

March 13, 1928.

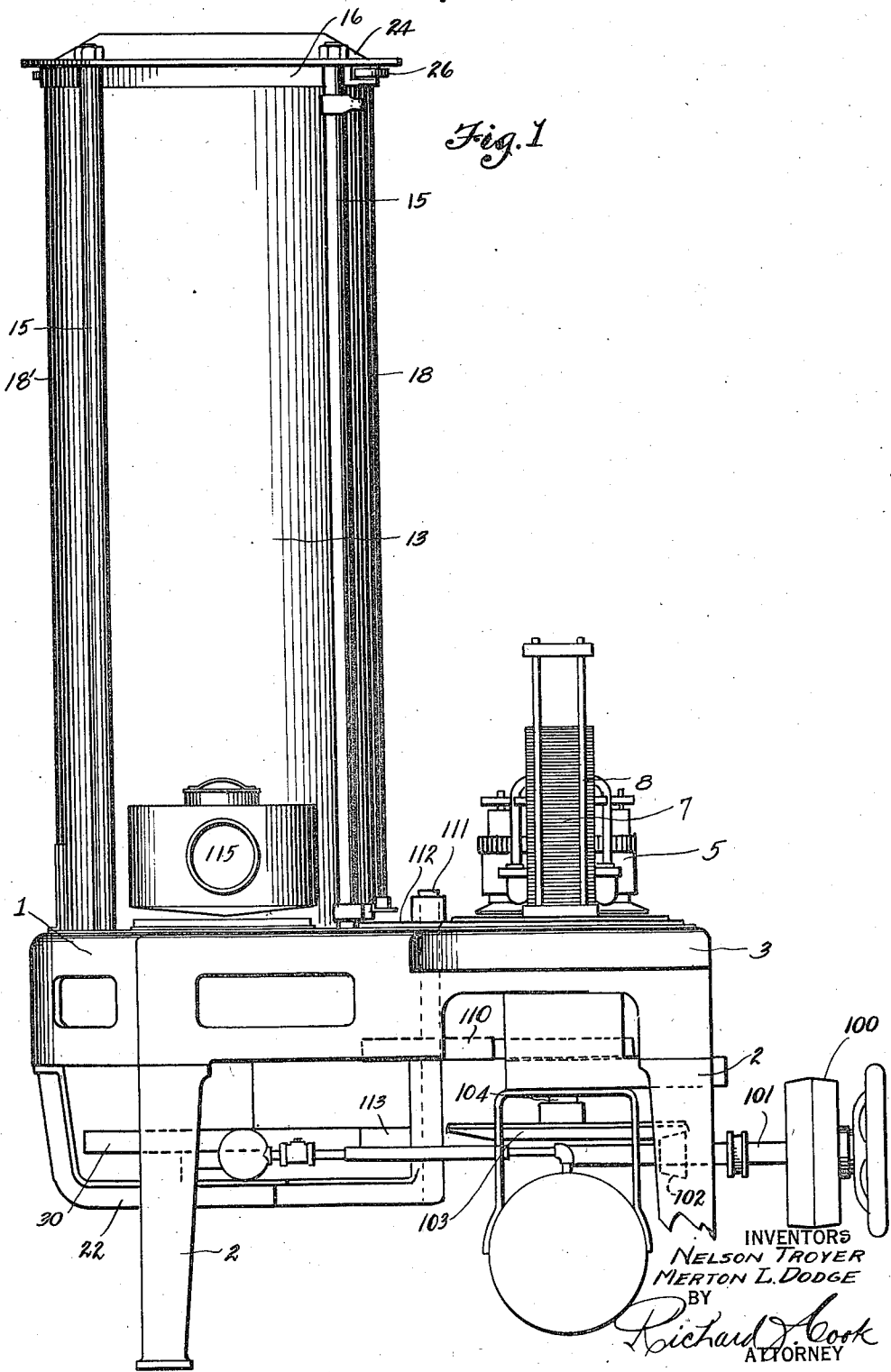
1,662,371

N. TROYER ET AL

DRYING MACHINE

Filed Sept. 24, 1925

7 Sheets-Sheet 1



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