Dec. 27, 1938. S. WELLMAR 2,141,578

CONVEYER FOR DRYING PLANTS

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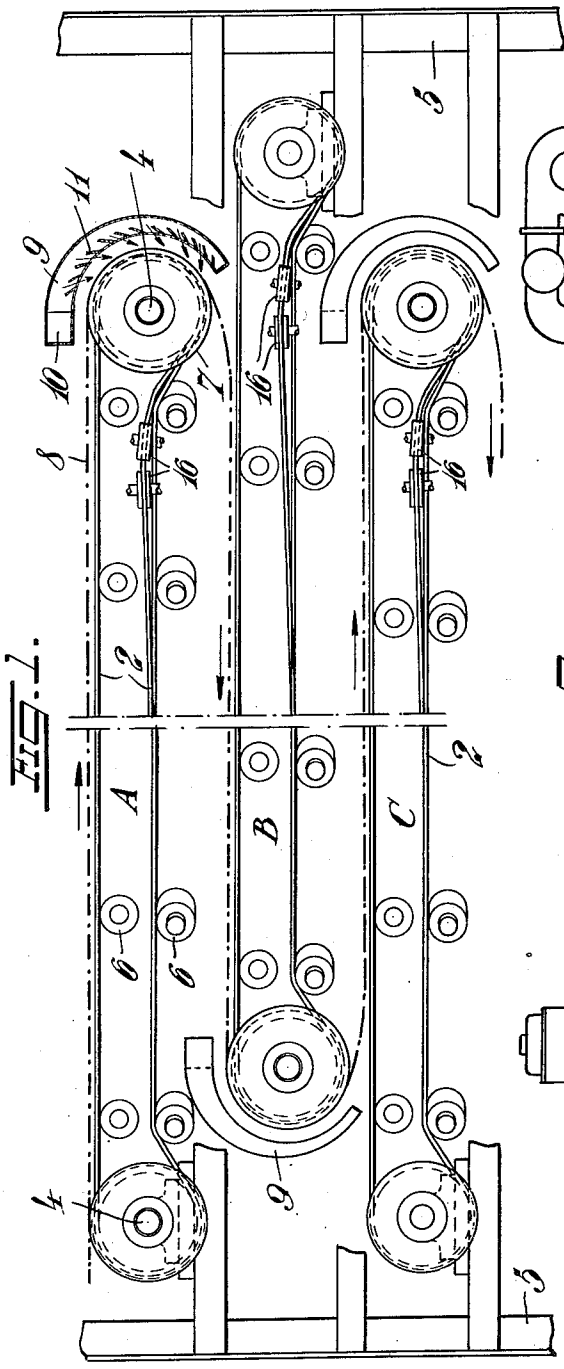


Fig. 1.

