindles marked 9, 9, 9^a, 9^b, at the feed end, 15 15^a and 15^b at the delivery end, are similar to and are placed near to the four pairs of sprocket wheels used for carrying the four above mentioned horizontal chains S and 1. Two other short vertical endless chains 23,—working over sprocket wheels 20, 21, mounted upon shafts 19 and 21^a,—provided at the feed end of the machine are also employed for assisting the passage of every rod or pole 2 while empty from the lower to the upper line of rods above mentioned. These last named short vertical chains 23 are actuated from the nearest revolving shaft of the lower horizontal chains, or from any other convenient source, say, by spur gearing.

On each of the endless chains used there are provided a suitable number of projections, marked respectively 31, 32, 33, 34, and 24, for propelling the rods or poles along the path prescribed for them.

Suitable gearing, such as for example, say, the mangle gear or device, or other like or equivalent device, is employed for maintaining a succession or a continuous cycle of intermittent movements of the endless chains and therefore of the rods. The mangle device consists of an oblong rack B with teeth on its outer perimeter into which gears a pinion C driven from pulley A through shaft D, bevel pinion E, and bevel wheel F. The rack B during its movement is made to work

upon rollers 36. The upper and the lower horizontal lines of rods are moved alternately and at equal and suitable intervals through a short distance, carrying forward with them the whole of the material being dried, by sliding the rods on which it is stretched along suitable races or ledges fixed to the sides of the drying chamber.

Immediately after each alternate movement of the upper or the lower pairs of chains S and 1 with its line of rods T and 2, the gearing employed imparts, as will be presently more fully described, a comparatively rapid reciprocating movement to the two pairs of longer vertical chains 12 and 13 to the extent of about the full vertical distance between the two lines of rods.

In the series of movements required for the forming of the material to be dried into festoons, and for their travel through the machine, six pairs of endless pitch chains are employed, of Ewart's or other similar type, namely, one pair of horizontal chains for upper tier, marked S. One pair of horizontal chains for lower tier marked 1. One pair of vertical feed chains marked 12. One pair of vertical delivery chains marked 13. One pair of vertical shorter chains marked 10. One pair of drivers for feed chains marked 23. Two single chains from rack marked 4 and $4^{\times}$. Motive power for these movements is received from any convenient source by the pulley A and its rotary motion may be converted into the required series or cycles of intermittent movements by the employment of, say, mangle gear consisting of the endless oblong rack B with straight or curved sides, and pinion C driven from the pulley A through the shaft D, the bevel pinion E and the wheel F which is rigidly connected to the rack pinion C both revolving on the fixed stud G carried by the arched bracket H which is shown to stand across the top of the fan chamber *b* about the middle of its length. Immediately below this bracket and parallel with it is a plate I having two vertical flanges across its upper face as far apart as the full width of the rack, so that any rotary motion of the pinion C when engaged in either end of the rack causes the plate I to slide in the channel J which is also fixed across the fan chamber, and having underneath it a T shaped lever K provided with an axis or fulcrum L at the point where its three arms meet, the longest of which is actuated by the pin M,—working in the slot M^1 in the channel J,—fixed in it which passes through the channel J and through the sliding plate I to which is thus given a limited reciprocating motion corresponding to the pitch line width of the rack. One of the shorter arms K^1 of the lever K is connected by the rod N to the double lever O fitted with a pawl O^2, retained in position by a flat or other spring O^3, engaging in a ratchet wheel P keyed on the shaft S^1 (see Fig. 4^a) on which are fixed two sprocket wheels R at the delivery end of the chamber *a*. These carry and actuate the two endless chains S which propel the upper tier of rods T—which are arranged across the drying chamber *a* to about its full width—freely along between the angle iron races U and U^1. The other shorter arm K^2 of the T lever K is connected by the rod V, the bell crank lever W and the rod X to the double lever Y, fitted with a pawl Y^1 retained in a position by a flat or other spring Y^2 with its ratchet wheel Z. These in a like manner actuate the two endless chains 1 working over sprocket wheels 1^a mounted upon shafts 25 which propel the lower tier of rods 2—arranged across the drying chamber to about its full width—freely along between the races 3.

