Oct. 7, 1930.

A. O. HURXTHAL

1,777,972

CHEMICAL LOOP DRIER

Filed June 13, 1929

6 Sheets-Sheet 1

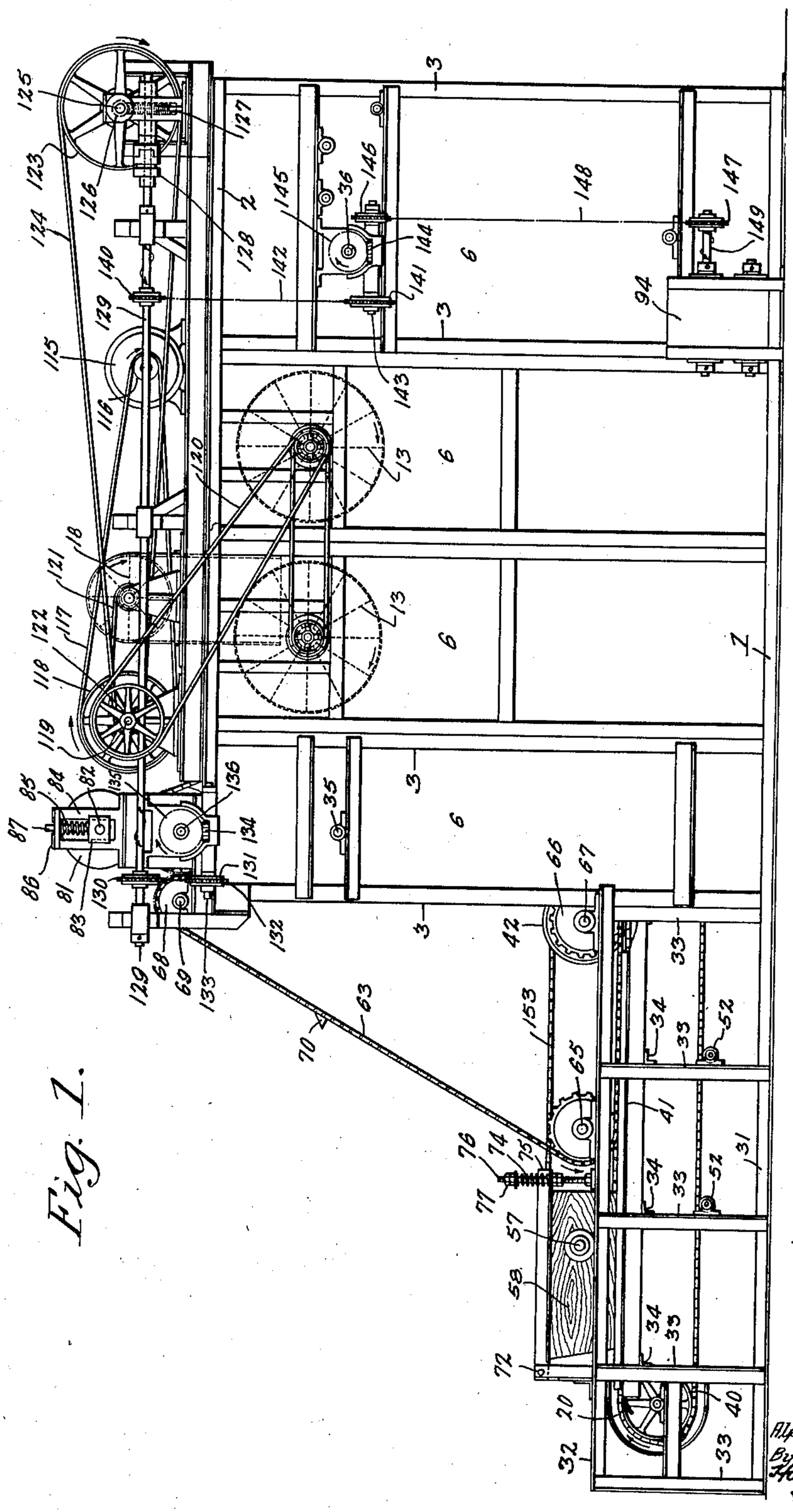

Fig. 1.

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6 Sheets-Sheet 2

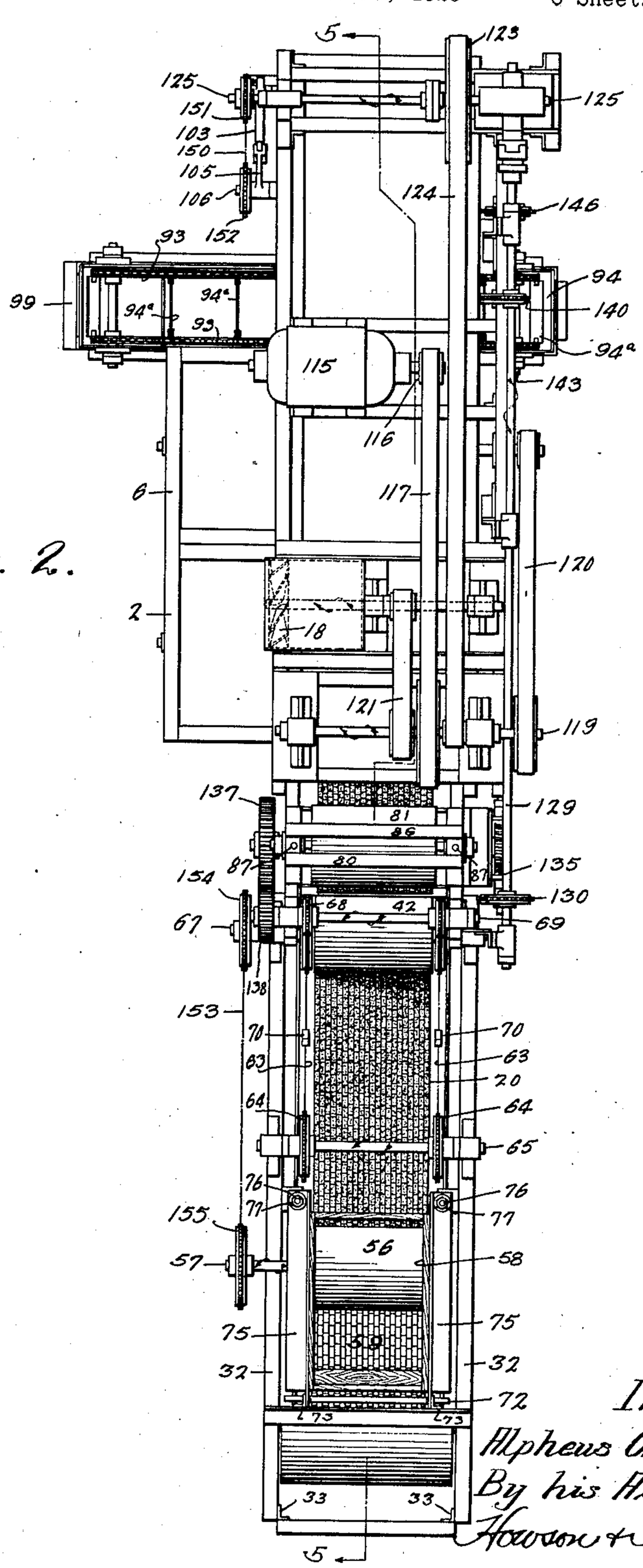

Fig. 2.

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CHEMICAL LOOP DRIER

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Fig. 3.

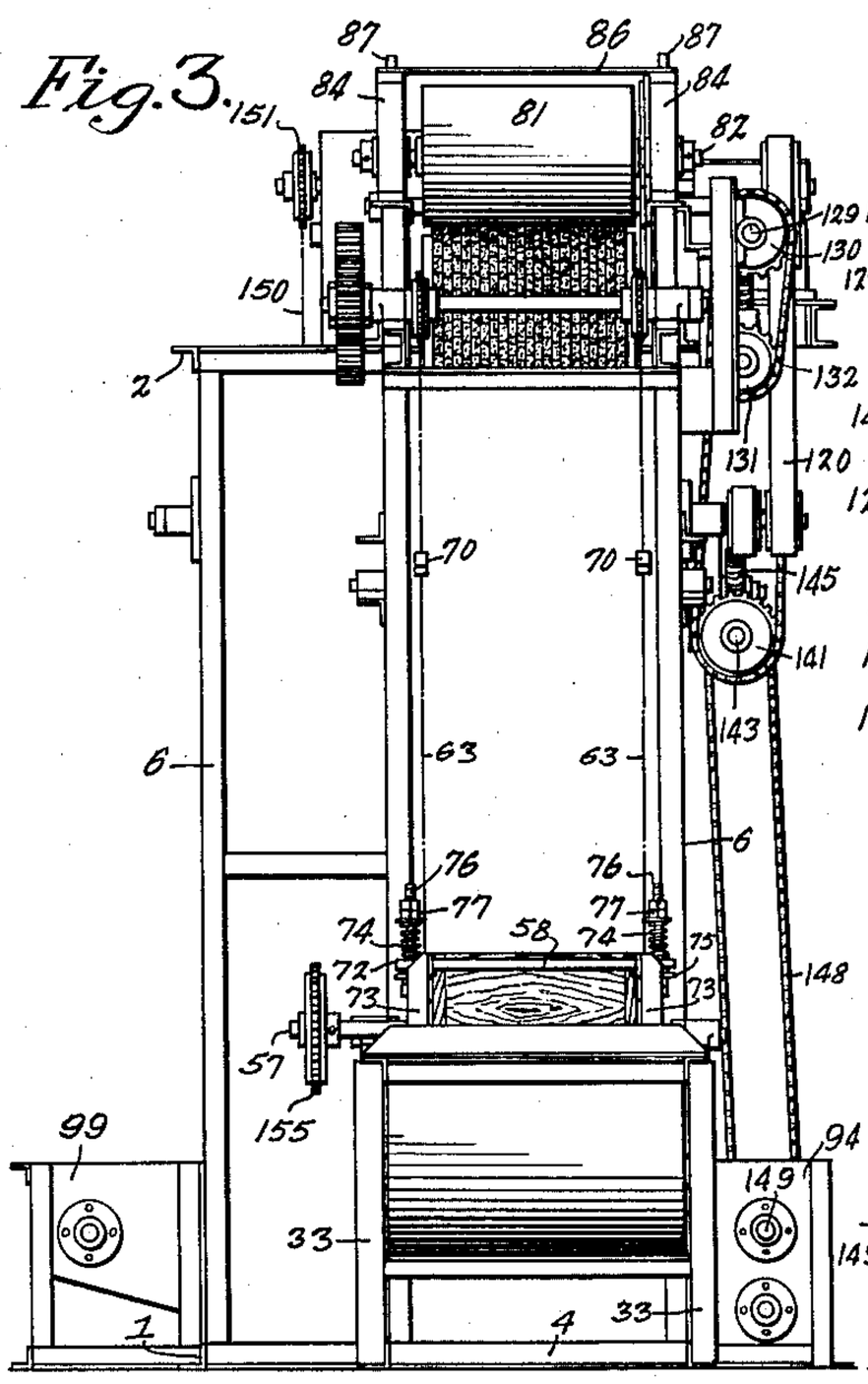


Fig. 4.