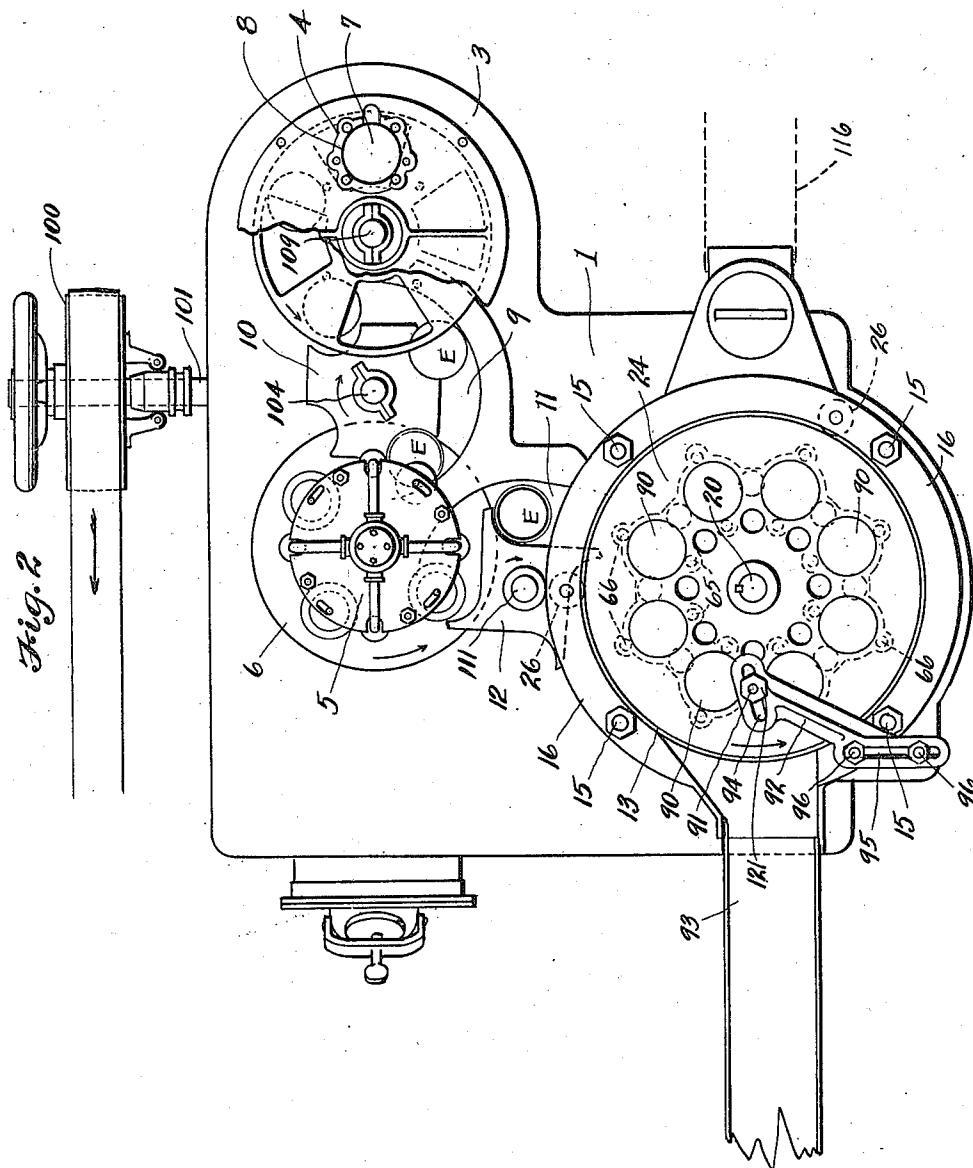
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7 Sheets-Sheet 3

Fig. 3

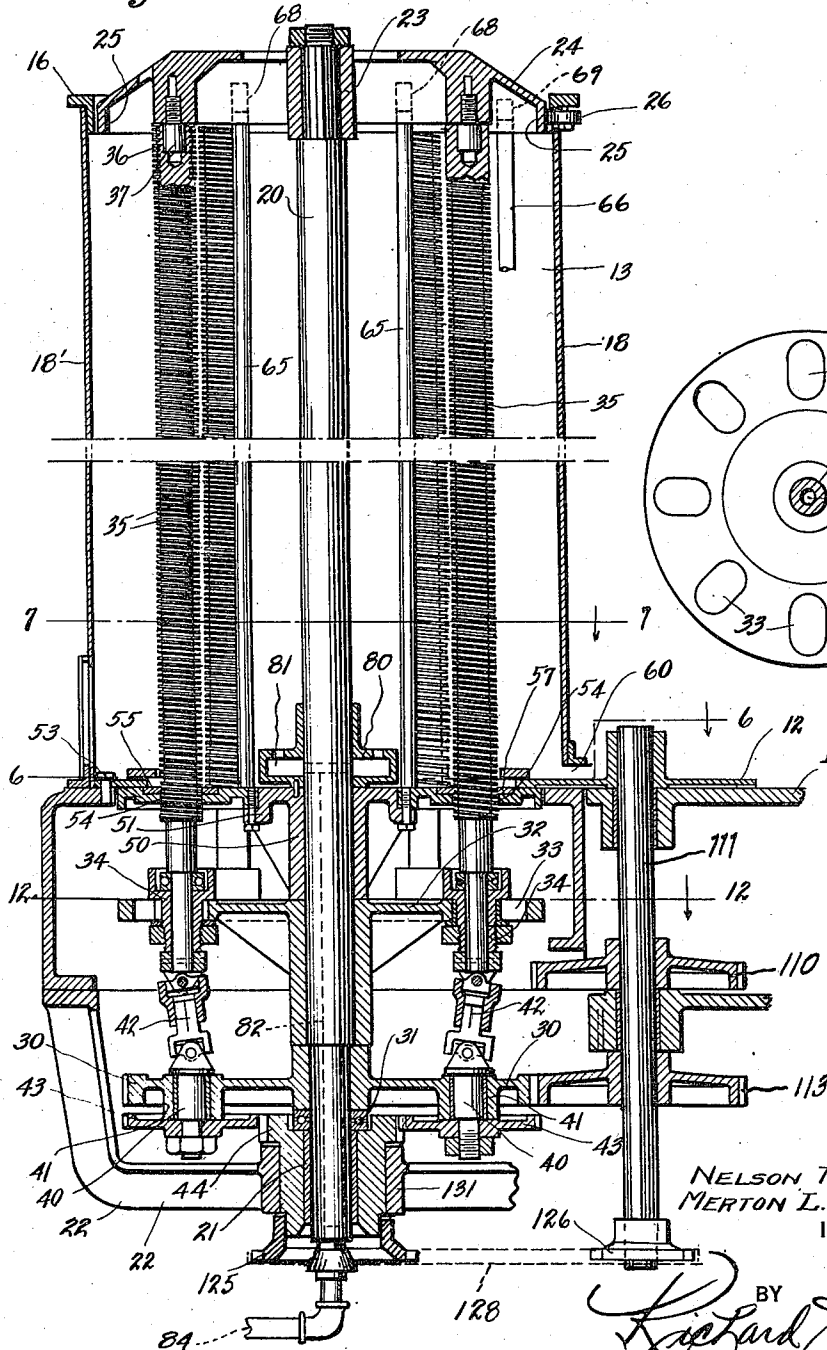
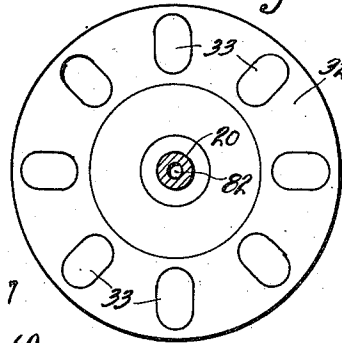


