

April 2, 1957

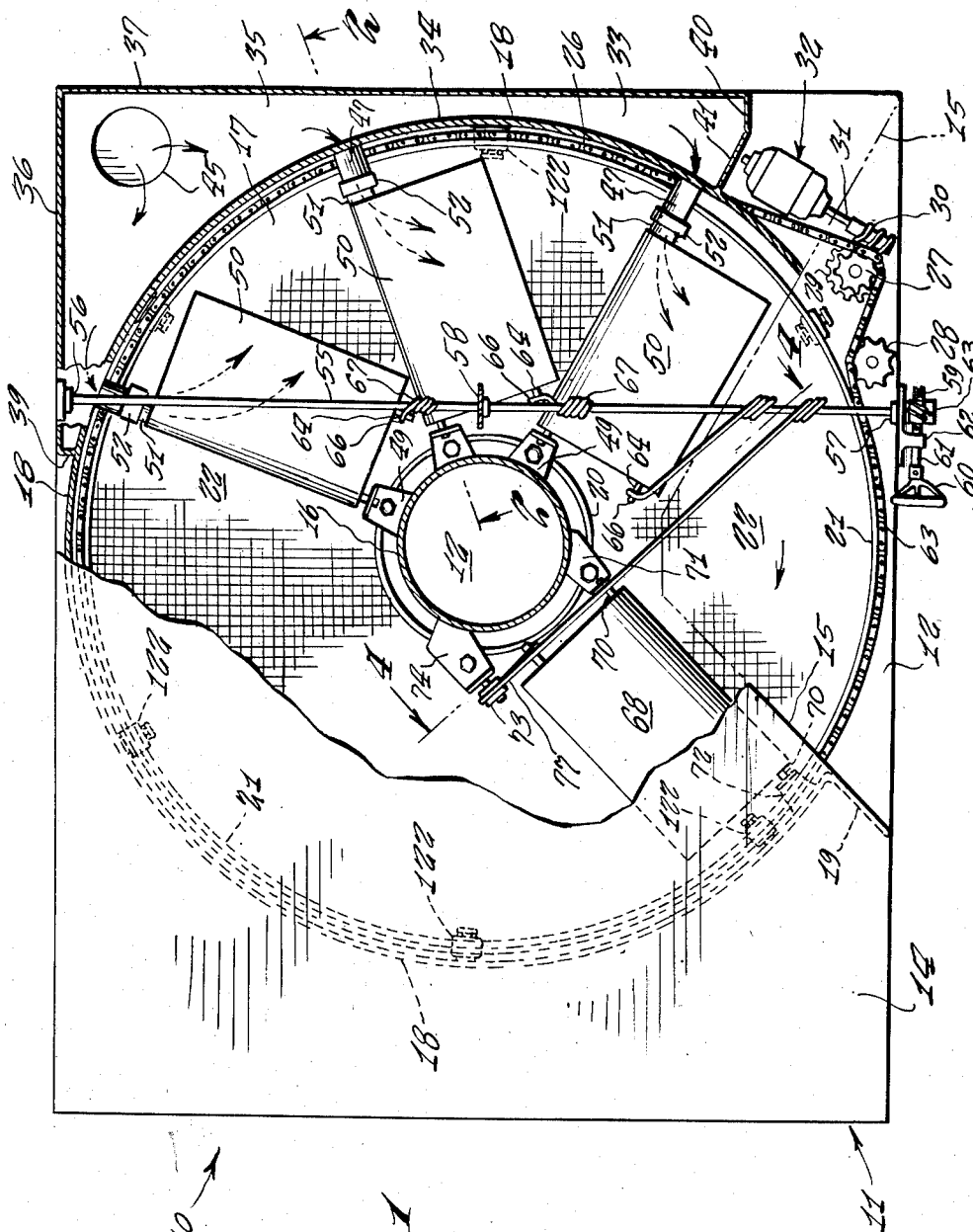
E. R. ZADEMACH

2,787,062

DRIERS

Filed Aug. 24, 1954

4 Sheets-Sheet 1



INVENTOR.
ERICH R. ZADEMACH
BY

Moses, Holte, Owens & Jerry