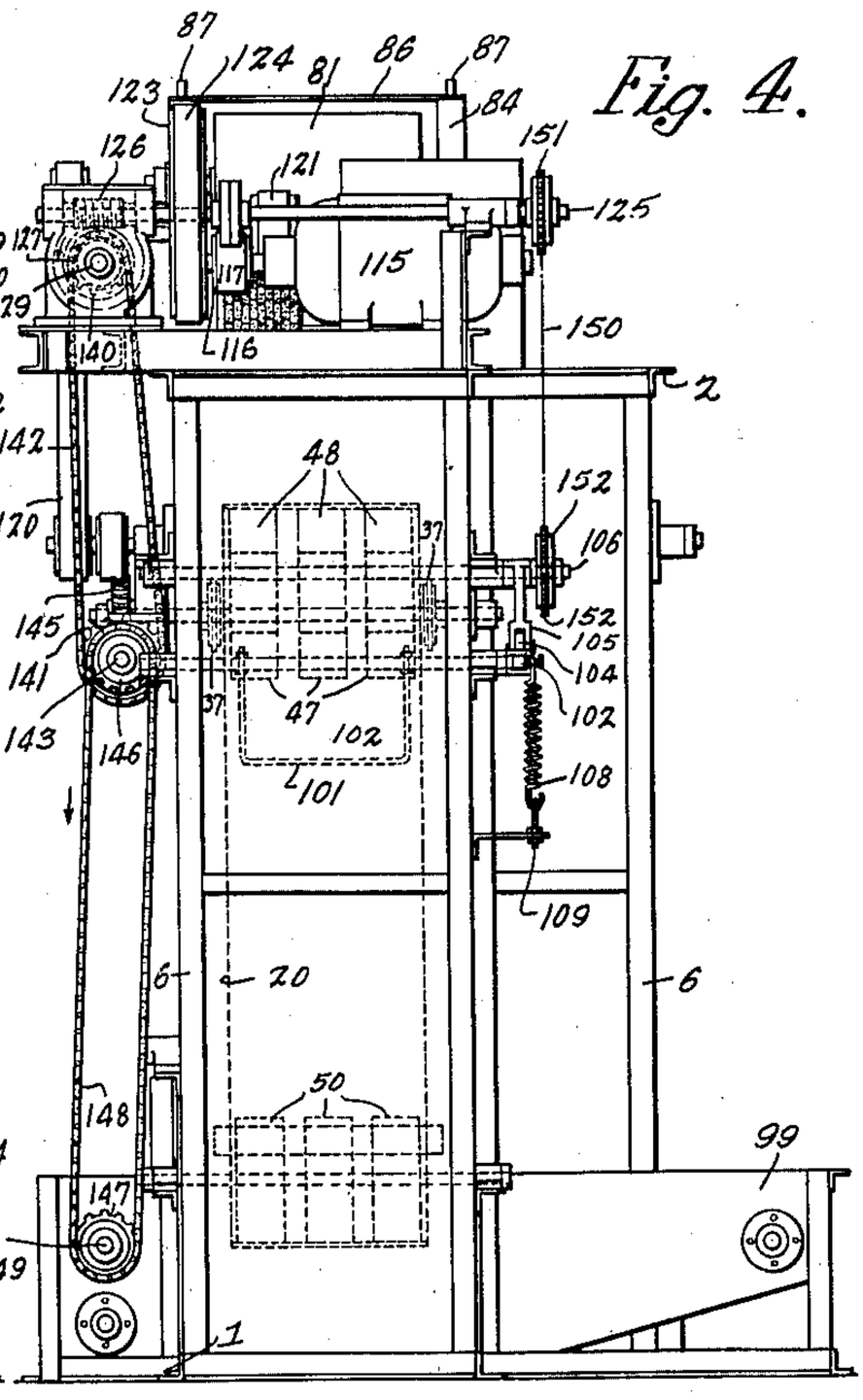
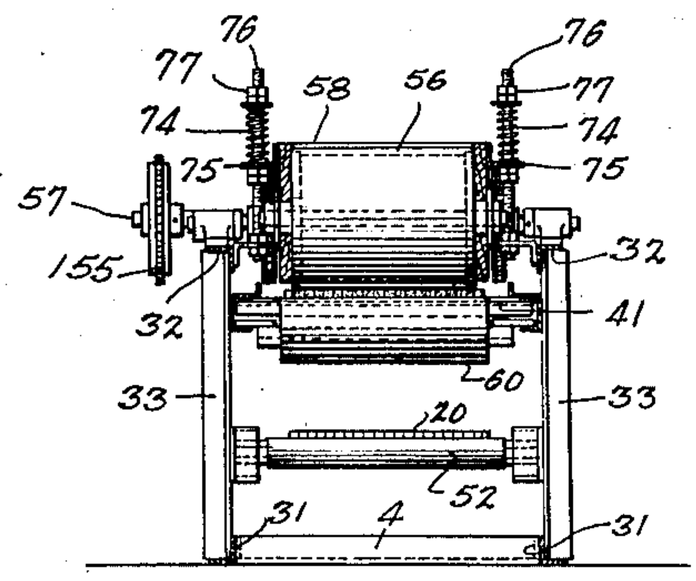


Fig. 7.



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CHEMICAL LOOP DRIER

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Fig. 5.

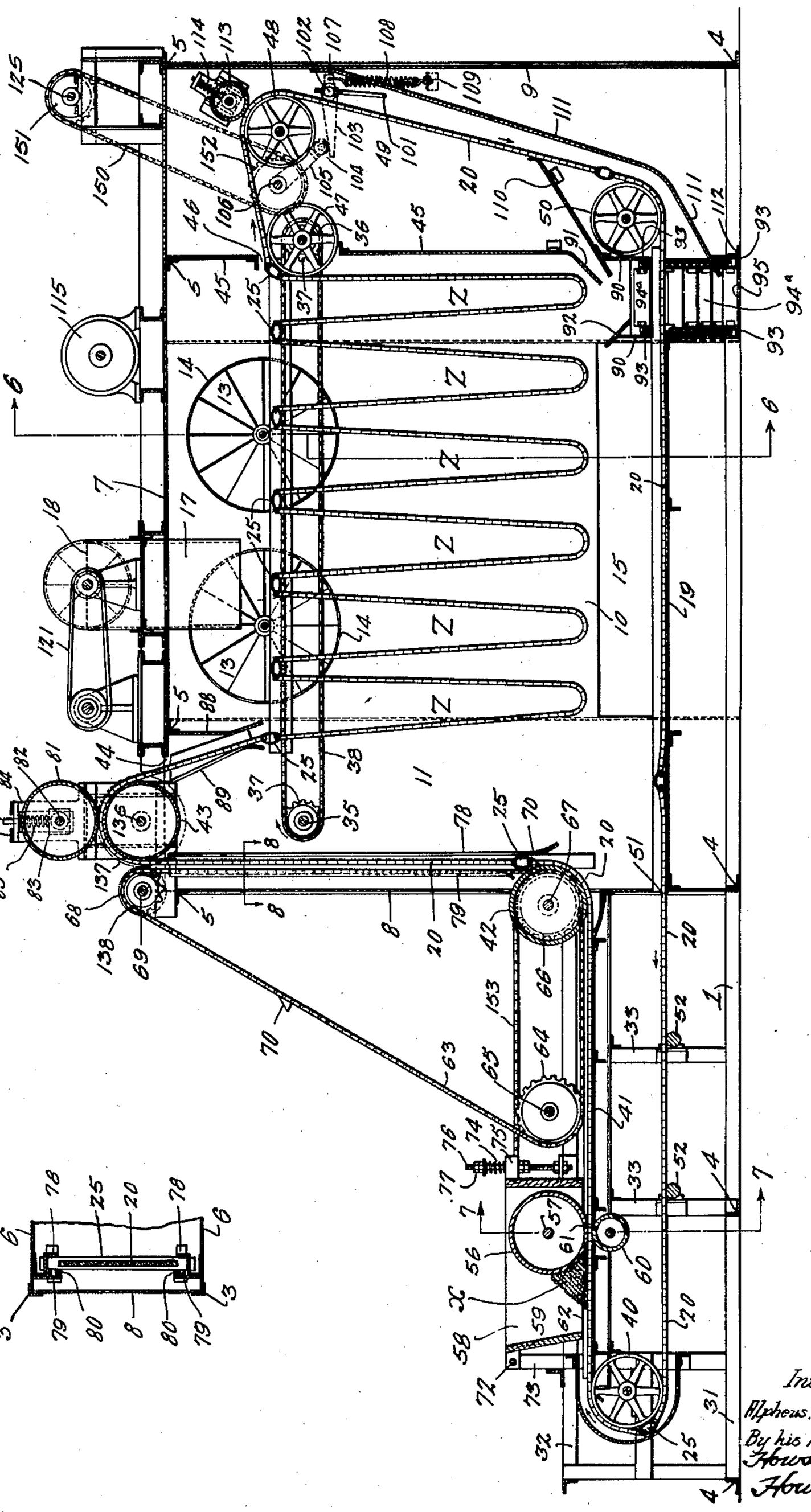

Fig. 8.

