April 15, 1930. A. O. HURXTHAL 1,755,006

LOOP DRIER

Filed July 3, 1928 2 Sheets-Sheet 1

Fig. 1.

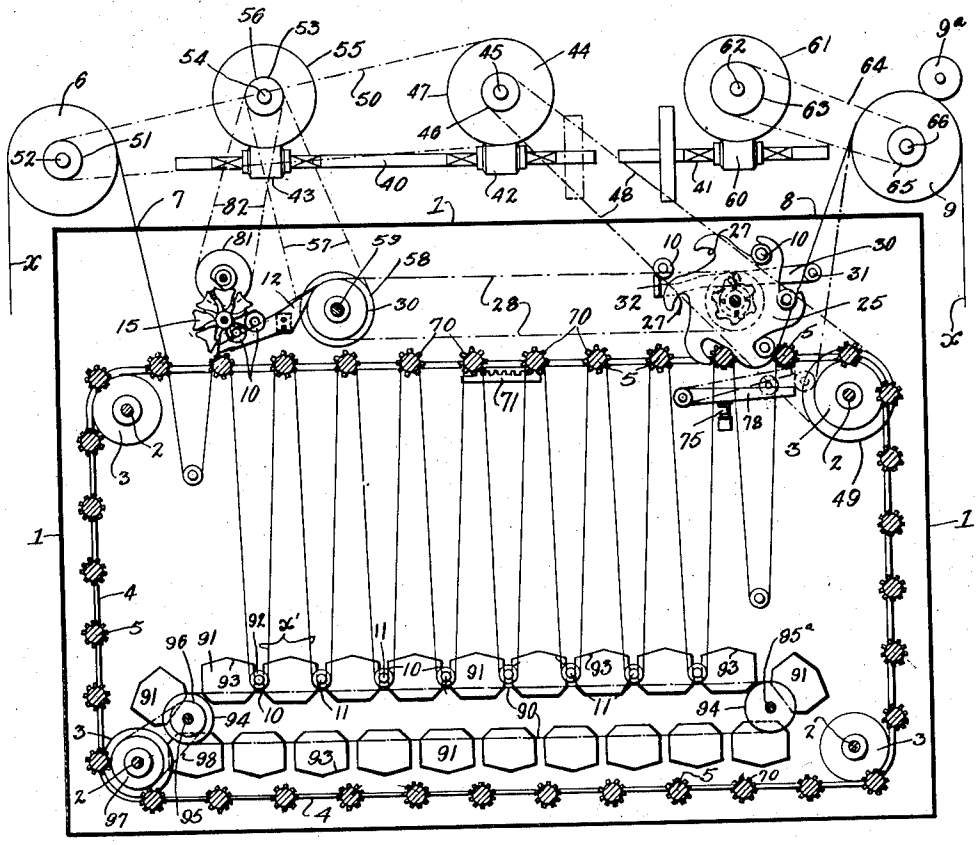


Fig. 5.

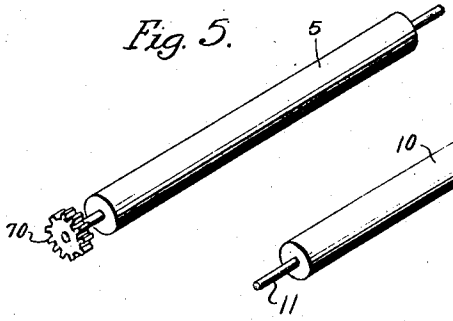
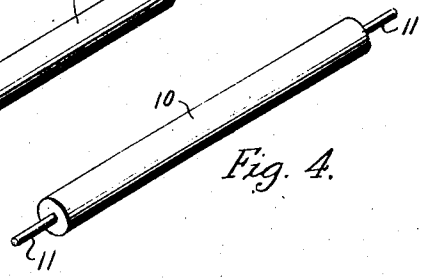


Fig. 4.



Inventor—
Alpheus O. Hurxthal
by his Attorneys
Howson + Howson

April 15, 1930. A. O. HURXTHAL 1,755,006

LOOP DRIER

Filed July 3, 1928 2 Sheets-Sheet 2

Fig. 2.