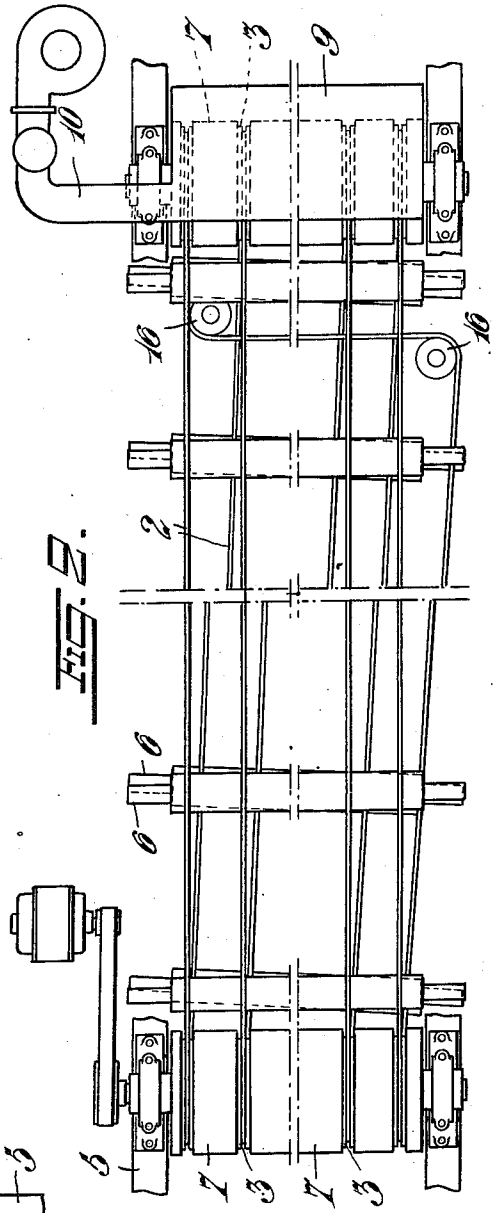


Fig. 2.

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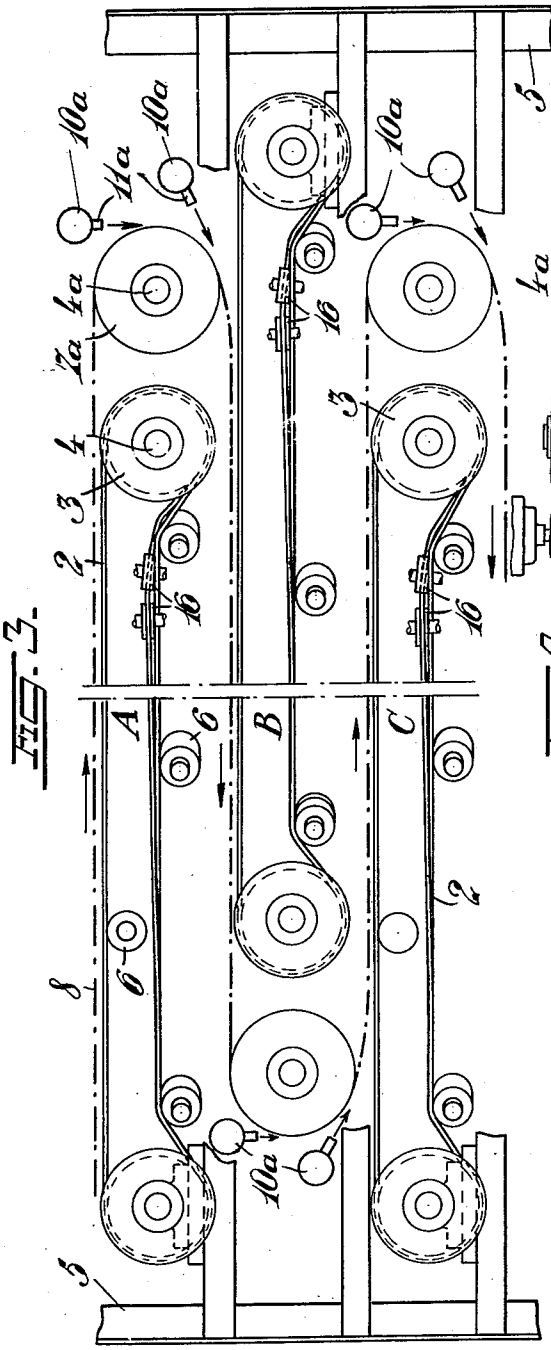



FIG. 3.