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CHEMICAL LOOP DRIER

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Fig. 6.

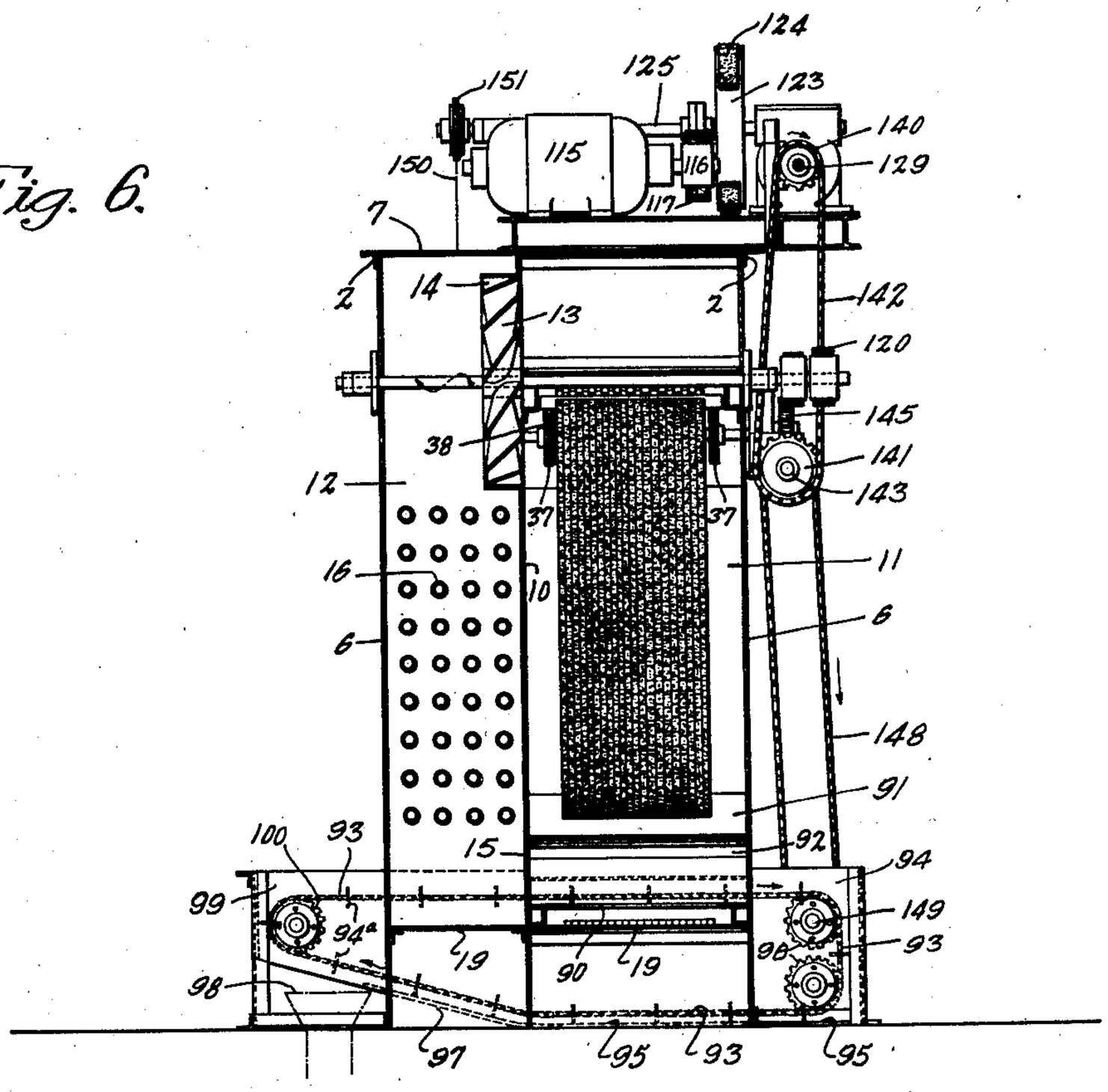
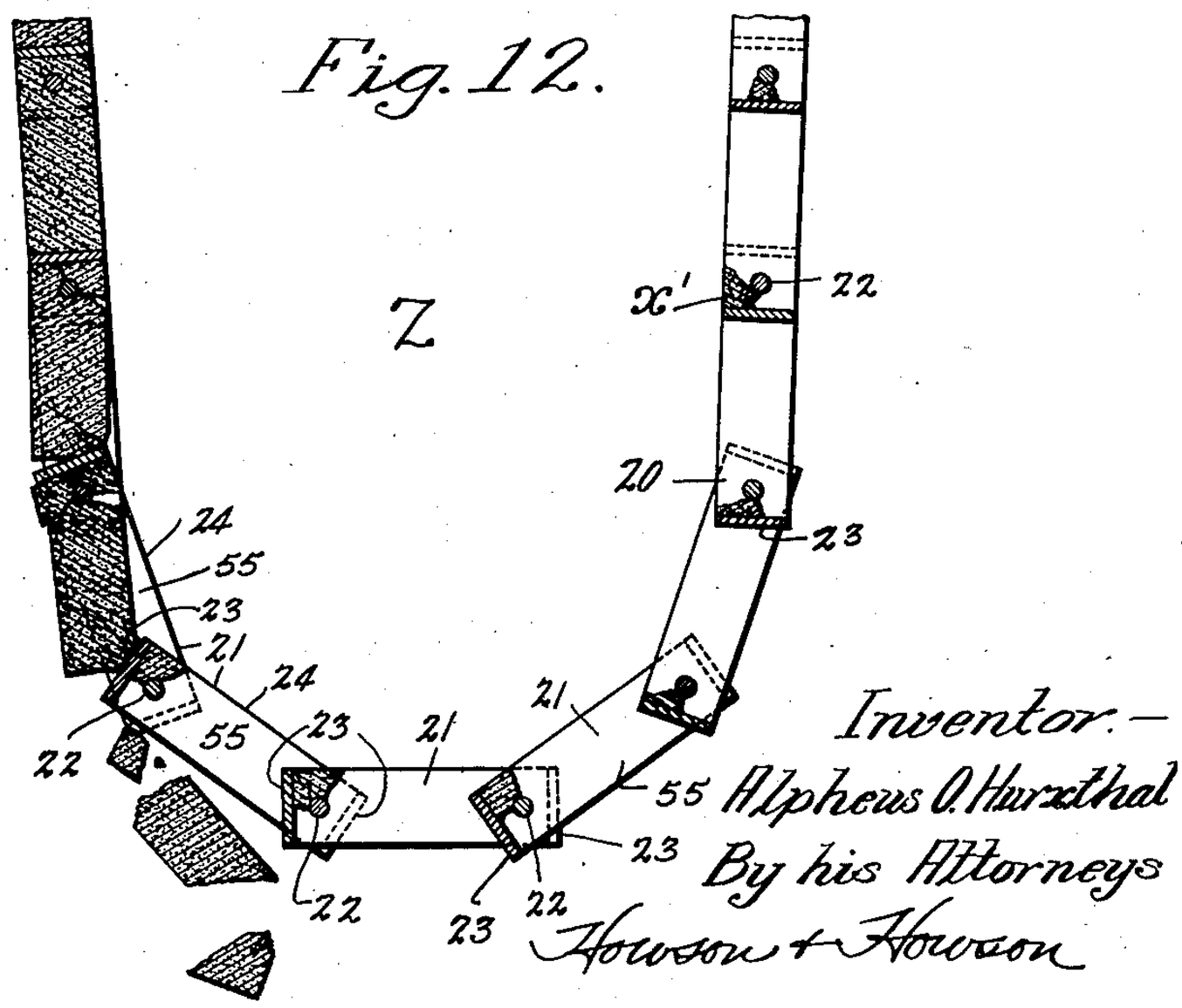


Fig. 12.



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CHEMICAL LOOP DRIER

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Fig. 11.

