

Jan. 13, 1942.

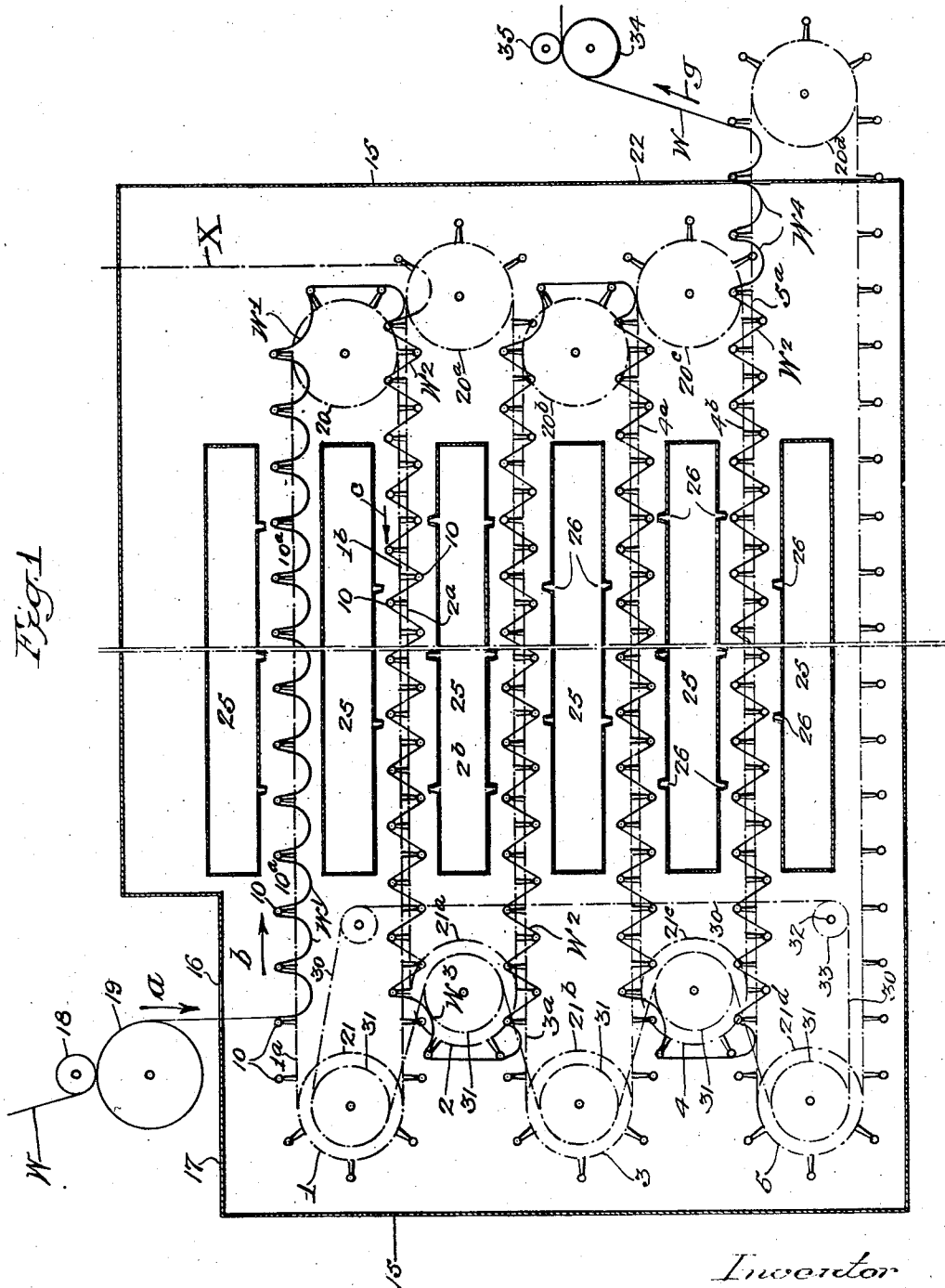
A. O. HURXTHAL

2,270,125

DRIER FOR CONTINUOUS WEB, STRIP, OR STRING MATERIALS

Filed Aug. 4, 1939

2 Sheets-Sheet 1



Inventor
 Alpheus O. Hurxthal
 by his Attorneys
 Howson & Howson

Jan. 13, 1942.