ATTORNEYS

April 2, 1957

E. R. ZADEMACH

2,787,062

DRIERS

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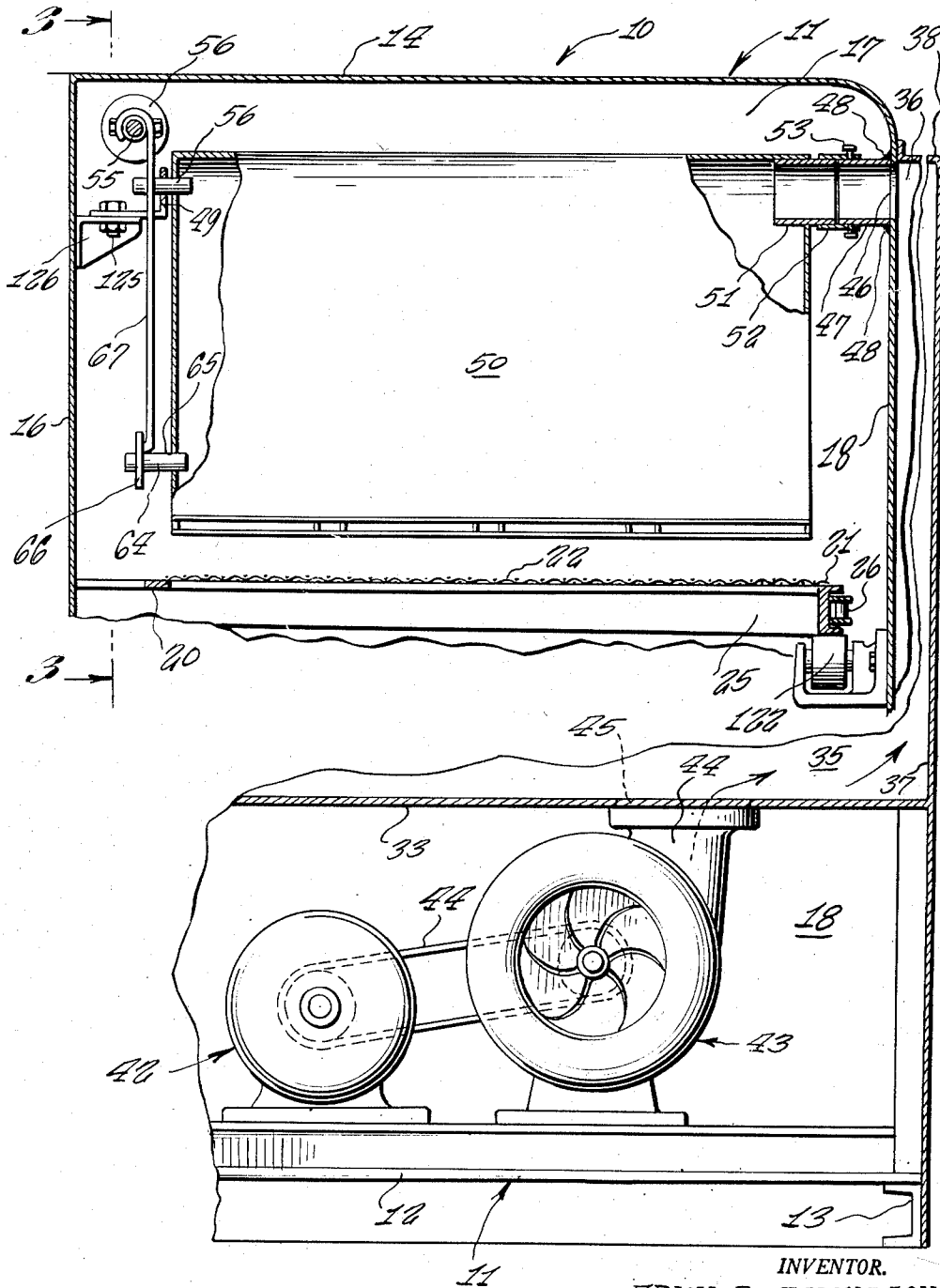


Fig. 2

INVENTOR.