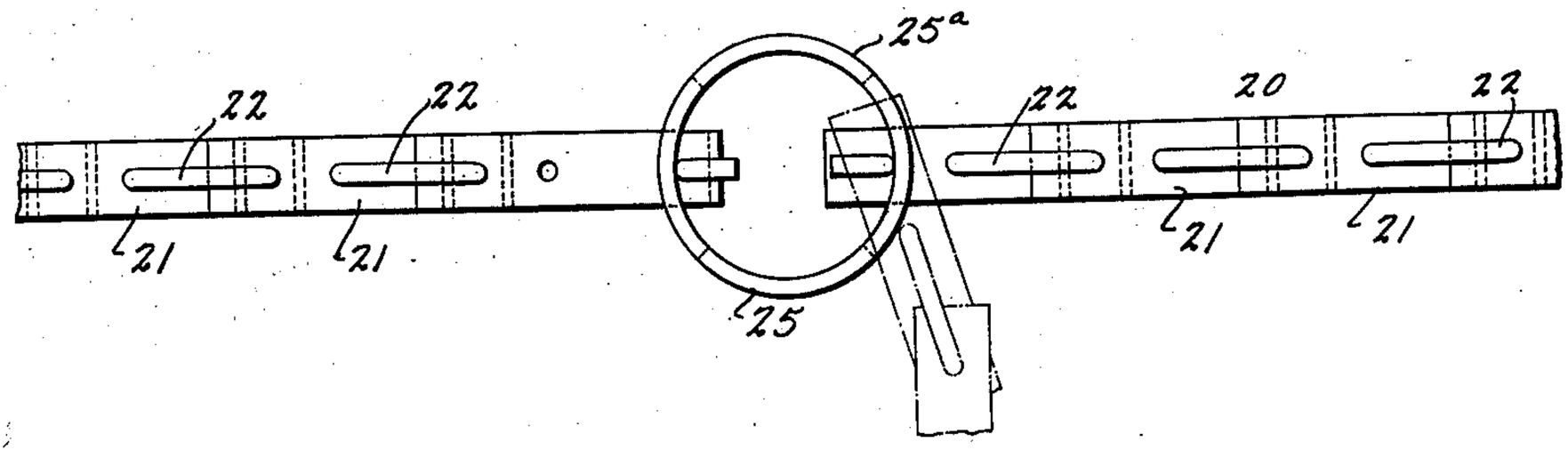
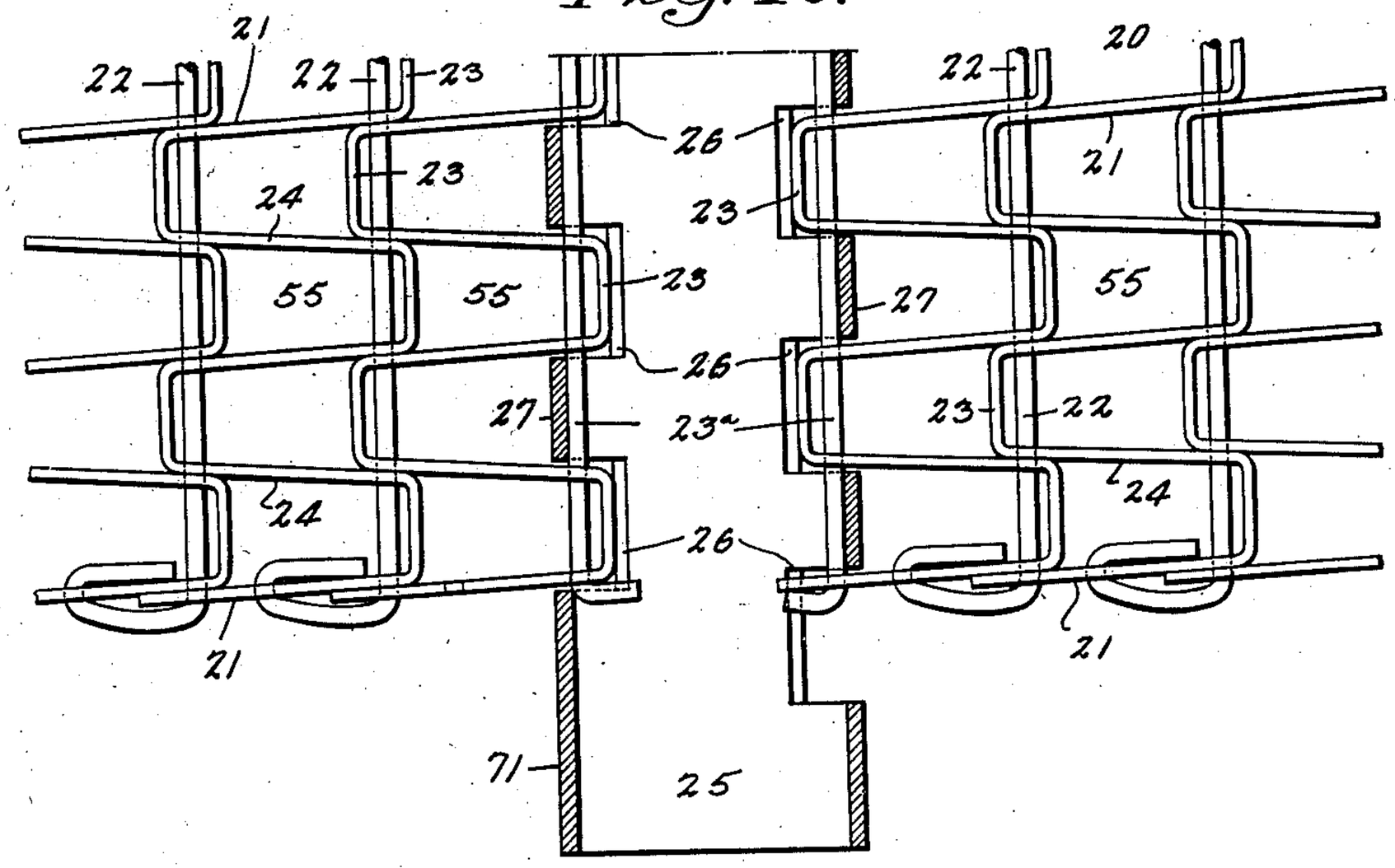


Fig. 10.



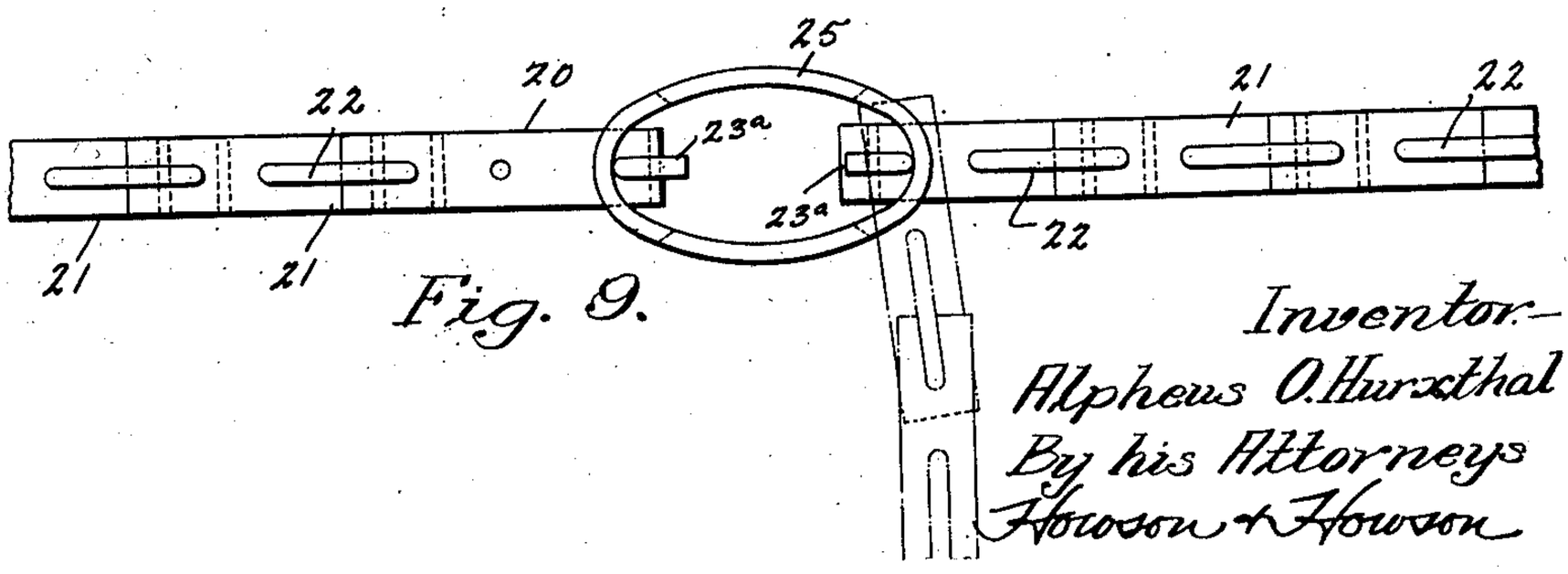


Fig. 9.

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UNITED STATES PATENT OFFICE

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CHEMICAL LOOP DRIER

Application filed June 13, 1929. Serial No. 370,662.

This invention relates to apparatus for handling plastic materials; and to a particular adaptation of a self-ejecting conveyer for plastic materials, such as is shown and described in my co-pending application Serial No. 305,589, filed September 12, 1928.

The present invention relates particularly to the application of the handling apparatus to a drying apparatus, in which the material to be dried is applied to the conveyer outside the drying chamber of the apparatus, after which the conveyor is passed into the drier and hung in loops within the drying chamber thereof, to conserve space and increase the capacity of the drier.

The loops of the conveyer are transported through the drying chamber by suitable conveying or carrying mechanism, without disturbing the relative positions of the loops with respect to each other; and without effecting relative movement between the respective sections of the respective loops, which permits the material to be dried and thereby transformed from a plastic state to a relatively brittle state, while the conveyer remains in a substantially quiescent state.

At the delivery end of the drier, mechanism is provided for drawing the conveyer out of the loops one after another. The drawing of the conveyer out of the loops causes a relative movement to be effected between the respective link sections of the respective loops of the conveyer which, due to the construction of the conveyer link sections and the relatively brittle condition of the material after it has been dried, causes the material to be broken up and ejected from the conveyer, thereby obviating the necessity for severely beating the conveyer to remove the material therefrom; and thereby prolonging the useful life of the conveyer.

The subject matter of the present application comprises the use of suitable girts as part of the conveyer, by which the conveyer may be handled by the operating mechanisms of the apparatus, for suspending the conveyer in the loops and for advancing the conveyer through the apparatus in co-operation with suitable mechanism for applying the material to the conveyer, suitable mechanism for forming the conveyer into said loops, mechanism for drawing the conveyer out of the loops to eject the dried material, and mechanism for gently tapping or vibrating the conveyer to remove such particles of the dried material as may have adhered to or been loosely carried by the conveyer, after the same has been drawn out of the loops.

The construction and operation of the above mentioned apparatus will be fully disclosed hereinafter, reference being had to the accompanying drawings, of which:

Fig. 1 is a side elevation of a drier made in accordance with the principles of my invention;

Fig. 2 is a plan view;

Fig. 3 is a feed-end elevation;

Fig. 4 is a delivery-end elevation;

Fig. 5 is a longitudinal sectional elevation taken on the line 5—5, Fig. 2;

Fig. 6 is a transverse sectional elevation taken on the line 6—6, Fig. 5;

Fig. 7 is a transverse sectional elevation taken on the line 7—7, Fig. 5;

Fig. 8 is a fragmentary sectional plan view taken on the line 8—8, Fig. 5;

Fig. 9 is a side elevation of a portion of the conveyer showing one form of girt applied thereto;

Fig. 10 is a plan view of a portion of the conveyer shown in Fig. 9, showing the girt in section;

Fig. 11 is a view similar to Fig. 9, showing a slightly modified form of girt; and

Fig. 12 is a longitudinal sectional elevation of a portion of the conveyer showing the same being drawn out of a loop; and the relative movement between the conveyer link sections forcing or ejecting the dried material from the conveyer.