In order to transmit the motion of the pinion C as it engages in the sides of the rack B, from each end of the rack B is led a pitch chain 4, $4^{\times}$. One of them 4, engages the sprocket wheel 5, Figs. 4 and 7, which is keyed on the shaft S^1 at the feed end of the machine, and therefore actuates the two similar sprocket wheels 7 keyed on the same shaft close to but outside of the fan chamber. These drive two similar wheels *q* on two spindles 9 to which they are respectively connected by short endless pitch chains 10, Figs. 4 and 9. As shown in Figs. 4 and 9 there are fixed on the same two spindles 9 as the said two driven wheels *q*, two other and similar sprocket wheels 8 and 8^a inside the chamber *a*. These carry and actuate the two feed chains 12 which are thus reciprocated from the feed end of the rack when it is propelled to and fro by the pinion C. The chain $4^{\times}$ led from the other and rear end of the rack engages the sprocket wheel 14. This is keyed on the same through shaft 15 as are also keyed the two sprocket wheels 16, 16^a. On spindles 15^a, 15^b, are also mounted two sprocket wheels 17 and 17^a. The sprocket wheels 16, 16^a, 17 and 17^a carry and actuate the two delivery chains 13 which are thus reciprocated from the delivery end of the rack. The two chains 4 and $4^{\times}$ secured to the rack B are continued towards each other until their ends are a convenient distance apart where they are connected by a suitable device for adjusting them as they wear so as to be taut enough to engage the two sprocket wheels 5 and 14 properly without loss of motion. As each of the rods in the lower return tier 2 below the chains 1 arrives in succession at the feed end of the machine, it is necessary that it should be effectually removed from the lower tier by being raised so far as to enable the feed chains 12 to lift it to the upper tier T of rods. This is effected as follows:—Across the feed end of the machine, below the lowermost tier of rods 2 a shaft 19 is provided on which are mounted two sprocket

wheels 20. Two similar wheels 21 are mounted directly above them and connected to the wheels 20 by two endless pitch chains of suitable length 23 on each of which at regular intervals are four projections or attachments 24 similar to those on the chains 1 and S, and in order that these attachments may work correctly with the horizontal chains, the shaft 19 is driven from the shaft 25 at four times its own speed by means of the spur wheel 26 and the pinion 27. The pawls 28 move freely on the pivots 29 so as to allow the rods so lifted to pass upwards, after which the pawls fall immediately into their former position so as to guide properly the rods regularly returned by the feed chains from the upper to the lower tier. The effect of these successive cycles or movements is that there is obtained a cycle of four successive movements in which the six hereinbefore mentioned chains—five pairs of which carry poles—are employed, whereby the separate rods are regularly and automatically inserted between folds of the material at the top and also at the bottom of the drying space as it enters the machine so that every rod in succession takes its place in the upper and in the lower traveling line of rods, and these rods are also at the exit end of the machine as regularly and automatically returned by the chains, though not necessarily by the same pair of chains, to be automatically reinserted at the feed end as before.

The material after being dried may be delivered by the machine to either of its ends, and may be there folded or wound by it in any usual method, such as by cuttle on brackets 42.

In this apparatus wool may be also dried by forming the festoons of netting and placing the wool in one or more layers or pockets of the netting.

The material 30 is passed into the drying chamber *a* through openings 37 at the feed end of the machine and is threaded or passed,—as shown in dotted lines at Fig. 5,—over each of the lower row of rods T in the upper tier and under each of the upper row of rods 2 in the lower tier until the opening 38 at the delivery end of the machine is reached.

The upper row of the upper tier of rods T and the lower row of the lower tier of rods 2 are termed "free rods" as they are returned unloaded.