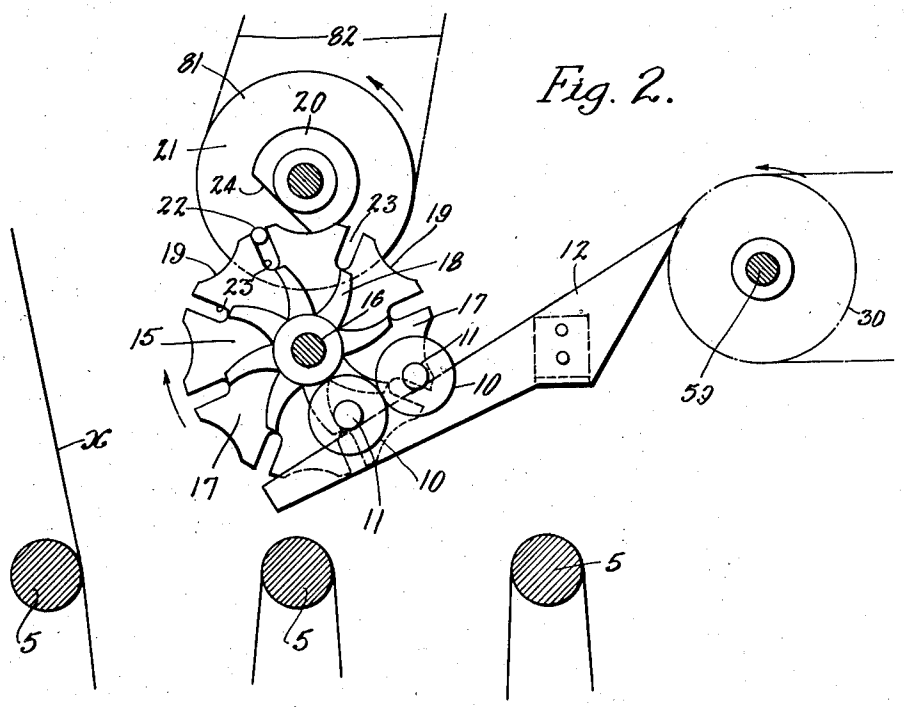
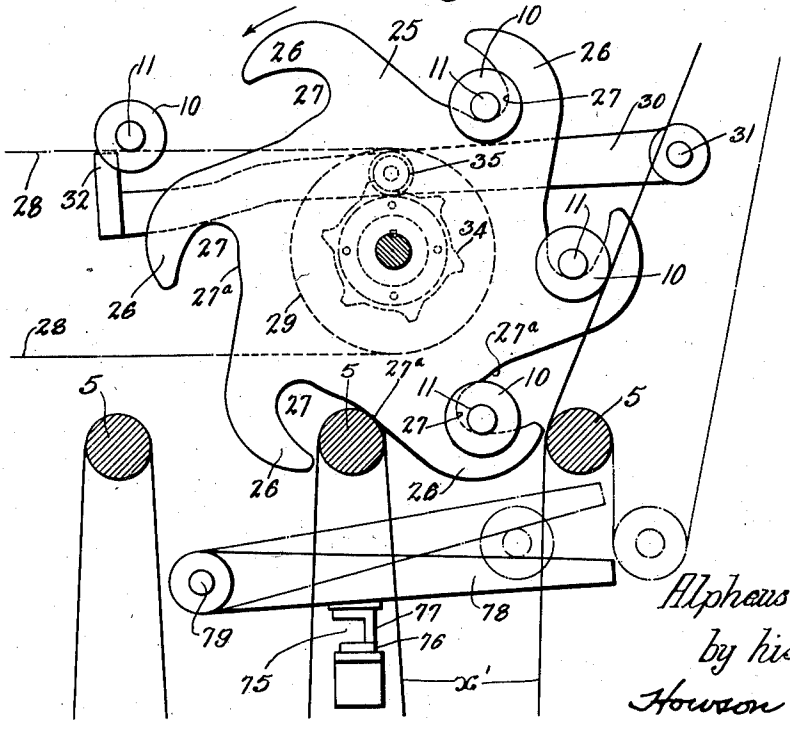


Fig. 3.



Inventor.
Alpheus O. Hurxthal
by his Attorneys
Howson & Howson

Patented Apr. 15, 1930 1,755,006

UNITED STATES PATENT OFFICE

ALPHEUS O. HURXTHAL, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO PROCTOR AND SCHWARTZ, INCORPORATED, OF PHILADELPHIA, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA

LOOP DRIER

Application filed July 3, 1928. Serial No. 290,092.