As shown in the drawings, the drier comprises a suitable framework comprising a plurality of longitudinally extending base elements 1 and top beams 2 suitably connected by a plurality of vertically extending members 3, 3 and a plurality of transversely extending bottom members 4, 4 and transversely extending top members 5, 5.

Supported by these frame members is a plurality of side plates or panels 6, 6, a roof

plate or panel 7, and a pair of transversely extending end plates 8 and 9 which, together form the drier casing.

A vertically and longitudinally extending partition 10 divides the said casing into a drying chamber 11 and a heating chamber 12, a plurality of fans 13, 13 being respectively mounted in openings 14, 14, formed in the partition 10 adjacent the top thereof, and an opening 15 being formed in the said partition 10 near the bottom thereof for the purpose of circulating, and to permit the circulation of, air through the said heating and drying chambers of the drier casing, the heating chamber 12 being provided with any suitable form of heating apparatus, such as the steam coil 16, for heating the air in circulation.

In the roof 7 of the casing is provided a suitable conduit 17 which extends into the drying chamber 11 and also above the top of the roof 7. The conduit 17 is provided with a suitable fan 18 for drawing out a predetermined amount of the moist air from the drying chamber.

The drier casing is also provided with a horizontally and longitudinally extending plate 19, which forms a floor in the drying and heating chambers 11 and 12 respectively, the opening 15 in the partition 10 being disposed directly above the floor plate 19.

The conveyer for the plastic material to be dried is illustrated at 20, being shown in detail in Figs. 9 and 10. The conveyer comprises a plurality of link sections 21, 21 pivotally secured together by pintles or rods 22, extending transversely of the conveyer. Each link section 21 consists of a continuous bar which is rectangular in cross section and is bent into a wave-like form, the undulations of which consist of short sections 23 which extend transversely of the conveyer and relatively longer sections 24 which extend substantially longitudinally of the conveyer.

As shown in Fig. 10, the closed ends 23 of the undulation of each link section 21 extend into the corresponding open portions of the undulations of the next adjacent link section, whereby the said link sections intermesh one with the other and the pivot rods 22 extend through the intermeshing portions of adjacent link sections.

At spaced intervals throughout the endless conveyer 20 the said conveyer is provided with suitable girts 25, 25, which, in Fig. 9, are shown as being hollow members elliptical in cross-section, and in Fig. 11 the girts 25a are shown as being of a circular hollow cross-section.

Each side of each of the said girts is provided with a plurality of spaced openings 26, into which the closed ends 23 of adjacently positioned link sections 21 extend, each of the said girts taking the place of one of the link sections of the conveyer and the openings 26, 26 in the opposite sides of the said girt being positioned in staggered relation with respect to each other in order to accommodate the relatively staggered closed ends 23 of the adjacent link sections 21.

As shown in Fig. 10, the pivot rods 23a which pivotally attach the girts to the adjacent link sections extend through the portions of the link sections which project into the interior of the said girt, the said pintles lying behind the side walls 27 of the said girt. By this means the link sections of the conveyer are permitted a wide range of pivotal motion with respect to the girt.

As shown in the drawings, a supplementary framework is located at one end of the drier casing and consists of extensions 31 of the base members 1, longitudinally extending frame members 32, spaced above and substantially parallel to the extensions 31, being supported in such position by vertically extending upright members 33, 33 which are connected by transversely extending members 34, 34.

Rotatably mounted in and extending transversely of the drying chamber 11 and disposed respectively at the opposite ends thereof is a pair of shafts 35 and 36 respectively, on each of which is secured a pair of sprocket wheels 37, 37, located adjacent the side walls 6 and 10 respectively of the drying chamber 11. Passing around the sprocket wheels 37, 37 are endless belts or chains 38, 38.

The conveyer 20 is supported within the apparatus by a drum 40 rotatably mounted in the supplemental framework extending beyond the one end of the drier casing, the said conveyer passing around the drum 40 and onto a platform 41 carried by said supplemental framework, from which it passes around a lower drum 42 rotatably mounted on said framework immediately adjacent the end wall 8 of the drier casing.

One side of the drum 42 extends within the drying chamber 11, and as the conveyer 20 passes around the underside of said drum from a horizontal plane on the platform 41 it enters the said drying chamber and passes into a vertical plane from the said lower drum 42 to and over an upper drum 43, which is rotatably mounted on the main framework of the drier and disposed in an opening 44 formed in the roof 7 of the drier casing.

From the upper drum 43 the conveyer 20 passes downwardly through the opening 44 into the drying chamber 11 and between the endless conveyer or carrier chains 38, 38, disposed at cpposite sides of said drying chamber, the ends of the girts 25 extending laterally from opposite sides of the conveyer 20 engaging the top runs of said carrier chains, which move slowly in a direction toward the opposite end of the drying chamber, thereby forming the conveyer 20 into a series of loops suspended by the girts 25 from the upper runs of the chains 38, 38.

At the opposite end of the drying chamber 11 is a vertically and transversely extending partition 45 which forms one end of the said drying chamber and is provided with an opening 46 in which is located a drum 47 rigidly secured to the carrier shaft 36. The drum 47 is disposed in the path of the loops of the conveyer as the loops are carried by the chains 38, 38 toward the delivery end of the apparatus.

The conveyer 20 passes over the top of the drum 47 and around a drum 48 which is rotatably mounted in the upper end of a beating chamber 49 formed in the end of the drier casing between the partition 45 and the end wall 9 of the casing. From the drum 48 the conveyer chain 20 passes downwardly and around the lower side of a drum 50 which is rotatably mounted in the lower end of the beating chamber 49. From the drum 50 the conveyer 20 passes onto the floor plate 19 of the drying chamber passing along the bottom of said drying chamber and out of the casing through an opening 51, formed in the opposite end 8 of the casing, to the underside of the drum 40 located at the outer end of the supplemental framework, which extends from the one end of the drier, the said conveyer being supported intermediate the end wall 8 and the drum 40 by a pair of supporting rolls 52, 52 rotatably mounted in bearings secured to the upright members 33 of the supplemental frame.

The plastic material x is applied to and is pressed into the cavities 55, formed in the conveyer chain 20, by means of a roll 56 secured to a shaft 57 rotatably mounted in bearings secured to the side walls 58 of a hopper 59, a small roll 60, which is rotatably mounted on the said supplemental or extension frame below the platform 41 and extending through an aperture 61 formed in said platform, co-operating with the roll 56 to compress the plastic material x in the said material-receiving cavities 55 in the said conveyer belt 20.

The conveyer belt 20 is drawn over the platform 41 and between the compressing rolls 56 and 60 by means of chains 63, 63, located respectively adjacent the opposite sides of the conveyer belt 20, the chains 63 passing around sprocket wheels 64, 64 secured to a shaft 65 which is rotatably mounted in bearings secured to the upper member 32 of the said extension frame. The chains 63, 63 also pass around sprocket wheels 66, 66 secured to the shaft 67 which also supports the drum 42. The chains 63, 63 also pass around a third pair of sprocket wheels 68, 68 which are secured to a transversely extending shaft 69 rotatably mounted in bearings secured to the drier frame.

The chains 63, 63 are respectively provided with projections 70, 70 which are adapted to engage the projecting ends 71 of the girts 25 and in this manner, it being understood that the drive chains 63, 63 are themselves driven by mechanism hereinafter described, advance the conveyer 20 into and out of and through the apparatus.

Upon referring to Figs. 9 and 10, it will be noticed that the girts 25 are of the thickness greater than the thickness of the conveyer 20 and in order to permit these girts to pass between the pressing rolls 56 and 60 the hopper 59 is pivoted at 72 to vertical extensions 73 of the extension frame, the roll 56 being resiliently forced toward the roll 60 by means of compression springs 74 placed on top of extensions 75 of the hopper and surrounding vertically extending rods or bolts 76, the lower ends of which are anchored to the extension frame and the upper ends of which are provided with adjusting nuts 77 by means of which the pressure exerted by the roll 56 against the roll 60 may be controlled.

As shown in Fig. 5, the lower edge 62 of the hopper is spaced a sufficient distance above the platform 41 to permit the girts to pass therebetween.

The extensions 70 of the drive chains 63 engage the girts 25 immediately after the same have passed under the hopper 59 and remain in contact with the girts until the conveyer passes around the upper drum 43, at which place the said chains pass in an opposite direction around the adjacently positioned sprocket wheels 68, and are thereby disconnected from the said girts.

The intimate contact between the lugs 70 and the girts 25 is maintained by means of vertically extending guides 78 and 79 between which the girt ends at the sides of the conveyer and the drive chains adjacent thereto move, in passing from the lower drum 42 to the upper drum 43, the guide 79, at each side of the conveyer, having a lateral extension 80 which extends around the adjacent drive chain 63 and engages the girts 25 on the side thereof opposite to that engaged by the guide 78.

The conveyer 20 is pressed against the upper drum 43 by means of a pressure roll 81 mounted on a shaft 82 which is rotatably mounted in journal blocks 83 slidably mounted in brackets 84 which are secured to the upper framework of the casing. Compression springs 85 are provided between the tops of the journal blocks 83 and top plates 86 of the brackets 84, rods 87 being secured to the blocks 83 and passing axially through the springs 85 and suitable apertures formed in the upper plates 86, for the purpose of maintaining the springs 85 in operative relation to the journal blocks and the brackets 84.

The pressure roll 81 functions in conjunction with the drum 43 to feed the conveyer 20 to the carrier belts 38 so that as these said carriers are moved slowly in a horizontal plane and the conveyor 20 is fed at a relatively

greater rate of speed between the carriers 38, 38 in a plane intersecting the plane of travel of the carriers 38, 38 the projecting ends of the girts 25 at the opposite sides of the conveyer will engage the top runs of the belts 38, 38 respectively, and thereby form the conveyer 20 into a series of loops *z*, which hang from the said upper runs of the carrier belts 38 to a point adjacent the floor plate 19 of the drying chamber 11.