Fig. 12



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Fig. 4

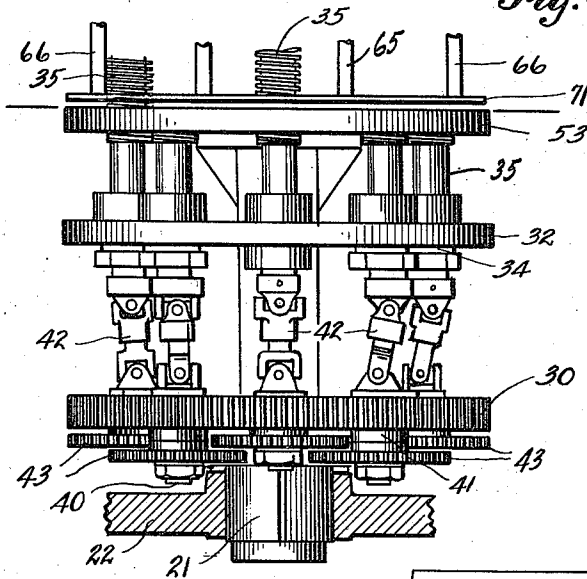
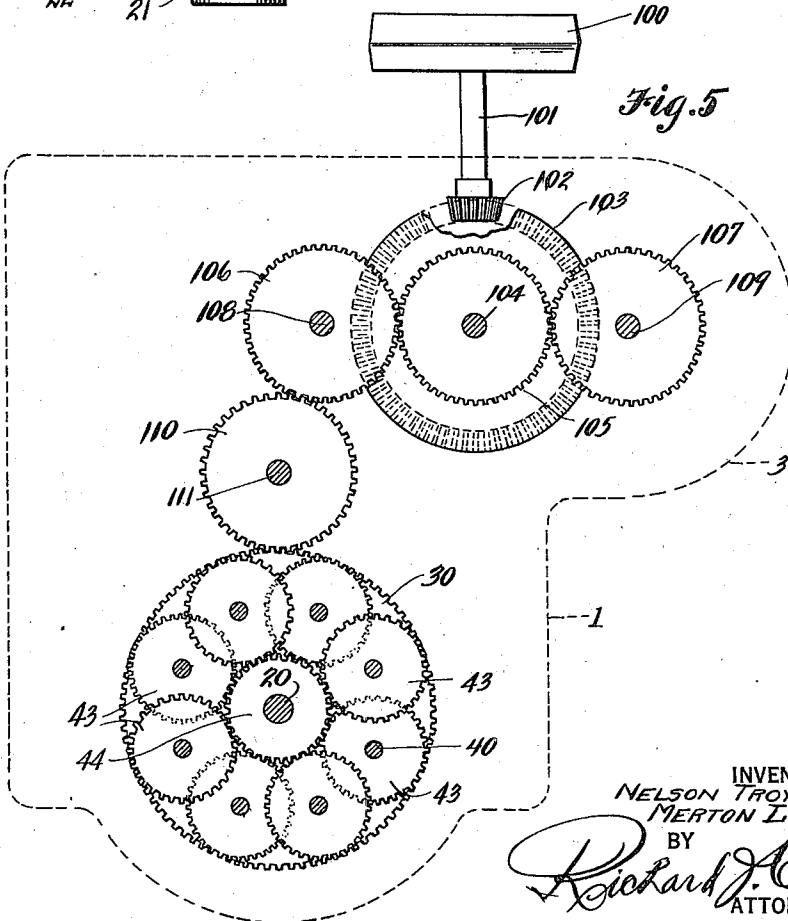