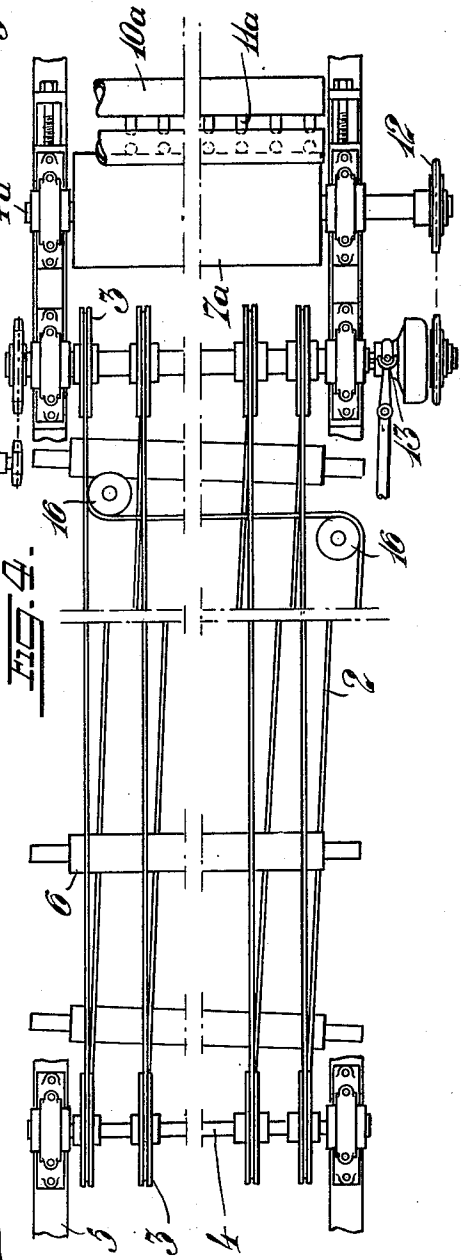



FIG. 4.

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FIG. 5.

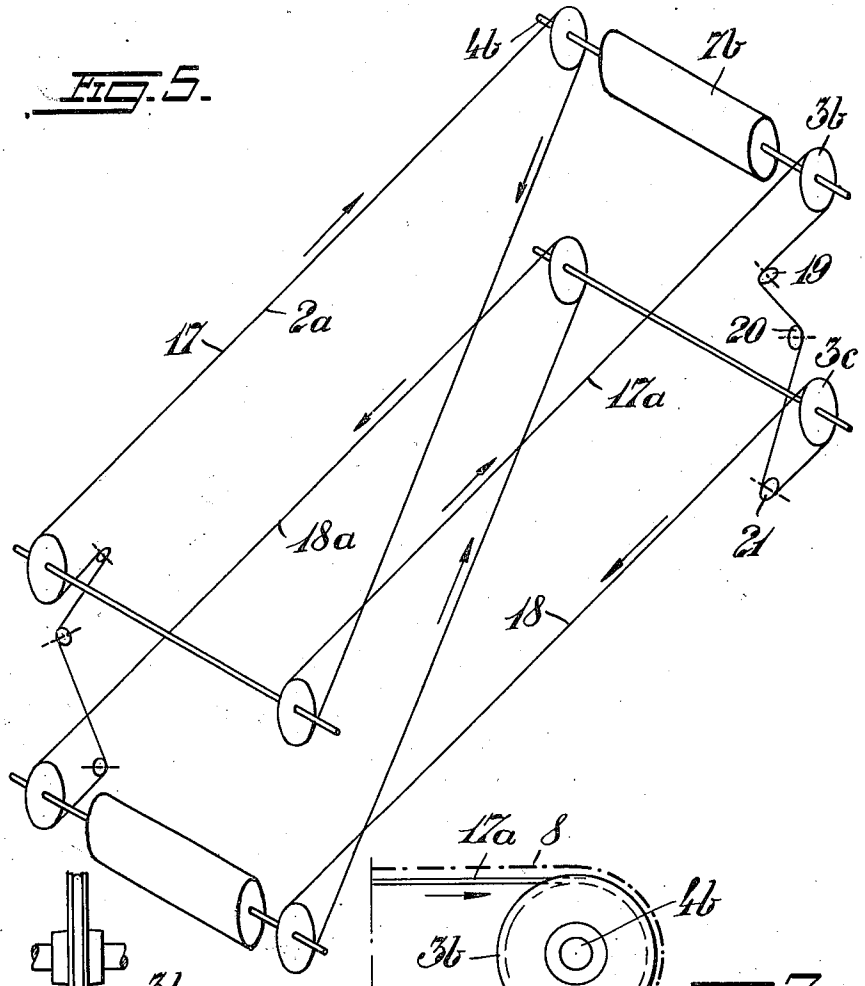



FIG. 6.