ERICH R. ZADEMACH

BY

Moses, Holte, Crews + Berry

ATTORNEYS

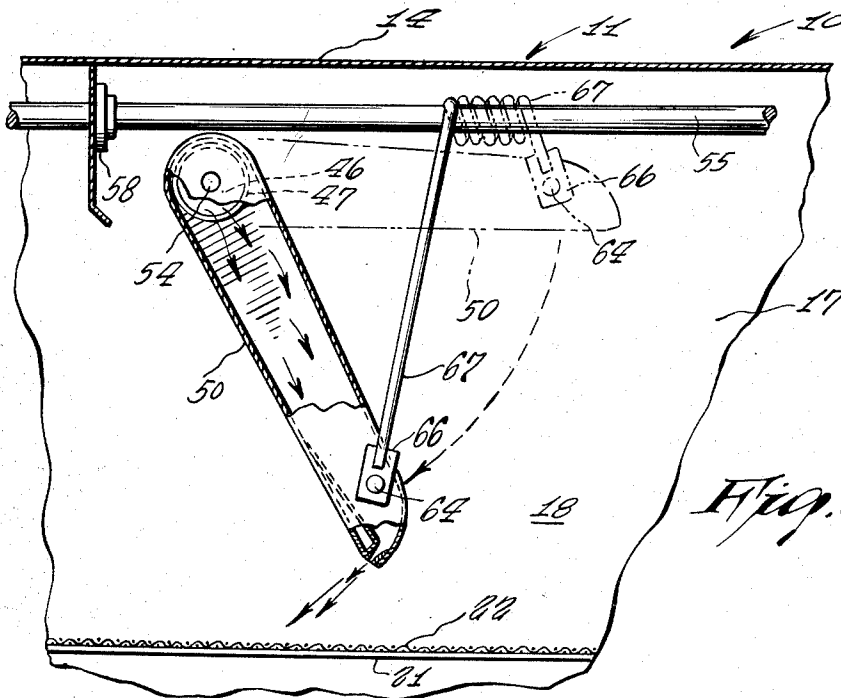
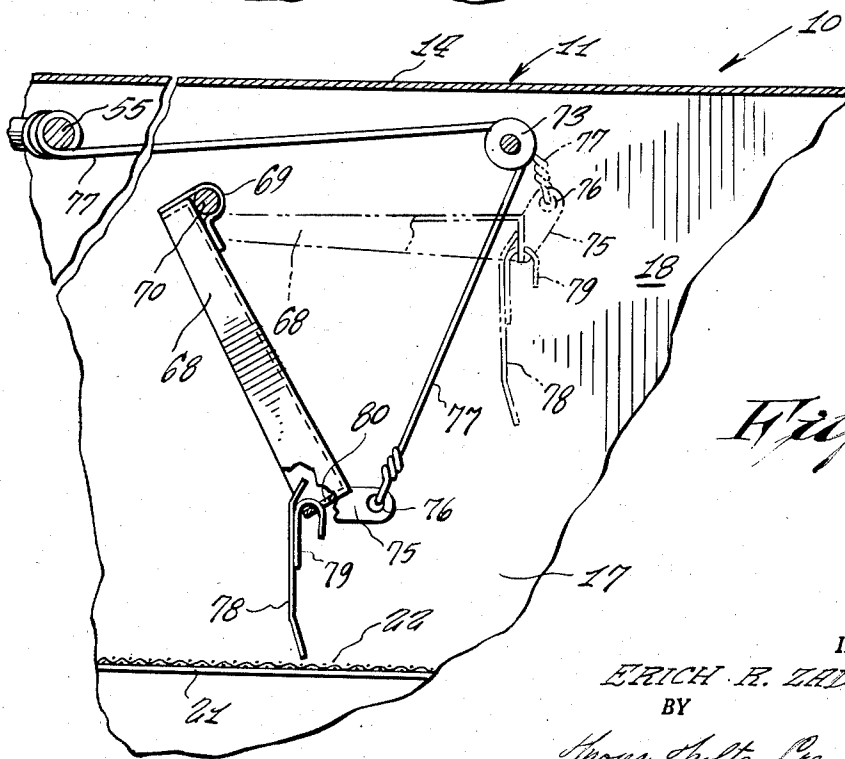
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E. R. ZADEMACH

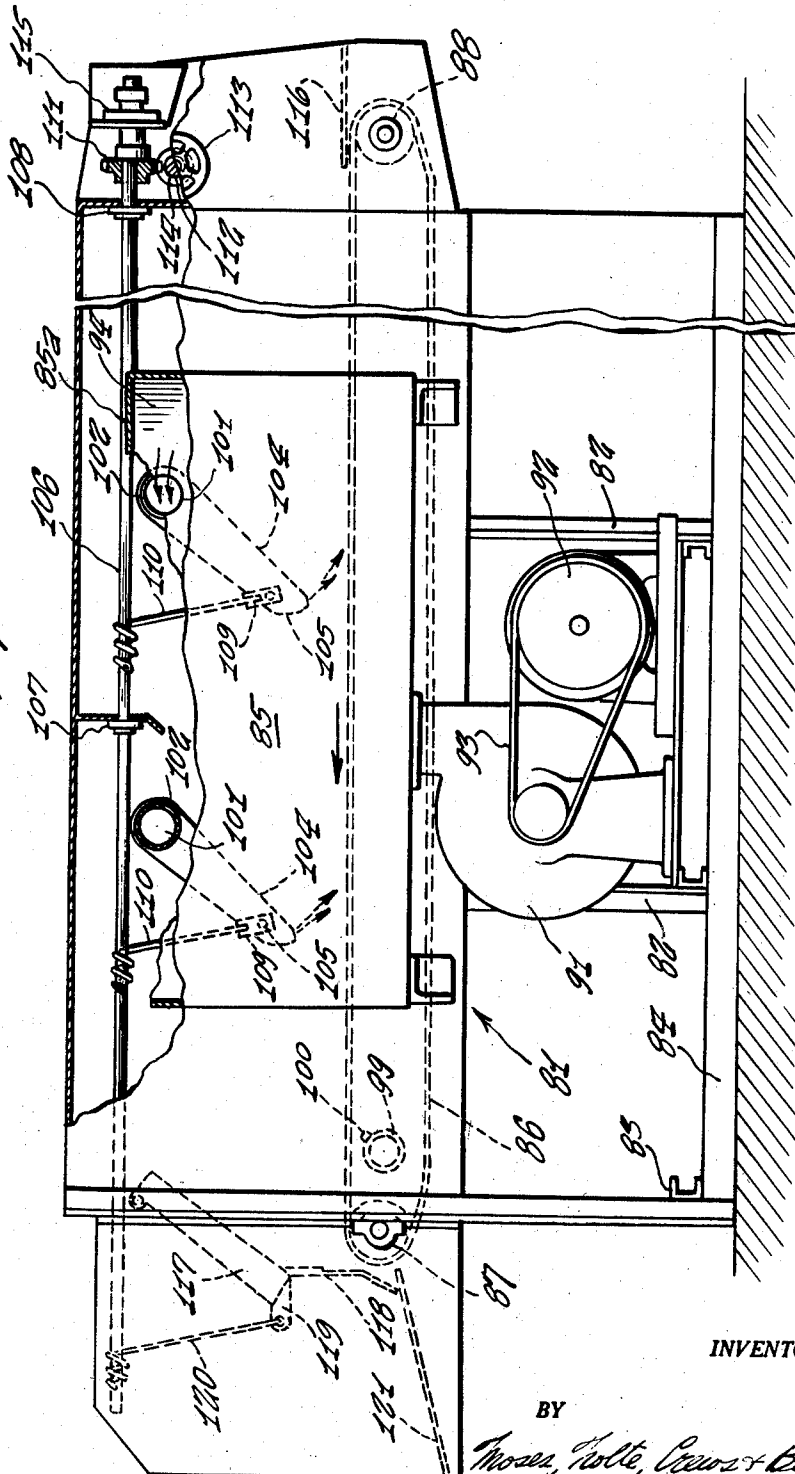
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DRIERS