To automatically insert the rods T and 2 within the folds or festoons of the material to be dried there are four successive movements of the endless chains S, 1, 12, 13, 23, as follows:—Two of the rods 2 having been first received respectively by the chains 12 and 13 from the lower tier, namely, one at each end of the machine, as hereafter described, the upper endless chains S are then moved to the extent of the pitch of the rods T carrying forward the loaded lower row of the upper tier on chains S, one of which it drops at 39 into the delivery chains 13 by which it is conveyed down to the upper row of the lower tier on chains 1. Simultaneously with this movement of the rods, the free rods T in the upper tier are moved and one of them is passed to the feed chains 12. The feed chains 12, and the delivery chains 13 all move together, the feed chains taking the rods just received from the returning chains of the upper tier down between the two folds of fresh moist material to and between the projections 32 on chains 1 of the upper row of loaded rods on the lower tier. The delivery chains take down to the upper row of the lower tier one of the rods T from the loaded and lower row of rods T in the upper tier so passing it from between the folds of dried material. A free rod at the delivery end of the same lower chains 1 is returned by them to the lower row thereof. The lower chains 1 on receiving the said two rods are moved a pitch of the rods, carrying forward the lower tier of loaded rods 2, one of which is lifted to the delivery chains 13 and returning to the same extent the row of free rods in the lower tier. One of the free rods 2 is carried by a projection 24 on the endless chains 23 up to the feed chains 12. As this latter rod is carried up by the feed chains 12 it comes in contact with the underside of the moist material, and by the time the race U^1 is reached the said material will have been made to surround the upper surface of the rod. The feed chains 12 and the delivery chains 13 are then returned simultaneously to their former positions, as shown at Fig. 5; the feed chains 12 carrying with them the just mentioned free rod from the lower tier to form the now completed loop or festoon, and the delivery chains 13 carrying a rod from between the two folds of dried material to the upper chains S to be carried to and returned free by them on the upper level.

By the herein described means the upper row of the upper tier of rods T and the lower row of the lower tier of rods 2 are kept supplied with the correct number of rods for insertion between the loops or festoons of material to be dried.

In the herein described arrangement the material 30 is shown at Fig. 5 to be drawn into the machine at its feed end by the tension of the rods or poles on the material as they are placed in position in the horizontal races and within the top and bottom portions of the folds or festoons of the same. As the rods or poles upon the said upper and the lower races are intermittently and simultaneously traversed through the drying chamber, the material is thereby carried forwards so as to pass out at the delivery end. But when desired, the machine may be arranged for the material to be returned to the same end, as shown by dotted line 40.

I claim:

1. In a drying machine of the character described, a fan chamber, a drying chamber communicating therewith at its top and bottom, two sets of supports arranged in said drying chamber for carrying the material to be dried, and for holding the same in the form of loops or festoons, and means for causing said supports to travel continuously through said drying chamber.

2. In a drying machine of the character described, a drying chamber provided at its ends with inlet and exit openings, means for causing air to circulate therethrough, two sets of supports arranged in said chamber and means for causing said supports to travel continuously through said chamber, whereby they are adapted, to receive material consisting of an endless fabric, and from the same into loops.

3. In a machine for drying endless fabric, a drying chamber, and means within said chamber for forming said fabric into festoons continuously, said means comprising two series of separate traveling supports, and raceways arranged to guide and carry said supports.

4. In a machine for drying endless fabric, a drying chamber, and means within said chamber for receiving said fabric, forming it into a series of continuous loops, carrying said loops through said chamber, and discharging the fabric from the chamber, said means comprising two parallel series of traveling supports, and means for transferring said supports from one series to the other, when the loops are formed.

5. In a machine for drying a continuous web of fibrous material in loops, a drying chamber, means within said chamber for supporting the loops at both ends, means within the chamber for automatically moving said supports to form the web into loops, means to convey the supports and the loops thereon through the chamber and means for moving the supports for dissolving said loops as the material leaves the chamber.

6. In a machine for drying fabrics, a drying chamber, and means within said chamber for conveying said fabric therethrough, said means comprising two series of traveling parallel rods or poles, raceways for guiding the same, means for propelling said rods in said raceways, and means for looping the fabric around each rod as it reaches the end of the raceways.

7. In a machine for drying fabrics, a drying chamber, and means within said chamber for conveying the fabrics therethrough, said means comprising two series of traveling supports, and means for automatically transferring said supports from one series to the other, each of said supports thus forming and engaging a loop in the fabric.

8. In a machine for drying fabrics, a drying chamber, and means within said chamber for conveying the fabric therethrough, said means comprising two parallel series of traveling supports, raceways for guiding the same, and means for automatically transferring each support from one series to the other when it reaches the ends of the raceways.