Fig. 5



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Fig. 6

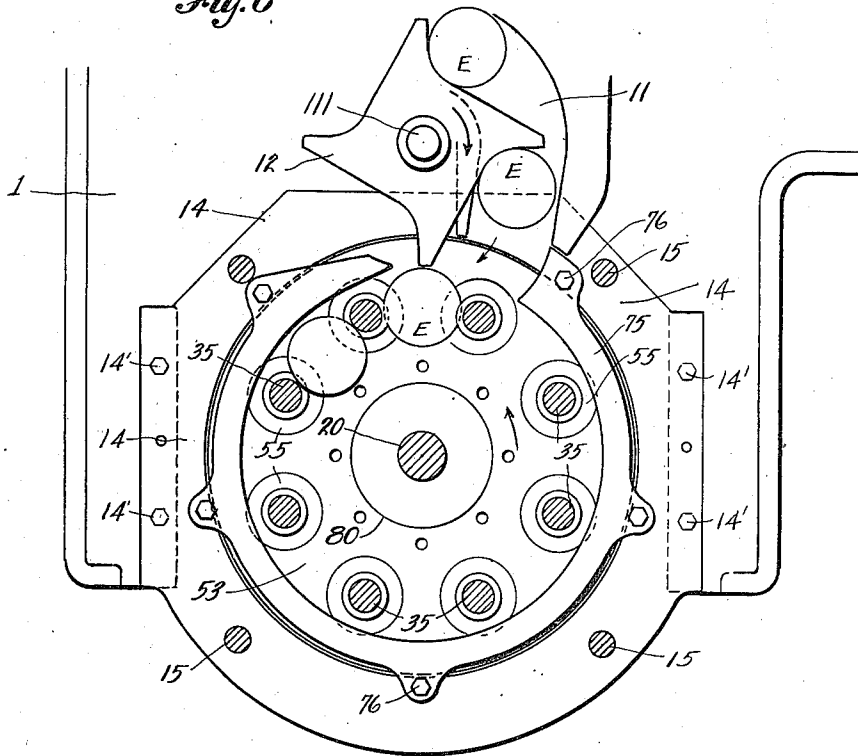
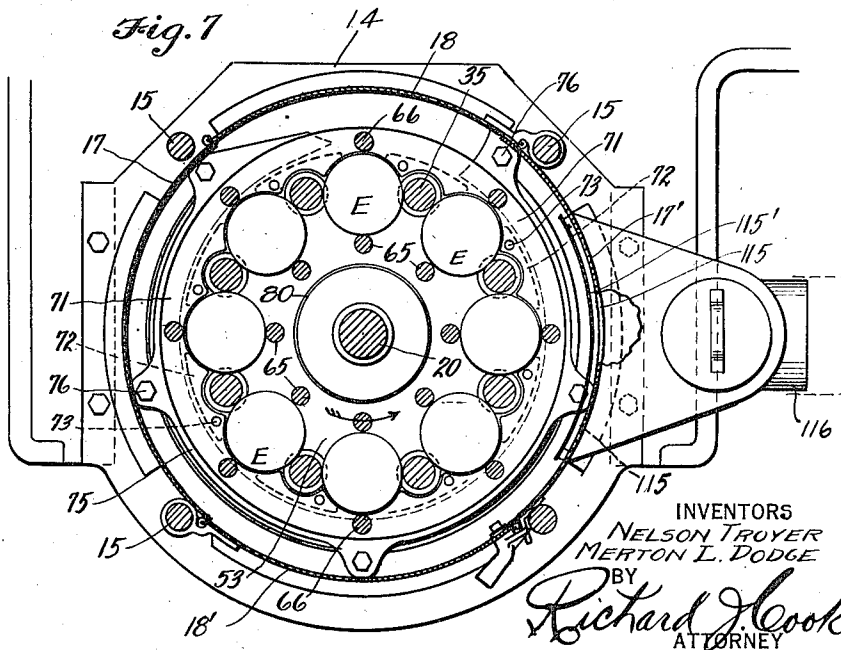