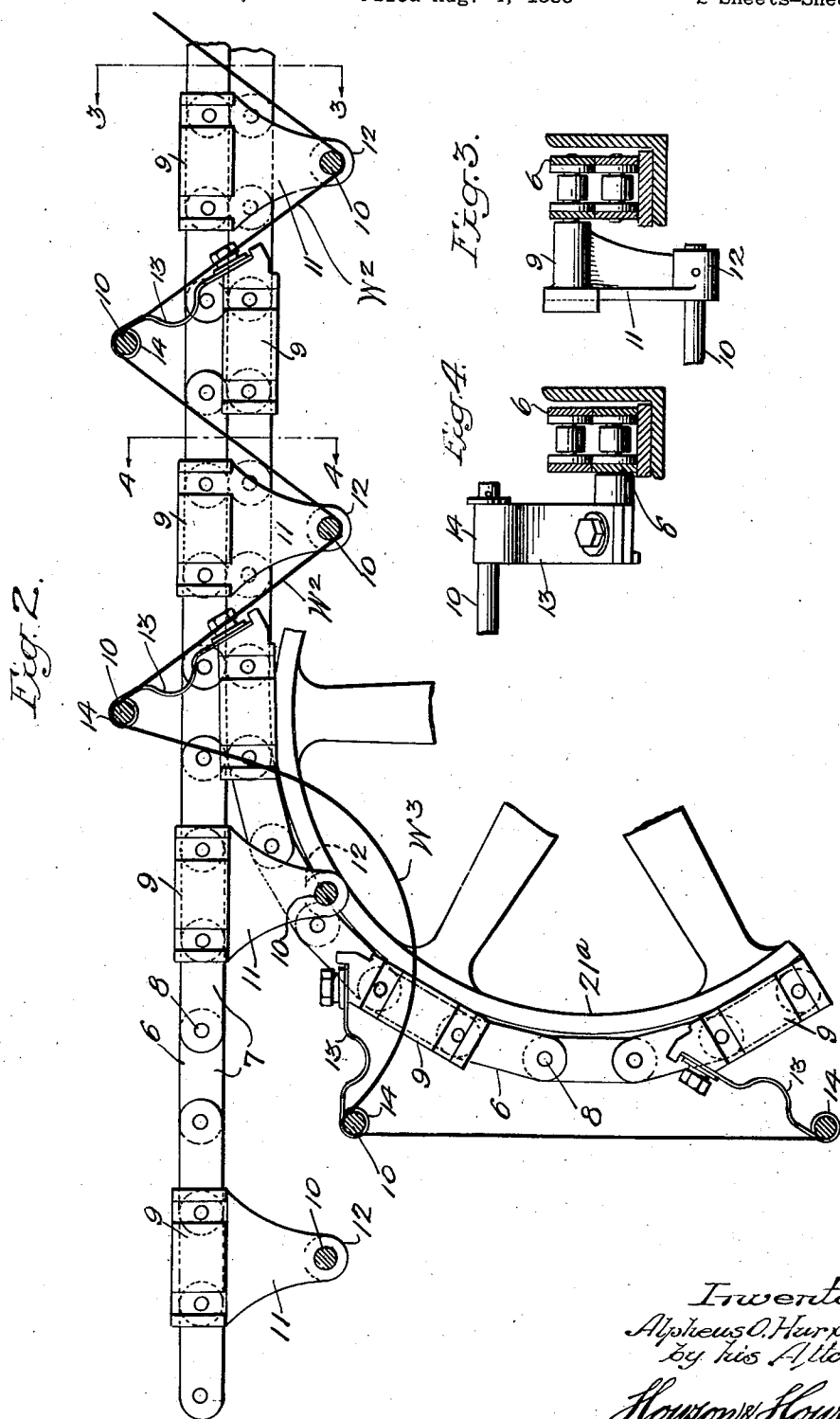
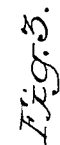
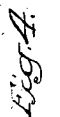
A. O. HURXTHAL