My invention relates to loop driers of the type employed in the drying of web materials such as paper, cloth, and other fabrics, or for the purpose of simultaneously drying a plurality of threads or strands of yarn, such as those of which warps are composed.

The principal object of my invention is to provide means for automatically placing or dropping a series of poles or rollers respectively and successively onto the material between pairs of adjacently positioned slats or girts of a suitable conveyer, whereby the material will be pressed down between the girts and thereby formed into a series of depending loops or festoons.

Each roller at all times assumes a position in the bottom of the respective loop and is of such weight as to place the material under sufficient tension between the girts to cause the loops to form without wrinkling the material.

The tension, thus produced, stabilizes the loops to the extent that, during the formation and extraction of the loops and during the drying process, each loop will hang free from contact with the adjacent loops, thereby permitting the conveyer girts to be placed closer together than usual, consequently effecting a conservation of space and permitting the drier to be made shorter for a given number of loops than was possible heretofore.

Stabilization of the loops, as above noted, permits the air in the drier to be circulated at a higher velocity than was possible heretofore, thereby effecting a quicker drying of the material because the loops are not apt to flutter in the air and thereby become wrinkled and entangled with each other.

The tension rollers or weights lying in the bottom of the loops produces sufficient friction between the material and the girts, and between the material and the tension rollers, to cause the material to move relative to the girts and rollers when the girts are rotated. This rotation of the girts may be continuous or intermittent, as desired, and prevents, what is known to the trade as "stick marks" being produced on the material.

Another object of the invention is to provide means at the delivery end of the drier for automatically removing the tension rollers from the material as the same is drawn out of the loops.

And still another object of the invention is to return the extracted rollers automatically to the feed end of the drier for further use in the formation of subsequent loops.

In the accompanying drawing:

Fig. 1 is a longitudinal sectional view, in diagram, illustrating my improved loop drier;

Fig. 2 is an enlarged view of one of the feed wheels for the tension rollers at the feed end of the machine;

Fig. 3 is an enlarged view showing one of the roller elevating wheels at the discharge end of the machine;

Fig. 4 is a perspective view of one of the tension rollers; and

Fig. 5 is a perspective view of one of the girts.

As illustrated in Fig. 1 of the drawing, the drier comprises a casing 1. Rotatably mounted in and extending transversely of the casing 1 is a series of shafts 2, 2. Each shaft 2 has secured thereto, in spaced relation to each other, a pair of sprocket wheels 3. In the drawing but one wheel 3 is shown on each shaft 2 adjacent one side of the casing 1, it being understood that adjacent the opposite side of the casing 1 is positioned the other wheel 3 of each of the pairs of wheels secured to each shaft 2, as above noted.

The wheels 3 at each side of the casing are aligned to receive a conveyer chain 4. Extending between and rotatably mounted on the conveyer chains 4, 4 is a series of girts 5, 5.

The material to be dried, indicated at x, is adapted to be formed into a series of loops x^1, respectively located between pairs of adjacent girts 5.

In the bottom of each loop x^1 is located a tension weight, in the form of a roller 10, having trunnions 11, 11 projecting longitudinally from the opposite ends of and axially aligned with each roller.

The material to be dried passes over a roller 6 and enters the casing 1 through a slot 7 located at the feed end of the drier. At the opposite end of the drier the dried material

is drawn out of the casing 1, through a slot 8 formed therein, by a roller 9, being gripped between the roller 9 and a co-operating roller 9^a.

At the feed end of the drier and adjacent the inner side of each of the conveyer chains 4 is rigidly mounted an inclined rack element 12 on which the trunnions 11, of the rollers 10, are adapted to rest.

Feeding of the rollers 10 onto the material x at predetermined intervals is effected by means of star wheels 15, 15 located respectively adjacent the outer sides of the rack elements 12.

The star wheels 15 each comprise a hub 16, a flange 17 and a series of radially extending ribs 18. The trunnions 11 of the rollers 10 engage the ribs 18 of the star wheels and lie intermediate the flanges 17 of the star wheels located at the opposite sides of the drier.

By this means the rollers are held in correct position transversely of the drier to be dropped onto the material intermediate the conveyer chains 4, 4.

The flange 17 of each star wheel 15 functions as one element of a "Geneva" movement, by which the rollers 10 are dropped onto the material at predetermined intervals, as the upper run of the material conveyer moves toward the discharge end of the drier, to bring the girts 5 successively into proper position for the formation of the loops therebetween.