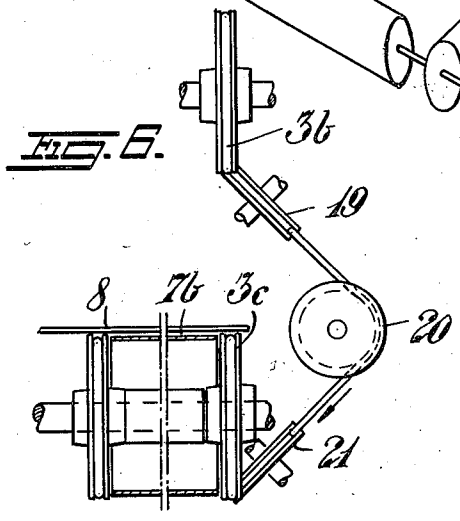
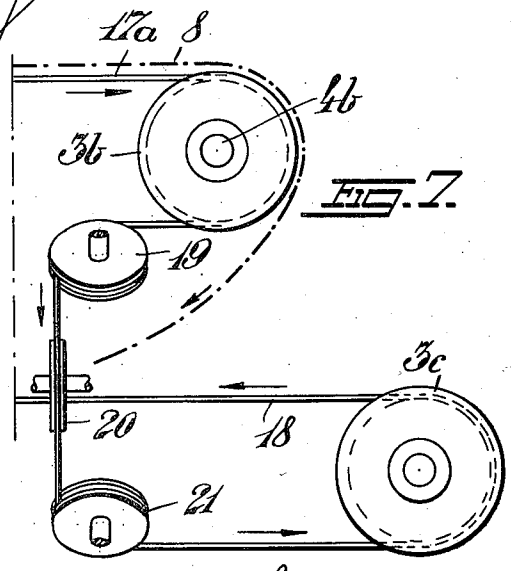



FIG. 7.




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Fig. 8.

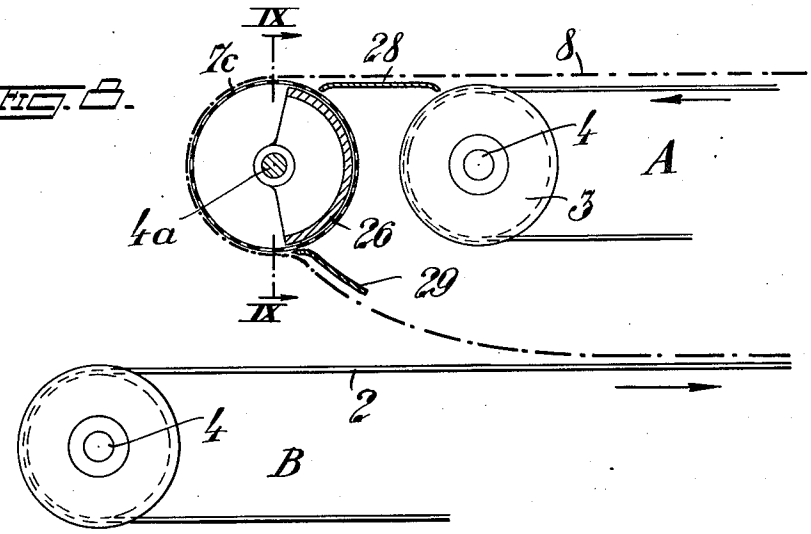



Fig. 9.