2,270,125

DRIER FOR CONTINUOUS WEB, STRIP, OR STRING MATERIALS

Filed Aug. 4, 1939

2 Sheets-Sheet 2



Inventor
Aplieus O. Hursthal
by his Attorneys
Houson & Houson

UNITED STATES PATENT OFFICE

2,270,125

DRIER FOR CONTINUOUS WEB, STRIP, OR
STRING MATERIALS

Alpheus O. Hurxthal, Wyncote, Pa., assignor to
Proctor & Schwartz, Incorporated, Philadel-
phia, Pa., a corporation of Pennsylvania

Application August 4, 1939, Serial No. 288,419

10 Claims. (Cl. 34—159)

This invention relates to driers for continuous web, strip, or string materials, and more especially single or double-ply cloth, including flattened tubular goods.

The invention more especially relates to that type of drier which includes a stack of superposed horizontal conveyers for supporting and transporting the material through a drying chamber, in the presence of circulating current or impinging jets of air or other conditioning medium, to effect drying or other processing of the material; and wherein the material fed to the uppermost conveyer, at one end of the drying chamber, is carried thereby to the opposite end and delivered to the next lower conveyer for a return trip to the first said end of the drier; and wherein the transportation of the goods in opposite directions alternately, by successively lower conveyers respectively, continues uninterruptedly until the drying or other processing of the goods has been completed.

In the type of drier noted, the superposed conveyers are respectively composed of pairs of laterally spaced side chains of the endless belt type, with each pair of side chains connected by transversely extending laterally spaced girts upon which the continuous run of material is laid and between which the material sags or forms into shallow concaves intermediate the side chains.

The capacity of the above-noted type of drier is relatively low per foot of conveyer employed in the drier, and the goods is subject to lateral movement on the girts into damaging contact with the side chains of the conveyers or the tracks upon which the side chains ride.

One object of the present invention is to increase the capacity of the above-noted type of drier by increasing the lineal yardage of goods fed to and hanging between adjacent girts of the conveyers.

Another object of the invention is to construct, arrange and operate the conveyers in such a manner that damage to the goods will be eliminated, by having the otherwise idle girts on the return run of one conveyer intermesh with and occupy the spaces between the goods-supporting girts in the carrying run of the next lower conveyer, whereby the idle girts will engage and hold the goods, between the carrying girts, in a plane below that of the carrying girts, to prevent accidental displacement of the goods thereon.

A still further object of the invention is to provide a yielding connection between the girts and side chains of predetermined conveyers to

prevent damage to the goods or the apparatus, or both, should the goods be placed under excessive tension as a result of abnormal shrinkage or inadequate rate of feed.

The construction and operation of a drier made in accordance with the principles of the present invention will be fully disclosed hereinafter, reference being had to the accompanying drawings, of which:

Figure 1 is a diagrammatic longitudinal sectional elevation of a drier equipped with supporting conveyers in accordance with the present invention;

Fig. 2 is an enlarged detail of a portion of the conveyer arrangement shown in Fig. 1;

Fig. 3 is a section taken on the line 3—3, Fig. 2, and

Fig. 4 is a section taken on the line 4—4, Fig. 2. As shown in Fig. 1, the apparatus comprises a stack of superposed horizontal conveyers indicated at 1, 2, 3, 4 and 5, respectively. Each conveyer comprises a pair of laterally spaced side chains 6, each chain being composed of a series of links 7 pivotally connected at 8. Interposed between predetermined links 7, 7 are carriers 9 for girts 10. The girts 10 extend transversely of the conveyer from one of the side chains 6 thereto to the corresponding chain at the opposite side of the conveyer.