9. In a drying machine of the character described, the combination of a drying chamber provided with inlet and exit openings respectively at its ends, fan chambers arranged on each side of the drying chamber communicating therewith by openings arranged at its top and bottom, with races arranged in pairs fixed longitudinally to each inner side of the drying chamber near both its top and bottom, a pair of horizontal endless chains for each pair of races, each of said chains provided with projections, a pair of sprocket wheels mounted upon a shaft carried in bearings at the end of each race, substantially as set forth.

10. In a drying machine of the character described, the combination of a drying chamber provided with inlet and exit openings, a fan chamber arranged on one or both sides of the drying chamber, and communicating therewith by openings arranged at or near its top and bottom, a pair of longitudinal races arranged respectively near the top and bottom of each inner side of the drying chamber, a transverse shaft mounted in bearings at the ends of each race, each shaft having a pair of sprocket wheels mounted thereon at suitable distances apart, a number of horizontal endless chains arranged to work at the side of and parallel with the said races and over the said sprocket wheels, each endless chain having projections fixed to it at regular distances apart, means for intermittently operating the said shaft, and a number of poles for receiving the material arranged to be placed upon the said chains and traversed through the drying chamber, substantially as set forth.

11. In a drying machine of the character described, the combination of a drying chamber provided with inlet and exit openings respectively at its ends, a fan chamber arranged parallel with the drying chamber and to communicate therewith at its top and bottom, heating apparatus arranged at the base of the fan chamber, division plates for dividing the upper portion of the fan chamber, a shaft carried in bearings in the upper portion of the fan chamber and having a number of fans mounted thereon for drawing the air through openings in the sides of the fan chamber into its interior, and for passing the air through the drying chamber and withdrawing it therefrom, substantially as set forth.

12. In a drying chamber of the character described, the combinaiton of a drying cham-

ber provided with inlet and exit openings respectively at its ends, a fan chamber arranged parallel with the drying chamber and to communicate therewith at its top and bottom, heating apparatus arranged at the base of the fan chamber, division plates for dividing the upper portion of the fan chamber, a shaft carried in bearings in the upper portion of the fan chamber and having a number of fans mounted thereon for drawing the air through openings in the sides of the fan chamber into its interior and for passing the air through the drying chamber and withdrawing it therefrom, with a mangle motion mounted on the top of the fan chamber consisting of an oblong rack and a pinion driven from a pulley from a shaft, a slide in which the said rack is made to reciprocate, rollers mounted upon shafts at suitable distances apart for guiding the rack in its traverse, a chain connected respectively to the ends of the rack, said chain being connected to lever mechanism for actuating the moving parts of the machine, substantially as set forth.

13. In drying machinery of the character described, the combination of a drying chamber communicating with a fan chamber arranged parallel therewith on one or both of its sides, openings at the top and bottom of the sides of the drying chamber for forming a communication between the chambers, races fixed longitudinally to each inner side of the drying chamber at or near its top and bottom, a horizontal shaft mounted in bearings at the ends of each race, each shaft having a pair of sprocket wheels mounted thereon at a distance apart, a number of horizontal endless chains each provided with projections and arranged to work intermittently over the sprocket wheels at the side of and parallel with each of the said races, a series of poles mounted upon the horizontal chains between their projections at the top and bottom of the drying chamber, with a double pair of vertical endless chains at the feed end of the machine and a single pair of chains at the delivery end of the drying chamber, each of the chains being provided with projections and arranged to intermittently reciprocate in pairs over sprocket wheels mounted upon shafts carried in bearings for conveying the rods or poles when free from the material from the lower to the upper races and from the upper to the lower races, and the mangle motion comprising an oblong rack and a pinion driven from a pulley from a shaft, a slide in which the said rack is made to reciprocate, rollers mounted upon shafts at suitable distances apart for guiding the rack in its traverse, a chain connected respectively to the ends of the rack, said chain being connected to lever mechanism for actuating the moving parts of the machine for controlling the cycle of intermittent movements of the whole of the endless chains for automatically arranging and inserting the said pulleys in position alternately on the under and upper surfaces of the material for forming it into loops and for traversing it horizontally through the drying chamber and afterwards disengaging the poles from the said loops and returning the poles into position for reinsertion.

AUTHUR NORRISON MARR.

Witnesses:

WILLIAM SADLER,

JENNIE EVELYN WYNN.