The conveyer 20 is guided in its movement from the drum 43 to the upper runs of the carrier belts 38 by and between a short vertically and transversely extending partition 88 and guides 89, 89 extending laterally and respectively from the side walls 10 and 6 of the drying chamber 11, into the said drying chamber.

During the passage of the loops *z*, *z* of the conveyer 20 from the feed end of the casing toward the delivery end of the drying chamber of the casing air is circulated through the said drying chamber by means of the fans 13, 13, the said air being heated in circulation by the heating coil 16 located in the heating chamber 12. The circulating air dries the plastic material carried by the conveyer 20 and transforms the same from a plastic state to a relatively brittle condition.

At the same rate at which the loaded conveyer belt 20 is fed to the carrier chains 38, to form new loops at the one end of the casing, the loop lying nearest the delivery end of the casing is being removed from the conveyer chains 38, the return run of the conveyer 20 between the drum 40 and the drum 47 functioning to draw out the loops containing the dried material as these loops are carried into engagement with the drum 47 by the carrier belts or chains 38.

Drawing out of the loops *z* causes a relative movement to be effected between the adjacent link sections 21 of the belt in the manner illustrated in Fig. 12, the portions 23 of the link sections, which extend into the material-receiving openings 55 of the adjacent link sections, and the walls of these portions 23 extending substantially perpendicular to the general plane of the conveyer 20, causing the brittle dried material to be broken up and ejected from the cavities 55 in the manner illustrated in Fig. 12.

The broken material, as it is removed from the conveyer, drops into a transversely extending discharge trough 90, being guided thereinto by an angularly disposed flange 91 on the lower end of the partition 45 and an angularly disposed plate 92 extending transversely, from side to side of the drying chamber 11, between the side walls 6 and 10 thereof. The material is conveyed transversely of the drier casing through the trough 90 by means of a drag conveyer comprising chains 93, 93 having blades 94^a secured thereto and extending above and below the said chains 93.

The material is discharged from the trough 90 outside the side wall 6 of the casing into a hopper 94, falling onto the bottom plate 95 of said hopper, the conveyer chains 93 passing around sprocket wheels 96, 96 located within said hopper and changing the direction of movement of the drag conveyer 93, so that the material which has fallen onto the bottom plate 95 of the hopper will be dragged along the bottom plate 95, which is inclined as illustrated at 97 and discharges the material into a chute having a mouth 98 located in a hopper 99 which is located at the opposite side of the drier casing from that occupied by the hopper 94. In the hopper 99 is a sprocket wheel 100 around which the drag chains 93 pass and thereby again reverse their direction of movement to return through the discharge trough 90.

The greater part of the material carried by the conveyer belt 20 is removed from the conveyer in the manner above noted as the conveyer is drawn out of the loops *z* successively, however, small portions of the material, such as illustrated at x^1 in Fig. 12, may adhere to the conveyer. These portions are subsequently removed from the conveyer by a tapping or vibrating apparatus 101, comprising a U-shaped rod, illustrated in Fig. 4, the opposite ends of which are secured to a transversely extending rock-shaft 102 mounted for oscillation in bearings secured to or adjacent the side walls 6 and 10 of the drying chamber of the casing. Secured to one end of the rock-shaft 102, outside the casing, is an arm 103, which is adapted to be periodically engaged by a roller 104 rotatably mounted on the outer end of a lever or crank arm 105. The crank arm 105 is secured to a shaft 106, which extends transversely of the casing and is rotatably mounted in suitable bearings located on or adjacent to the side walls of said casing. The lever 103 extends to the opposite side of the shaft 102, as illustrated at 107 in Fig. 5, and a spring 108, having one end secured to the lever 107 and the opposite end secured to the lug or bracket 109 on the side of the casing, functions to rock the shaft in one direction when the roller 104 rides off the free end of the lever 103, thereby releasing the said lever and permitting the spring 108 to snap the U-shaped element 101 into contact with the conveyer 20 thereby beating out any of the portions of the material which may have adhered to the conveyer belt 20.

Such portions of the material as fall between the conveyer 20 and the partition 45 are directed into the discharge trough 90 by means of an inclined plate 110 which extends transversely of the beating chamber 49, between the side walls of the casing. Such portions of the material as fall be-

tween the conveyer 20 and the end wall 9 of the casing are directed onto the bottom plate 95, which forms a part of a second discharge trough 112 extending transversely of the casing below the upper trough 90.

To prevent the conveyer belt 20 from being drawn out of the loops *z* at a greater rate of speed than that at which the new loops are being formed, a pressure roll 113 is provided in the upper portion of the beating chamber 49 and bears against the conveyer 20, forcing the same into contact with the drum 48 and thereby retarding the movement of the conveyer belt so that the said conveyer belt will be held in a taut condition between the drum 48 and the point at which the girts of the conveyer 20 are engaged by the lugs 70 on the driving chains or belts 63.

As shown in Fig. 5, the retarding roll 113 is resiliently held in contact with the conveyer belt 20 by means of springs 114 which will permit the roll 113 to move away from the drum 48 to permit the girts 25 to pass therebetween.

The operating elements of the drier as above described may be driven from any suitable source and by any suitable means but in order to make the device an independent unit, I prefer to employ a single operating motor 115 which is mounted on a suitable framework on top of the drier.

The shaft of the motor 115 is provided with a pulley or sprocket wheel 116, which, through a belt or chain 117 passing around the wheel 116 and a wheel 118, drives the shaft 119, on which the wheel 118 is secured.

The fans 13, 13 are driven from the shaft 119 by a belt 120. The exhaust fan 18 is driven from the shaft 119 by a belt 121. The shaft 119 is provided with the pulley 112 around which and a pulley 123 passes a drive belt 124. The pulley 123 is secured to a transversely extending shaft 125 on which is also secured a worm 123. The worm 126 meshes with a worm wheel 127 which is mounted on, and through a clutch 128, drives a longitudinally extending shaft 129.

On the shaft 129 is a sprocket wheel 130 around which and a sprocket wheel 131 passes a sprocket chain 132. The sprocket 131 is secured to a short longitudinally extending shaft 133, on which is secured a worm 134 which meshes with a worm wheel 135 secured to the shaft 136, which supports, and to which is rigidly secured, the drum 43 at the feed end of the casing.

Secured to the shaft 136 is a gear wheel 137 which meshes with the gear wheel 138 secured to the shaft 69 to which the sprocket wheel 68 which drive the drive chains 63 are secured.

Also secured to the longitudinally extending shaft 129 is a second sprocket wheel 140, around which, and a sprocket wheel 141, passes a sprocket chain 142. The sprocket wheel 141 is secured to a short longitudinally extending shaft 143 on which is also secured a worm 144 which meshes with a worm wheel 145 secured to the shaft 36 which supports and drives the sprockets 37, 37 and drum 47, at the delivery end of the casing. By this means the loop-carrying chains 38 are advanced through the drying chamber in timed relation with the drums 43 and 47 which respectively form the conveyer 20 into loops on the carrier chains 38, and subsequently remove the loops therefrom.

Secured to the shaft 143 is a second sprocket wheel 146 around which and a sprocket wheel 147 passes a sprocket chain 148. The sprocket wheel 147 is secured to the shaft 149 which extends through the hopper 94 at the delivery end of the casing and which has secured thereto one set of the sprocket wheels 96 which drive the drag chains 93 and move the drag conveyer through the troughs 90 and 95 to discharge the material from the drier.

The beater crank 105 which is carried by and rigidly secured to the shaft 106 is driven from the shaft 125 by means of a sprocket chain 150 which passes around a sprocket wheel 151 secured to the shaft 125 and a sprocket wheel 152 secured to the shaft 106.

The pressure roll 56 in the feeding hopper 59 is driven by a sprocket chain 153 which passes around a sprocket wheel 154 secured to the shaft 67, which carries the lower drum 42 at the feed end of the machine, and a sprocket wheel 155, which is secured to the shaft 57 on which the pressure roll 56 is rigidly secured.

From the above description, the operation of the device will be apparent, and which may be summarized in the following manner:

The conveyer belt 20 is drawn through the bottom of the drier from the delivery end thereof to the feed end thereof, and through the feed hopper 59, wherein the pressure roll 56 presses the plastic material into the cavities 55 of the conveyer belt 20, by the driving chains 63, carrying the loaded conveyer up through the drier casing and delivering the same to and over the drum 43, at the receiving end of the casing, the drum 43 and drive chains 63 traveling at the same rate of linear speed. The pressure roll 81 by cooperating with the upper drum 43 feeds the conveyer belt 20 into the casing at a constant and predetermined rate of speed. The loop-carrying chains 38 are driven at a slower rate of speed than the conveyer belt 20, and as the belt 20 is fed between the chains 38, 38 the ends of the girts 25 of the said belt 20 engage the top runs of the carrying chains 38, thereby arresting the feeding of the conveyer belt between the said carrier chains and completing a loop *z* of the belt 20.

Continued feeding of the conveyer belt

20 between the carrier chains causes the said belt to start forming into another loop, supported at one end by the last said girt 25, which is being moved slowly through the drier casing on and by the carrier chains 38, 38, and, as the belt 20 is continuously fed between the said carrier chains 38, 38, another of the girts 25 is brought into contact with the upper runs of the carrying chains 38, and another of the loops *z* is thereby formed in the belt 20. This loop-forming operation is continuously repeated as the belt 20 is fed into the casing.

As the loops *z* pass through the drying chamber of the casing the plastic material carried thereby is transformed into a brittle state by the heated air circulating through the drying chamber.

At the same rate of speed at which the new loops are being formed in and at the feed end of the machine, the previously formed loops containing the dried material are being drawn out one after another at the opposite or delivery end of the drier, the relative movement of the link sections of the conveyer belt 20 causing the brittle material to be broken up and ejected from the belt 20, after which the belt passes through the beating chamber 49, wherein the belt is subjected to a light beating or tapping to remove all portions of the material which may have adhered to the conveyer belt 20, the material falling into the discharge troughs 90 and 95 and being discharged from the casing by the drag conveyer 93, the empty belt returning to the feed end of the apparatus for refilling, as above noted.