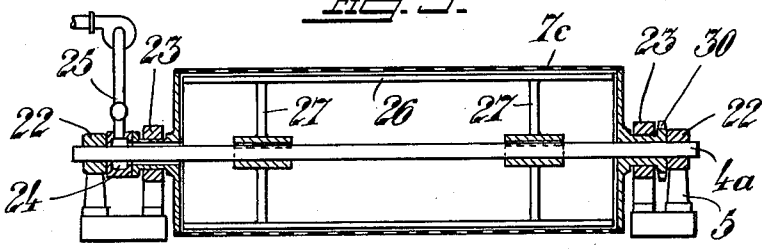
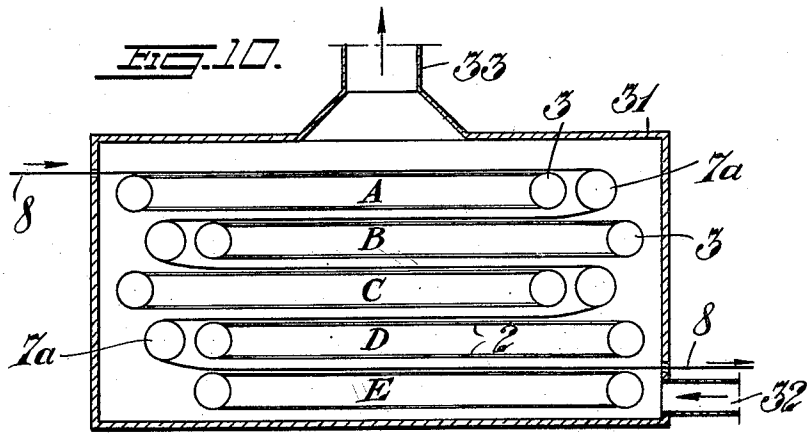



Fig. 10.




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# UNITED STATES PATENT OFFICE

2,141,578

## CONVEYER FOR DRYING PLANTS

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Application October 8, 1937, Serial No. 168,102

8 Claims. (Cl. 34—12)

In drying plants for webs of material, such as cellulose, paper, fabric etc., it is customary to let the web pass in a zig-zag path through a drying chamber. The conveyers heretofore used for this purpose suffer, however, from serious drawbacks. Thus, they cannot be operated at high speeds, and difficulties also arise when the web is broken off or rips.

The chief object of this invention is to provide a conveying device for drying plants which may be safely operated at high speeds.

Another object of this invention is to provide a very simple and reliable conveyer for the purpose mentioned.

Another object of this invention is to facilitate the work necessary when the web has been ripped.

Another object of this invention is to render it possible to put the machine automatically into operation again, after the web has ripped or burst.

Other objects will be evident from the following specification and claims.

Several embodiments of the invention are shown in the annexed drawings.

Fig. 1 shows a side view of several cooperating conveyers in accordance with this invention, some parts being broken away for the sake of clearness.

Fig. 2 shows a plan of the uppermost conveyer in Fig. 1.

Fig. 3 shows a side view of a second embodiment, in which the web reversing drums are placed beyond the rope pulleys, that is on the outside thereof.

Fig. 4 shows a plan view of the uppermost conveyer in Fig. 3.

Fig. 5 is a perspective view of a third embodiment in the form of a two-storey conveyer, in which the rope is common to the two stories.

Fig. 6 shows an end view of a detail of Fig. 5, on a larger scale.

Fig. 7 shows a side view of the parts shown in Fig. 6, as seen from the right in Fig. 6.

Fig. 8 shows the end of two conveyers, having a blowing device of a different design.

Fig. 9 shows a partial sectional view on the line IX—IX in Fig. 8.

Fig. 10 shows a sectional view through a drying chamber, illustrating the general arrangement of the conveyers.

Referring now to Figs. 1 and 2 of the drawings, A, B, and C indicate rope conveyers arranged above each other. Each conveyer comprises an endless rope 2, running on pulleys 3, which are rotatably journalled on shafts 4 in the stationary machine frame 5. At least one of the shafts 4 of each conveyer is power-driven. The rope 2 also runs on support rollers 6 whose shafts are journalled in the machine frame and are located at right angles to the part of the rope, which runs on them. Thus, the shafts of the upper rollers form an angle with those of the lower rollers.

Guide pulleys 16 are journalled in the stationary machine frame and serve to guide the ropes laterally across the machine.

On the shafts 4 rollers 7 are arranged between the pulleys 3. The rollers 7 serve to support or guide the web 8, when it turns to move in the opposite direction. All the rollers 7 may run loosely on the shafts 4. Preferably, however, on those shafts 4 which are power-driven the pulleys 3 are keyed and the rollers 7 run loosely, while on the other shafts 4 the rollers 7 are keyed and the pulleys 3 run loosely.