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Fig. 5



INVENTOR.

BY

Thos. H. Cole, Cress & Beck
ATTORNEYS

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2,787,062

DRIERS

Erich R. Zademach, Hillside, N. J., assignor to Metalwash Machinery Company, Elizabeth, N. J., a copartnership

Application August 24, 1954, Serial No. 451,854

10 Claims. (Cl. 34—229)

This invention relates to driers which act to blow air upon wet articles carried through a drying chamber by means of a conveyor or turntable and proposes certain improvements in my United States Patent 2,334,854, dated November 23, 1953, for a Drier.

Driers of this kind are generally used at different times for drying articles of different sizes, although the articles put through in any single run are generally all of the same size. It is desirable that the blowing nozzles be located as close to the articles on the conveyor or turntable as is practical because the blast from the nozzle is strongest right at the nozzle tip.

It is an object of the present invention to provide a series of nozzles which may be adjusted so as to locate the nozzle tips at different distances above the conveyor or turntable. Thus, for small articles the nozzle tips will be located at a low level to be near the articles, while for relatively large articles the tips will be adjusted to a higher level which is sufficiently high to clear the articles comfortably.

It is a further object of the invention to provide a common adjusting means for adjusting all of the nozzles in unison.

It is still another object of the present invention to provide an exit gate or guard at the exit end of the machine which is also adjustable in unison with the nozzles.

It is still another object of the present invention to provide a rotary drier provided with nozzles and adjusting means of the above type.

It is still another object of the present invention to provide a rotary drier of the above type having an entrance gate or guard at the entrance of the machine which is also adjustable in unison with the nozzles.

It is still another object of the present invention to provide common adjusting means for a series of nozzles for adjusting the nozzles in unison which consists essentially of an elongated rotatable bar connected to the ends of the nozzles by flexible cables whereby a simple rotation of the bar will raise or lower the nozzles in unison the desired amount.

Other objects of the present invention are to provide a drier bearing the above objects in mind which is of simple construction, inexpensive to manufacture, has a minimum number of parts, is easy to use and efficient in operation.

For other objects and a better understanding of the invention, reference may be had to the following detailed description taken in connection with the accompanying drawing, in which:

Figure 1 is a top plan view of a rotary drier embodying the features of the present invention, shown partly in section to show the interior construction thereof;

Figure 2 is a fragmentary vertical sectional view taken along the line 2—2 of Fig. 1;

Figure 3 is a fragmentary vertical sectional view taken along the line 3—3 of Fig. 2;

Fig. 4 is a fragmentary vertical sectional view taken along the line 4—4 of Fig. 1, and

Fig. 5 is a fragmentary view in side elevation illustrating a modified form of the present invention.

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Referring now more in detail to the drawing, wherein similar reference numerals identify like parts throughout the several views, there is shown in Figs. 1 through 4 a rotary drier, indicated generally at 10, and including an upstanding rectangular housing 11, substantially as illustrated.

The housing 11 includes a bottom wall 12 supported on the beams 13 (Fig. 2) and a top wall 14, the top wall 14 being provided with the V-shaped opening 15.

A hollow cylindrical pillar 16 (Fig. 1) is centrally mounted on base 12 in suitable manner and supports the top wall 14.