In predetermined conveyers, for example in the conveyers 1, 3 and 5, each girt carrier 9 includes a solid bracket 11 having a bearing 12 in which one end of a girt 10 is rigidly mounted.

In the intermediate conveyers 2 and 4, for example, the girt carriers 9 support resilient arms 13 which are provided with eyes or bearings 14 at their outer free ends for reception of the ends of the girts 10.

As shown in Figs. 1 and 2, the girts 10 are spaced outwardly from the common plane of the side chains 6, 6, and the succeeding conveyers are so arranged that the side chains in the lower, idle or return run of an upper conveyer rest on the side chains of the upper or carrying run of the next lower conveyer, with the girts of said return run in intermeshing relation with the girts of said carrying run, the girts of said carrying run being disposed in a plane above the superposed side chains of the return and carrying runs of the two conveyers, and the girts of said return run being disposed in a plane below the superposed side chains of said runs of the two conveyers.

As shown in Fig. 1, the stack of superposed conveyers is mounted within a suitable casing 15.

The carrying run 1a of the uppermost conveyer 1 passes horizontally below a feed opening 16 formed in the roof or top 17 of the drier casing. A continuous web of material W passes between feed rolls 18 and 19, which deliver the material in the direction of the arrow a through the opening 16 while the upper run 1a of the conveyer 1, with its girts 10, travels horizontally below said opening in the direction of the arrow b, whereby the web W is laid on the girts 10 and forms into small loops or festoons W¹ which hang in the spaces 10a between the girts 10, 10 over which the web W is laid.

At the opposite end of the drier casing 15, the side chains 6, 6 of the conveyer 1 pass around sprockets 20, whereby the direction of movement of the conveyer 1 is changed from that indicated by the arrow b, in the upper carrying run 1a, to that indicated by the arrow c, in the lower, idle or return run 1b.

At the feed end of the casing adjacent the feed opening 16, the side chains 6 of the conveyer 1 pass around sprockets 21, to return the conveyer from the lower, idle run 1b to the upper carrying run 1a for a repeat of the cycle.

The upper or carrying run 2a of the next lower conveyer 2 travels concurrently with the lower or idle run 1b of the upper conveyer 1, with the girts 10 of the carrying run 2a of the conveyer 2 in staggered relation to the girts 10 in the lower, idle run 1b of the conveyer 1, the girts of the idle run of the conveyer 1 occupying the spaces 10a between the girts of the carrying run 2a of the conveyer 2.

As the conveyer 1 passes around the aligned axes of the sprockets 20, the web W is drawn out of the small loops or festoons W¹ and is laid over the girts 10 of the carrying run 2a of the conveyer 2, said web sagging between the girts in substantially the same manner as indicated in the carrying run 1a of the upper conveyer 1. However, due to the concurrent movement of the conveyers 1 and 2, in the direction of the arrow c, the girts 10 of the conveyer 2 in passing around the axes of the sprockets 20a, about which the side chains of the conveyer 2 pass, automatically enter the spaces 10a between the girts 10 of the conveyer 1 and engage the web W between said girts, whereby the girts in the carrying run 2a of the conveyer 2 assume the duty of supporting the web W, while the girts 10 of the idle run 1b of the conveyer 1 force the material down between the girts of the carrying run 2a of the conveyer 2 in the form of sharp angular V-shaped undulations, as indicated at W². In this manner, the material is held under tension between the staggered girts as the adjacent runs of the conveyers 1 and 2 travel concurrently in the direction of the arrow c.

As the conveyer 2 passes around the axes of the sprockets 21a, over which the side chains of the conveyer 2 are trained, the girts 10 of the upper or carrying run 2a of the conveyer 2 move out from between the girts 10 of the lower or idle run 1b of the conveyer 1, thereby withdrawing the web W from the tensioned undulations W² and causing the web to assume the form of a loose untensioned loop W³.