At each set of reversing rollers 7 a chamber 9 is arranged which is bent along a portion of the periphery of the rollers and extends axially across the entire width of the web. The concave wall of the chamber facing the web is perforated, and the chamber has an inlet 10 for compressed air. At the perforations guide walls 11 are arranged for giving the air flowing out a somewhat oblique direction, as indicated by small arrows in Fig. 1. Other arrows indicate the direction of motion of the web.

It is understood that the conveyers A, B, C, the number of which is arbitrary and may be chosen with regard to the actual circumstances, are arranged in a drying chamber, substantially in accordance with the general arrangement shown in Fig. 10.

The device described operates as follows:

In ordinary operation the rope carries the web 8 in the path indicated by the dash-and-dot line. Because the reversing rollers 7 run loosely on those of the shafts 4, which are driving, the web rotates said rollers at the same peripheral speed as that of the web, that is, as that of the rope, though the diameter of the rollers 7 is somewhat greater than the diameter of the pitch circle of the pulleys 3. Thus, the web is not subjected to such strains as would be generated, if both the rollers 7 and the pulleys 3 were secured to the shaft 4, on which they are arranged. Consequently, the web is subjected to the minimum strains and stresses possible, during its passage through the machine.

If, however, the web rips, compressed air is

supplied to the pipes 10. The forward end of the ripped web is then moved along the upper surface of the uppermost conveyer A and then the air flowing out from the chamber 9 forces said forward end of the web to pass round the rollers 7 down on the second conveyer B. This procedure is repeated for each conveyer, until the web has re-assumed its correct path through the machine. Thereafter, the compressed air is cut off from the tubes 10. It is evident that after the web has been ripped, the machine is put into operation again almost automatically. For this purpose, it is not necessary that the operators enter the drying chamber in which the machine is enclosed. The high temperature and the high degree of humidity in such chamber render it very unpleasant for the operators to enter the chamber and to work therein, but heretofore this was unavoidable.

In the embodiment shown in Figs. 3 and 4 the rollers 7*a* are not journalled on the shafts 4, but on separate shafts 4*a* journalled stationarily beyond the shafts 4. Preferably, the rollers 7*a* are secured to the shafts 4*a* which generally run loosely in their bearings and are driven by the web only. The rollers 7*a* are not divided into sections, in contrast to the rollers 7 in Figs. 1 and 2.

At each reversing roller 7*a*, two tubes 10*a* are arranged to which compressed air may be supplied. These tubes have outlet pipes 11*a* for blowing air against the web 8. Via a gear 12 and a coupling 13 the shaft 4*a* may be temporarily driven by the adjacent shaft 4. In other respects this embodiment is analogous with that shown in Figs. 1 and 2, and similar parts carry the same reference characters.

In ordinary operation, the endless rope 2 carries the web 8 through the machine in the same manner as described above in connection with Figs. 1 and 2. If the web rips, compressed air is supplied to the tubes 10*a* and the couplings 13 are brought into operative position. Thus, the point or forward end of the web is drawn on to the roller 7*a* at the uppermost conveyer A and is pressed around that roller by the air flowing out from the outlets 11*a*, until the web correctly reaches the underlying conveyer B and is gripped by it. Then the coupling 13 for the uppermost conveyer A is disconnected and the same procedure is repeated for the second conveyer B, etc., until the web runs correctly through the machine again. Then the air to the pipes 10*a* may be cut off.

Figs. 5 to 7 show that the endless rope 2*a* may be common to two conveyers or "stories" of the machine. Similarly, the rope may be made common to three or more conveyers or stories. The reference characters 17, 17*a* indicate the two rope parts forming the upper carrying "surface" of the upper storey and the reference characters 18, 18*a* indicate the two rope parts forming the carrying "surface" or plane of the lower storey. Thus, the web is carried first by the parts 17, 17*a*, is then guided by rollers 7*b* to a motion in the opposite direction on the parts 18, 18*a*. This may be repeated by arranging several such double-storeyed conveyers above each other.