Although the invention will now be described with reference to a full circular drier, it will be readily apparent to those skilled in the art that the invention is equally applicable to a half-circular drier and half wash and rinse unit without departing from the spirit and scope of the invention.

A circular drying chamber 17 is formed around pillar 16 between the bottom wall 12 and the top wall 14 by a cylindrical side wall 18, one vertical edge of the cylindrical wall 18 terminating at one side of the V-shaped opening 15 and the other vertical edge extending to the other side of the opening 15 and being bent parallel thereto, as at 19 (Fig. 1).

Substantially midway between the top wall 14 and the bottom wall 12 there is provided a turntable made up of an inner ring 20, an outer, channel-shaped ring 21, and wire mesh 22 connecting the rings. It will be noted that the outer ring 21 is freely spaced from the inner face of the cylindrical wall 18 while the inner ring 20 is freely spaced from the pillar 16 (Fig. 2).

The turntable is supported on a plurality of radially spaced rollers, 122 rotatably mounted on the inside of wall 18, such rollers supporting the undersurface of the ring 21.

As a means of driving the turntable, the ring 21 (Fig. 2) receives thereon an endless chain 26. The chain 26 (Fig. 1) passes around a driven sprocket 27 and an idler sprocket 28. A worm gear 29 is keyed onto the same shaft as the driven sprocket 27 therebelow and is in mesh with a worm 30 keyed onto the drive shaft 31 of motor 32, the motor 32 being suitably mounted upon the bottom wall 12 adjacent one vertical edge of the side wall 18.

A shelf 33 (Figs. 1 and 2) extends around one side of the cylindrical wall 18, the shelf 33 being provided with a cut out portion 34 receiving the wall 18. A heated chamber 35 is formed above the shelf 33 by the vertical side walls 36 and 37 (Figs. 1 and 2) and top wall 38, the vertical edge of the side wall 36 being sealed to the side of the cylindrical wall 18 by panel 39 while the vertical edge of the side wall 37 is sealed to the cylindrical wall 18 by the panels 40 and 41.

A second electric motor 42 (Fig. 2) is suitably mounted intermediate the bottom wall 12 and shelf 33 and drives a blower 43 suitably mounted adjacent thereto through a belt 44, the shelf 33 being provided with an opening 45 connected to the outlet 44 of blower 43. The blower 43 may, of course, be driven directly by motor 42. Thus, preheated air fed in suitable manner to the blower 43 will be circulated upwardly in the direction of the arrows toward the top of the heated chamber 35. As an alternate construction, the air passing upwardly through the blower 43 need not be preheated, in which case suitable heating elements will be provided within chamber 35 of the type disclosed in my prior United States Patent 2,334,854.

The air from the heated chamber 35 enters the drying chamber 17 through openings 46 provided in wall 18 (Fig. 2) through nozzles to be hereinafter described. A bearing tube 47 is secured within the chamber 17 in line with each opening 46 by means of welding 48. Bearing

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brackets 49 in line with each of the bearing tubes 47 are suitably secured to the outside of the pillar 16, the brackets 49 being mounted by nuts and bolts 125 on angle brackets 126 suitably secured to the outside of pillar 16.

Nozzles 50 are each provided at one end with bearing tubes 51 of the same size as the bearing tubes 47. Bearing rings 52 are provided which may be initially mounted upon the bearing tubes 47 and which may then be slid inwardly to overlap the bearing tubes 51 when the latter have been put in place. Set screws 53 are provided for fixing the position of the bearing rings 52 upon the bearing tubes 47. Each of the nozzles 50 is provided at its other end with a pin 54 in line with the bearing tubes 51, the pins 54 being rotatably mounted within each of the bearing brackets 49.

The nozzles 50 are each so shaped that the hot air is directed in a direction opposed to the travel of the articles being treated.

A shaft 55 extends through the drying chamber 17 parallel to the side wall 37 the opposite ends of the bar 55 being rotatably mounted in the bearings 56 and 57. The shaft 55 is also rotatably supported intermediate its ends by the bearing 58.

A worm gear 59 is keyed onto the front end of the shaft 55 adjacent the outer face of bearing 57. A hand wheel 60 is located at the introductory end of the apparatus and is keyed upon a shaft 61. The shaft 61 is journaled in bearings 62 and has keyed thereon a worm 63 in mesh with worm gear 59. Thus, the hand wheel 60 may be used to effect the desired adjustments of the bar 55. This worm-gear arrangement has the additional advantage of being self-locking in any position.

A loading platform, not shown, will be provided at the entrance end of the drier which stands a little above the level of the turntable.

A pin 64 is secured to the inner end of each of the nozzles 50 below the pins 54 by means of the welding 65. Plates 66 are each provided with an opening permitting the same to be mounted upon each of the pins 64, a flexible cable 67 being suitably secured to the upper end of each of the plates 66. The other end of each of the cables 67 is suitably secured to the bar 55 in the manner shown.