Fig. 7



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Fig. 8

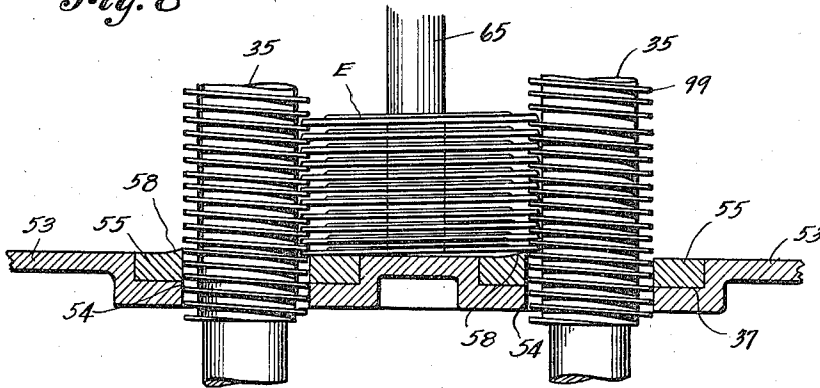


Fig. 9

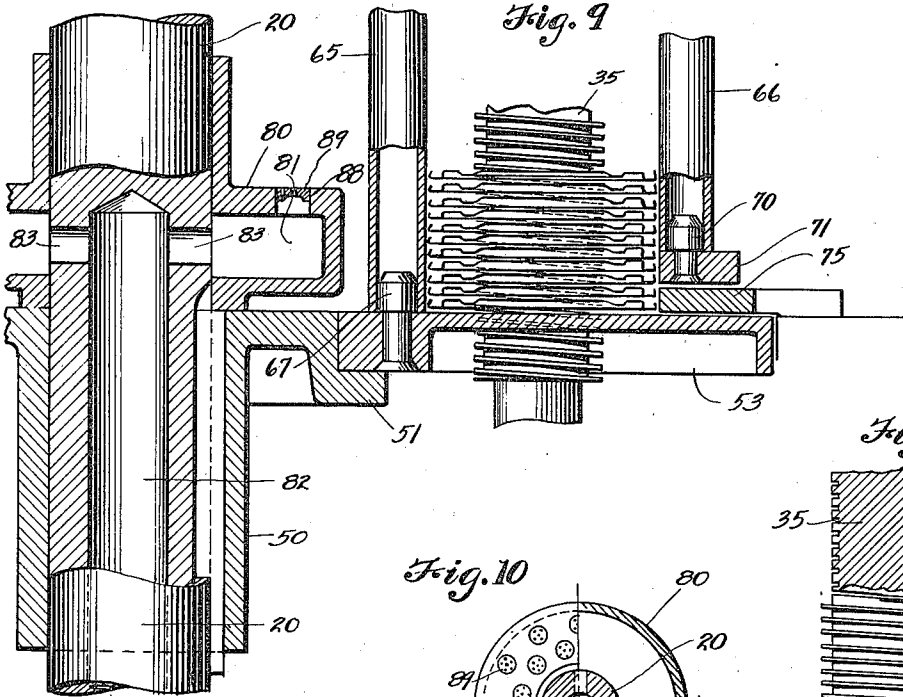


Fig. 11

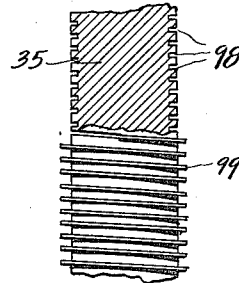
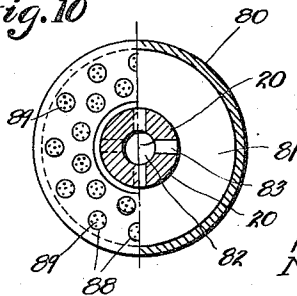


Fig. 10



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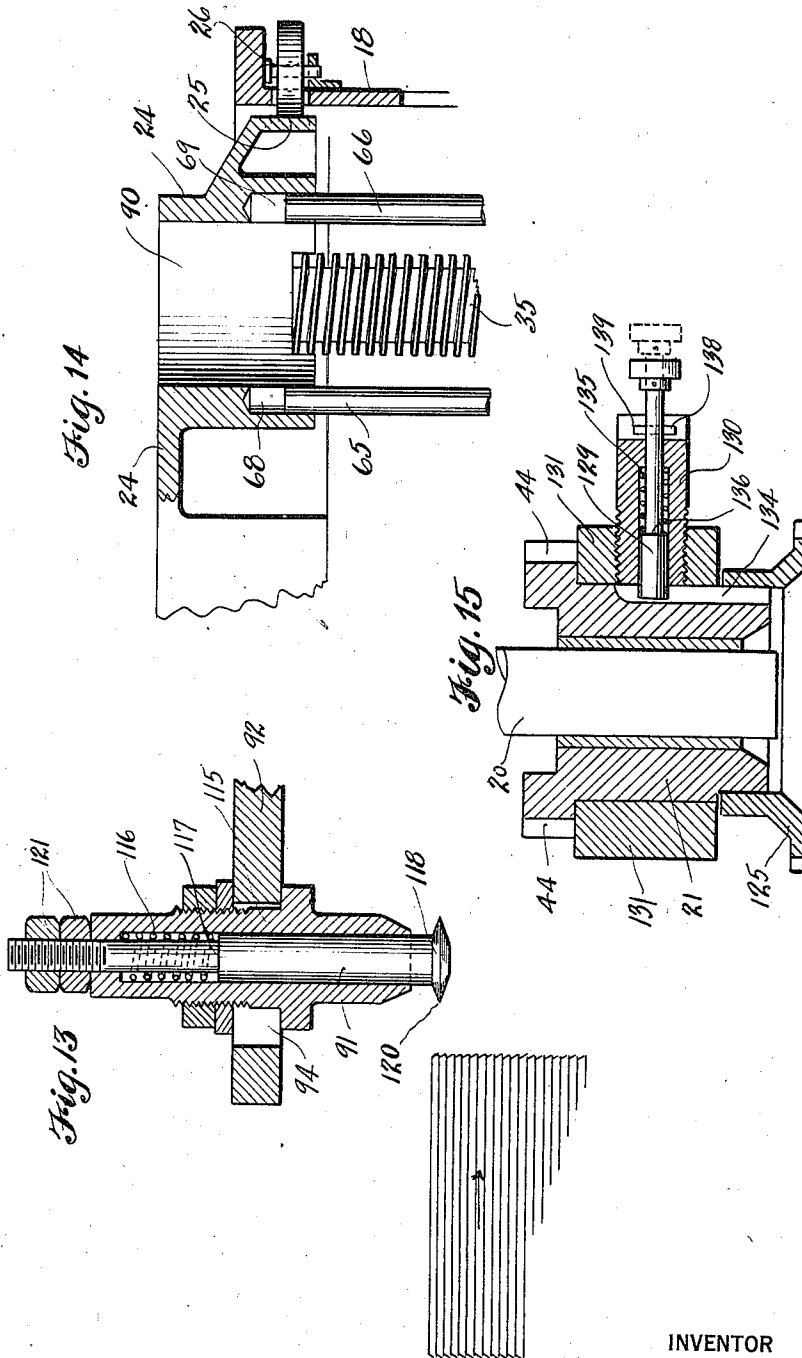
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DRYING MACHINE

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7 Sheets-Sheet 7



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Patented Mar. 13, 1928.

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UNITED STATES PATENT OFFICE.

NELSON TROYER AND MERTON L. DODGE, OF SEATTLE, WASHINGTON.

DRYING MACHINE

Application filed September 24, 1925. Serial No. 58,430.

This invention relates to improvements in drying machines for drying the thin coating of fluid sealing compound that is applied to the flanges of can ends for the purpose of insuring the sealing of the joint between the can bodies and ends when the latter are seamed over the bodies; the machine being of that type wherein the can ends are advanced through the drying chamber by the coaction of paired, rotatably driven shafts having threads thereon for engaging with opposite sides of the can ends so that the latter will be advanced through the drying chamber incidental to rotation of the shafts. The present invention is a further development of the drying machine described and illustrated in United States Patent No. 1,308,208 issued July 1, 1919, in which a single pair of elevating screws are employed for elevating the can ends through the drying chamber; the above machine having been found inadequate for the present day needs on account of its limited capacity and for the reason that to increase its capacity would require that the drying chamber be extended to an undesirable height.