While I have shown and described the conveyer belt or apron 20 as an endless element moving continuously through a drying apparatus in which the loading, festooning, drying and ejecting form a continuous cycle, obviously the apron 20 may be made in the form of an elongated strip which may be completely loaded with the plastic material and, by means of the girts forming a permanent part of the apron, the apron may be handled and formed into festoons or loops and suspended within any suitable form of apparatus for treating the material being left in the apparatus in a quiescent state for any desired length of time.

Prior to my invention carrier aprons, which were adapted to be hung in festoons or loops, were not provided with any means permanently attached to the apron by which the apron could be handled to be formed into or supported in the festoons, and it has been the common practice to provide separate poles over which the apron was draped in forming the festoons.

This common practice has many disadvantages. With the use of the separate poles the apron is liable to be formed into festoons of unequal lengths and the longer of an adjacent pair of festoons, being consequently the heavier, is apt to draw out the smaller festoon over the intermediate pole permitting the longer festoon to drag on the floor of the apparatus and thereby destroy the material carried by the apron.

With my permanently attached girts, it is impossible for the festoons to move relative to each other in the manner noted and I form the festoons in uniform lengths, thereby permitting the lower ends of the festoons to be brought into close proximity to the floor of the apparatus, without fear of the apron dragging on the floor, thereby increasing the capacity of the apparatus.

I claim:

1. A carrier apron provided with a permanently attached means for supporting the apron in festoons.

2. A carrier apron provided with permanently attached means at spaced intervals for supporting the apron in festoons.

3. A carrier apron provided with permanently attached means extending from the side edges thereof for supporting the apron in festoons.

4. A carrier apron provided with permanently attached means extending outwardly from the side edges thereof for supporting the apron in festoons.

5. A carrier apron provided with permanently attached laterally extending means at spaced intervals along its side edges for supporting the apron in festoons.

6. A carrier apron provided with permanently attached transversely extending girts for supporting the apron in festoons.

7. A carrier apron provided with permanently attached transversely extending girts projecting beyond its side edges for supporting the apron in festoons.

8. A carrier apron provided with permanently attached transversely extending girts at spaced intervals for supporting the apron in festoons.

9. A carrier apron provided with permanently attached transversely extending girts projecting beyond its side edges at spaced intervals for supporting the apron in festoons.

10. A carrier apron comprising a plurality of sections and a plurality of girts respectively and permanently interposed between the sections for supporting the apron in festoons.

11. A carrier apron comprising a plurality of sections and a plurality of girts respectively and permanently interposed between said sections and extending beyond the side edges of the apron for supporting the apron in festoons.

12. A carrier apron comprising a plurality of sections and a plurality of girts respectively interposed between and permanently attached to each adjacent pair of said sections for supporting the apron in festoons.

13. A carrier apron comprising a plurality

of sections respectively composed of a plurality of link elements, and a plurality of girts respectively interposed between the said sections and permanently attached to the adjacent link elements thereof for supporting the apron in festoons.

14. A carrier apron comprising a plurality of sections respectively composed of a plurality of link elements having openings adapted to receive plastic material, girts respectively interposed between and permanently attached to adjacent sections for supporting the apron in festoons, and means carried by said link elements and extending into the openings of adjacent link elements for ejecting the material from the said openings under predetermined conditions.

15. A carrier apron comprising a plurality of sections respectively composed of relatively movable link elements co-operatively forming openings having relatively movable walls and adapted to receive plastic material, and girts interposed respectively between the sections of the apron for supporting the apron in festoons, the relatively movable walls of the said openings being adapted to eject the material from said openings under predetermined conditions when the apron is drawn out of said festoons whereby a relative movement of said walls is effected.

16. The combination of an apron provided with permanently attached girts, and means adapted to co-operate with said girts for forming the apron into festoons.

17. The combination of an apron provided with permanently attached girts, and means adapted to co-operate with said girts for supporting the apron in festoons.

18. The combination of an apron provided with permanently attached girts, means for forming the apron into festoons, and means co-operating with said girts for supporting the festoons.

19. The combination of an apron provided with permanently attached girts, means co-operating with said girts for forming the apron into festoons, and means co-operating with the said girts for supporting the apron in said festoons.

20. The combination of an apron provided with transversely extending girts permanently attached to the apron and projecting beyond the side edges thereof, and means adapted to engage the projecting ends of said girts for advancing the apron.

21. The combination of an apron provided with transversely extending girts permanently attached to the apron and projecting beyond the side edges thereof, and means adjacent the said edges of the apron adapted to be engaged by the said projecting ends of said girts for supporting the apron in festoons.

22. The combination of an apron provided with transversely extending girts permanently attached to the apron and projecting beyond the side edges thereof, and carriers respectively located adjacent the said edges of the conveyer and adapted to be engaged by the projecting ends of said girts for supporting the apron in festoons.

23. The combination of an apron provided with transversely extending girts permanently attached to the apron and projecting beyond the side edges thereof, carriers respectively located adjacent the said edges of the conveyer and adapted to be engaged by the projecting ends of said girts for supporting the apron in festoons, and means for forming the apron in festoons on said carriers.

24. The combination of an apron provided with transversely extending girts permanently attached to the apron and projecting beyond the side edges thereof, carriers respectively located adjacent the said edges of the conveyer and adapted to be engaged by the projecting ends of said girts for supporting the apron in festoons, means for forming the apron in festoons on said carriers, and means co-operating with the projecting ends of said girts for feeding the apron to the festooning means.

25. The combination of an apron provided with transversely extending girts permanently attached to the apron and projecting beyond the side edges thereof, carriers respectively located adjacent the said edges of the conveyer and adapted to be engaged by the projecting ends of said girts for supporting the apron in festoons, means for forming the apron in festoons on said carriers, means co-operating with the projecting ends of said girts for feeding the apron to the festooning means, and means for operating the said feeding and festooning means and the said carriers in synchronism to effect the proper formation of said festoons.

26. In an apparatus for handling plastic material, the combination of a foraminous apron provided with transversely extending girts permanently attached to the apron and projecting beyond the side edges thereof, means for applying the plastic material to the said apron, and means adapted to engage the said projecting ends of said girts for advancing the apron through the said applying apparatus.

27. In an apparatus for handling plastic material, the combination of a foraminous apron provided with transversely extending girts permanently attached to the apron and projecting beyond the side edges thereof, means for applying the plastic material to the apron, carriers adjacent the said edges of said apron adapted to receive the said projecting ends of said girts for supporting the loaded apron in festoons, and means adapted to engage the said projecting ends of said girts for advancing the apron through the applying

apparatus and for feeding the apron to said carriers.

28. In an apparatus for handling plastic material, the combination of a foraminous apron provided with transversely extending girts permanently attached to the apron and projecting beyond the side edges thereof, means for applying the plastic material to the apron, carriers adjacent the said edges of said apron adapted to receive the said projecting ends of said girts for supporting the loaded apron in festoons, means adapted to engage the said projecting ends of said girts for advancing the apron through the applying apparatus and for feeding the apron to said carriers, and means intermediate the advancing means and said carriers for forming the apron in said festoons on said carriers.

29. In an apparatus for handling plastic material, the combination of a foraminous apron provided with transversely extending girts permanently attached to said apron and projecting beyond the side edges thereof, means for applying plastic material to said apron, carriers adjacent the said edges of the apron adapted to receive the said projecting ends of said girts for supporting the apron in festoons, means for forming the apron in successive festoons on said carriers, means for operating the carriers to advance the festoons in a quiescent state through said apparatus, and means for drawing the apron out of said festoons successively.

30. In an apparatus for handling plastic material, the combination of a foraminous apron provided with transversely extending girts permanently attached to said apron and projecting beyond the side edges thereof, means for applying plastic material to said apron, carriers adjacent the said edges of the apron adapted to receive the said projecting ends of said girts for supporting the apron in festoons, means for forming the apron in successive festoons on said carriers, means for operating the carriers to advance the festoons in a quiescent state through said apparatus, wherein the said material changes from a plastic to a relatively solid state, and means for drawing the apron out of said festoons successively whereby the relatively solid material will be broken up and discharged from the apron by the said drawing out operation.

31. In an apparatus for handling plastic materials, the combination of a foraminous apron comprising a plurality of relatively movable link sections co-operatively forming material-receiving openings having relatively movable walls adapted to eject the material from the openings under predetermined conditions when the link sections are relatively moved, and a girt secured to said apron providing means whereby the apron may be handled.

32. In an apparatus for handling plastic materials, the combination of a foraminous apron comprising a plurality of relatively movable link sections co-operatively forming material-receiving openings having relatively movable walls adapted to eject the material from the openings under predetermined conditions when the link sections are relatively moved, and a girt secured to and extending across said apron providing means whereby the apron may be handled.

33. In an apparatus for handling plastic materials, the combination of a foraminous apron comprising a plurality of relatively movable link sections co-operatively forming material-receiving openings having relatively movable walls adapted to eject the material from the openings under predetermined conditions when the link sections are relatively moved, and a girt secured to said apron and having ends extending latterally from the opposite sides of said apron providing means whereby the conveyer may be handled.

34. In an apparatus for handling plastic materials, the combination of a foraminous apron comprising a plurality of relatively movable link sections co-operatively forming material-receiving openings having relatively movable walls adapted to eject the material from the openings under predetermined conditions when the link sections are relatively moved, and a girt secured to and extending across said apron and having ends extending laterally from the opposite sides of said apron providing means whereby the apron may be handled by operating elements of said apparatus.

35. In an apparatus for handling plastic materials, the combination of a foraminous apron comprising a plurality of relatively movable link sections co-operatively forming material-receiving openings having relatively movable walls adapted to eject the material from the openings under predetermined conditions when the link sections are relatively moved, and a plurality of girts secured to and located at spaced intervals along said apron providing means whereby the apron may be handled by operating mechanisms of said apparatus.