A loading door 68 is rotatably mounted along its upper edge near one side of the V-shaped cut out 15 by means of bearing tubes 69 and pins 70 (Fig. 4). The innermost pin 70 is rotatably mounted in a bearing bracket 71 suitably secured to the outside of pillar 16. The outer pin 70 is rotatably mounted within a bearing 72 suitably mounted on the inner face of the cylindrical wall 18. A pulley 73 is rotatably mounted upon a bearing bracket 74 suitably secured to the outside of the pillar 16. A lug 75 is provided along the lower edge of the loading door 68 and is provided with an opening 76 within which is suitably secured one end of a flexible cable 77. The cable 77 passes around the pulley 73 and is suitably secured at its other end to the bar 55.

A swinging baffle 78 extends across the width of the loading door 68 therebelow and is pivotally secured thereto by means of the hooks 79 and openings 80 provided in the lower end of the door. Thus, regardless of the adjustment of the door 68, the baffle 78 will always be in a substantially vertical position. Adjustment of the loading door and nozzles in unison is effected by operation of the hand wheel 60 as the articles are fed on to the turntable. Thus, by adjusting the loading door lower edge to the proper height above the turntable to accommodate the articles, the lower edges of the nozzles will automatically be adjusted to the proper height.

The dotted line and full line positions of Fig. 3 indicate the two extreme positions of the nozzles. The dotted line and full line positions of Fig. 4 illustrate the two extreme positions of the loading door. Such adjustments are made to permit the passage of articles of different

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size and still permit the impingement of the hot air flowing out of the nozzles on the articles as near the mouths of the nozzles as possible. The swinging baffle depends considerably below the lower edge of the door and is swung inwardly by the articles as they move on to the turntable.

In the present arrangement, the swinging baffle 78 serves to minimize the amount of cold air that will enter the drying chamber. It will be apparent that in the present arrangement the nozzles direct their hot air in the direction of the entrance of the drier. The result is that the articles are subjected to the drying action throughout 180° of the rotation of the turntable as the articles move through the machine. It is thus apparent that with the present arrangement the adjustment in unison of the nozzles disposed at varying angular positions is easily and readily effected by a common means.

Referring now particularly to Fig. 5, there is shown a modified form of the present invention incorporated in a linear drier of the type disclosed in my prior United States Patent 2,334,854. The drying chamber 81 is supported at a distance above the floor upon legs 82 in the form of angle bars. The legs are secured at their lower ends to cross beams 83, which in turn are secured to longitudinally extending channel bars 84. The drying chamber is desirably composed of a three-sided sheet metal plate 85 which forms the sides and bottom of the chamber, and a flat plate 85a which forms the top of the chamber. An endless conveyor belt 86 runs through the chamber, being arranged to travel around end sprockets 87 and 88 and to be supported between the sprockets on rails, not shown. The articles are conducted through the chamber upon the upper, or active, stretch of the belt 86.

A blower 91 mounted alongside the chamber 81 and below it, is driven from a motor 92 through a belt 93. The blower delivers air into a heating chamber 94 which is located above the blower and along one side of the drying chamber. As described in my prior United States Patent 2,334,854, the air passes first into a space which is bounded at its top by an imperforate plate and which is bounded along its sides by steam coils which have radiating fins formed or mounted upon them at frequent intervals. All the air delivered by the blower must pass out through one bank or the other of the heating pipes forming the steam coils. A portion of the air escapes from the heating chamber 14 through lower openings 99 to lower jets 100 which are located in the drying chamber between the upper and lower stretches of the conveyor. The air from the heating chamber 94 enters the nozzles through openings 101. A flange bearing tube 102 is secured within the chamber 81 in line with each opening 101. A similar bearing tube is secured to the opposite wall of the drying chamber. Nozzles 104 are each provided with bearing tubes, not shown, of the same size as the bearing tubes 102. Bearing rings are provided which may be initially mounted upon the bearing tubes 102 and which may be slid inwardly to overlap the bearing tubes on the nozzles when the latter have been put in place. Each nozzle has fixed to its lower side a pin 105 extending outside the lateral bounds of the nozzles.

A straight elongated bar 106 passes through the drying chamber 81 above the nozzles 104 and is notably mounted within the bearings 107 and 108. Plates 109 are each provided with suitable openings receiving the pins 105, the upper ends of the plates 109 being suitably secured to the cables 110. The other ends of each of the cables 110 are suitably secured to the bar 106. The bar 106 extends to a point adjacent the introductory end of the apparatus and has keyed thereon a worm gear 111. A shaft 112 is rotatably mounted below and at right angles to the bar 106, a hand wheel 113 being keyed thereon. A worm 114 is provided on the shaft 112 in mesh with gear 111. A thrust bearing 115 supports the end of the bar 106. In the illustrative embodiment a

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loading platform 116 is provided at the entrance end of the drying unit which stands a little above the level of the conveyor 86.

The nozzles 104 are each so shaped that the hot air is directed in the direction opposed to the travel of the articles being treated.