The principal object of this invention is to provide a drying machine for the above purpose having a capacity that is made materially greater than that of the previous machine by the provision of a multiplicity of such paired lifting shafts and in which the rate of drying is greatly accelerated by causing the several stacks of ends to be revolved bodily within the drying chamber about the central axis; such rotation also providing for the feeding of the can ends consecutively to the paired shafts as they are thus rotated past the discharge point of the compound applying machine.

Another object of the invention is to provide a drying machine of the above character in which the can end lifting shafts are adapted to be adjusted in such manner as to adapt the machine for the drying of ends of different diameters.

Another object is to provide simple, efficient and relatively inexpensive driving means whereby the lifter shafts are rotated and the entire set revolved about a central axis and in which provision is made for making the required adjustments for receiving can ends of different diameter without necessitating a substitution or rearrangement of driving gears.

Another object is to provide means for

effectively heating the interior of the drying chamber and for creating a flow of air through the same.

Still another object resides in the novel means provided for removing the can ends as they reach the discharge point at the upper ends of the revolving stacks.

Other objects reside in the various details of construction and combination of parts embodied in the invention and in their mode of operation.

In accomplishing these objects, we have provided the improved details of construction, the preferred forms of which are illustrated in the accompanying drawings wherein—

Figure 1 is a side elevation of a machine embodying the present invention.

Figure 2 is a plan view of the machine.

Figure 3 is a central, vertical section through the drying chamber, particularly illustrating the elevating screws and the gearing for rotating the screws and for revolving the stacks about the central supporting axis.

Figure 4 is a side elevation of the driving gears for the elevating screws, and their connections therewith.

Figure 5 is a diagrammatic view of the driving gears for the elevating screws and those of the compound applying machine with which the present machine is synchronized.

Figure 6 is a horizontal section taken on the line 6—6 in Figure 3.

Figure 7 is a horizontal section taken on the line 7—7 in Figure 3.

Figure 8 is an enlarged detail view of parts of two paired lifting screws particularly illustrating the disposition and manner of lifting a stack of can ends.

Figure 9 is a detail sectional view showing parts of the heater, the revolving table and a pair of guide rods for a stack of can ends.

Figure 10 is a partial plan view and horizontal section taken through the heater.

Figure 11 is a detail view showing the method of threading of the can end lifting shafts.

Figure 12 is a horizontal section taken on line 12—12 in Figure 3.

Figure 13 is a sectional detail showing the ejector pin for removing the can ends from the upper ends of the stacks.

Figure 14 is a detail, sectional view show-

ing the mounting of the can end guide rods and screws in the top end frame.

Figure 15 is a sectional detail illustrating means for locking the central gear of the screw driving train.

The present machine is intended to be used with can ends of that type having a peripheral groove in which the sealing compound is applied and the machine in the present instance has been illustrated in connection with another machine which operates to apply the sealing compound to the ends just prior to their delivery into the drying chamber.

The driving mechanisms for the two combined machines are synchronized so that as the ends are delivered from the compound applying machine, they are fed into the drying machine to be taken up consecutively by the paired sets of lifting screws as the latter are rotated about a supporting axis.

Referring more in detail to the drawings—

In Figures 1 and 2, we have illustrated a drying machine as used in connection with mechanism for applying the sealing compound to the can ends. This latter mechanism will be but briefly described for the reason that it forms no part of the present invention and will be fully described in a separate application. As herein shown the machine comprises a base structure 1 supported at a suitable height by a plurality of legs 2.

There is a lateral extension 3 at one side of the base on which a feed mechanism, designated in its entirety by reference character 4, is mounted, and adjacent to this is the mechanism for applying the compound to the grooves of the can ends as they are delivered therethrough. The applying mechanism, designated as a whole by the reference numeral 5, is carried by a revolving table 6 fitted within the base. The can ends to be treated and dried are arranged in a stack 7 within a suitable guide 8 and are removed one at a time from the lower end of the stack and forwarded by the feed mechanism into a guideway 9 for advancement by a rotating turret 10 to the compound applying mechanism 5 which operates to apply the compound to the peripheral groove of the can ends and to deliver the ends into a guideway 11 where they are taken up and advanced by a revolubly driven turret 12 into the drying chamber, which is designated in its entirety, by the reference numeral 13.

The present drying chamber is formed by a cylindrical, vertically disposed casing mounted on the base 1 within four equally spaced, circularly arranged posts 15 which, at their lower ends, are fixed to a base plate 14 that is removably fixed in base 1 by bolts 14', (see Figure 6). At their upper ends the

posts 15 are fixed to a ring 16 which, as will presently be described, serves as a support and guide within which the upper end frame of the structure, which supports the several stacks of can ends, is revolubly contained and held against lateral sway or vibration.

The walls of the drying chamber are formed from four sheet metal sections, see Figure 7, two of which forming opposite sides of the chamber, as designated at 17—17', are fixed to the supporting posts while the other two, designated at 18—18', are hingedly mounted so that they will be swung open to give access to the interior of the chamber for the repair or readjustment of parts or for the inspection of can ends.