As the conveyer 2 moves out of the carrying run 2a into the idle or return run 2b thereof, the web W is laid on the girts 10 of the carrying run 3a of the next lower conveyer 3, and the girts 10 of the idle run 2b of the conveyer 2 move into the spaces 10a between the girts 10 of the carrying run 3a of the conveyer 3, to reform the web

W into another series of tensioned V-shaped undulations W², in the same manner as previously described in regard to the transfer of the web W from the conveyer 1 to the conveyer 2.

The above-noted operations are repeated in transferring the web W from the conveyer 3 to the conveyer 4, and from the conveyer 4 to the conveyer 5.

As the side chains of the conveyer 4 pass around their supporting sprockets 20c, while the conveyer 4 moves out of the idle run 4b into the carrying run 4a, the girts 10 of the conveyer 4 move out of the spaces between the girts 10 of the carrying run 5a of the conveyer 5, thereby releasing the tension on the web W and permitting the web to change from the tensioned undulations W² to the untensioned loops W⁴.

The conveyer 5, as illustrated in Fig. 1, passes outwardly beyond the casing 15 through the end wall 22 thereof, with the untensioned loops W⁴ hanging loosely over the girts 10 in the carrying run 5a of the conveyer 5, from which the web W is drawn in the direction of the arrow g by rolls 34 and 35 or any other suitable means.

Should the web become excessively taut, as a result of abnormal shrinkage or as a result of the feed rolls 18 and 19 failing to feed the web W at a sufficiently fast rate of speed to prevent such excessive tensioning of the web, the resilient supports 13 for the girts 10 of the alternate conveyers will yield sufficiently to permit a decrease in the height of the undulations W², thereby preventing breakage of or other damage to the web, and preventing undue flexing or breaking of the girts 10.

While the yielding supports for the girts 10 in the present instance have been shown only in connection with the alternate conveyers, it will be obvious that the girts 10 of each and all of the conveyers, or any predetermined conveyers, may be provided with the yielding supports 13.

As the web W is transported through the casing 15 in the manner above noted, it is subjected to the influence of a drying or other processing medium, such as conditioned air, which may be circulated transversely across the conveyers and the casing by any suitable well known means; or a conditioning medium may be forced under pressure into suitable conduits 25, to escape through nozzle openings 26 therein which are directed toward the traveling web, to effect impingement of jets of air against the material, it being understood that the jets may be arranged as close to each other or as far apart as found necessary or convenient in each of the conduits 25.

If desired, the web may be fed to the upper run of the conveyer 2 as it passes into intermeshing relation to the lower run of the conveyer 1, as indicated by broken lines at X in Fig. 1; to be formed immediately into the sharp V-shaped undulations W² between the lower run of the upper conveyer and the upper run of the lower conveyer instead of being initially formed into the U-shaped loops or festoons W¹ on the upper run of the upper conveyer.

It will be understood that the sprockets 20, 20a, 20b, 20c and 20d, and the sprockets 21, 21a, 21b, 21c and 21d, about which the conveyers 1, 2, 3, 4 and 5 are trained are driven at similar speeds by any suitable means, such for example as the chain 30 and sprockets 31, 31, driven from a motor or other power shaft 32 through a sprocket 33 thereon, to provide the concurrent movement of the adjacently disposed conveyer sections, i. e.,

the cooperating carrying and idle or return runs of the conveyers where the girts of each lie between and beyond the girts of the other in an intermeshing and staggered relation to each other.

I claim:

1. In a drier for continuous materials, two superposed horizontal substantially parallel concurrently movable conveyer sections each including a pair of laterally spaced side chains disposed in a common plane and a series of transverse laterally spaced girts disposed in a common plane substantially parallel to but spaced apart from the common plane of said side chains, and means supporting said girts in said spaced plane with the girts of each section projecting through the other of said sections and disposed in a plane beyond the plane of the side chains of said other section with the girts of each section interposed between and alternating with the girts of the other of said sections in staggered relation thereto.