An exit door 117 is pivotally mounted at its upper end in suitable manner above the exit end of the conveyor 86 and pivotally mounts the swinging baffle 118 in a manner similar to the first form of the invention. A lug 119 is provided along the lower edge of the exit door 117 and is connected to a flexible cable 120 suitably secured at its other end to the bar 106. Thus adjustment of the nozzles and the exit door may be effected in unison by the hand wheel 113, as will be obvious.

The swinging baffle 118 depends considerably below the mouth of the nozzles and is swung outwardly by the articles as they tumble off the belt 86 on to the delivery platform 121. The swinging baffle 118 serves to minimize the amount of cold air that will enter the drying machine.

It should now be apparent that there has been provided driers of both the rotary and conveyor type wherein a series of nozzles may be adjusted so as to locate the nozzle tips at different distances above the conveyor or turntable. It should also be apparent that there has been provided a common adjusting means for adjusting all of the nozzles in unison. It should further be apparent that there have been provided loading and exit doors which are adjustable in unison with the nozzles.

While various changes may be made in the detail construction, it shall be understood that such changes shall be within the spirit and scope of the present invention as defined by the appended claims.

What is claimed is:

1. In a drier, the combination with a drying chamber and means for moving the articles therethrough, of a series of nozzles disposed over the moving means, each of said nozzles being pivotally mounted and capable of assuming any position between two extreme positions for varying the distance between the mouth of the nozzle and the moving means, means adapted to minimize the amount of cold air that will enter the drier, said means including a freely swingable baffle depending substantially below the mouth of the nozzle, and means for adjusting said nozzles in unison, said last mentioned means comprising an elongated bar rotatably mounted within the drying chamber, externally operable means for rotating said bar about its longitudinal axis, and a flexible cable element connecting the lower portion of each of said nozzles with said bar whereby upon rotation of said bar in opposite directions, said nozzles will be raised or lowered.

2. In a drier, the combination with a drying chamber and a turntable rotatable therein, of a series of nozzles disposed over said turntable, each of said nozzles being pivotally mounted and capable of assuming any position between two extreme positions for varying the distance between the mouth of the nozzle and the conveyor, means adapted to minimize the amount of cold air that will enter the drier, said means including a freely swingable baffle depending substantially below the mouth of the nozzle, and means for adjusting said nozzles in unison, said last mentioned means comprising a substantially straight, elongated bar rotatably mounted within said drying chamber above said nozzles, externally operable means for rotating said bar about its longitudinal axis and a flexible cable element connecting the lower edge of each of said nozzles with said bar whereby upon rotation of said bar in opposite directions, said nozzles will be lowered or raised.

3. In a drier, the combination with a drying chamber and a turntable rotatable therein, of a series of nozzles disposed over said turntable, each of said nozzles being pivotally mounted and capable of assuming any position

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between two extreme positions for varying the distance between the mouth of the nozzle and the conveyor, and a loading door disposed over said turntable, said loading door being pivotally mounted and capable of assuming any position between two extreme positions for varying the distance between the lower edge of the door and the turntable, and a swinging baffle pivotally connected to the lower edge of said loading door, and common means for controlling the position of said loading door and adjusting said nozzles in unison, said common means comprising a substantially straight, elongated bar rotatably mounted within the drying chamber at one side of said turntable, a flexible cable element connecting the lower portion of each of said nozzles with said bar, a pulley mounted above said loading door and a flexible cable element connecting the lower portion of said loading door with said bar, said second cable element passing over said pulley.

4. In a drier, the combination with a drying chamber and a turntable rotatable therein, of a series of nozzles disposed over said turntable, each of said nozzles being pivotally mounted and capable of assuming any position between two extreme positions for varying the distance between the mouth of the nozzle and the conveyor, and a loading door disposed over said turntable, said loading door being pivotally mounted and capable of assuming any position between two extreme positions for varying the distance between the lower edge of the door and the turntable, and a swinging baffle pivotally connected to the lower edge of said loading door, and common means for controlling the position of said loading door and adjusting said nozzles in unison, said common means comprising a substantially straight, elongated bar rotatably mounted within the drying chamber at one side of said turntable, a flexible cable element connecting the lower portion of each of said nozzles with said bar, a pulley mounted above said loading door and a flexible cable element connecting the lower portion of said loading door with said bar, said second cable element passing over said pulley, and air heating and propelling means located beneath the drying chamber.

5. In a drier, the combination with a drying chamber and a turntable rotatable therein, of a series of nozzles disposed over said turntable, each of said nozzles being pivotally mounted and capable of assuming any position between two extreme positions for varying the distance between the mouth of the nozzle and the conveyor, and a loading door disposed over said turntable, said loading door being pivotally mounted and capable of assuming any position between two extreme positions for varying the distance between the lower edge of the door and the turntable, and a swinging baffle pivotally connected to the lower edge of said loading door, and common means for controlling the position of said loading door and adjusting said nozzles in unison, said common means comprising a substantially straight, elongated bar rotatably mounted within the drying chamber at one side of said turntable, a flexible cable element connecting the lower portion of each of said nozzles with said bar, a pulley mounted above said loading door and a flexible cable element connecting the lower portion of said loading door with said bar, said second cable element passing over said pulley, and air heating and propelling means located beneath the drying chamber, and a heated chamber surrounding the drying chamber at one side thereof and opening on to each of said nozzles, said air heating and propelling means opening into said heated chamber.