The flange 17 of each star wheel 15 is provided with concaved portions 19 in which the circular portion 20 of the second element of the "Geneva" movement is adapted to rotate. This second element of the "Geneva" movement is provided with a flange 21 in which is secured a laterally extending pin or roller 22 which is adapted to enter, successively, a series of slots 23 formed in the flange 17 of the star wheel 15. The slots 23 are radially aligned with the respective ribs 18 of the star wheel.

The circular portion 20 of the second element of the "Geneva" movement is cut out, as at 24, to permit the passage of the concaved portions 19 of the flange 17 of the star wheel 15 to pass, when the roller 22 enters one of the radial slots 23 of the flange 17.

At the delivery end of the drier is provided an elevator wheel 25 adjacent the inner side of each of the conveyer chains 4.

The elevator wheels 25 are rotatably mounted in a fixed position within the casing 1, and are provided with teeth or hook portions 26 which are adapted to enter between the girts 5, 5, to receive the trunnions 11 of the respective rollers 10, when the rollers are raised to a position adjacent the upper run of the conveyer chains 3, by the material being drawn out of the last loop x^1 of the series by the co-operating drawing rollers 9 and 9^a.

The roller trunnions 11, 11 are carried in the gullets 27 of the hooks 26, and are deposited on endless chains 28 which pass around sprocket wheels 29 secured to the respective elevator wheels 25 and around sprocket wheels 30 rotatably mounted adjacent the upper ends of the rack elements 12, at the feed end of the drier. By this means the tension rollers are returned to the feed end of the drier for subsequent use.

To prevent the rollers 10 from rolling along the chains 28 as they are dropped out of the gullets 27 of the elevator wheels 25, an escapement device is provided at each side of the drier, each of which consists of a lever 30 pivoted at 31 and having a vertical projection 32 adapted to be raised above the upper run of the adjacent chain 28 to act as a stop for the rollers, and to be lowered below the upper run of the chain to release the rollers after the same become inert on the chains 28.

Raising and lowering of the stops 32 is effected by cam wheels 34 secured to the elevator wheels 25 and engaging rollers 35 rotatably mounted on the levers 30.

The material conveyer chains 4, the material feed roller 6, the roller feed wheels 15, the roller elevator wheels 25, and the roller return conveyer 28 are adapted to be driven at predetermined relative speeds from a common drive shaft 40, while the drawing rollers 9, 9^a are driven from an independent shaft 41, in the present instance.

The shaft 40 is rotatably mounted in suitable bearings, not shown, and adapted to be rotated at the desired speed by any suitable means, such as an electric motor, not shown.

On the shaft 40 is a pair of worms 42 and 43. The worm 42 meshes with a worm wheel 44 secured to a rotatably mounted shaft 45, on which is secured sprocket wheels 46 and 47.

The sprocket wheel 46 meshes with a sprocket chain 48 which drives a sprocket wheel 49 secured to one of the shafts 2, for moving the material conveyer girts 5 through the machine at a predetermined rate of speed.

The sprocket wheel 47 meshes with a sprocket chain 50 which drives a sprocket wheel 51 secured to the shaft 52 on which the feed roll 6 is secured, thereby rotating the feed wheel at a definite rate of speed relative to the movement of the girts 5, whereby the material is laid in loops over the said girts.

The star wheels 15 are partially rotated at predetermined intervals to drop a tension roller onto the material which is carried between a pair of adjacent girts 5 which are being moved under the lower ends of the rack elements 12, to cause the roller to press the material down between the girts to form a loop.

Intermittent movement of the star wheels

15 is effected by the above mentioned "Geneva" movements, one element of each of which is provided with a sprocket wheel 81 which is driven by a sprocket chain 82 from a sprocket wheel 53 secured to a rotatably mounted shaft 54. The shaft 54 is provided with a worm wheel 55 which meshes with the worm 43 on the shaft 40.

Another sprocket wheel 56 on the shaft 54 is operatively connected by a sprocket chain 57 to a sprocket wheel 58 secured to the shaft 59 on which the sprocket wheels 30 of the roller return conveyers 28 are secured. The elevator wheels 25 are rotated by the conveyer chains 28.