The several can end lifting units are disposed within the heating chamber 13 about a centrally located, vertical shaft 20 which, at its lower end, is rotatably contained within and supported by a bearing 21 in a sub-frame structure 22. The upper end of the shaft 20 is keyed within the hub portion 23 of a circular end frame 24 having a depending peripheral flange 25 fitted rotatably within the ring 16. Rollers 26 are mounted at spaced intervals on the ring 16 against which the flange of the end frame 24 operates, as shown in Figure 2, so that the upper end of the structure will rotate freely and at the same time be held against vibration or lateral swing incidental to operation.

Keyed to the shaft 20, near its lower end and just above the bearing 21, is the master driving gear 30. The hub portion of this gear seats at its upper edge against a downwardly facing shoulder on the shaft 20 and at its lower end rests upon an anti-friction bearing 31 located in the recessed upper end of the bearing 21. Also keyed to the shaft 20 at some distance above the gear 30 is a turret 32 provided with eight equally spaced, laterally directed slots 33, in which bearing sleeves 34 are adjustably fixed for movement from or toward the shaft 20.

In the present machine we employ eight threaded lifter shafts 35 which are arranged at equal radial distances from the shaft 20 and are spaced apart the proper distance to receive the can ends between them and so that opposite edges of the ends will be taken up by the threads when the shafts are revolved. At their upper ends the shafts are provided with axial bores 36 for receiving downwardly projecting studs 37 that are mounted in the under side of the top frame 24, and at their lower ends extend revolubly through and are supported by the bearings 34. All of the shafts are parallel with each other and with the shaft 20, and by rotation of the shaft 20 will be caused to revolve bodily thereabout. The eight lifter shafts are of the same size and are provided with threads of equal pitch and all the shafts are caused

to rotate in the same direction on their axes as they revolve about the central shaft 20. The rate of rotation being once for each revolution about the shaft 20.

6 The means provided for rotating the lifter shafts is illustrated best in Figure 3 and Figure 5 wherein 40 designates short shafts, eight in number, that are arranged circularly about the hub of the gear 30 and are rotatably fixed in bearings 41. The upper ends of the shafts 40 are connected through universal and telescopic couplings 42 with the lower ends of corresponding lifter shafts, and fixed to the lower end of each of these
15 shafts 40 is a gear wheel 43 that travels in mesh with the teeth of a gear 44 formed about the upper end of the bearing 21. The gear 44 is normally retained against rotation and since all of the gears 43 are of equal diameter and of the same diameter as the gear 44 it is apparent that with each
20 revolution of the lifter shafts about the shaft 20 they are caused to rotate once about their own axes; the direction of rotation being such that a can end that is disposed between adjacent shafts and engaged by the threads of these shafts, will be lifted upwardly between them.

Keyed onto shaft 20 just above the turret
30 32 is a hub 50 having an annular flange 51 on which a disk 53 is fixed. The disk is circular in form and is located flush with the top of the base plate 14 and rotates within an opening that is provided therefor in the
35 base plate. The several lifter shafts extend through openings 54 provided in the disk and centrally through circular plates 55 that are seated within recesses 57 in the upper face of the disk and which have slightly raised portions 58, see Figure 8, adjacent
40 one side of the shaft whereby the can ends will be lifted and guided between threads of the shafts.

In operation, the lifter shafts are revolved
45 bodily about the shaft 20 in the direction indicated by the arrow in Figure 7, and the can ends which are designated by reference character E, are delivered into the drying chamber by the turret 12 which operates through a slot 60 left between the lower
50 edge of the wall section 18 and the top surface of the base plate 14. The movement of the turret is so timed with the movement of the lifter shafts that the can ends will be delivered successively between the shafts.

As each can end is delivered into the dryer between a pair of shafts, its forward edge, as shown in Figure 8, will be lifted by the raised portion 58 of a plate 55 so that
60 it will pass between the threads of the forward screw while the rearward edge slides into position between threads of the following screw. After the shafts have been revolved once about the dryer they will have
65 been rotated once on their own axes and will

have lifted the can ends so as to provide for the intaking of other ends during the next revolution. Thus by a continued feeding of ends into the drying chamber, the stacks of can ends will be built up between the shafts 70 as shown in Figures 8 and 9.

For the purpose of retaining the stacks of ends between the lifter shafts there is provided a circularly arranged row of vertical
75 guide rods 65 against which the inner edges of the stacked ends will engage and another circularly arranged row of guide rods 66 against which the outer edges of the ends may engage. The guide rods 65 and 66 for each stack are located on radial lines that
80 bisect the angles formed between each pair of shafts and center of the chamber. The inner guide rods 65 are seated at their lower ends over studs 67 fixed in the disk 53 and at their upper ends are slidably contained
85 within holes 68 in the under face of the upper end frame 24. The outer guide rods 66 are likewise held at their upper ends in holes 69 in the end frame 24 but at their lower ends are seated over studs 70 that are
90 fixed in and which project upwardly from a ring 71, see Figure 9, that is supported from and in slightly spaced relation above the surface of the disk 53; the said ring, for the purpose of support, being provided on its
95 under side with a plurality of bosses 72 through which pins, or screw bolts, 73 are extended to hold the ring in place. It is required that this ring be held spaced above the disk 53 in order that the turret 12 may
100 operate to deliver the can ends between the paired shafts without interfering with the guide rods 66. For the purpose of retaining the can ends between the screws during the first few revolutions of the stacks after the
105 ends have been delivered into the chamber and until they have been elevated sufficiently to be held against outward movement by the guide rods 66, we have provided the guide ring 75, as shown best in Figures 6
110 and 7, which is supported from the base 14 concentrically about shaft 20 and is held in place by bolts 76. The inner edge of the ring projects beneath the edge of the ring 71, as shown in Figures 6 and 9, so that its
115 inner edge is in line with the inner edge of the guide rods 66.