6. In a drier, the combination with a drying chamber and a turntable rotatable therein, of a series of nozzles disposed over said turntable, each of said nozzles being pivotally mounted and capable of assuming any position between two extreme positions for varying the distance between the mouth of the nozzle and the conveyor, means adapted to minimize the amount of cold air that will enter the drier, said means including a freely swing-

able baffle depending substantially below the mouth of the nozzle, and means for adjusting said nozzles in unison, said last mentioned means comprising a substantially straight, elongated bar rotatably mounted within said drying chamber above said nozzles, externally operable means for rotating said bar about its longitudinal axis and a flexible cable element connecting the lower edge of each of said nozzles with said bar whereby upon rotation of said bar in opposite directions, said nozzles will be lowered or raised, and a laterally extending pin secured to the inner end of each of said nozzles near the lower edges thereof, and a plate secured to the lower end of each of said elements, each of said plates having an opening receiving one of said pins there-through.

7. In a drier, the combination with a drying chamber and a conveyor running therein, of a series of nozzles disposed over the conveyor, each of said nozzles being pivotally mounted and capable of assuming any position between two extreme positions for varying the distance between the mouth of the nozzle and the conveyor, means adapted to minimize the amount of cold air that will enter the drier, said means including a freely swingable baffle depending substantially below the mouth of the nozzle, and means for adjusting said nozzles in unison, said means comprising a substantially straight elongated bar rotatably mounted within the drying chamber above said nozzles, a flexible cable element connecting the lower portion of each of said nozzles with said bar and externally operable means for rotating said bar about its longitudinal axis.

8. In a drier, the combination with a drying chamber and a conveyor running therein, of a series of nozzles disposed over the conveyor, each of said nozzles being pivotally mounted and capable of assuming any position between two extreme positions for varying the distance between the mouth of the nozzle and the conveyor, means adapted to minimize the amount of cold air that will enter the drier, said means including a freely swingable baffle depending substantially below the mouth of the nozzle and means for adjusting said nozzles in unison, said means comprising a substantially straight elongated bar rotatably mounted within the drying chamber above said nozzles, a flexible cable element connecting the lower portion of each of said nozzles with said bar and externally operable means for rotating said bar about its longitudinal axis, and an exit door disposed over the exit end of the conveyor, said door being pivotally mounted and capable of assuming any position between two extreme positions for varying the distance between the bottom of said door and the conveyor, and a flexible cable element connected at one end to the lower portion of said swinging door and at its other end to said bar.

9. In a drier, the combination with a drying chamber

and a conveyor running therein, of a series of nozzles disposed over the conveyor, each of said nozzles being pivotally mounted and capable of assuming any position between two extreme positions for varying the distance between the mouth of the nozzle and the conveyor, and means for adjusting said nozzles in unison, said means comprising a substantially straight elongated bar rotatably mounted within the drying chamber above said nozzles, a flexible cable element connecting the lower portion of each of said nozzles with said bar and externally operable means for rotating said bar about its longitudinal axis, and an exit door disposed over the exit end of the conveyor, said door being pivotally mounted and capable of assuming any position between two extreme positions for varying the distance between the bottom of said door and the conveyor, and a flexible cable element connected at one end to the lower portion of said swinging door and at its other end to said bar, and a swinging baffle pivotally connected along its upper portion to the lower portion of said exit door adapted to minimize the amount of cold air that will enter the drier.

10. In a drier, the combination with a drying chamber and a conveyor running therein, of a series of nozzles disposed over the conveyor, each of said nozzles being pivotally mounted and capable of assuming any position between two extreme positions for varying the distance between the mouth of the nozzle and the conveyor, and means for adjusting said nozzles in unison, said means comprising a substantially straight elongated bar rotatably mounted within the drying chamber above said nozzles, a flexible cable element connecting the lower portion of each of said nozzles with said bar and externally operable means for rotating said bar about its longitudinal axis, and an exit door disposed over the exit end of the conveyor, said door being pivotally mounted and capable of assuming any position between two extreme positions for varying the distance between the bottom of said door and the conveyor, and a flexible cable element connected at one end to the lower portion of said swinging door and at its other end to said bar, and a swinging baffle pivotally connected along its upper portion to the lower portion of said exit door adapted to minimize the amount of cold air that will enter the drier, a laterally extending pin provided at one side of each of said nozzles near the lower portions thereof, and a plate adapted to fit on to each of said pins, each of said plates being connected to the lower end of each of said elements.

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