The shaft 41 is provided with a worm 60 which meshes with a worm wheel 61 secured to a shaft 62 on which is also secured a sprocket 63. The sprocket 63 is operatively connected by a sprocket chain 64 with a sprocket wheel 65 secured to the shaft 66 on which the drawing roll 9 is secured.

The shaft 41 which operates the drawing roll 9 is adapted to be driven from a source of power independent of that of the shaft 40, preferably by a separate electric motor, not shown, in order that the speed at which the material is drawn out of the loops may be properly regulated relative to the speed of movement of the material conveyer and the elevator wheels 25, so that the tension roller 10 in the last loop x^1 of the series will be raised to and maintained at the proper position to be delivered to the hooks of the elevator wheels at such time as the said hooks are in the proper position to receive the trunnions of the tension rollers.

For this purpose a suitable switch 75 is provided for controlling the flow of current to the motor which drives the roll 9. The switch 75, in the present instance, comprises a fixed contact 76 and a movable contact 77. The contact 77 is carried on a lever 78, which is pivoted at 79. The end of the lever 78 projects into the path of the roller 10 when the roller is being raised. When the roller is raised to a predetermined position it strikes the lever 78 and turns the same on its pivot, thereby separating the contacts 76 and 77, which interrupts the flow of current to the motor to stop the roll 9.

As the material conveyer advances, the roller 10 is moved along the lever 78 and the hooks of the elevator wheels 25 are brought into a position substantially as shown in Fig. 1, whereupon the roller 10 rides from under the switch arm 78 permitting the same to drop, to close the switch 75. Closing of the switch 75 starts the motor which rotates the roll 9, thereby drawing the material from the broken line position to the full line position in Fig. 1, which delivers the roller 10 into the hooks of the elevator wheel 25.

Continued movement of the elevator wheel 25 deposits the rollers onto the conveyer chains 28, which carry the rollers to and deposit them on the inclined rack elements 12, from which they are delivered by the star wheels 15 for a repeat of the cycle.

The bottom edge 27^a of each of the gullets 27 of the elevator wheels 25 are arranged to engage the material lying over the girt 5 at the rear of the last loop of the series, so that the said last loop can be drawn out without affecting the other loops of the series. As the girts and elevator wheels advance the said edges of the gullets move away from the engaged girt to permit the next loop to be drawn out.

On one end of each of the girts 5 is a pinion 70, which in the present instance is adapted to be brought into co-operative engagement with a fixed gear rack 71, so that, as the upper run of the material conveyer advances toward the delivery end of the drier, the girts 5 will be rotated, which will cause a relative movement of the material with respect to the girts. This movement of the material will cause a similar relative movement with respect to the tension roller 10 lying in the bottom of the loop, thereby preventing the formation of "stick marks" on the material.

Any of the well known means for heating and circulating the air in the casing 1 may be provided, but as these means form no part of the present invention they have been eliminated from the drawings for the purpose of clarity.

In the drying of certain classes of material the goods is apt to shrink unevenly causing some of the tension rollers 10 to swing out of parallel alignment with the adjacent rollers or all the rollers to swing from their normal positions at right angles to the longitudinal center line of the goods to positions at various angles relative to said line.

To overcome this possibility and to hold the rollers in correct position at right angles to the longitudinal center line of the goods and parallel to each other, as the loops travel through the drier, an endless chain 90 is provided at each side of the drier, having plates 91 secured thereto, the plates 91 being positioned on the chains 90 in a manner to form vertically extending slots 92, between the plates, which are adapted to receive the trunnions 11 of the rollers 10, the upper ends of said slots being flared as shown at 93 to guide the trunnions 11 of the rollers into the slots 92.

The chains 90, 90 pass around sprockets 94 secured to shafts 95, 95^a rotatably mounted in the drier, and on the shaft 95 is secured a sprocket 96 which is operatively connected by a sprocket chain 97 to a sprocket wheel 98 secured to one of the shafts 2, which carry the material conveyer chains 4, thus the loop or roller steadying mechanism is driven in syn-

chronism with the material conveyer and the lower ends of the loops or festoons are held in parallel relation to each other, and at right angles to the longitudinal center line of the goods throughout the drying operation.

I claim:

1. The combination in a loop drier, of a casing enclosing a drying chamber; an endless conveyer; girts carried by the conveyer over which the material is to be looped; means for feeding the material to the conveyer; a feed wheel for placing poles on the material between the girts to form the loops; an elevating wheel at the discharge end of the drier arranged to receive the poles from the loops as they are drawn up; and an endless conveyer for carrying the poles from the discharge end of the drier to the delivery end thereof.