36. In an apparatus for handling plastic materials, the combination of a foraminous apron comprising a plurality of relatively movable link sections co-operatively forming material-receiving openings having relatively movable walls adapted to eject the material from the openings under predetermined conditions when the link sections are relatively moved, and a plurality of girts located at spaced intervals along said apron and interposed between adjacent link sections providing means whereby the apron may be handled by operating mechanisms of said apparatus.

37. In an apparatus for handling plastic materials, the combination of a foraminous

apron comprising a plurality of relatively movable link sections co-operatively forming material-receiving openings having relatively movable walls adapted to eject the material from the openings under predetermined conditions when the link sections are relatively moved, and a plurality of girts located at spaced intervals along said apron and interposed between adjacent link sections the ends of said girts extending beyond the sides of the apron providing means whereby the conveyer may be handled by operating mechanisms of said apparatus.

38. In an apparatus for handling plastic materials, the combination of a foraminous apron comprising a plurality of relatively movable link sections co-operatively forming material-receiving openings having relatively movable walls adapted to eject the material from the openings under predetermined conditions when the link sections are relatively moved, a plurality of girts carried by said apron at spaced intervals, and means adapted to engage said girts to advance the apron through said apparatus.

39. In an apparatus for handling plastic materials, the combination of a foraminous apron comprising a plurality of relatively movable link sections cooperatively forming material-receiving openings having relatively movable walls adapted to eject the material from the openings under predetermined conditions when the link sections are relatively moved, a plurality of girts interposed between adjacent link sections at spaced intervals along the apron, the ends of said girts projecting laterally from the sides of said apron, and means adapted to engage the projecting ends of said girts to advance the apron through the apparatus.

40. In an apparatus for handling plastic materials, the combination of a foraminous apron comprising a plurality of relatively movable link sections co-operatively forming material-receiving openings having relatively movable walls adapted to eject the material from the openings under predetermined conditions when the link sections are relatively moved, a plurality of girts interposed between adjacent link sections at spaced intervals along the apron, the ends of said girts projecting laterally from the sides of said apron, a pair of carrying elements disposed respectively in planes adjacent the side edges of said apron and adapted to receive the projecting ends of said girts, and means for advancing the apron between the said carrying elements at an angle with respect to the plane of said carrying elements whereby the apron is formed into a series of festoons on and supported by said carrier elements.

41. In an apparatus for handling plastic materials, the combination of a foraminous apron comprising a plurality of relatively movable link sections co-operatively forming material-receiving openings having relatively movable walls adapted to eject the material from the openings under predetermined conditions when the link sections are relatively moved, a plurality of girts interposed between adjacent link sections at spaced intervals along the apron, the ends of said girts projecting laterally from the sides of said apron, a pair of carrying elements disposed respectively in planes adjacent the side edges of said apron and adapted to receive the projecting ends of said girts, means for advancing the apron between the said carrying elements at an angle with respect to the plane of said carrying elements whereby the apron is formed into a series of festoons on and supported by said carrier elements, and means for moving the carrier elements relative to the apron advancing means, whereby the festoons are advanced through the apparatus in undisturbed relation with respect to each other.

42. In an apparatus for handling plastic materials, the combination of a foraminous apron comprising a plurality of relatively movable link sections co-operatively forming material-receiving openings having relatively movable walls adapted to eject the material from the openings under predetermined conditions when the link sections are relatively moved, a plurality of girts interposed between adjacent link sections at spaced intervals along the apron, the ends of said girts projecting laterally from the sides of said apron, means for pressing the plastic material into the openings in said apron, a pair of carrying elements disposed respectively in planes adjacent the side edges of said apron and adapted to receive the projecting ends of said girts, means for advancing the apron between the said carrying elements at an angle with respect to the plane of said carrying elements whereby the apron is formed into a series of festoons on and supported by said carrier elements, means for moving the carrier elements relative to the apron advancing means, whereby the festoons are advanced through the apparatus in undisturbed relation with respect to each other, and means for drawing the apron out of the said festoons whereby the link sections are moved relative to each other and the material thereby ejected from the conveyer openings.

43. In an apparatus for handling plastic materials, the combination of a foraminous apron comprising a plurality of relatively movable link sections co-operatively forming material-receiving openings having relatively movable walls adapted to eject the material from the openings when the link sections are relatively moved, a plurality of girts interposed between adjacent link sections at spaced intervals along the apron, the ends of said girts projecting laterally from

the sides of said apron, means for pressing the plastic material into the openings in said apron, a pair of carrying elements disposed respectively in planes adjacent the side edges of said apron and adapted to receive the projecting ends of said girts, means for advancing the apron between the said carrying elements at an angle with respect to the plane of said carrying elements whereby the apron is formed into a series of festoons on and supported by said carrier elements, means for moving the carrier elements relative to the apron advancing means, whereby the festoons are advanced through the apparatus in undisturbed relation with respect to each other, while the material is changing from a plastic to a relatively solid state, and means for drawing the apron out of the said festoons whereby the link sections are moved relative to each other and the relatively solid material contained within the openings is thereby ejected from said openings.

44. In an apparatus for handling plastic materials, the combination of a foraminous apron comprising a plurality of relatively movable link sections co-operatively forming material-receiving openings having relatively movable walls adapted to eject the material from the openings under predetermined conditions when the link sections are relatively moved, a plurality of girts interposed between adjacent link sections at spaced intervals along the apron, the ends of said girts projecting laterally from the sides of said apron, means for pressing the plastic material into the openings in said apron, a pair of carrying elements disposed respectively in planes adjacent the side edges of said apron and adapted to receive the projecting ends of said girts, means for advancing the apron between the said carrying elements at an angle with respect to the plane of said carrying elements whereby the apron is formed into a series of festoons on and supported by said carrier elements, means for moving the carrier elements relative to the apron advancing means, whereby the festoons are advanced through the apparatus in undisturbed relation with respect to each other, while the material is changing from a plastic to a relatively solid state, means for drawing the apron out of the said festoons whereby the link sections are moved relative to each other and the solidified material contained within the openings is thereby ejected from the openings, and means for discharging the material from the apparatus.

46. In an apparatus for handling plastic materials, the combination of a foraminous apron comprising a plurality of relatively movable link sections co-operatively forming material-receiving openings having relatively movable walls adapted to eject the material from the openings under predetermined conditions when the link sections are relatively moved, a plurality of girts interposed between adjacent link sections at spaced intervals along the apron, the ends of said girts projecting laterally from the sides of said apron, means for pressing the plastic material into the openings in said apron, a pair of carrying elements disposed respectively in planes adjacent the side edges of said apron and adapted to receive the projecting ends of said girts, means for advancing the apron between the said carrying elements at an angle with respect to the plane of said carrying elements whereby the apron is formed into a series of festoons on and supported by said carrier elements, means for moving the carrier elements relative to the apron advancing means, whereby the festoons are advanced through the apparatus in undisturbed relation with respect to each other, while the material is changing from a plastic to a relatively solid state, means for drawing the apron out of the said festoons whereby the link sections are moved relative to each other and the solidified material contained within the openings is thereby ejected from the openings, means for tapping the apron to remove such particles of the material as may have adhered to the apron.

45. In an apparatus for handling plastic materials, the combination of a foraminous apron comprising a plurality of relatively movable link sections co-operatively forming material-receiving openings having relatively movable walls adapted to eject the material from the openings under predetermined conditions when the link sections are relatively moved, a plurality of girts interposed between adjacent link sections at spaced intervals along the apron, the ends of said girts projecting laterally from the sides of said apron, means for pressing the plastic material into the openings in said apron, a pair of carrying elements disposed respectively in planes adjacent the side edges of said apron and adapted to receive the projecting ends of said girts, means for advancing the apron between the said carrying elements at an angle with respect to the plane of said carrying elements whereby the apron is formed into a series of festoons on and supported by said carrier elements, means for moving the carrier elements relative to the apron advancing means, whereby the festoons are advanced through the apparatus in undisturbed relation with respect to each other, while the material is changing from a plastic to a relatively solid state, means for drawing the apron out of the said festoons whereby the link sections are moved relative to each other and the solidified material contained within the openings is thereby ejected from the openings, means for tapping the apron to remove such particles of the material as may have adhered to the apron, means for collect-

ing the material discharged from the apron by the ejecting mechanisms, and means for discharging the collected material from the apparatus.

47. In an apparatus for handling plastic materials, the combination of an endless and foraminous conveyer comprising a plurality of relatively movable link sections respectively provided with openings adapted to receive said material, a plurality of girts carried by said conveyer at spaced intervals therealong, said girts having portions projecting beyond the side edges of said conveyer, means adapted to engage the projections on the conveyer girts for advancing the conveyer through the apparatus, means carried by each of said link sections adapted to project into the openings of another of said link sections for ejecting the material from said openings when the link sections are relatively moved, and means for effecting relative movement between said link sections.

48. In an apparatus for handling plastic materials, the combination of an endless and foraminous conveyer belt comprising a plurality of relatively movable link sections respectively provided with openings adapted to receive said material, a plurality of girts permanently carried by said conveyer at spaced intervals therealong, said girts having portions projecting beyond the side edges of said conveyer, means for pressing plastic material into the openings of the conveyer belt, means adapted to engage the projections of the girts for drawing the conveyer belt through the applying apparatus, carrier elements respectively disposed in planes adjacent the opposite sides of said conveyer belt beyond the material-applying means and adapted to receive the projecting portions of said girts, means for feeding the conveyer belt between said carriers in a plane intersecting the plane of said carriers, whereby the girt ends are successively brought into contact with said carries, means for simultaneously advancing said carriers to form the loaded portion of the conveyer belt into a plurality of festoons, said festoons being thereby supported and advanced bodily and quiescently through the apparatus, wherein the material changes from its plastic to a relatively brittle state, means carried by each of said link sections adapted to project into the openings of another of said link sections for ejecting the material from said openings when the link sections are relatively moved, and means for drawing the conveyer out of the loops in succession thereby effecting relative movement between said link sections.

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