2. In a drier for continuous materials, two superposed horizontal substantially parallel concurrently movable conveyer sections each including a pair of laterally spaced side chains disposed in a common plane and a series of transverse laterally spaced girts disposed in a common plane substantially parallel to but spaced apart from the common plane of said side chains, and means supporting said girts in said spaced plane with the girts of each section projecting through the other of said sections and disposed in a plane beyond the plane of the side chains of said other section with the girts of each section interposed between and alternating with the girts of the other of said sections in staggered relation thereto for supporting the material in relatively sharp angular undulations, and spring actuated means forming part of said girt supporting means in at least one of said conveyers for yieldably supporting the girts of one of said conveyers in said projected position at all times with respect to the side chains thereof.

3. In a drier for continuous materials, two superposed horizontal substantially parallel concurrently movable conveyer sections each including a pair of laterally spaced side chains disposed in a common plane and a series of transverse laterally spaced girts disposed in a common plane substantially parallel to but spaced apart from the common plane of said side chains, and means supporting said girts in said spaced plane with the girts of each section projecting through the other of said sections and disposed in a plane beyond the plane of the side chains of said other section with the girts of each section interposed between and altering with the girts of the other of said sections in staggered relation thereto for supporting the material in relatively sharp angular undulations, said girt supporting means including resilient arms respectively arranged at angles to said common planes with one end of each resilient arm secured to one of said side chains and the opposite free end of each resilient arm attached to one end of one of said girts, said arms being arranged in pairs with the arms of each pair respectively secured to a pair of said laterally spaced side chains of one of said conveyers for yieldably supporting the girts of one of said conveyers in said projected position at all times with respect to the side chains thereof and means for rigidly supporting the girts of the

other of said conveyers from and in said relationship to its side chains.

4. In a drier for continuous materials, two superposed horizontal substantially parallel concurrently movable conveyer sections each including a pair of laterally spaced side chains disposed in a common plane and a series of transverse laterally spaced girts disposed in a common plane substantially parallel to but spaced apart from the common plane of said side chains, and means supporting said girts in said spaced plane with the girts of each section projecting through the other of said sections and disposed in a plane beyond the plane of the side chains of said other section with the girts of each section interposed between and alternating with the girts of the other of said sections in staggered relation thereto for supporting the material in relatively sharp angular undulations, and means at one end of said sections for guiding the side chains thereof into said parallel relationship and the girts into said staggered alternating positions with the material between said conveyer sections.

5. In a drier for continuous materials, two superposed horizontal substantially parallel concurrently movable conveyer sections each including a pair of laterally spaced side chains disposed in a common plane and a series of transverse laterally spaced girts disposed in a common plane substantially parallel to but spaced apart from the common plane of said side chains, and means supporting said girts in said spaced plane with the girts of each section projecting through the other of said sections and disposed in a plane beyond the plane of the side chains of said other section with the girts of each section interposed between and alternating with the girts of the other of said sections in staggered relation thereto for supporting the material in relatively sharp angular undulations, means at one end of said sections for guiding the side chains thereof into said parallel relationship and the girts into said staggered alternating positions with the material between said conveyer sections, and means at the opposite end of said sections for separating said conveyer sections and the girts thereof to release said material therefrom.

6. In a drier for continuous materials, a plurality of superposed endless belt conveyers having a plurality of carrying runs and a plurality of cooperating return runs arranged with a carrying run of a lower conveyer in horizontal parallel cooperating relationship to a return run of an upper conveyer, each conveyer comprising laterally spaced side chains and a series of transverse laterally spaced girts, supports extending substantially perpendicular to said side chains, means on the outer ends of the supports for carrying the ends of said girts, the girt supports of each of said carrying runs projecting through the return runs of the next upper conveyers and the girt supports of said return runs projecting through the carrying runs of the next lower conveyers with the girts of adjacent conveyer runs alternating in vertical and lateral spaced relation and the material arranged in sharp angular undulations around and between said alternating girts, and sprockets for said side chains at the opposite ends of said conveyers for changing the directions of the conveyers from said carrying runs to said return runs and vice versa and feeding the material between and discharging the same from said cooperating runs at opposite ends respectively of the conveyers.