2. The combination in a loop drier, of an endless belt conveyer; girts on the conveyer over which the material is looped; poles arranged in the bottoms of the loops to hold the said loops straight as the material is traversed through the drier; an inclined rack on which the poles accumulate; feed wheels at the feed end of the machine arranged to feed the poles from the inclined rack into the loops; means at the discharge end of the machine for collecting the poles as the loops are drawn out; and means for returning the poles to the inclined rack.

3. The combination in a loop drier, of an endless conveyer having girts on which the material is looped; poles arranged in the bottoms of the loops; means for feeding the poles to the loops; an elevator wheel at the discharge end of the drier having arms which engage the poles as the loops are drawn, said arms frictionally holding the material on the girts as the loops are drawn; and means for returning the poles to the feed end of the machine.

4. The combination in a loop drier, of an endless conveyer; girts carried by said conveyer, on which the material is looped; poles arranged in the bottoms of the loops to place the material of the loops under tension; means for advancing the conveyer through the drier; and means for rotating the girts, whereby the tension produced by the poles on the bottoms of the loops will cause the material to frictionally engage the girts and the poles, and whereby rotation of the girts will cause a relative movement of the material with respect to the girts and the poles, said relative movement of the material causing a similar rotation of the poles.

5. The combination in a loop drier, of an endless conveyer; girts carried by said conveyer, on which the material is looped; poles arranged in the bottoms of the loops to place the material of the loops under tension; means for advancnig the conveyer through the drier; and means for rotating the girts, comprising a pinion on each girt and a rigidly mounted gear rack adapted to engage the teeth of said pinion.

6. The combination in a loop drier, of an endless conveyer; girts carried by said conveyer, on which the material is looped; poles arranged in the bottoms of the loops to place the material of the loops under tension; means for advancing the conveyer through the drier; and means for rotating the girts, comprising a pinion on each girt and a short rigidly mounted gear rack adapted to engage the teeth of the pinions as the respective girts pass from one end to the other end of said gear rack.

7. The combination in a loop drier, of an endless conveyer; girts on the conveyer over which the material is looped; poles located in the bottoms of the loops; means for driving the said conveyer to advance the loops through the drier; a discharge drum for drawing the material out of the loops successively; means for driving the discharge drum independent of the conveyer driving means; and an electric switch adapted to be engaged and operated by the pole in the loop being withdrawn, for controlling the operation of said discharge drum.

8. The combination in a loop drier, of a casing enclosing a drying chamber; an endless conveyer; girts carried by the conveyer over which the material is to be looped; means for feeding the material to the conveyer; a feed wheel for placing poles on the material between the girts to form the loops; an elevating wheel at the discharge end of the drier arranged to receive the poles from the loops as they are drawn up; an endless conveyer for carrying the poles from the discharge end of the drier to the delivery end thereof; and an escapement mechanism for positioning the poles on the last said endless conveyer.

9. The combination in a loop drier, of an endless conveyer adapted to be driven at a predetermined speed; girts on the conveyer in spaced relation and substantially parallel to each other over which the material to be dried is placed; means for feeding the material to the conveyer for the formation of said loops; means for feeding poles onto the material between the girts to form the loops; and means adjacent the bottoms of said loops for engaging the poles to steady the loops as they travel through the drier.

10. The combination in a loop drier, of an endless conveyer adapted to be driven at a predetermined speed; girts on the conveyer in spaced relation and substantially parallel to each other over which the material to be dried is placed; means for feeding the material to the conveyer for the formation of said loops; means for feeding poles onto the material between the girts to form the loops; endless chains adjacent the bottoms of the

loops; and plates on said chains spaced apart to form slots for the reception of said poles for steadying the bottoms of the loops.

11. The combination in a loop drier, of an endless conveyer adapted to be driven at a predetermined speed; girts on the conveyer in spaced relation and substantially parallel to each other over which the material to be dried is placed; means for feeding the material to the conveyer for the formation of said loops; means for feeding poles onto the material between the girts to form the loops; endless chains adjacent the bottoms of the loops; plates on said chains spaced apart to form slots for the reception of said poles for steadying the bottoms of the loops; and means for driving the plate carrying chains in synchronism with the girt carrying conveyer.

ALPHEUS O. HURXTHAL.