It is, of course, necessary that the rope does not interfere with the web, when the rope passes from the upper storey to the lower storey, or reversely. For this reason, the part 17*a*, for instance, runs on the guiding or driving pulley 3*b* and from it on to a guiding pulley 19 rotatably journalled on an oblique shaft in the machine frame. Then the rope runs on a guiding pulley 20, whose stationary shaft is at right angles to the shaft 4*b* of pulley 3*b*. A pulley 21 also journalled on an oblique shaft in the machine frame is provided for, on which the rope runs after leaving the pulley 20 and from the pulley 21 the rope runs on to the pulley 3*c* of the lower storey. Analogously, the rope is conducted from the lower storey to the upper one. It is obvious that the number of rope parts forming the carrying "surface" or plane in each storey is arbitrary and should be chosen with regard to the width of the web, etc. It is also obvious that in all the embodiments shown the direction of motion may be reversed without departing from the spirit of this invention. However, when the web moves from an upper conveyer down to a lower conveyer, as illustrated in Figs. 1–4, the reversing pulleys of the lower conveyer should project beyond the web reversing roller or rollers of the upper conveyer. For instance, in Figs. 1 and 3 the right hand pulleys of the conveyer B project to the right beyond the reversing rollers 7, 7*a* of the conveyer A, etc. Reversely, if the web moves in the opposite direction, that is from a lower conveyer upwards to an upper conveyer, the reversing roller of the upper conveyer should project outwards beyond the adjacent pulleys of the lower conveyer. This facilitates the procedure of drawing the web through the machine for putting it into operation again after ripping.

Figs. 8 and 9 illustrate a modified embodiment, in which the reversing roller 7*c* for the web 8 is perforated in this cylindrical surface. The shaft 4*a* is fixed in stationary bearings 22 in the machine frame 5 and cannot rotate. The cylindrical roller 7*c* has hollow journals rotatably journalled in bearings 23 in the frame 5. The hollow interior of one of the journals or trunnions of the cylinder 7*c* is in permanent communication with a chamber within a stationary box 24, connected with a suction pipe 25, which sucks air from the interior of the cylinder 7*c*. By means of arms 27 a stationary concave cylindrical plate 26 is secured to the non-rotary and stationary shaft 4*a*. During the rotary motion of the cylinder 7*c*, the stationary shielding or covering plate 26 permanently closes the perforations of the cylinder 7*c* at that part thereof, which in that moment is not in contact with the web. An upper plate 28 bridges the distance between the roller 7*c* and the adjacent pulleys 3, and a lower plate 29 has one of its edges close to the lower edge of the shielding plate 26.

If during the operation of the machine the web rips, power is supplied to the cylinder 7*c* via the sprocket wheel 30 on one of its trunnions so that the cylinder is rotated. Simultaneously, the sucking of air through the tube 25 begins, creating a vacuum within the cylinder 7*c*. The web 8 is moved by the upper conveyer A on to the bridge 28 and to the cylinder 7*c*. As a result of the vacuum now prevailing within the cylinder 7*c*, the web is sucked on to the surface of said cylinder and is consequently bent around this cylinder. At the lower side of the cylinder the web is again freed from the sucking action pressing it against the surface of the cylinder, because the plate 26 covers the corresponding perforations and consequently shields part of the web against the sucking action. Also the plate 29 serves to free the web from the lower side of the cylinder 7*c*, and the web now moves downwards and is transported further by the second conveyer B, etc. After the conveyer B has securely gripped

the foremost end of the web, the vacuum may be cut off from the cylinder 7c and the power may be disconnected from the sprocket wheel 30, if desired or necessary.

It is obvious that the web reversing rollers 7, 7a, 7b, 7c may be permanently power-driven at the same peripheral speed as that of the web running on them.