7. In a drier for continuous materials, a plu-

rality of superposed endless belt conveyers having a plurality of carrying runs and a plurality of cooperating return runs arranged with a carrying run of a lower conveyer in horizontal parallel cooperating relationship to a return run of an upper conveyer, each conveyer comprising laterally spaced side chains and a series of transverse laterally spaced girts, supports extending substantially perpendicular to said side chains, means on the outer ends of the supports for carrying the ends of said girts, the girt supports of each of said carrying runs projecting through the return runs of the next upper conveyers and the girt supports of said return runs projecting through the carrying runs of the next lower conveyers with the girts of adjacent conveyer runs alternating in vertical and lateral spaced relation and the material arranged in sharp angular undulations around and between said alternating girts, sprockets for said side chains at the opposite ends of said conveyers for changing the directions of the conveyers from said carrying runs to said return runs and vice versa and feeding the material between and discharging the same from said cooperating runs at opposite ends respectively of the conveyers, means for feeding the material vertically downward to the top run of the top conveyer, and means for advancing said top run horizontally below said feed means to form the material into loops over and between the girts thereof.

8. In a drier for continuous materials, a plurality of superposed endless belt conveyers having a plurality of carrying runs and a plurality of cooperating return runs arranged with a carrying run of a lower conveyer in horizontal parallel cooperating relationship to a return run of an upper conveyer, each conveyer comprising laterally spaced side chains and a series of transverse laterally spaced girts, supports extending substantially perpendicular to said side chains, means on the outer ends of the supports for carrying the ends of said girts, the girt supports of each of said carrying runs projecting through the return runs of the next upper conveyers and the girt supports of said return runs projecting through the carrying runs of the next lower conveyers with the girts of adjacent conveyer runs alternating in vertical and lateral spaced relation and the material arranged in sharp angular undulations around and between said alternating girts, sprockets for said side chains at the opposite ends of said conveyers for changing the directions

of the conveyers from said carrying runs to said return runs and vice versa and feeding the material between and discharging the same from said cooperating runs at opposite ends respectively of the conveyers, means for feeding the material vertically downward to the top run of the top conveyer; means for advancing said top run horizontally below said feed means to form the material into loops over and between the girts thereof, and means for withdrawing the material from similar loops on the carrying run of the bottom conveyer.

9. In a drier for continuous materials, a plurality of superposed endless belt conveyers having a plurality of carrying runs and a plurality of cooperating return runs arranged with the lower run of each conveyer paired with and disposed in adjacent superposed parallel cooperating relation to the upper concurrently moving run of the next lower conveyer, transverse laterally spaced girts secured to each conveyer with the girts of said lower runs projecting through said upper runs and vice versa to planes spaced above and below said upper and lower runs respectively to maintain said material in an undulated condition, and means intermediate succeeding vertically spaced pairs of said concurrently moving conveyer runs for directing air into said undulations substantially perpendicular to and against the upper and lower faces respectively of said material.

10. In a drier for continuous materials, a plurality of superposed endless belt conveyers having a plurality of carrying runs and a plurality of cooperating return runs arranged with the lower run of each conveyer paired with and disposed in adjacent superposed parallel cooperating relation to the upper concurrently moving run of the next lower conveyer, transverse laterally spaced girts secured to each conveyer with the girts of said lower runs projecting through said upper runs and vice versa to planes spaced above and below said upper and lower runs respectively to maintain said material in an undulated condition, means intermediate succeeding vertically spaced pairs of said concurrently moving conveyer runs for directing air into said undulations substantially perpendicular to and against the upper and lower faces respectively of said material, and corresponding means for directing air against the upper face solely of the material carried on the girts of the upper run of the uppermost of said conveyers.

ALPHEUS O. HURXTHAL.