Fig. 10 illustrates the general arrangement of the drying plant. The web 8 passes through a narrow slit into the drying chamber 31 which has an inlet 32 for dry air and an outlet 33 for moist air. The web 8 also leaves the chamber 31 through a narrow slit. Within the chamber, the conveyers A, B, C, D, E are arranged, to carry the web in a zig-zag path through the chamber. These conveyers may be arranged in accordance with Figs. 1–9.

What I claim is:—

1. In a drying plant for webs of paper, cellulose, textile fabric and the like, in combination, a drying chamber, an air inlet to said chamber, an air outlet from said chamber, a number of shafts, rope pulleys on said shafts, reversing rollers loosely journalled on said shafts between said pulleys for changing the direction of motion of said web, and a rope on said pulleys, said rope having parallel parts for carrying said web.

2. In a drying plant for a web of paper, cellulose, textile fabric or similar materials, in combination, a drying chamber, an inlet for dry air to said chamber, an outlet for moist air from said chamber, at least one rope conveyer in said chamber for moving said web therethrough in a zig-zag path, several parts of rope on said conveyer running in parallel to each other in a plane for carrying said web, loosely journalled rollers for reversing the motion of said web at the turning points of said zig-zag path, and couplings for connecting said rollers with said conveyer to be driven by it.

3. In a drying plant for a web of paper, cellulose, textile fabric or similar materials, in combination, a drying chamber, an inlet for dry air to said chamber, an outlet for moist air from said chamber, at least one rope conveyer in said chamber for moving said web therethrough in a zig-zag path, several parts of rope on said conveyer running in parallel to each other in a plane for carrying said web, and air-operated means at the turning points of the zig-zag path for reversing the motion of said web.

4. In a drying plant for a web of paper, cellulose, textile fabric or similar materials, in combination, a drying chamber, an inlet for dry air to said chamber, an outlet for moist air from said chamber, at least one rope conveyer in said chamber for moving said web therethrough in a zig-zag path, several parts of rope on said conveyer running in parallel to each other in a plane for carrying said web, rollers for reversing the motion of said web at the turning-points of said zig-zag path, and air-operated means for pressing said web against a part of said rollers, when the web has been ripped.

5. In a drying plant for a web of paper, cellulose, textile fabric or similar materials, in combination, a drying chamber, an inlet for dry air to said chamber, an outlet for moist air from said chamber, at least one rope conveyer in said chamber for moving said web therethrough in a zig-zag path, several parts of rope on said conveyer running in parallel to each other in a plane for carrying said web, and chambers having discharge openings for air under pressure at the turns of said zig-zag path said discharge openings having such direction that the compressed air flowing out from them forces the web to change its direction of motion properly.

6. In a drying plant for a web of paper, cellulose, textile fabric or similar materials, in combination, a drying chamber, an inlet for dry air to said chamber, an outlet for moist air from said chamber, at least one rope conveyer in said chamber for moving said web therethrough in a zig-zag path, several parts of rope on said conveyer running in parallel to each other in a plane for carrying said web, rollers for reversing the motion of said web at the turning-points of said zig-zag path, said rollers being perforated, and means for sucking air from the interior of said rollers.

7. In a drying plant for a web of paper, cellulose, textile fabric or similar materials, in combination, a drying chamber, an inlet for dry air to said chamber, an outlet for moist air from said chamber, at least one rope conveyer in said chamber for moving said web therethrough in a zig-zag path, several parts of rope on said conveyer running in parallel to each other in a plane for carrying said web, a roller for reversing the motion of said web at a turning-point of said zig-zag path, said roller being perforated, means for sucking air from the interior of said roller, and a stationary shield for covering some of said perforations.

8. In a drying plant for a web of paper, cellulose, textile fabric or similar materials, in combination, a drying chamber, an inlet for dry air to said chamber, an outlet for moist air from said chamber, at least one rope conveyer in said chamber for moving said web therethrough in a zig-zag path, several parts of rope on said conveyer running in parallel to each other in a plane for carrying said web, a roller for reversing the motion of said web at a turning-point of said zig-zag path, air-operated means for pressing said web against a part of said roller, and a stationary plate for freeing said web from said roller.

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