If, for any reason, it should be desired to remove the can ends from a stack, the guide rods 66 or 65 may be lifted upwardly to
120 free their lower ends from the retaining studs, 67 and 70, and they may then be moved laterally and lowered to free their upper ends.

The drying of the sealing compound in
125 the can ends during their movement upwardly through the chamber is effected by heating the interior of the chamber to a high degree. In the present machine, the heating is done by a gas burner 80 that is located
130

about the shaft 20 at the base of the chamber. It comprises a housing forming an annular chamber 81 into which gas is delivered through an axial bore 82 extended from the lower end of the shaft 20 and which communicates with the burner chamber through a plurality of ports 83. Gas is delivered into the shaft bore from a source of supply through a pipe 84 connected, as shown in Figure 3.

The upper wall of the burner housing is provided with a plurality of openings 88 for burner tips 89 through which the gas is delivered and burned. With this type of burner the interior of the chamber can be maintained at a high degree of heat and the can ends properly dried in a minimum amount of time. Air is withdrawn from the heating chamber through a side opening 115 at its lower end, see Figure 7, with which a stack or suction fan pipe 116 may be connected, and in order that this suction may not cause the flame of the burner to be drawn toward the opening 115 and thus unevenly heat the chamber, a baffle plate 115' is placed at a spaced distance in front of the opening which causes the air to be taken from opposite sides of the chamber.

As the can ends of the several stacks reach the top end of the drying chamber they are advanced through openings 90 in the top plate 24 and brought into engagement with an ejector pin 91 that is held by a bracket 92 which in turn is supported from the ring 16, as shown in Figure 2. This pin causes the ends to be discharged into a delivery chute 93. To provide for proper positioning or adjustment of the pin 91, one end of the bracket is provided with a slot 94 in which the pin is adjustable in a direction radially of the chamber and at its other end has a slot 95 through which the mounting bolts 96 extend and which provides for adjusting the bracket toward or from the chute.

In order that the stacks of can ends may, after entering the openings 90 in the top plate 24, have sufficient rigidity to insure proper removal of the ends by the ejector pin 91 without upsetting or disaligning the stack, we have made these openings of considerable length, as is shown in Figure 14, so that the ends, after passing from the threads of the lifter screws will stack up within the openings and will be held perfectly level thereby.

The ejector pin 91 is vertically slidable within a bushing 115 locked within the slot 94 of the supporting arm 92 and is yieldable upwardly against pressure of a spring 116 contained within the bushing and bearing downwardly against a shoulder 117 on the pin. At the lower end of the pin is a head 118 having conically formed upper and lower surfaces meeting in a sharp edge as at

120. At the upper end of the pin are lock nuts 121 whereby it may be accurately adjusted so that the head 118 will remove the top end from each stack as they rotate against the pin. It is desirable, however, to have the pin yieldable for there are sometimes irregularities in the support of the stacks that will cause them to set unevenly. If the end sets too low, the inclined lower surface of the head of the pin will cause it to slide upwardly and over the stack without causing damage to the end.

A feature of construction in the present machine resides in the threading of the lifter shafts. As shown best in Figure 11, the shafts are first provided with spirally formed grooves 98 of the required pitch and then a flat strip or ribbon 99 is wound tightly therein to form the threads whereby the ends are lifted.

The train of gears whereby the machines are driven is shown in Figure 5 wherein 100 designates a pulley about which a belt may operate. The pulley is mounted on a shaft 101 which carries a gear 102 that drives a gear 103 on a vertical shaft 104. Shaft 104 carries a gear 105 that drives gears 106 and 107 mounted respectively on shafts 108 and 109 which operate the feed mechanism and compound applying device. Gear 106 operates to drive a gear 110 on shaft 111 which carries the turret 12 and a gear 113 on the lower end of shaft 111 drives master gear 30, whereby the operation of the elevating screws is controlled.

With the parts so constructed and assembled it is apparent that the can ends delivered into the chamber will be taken up successively between the shafts and will be gradually elevated through the drying chamber and finally delivered into the chute.

To adjust the shafts for the reception of ends of different diameters the upper end frame 24 and disk 53 would be replaced by parts of the required size, and the shafts adjusted to the proper place by adjusting the bearings 34 in the slots 33 of the turret 32. The selected end plate 24 would be equipped with openings for the reception of the upper ends of the guide rods 65 and 66 and would also carry studs for supporting the upper ends of the lifting screws.

The driving gears require no adjustment or rearrangement because of the universal, adjustable connections between the lower ends of the lifter shafts and the shafts carried by the gears 30 and driven by gears 43.

To provide for the cleaning of the elevating screws which sometimes become clogged with compound from an over supply during application, we have provided for mechanically rotating the screws without revolving them about the central axis 20. Then by holding a brush or cloth against the rotating screws they may be cleaned.

For this purpose we have provided for releasing the bearing 21 which carries gear 44 for rotation within the supporting frame and have fixed a sprocket wheel 125 on the lower end of the bearing 21, see Figure 3, that is alined with a sprocket 126 on the lower end of shaft 111 and about these may be extended a chain belt 128 as shown in dotted lines. It is then necessary to disengage gear 30 from gear 113, and this is done by removing the bolts 14' which hold base plate 14 in base 1, then, shifting the plate 14 and the entire drying mechanism, which is carried thereby, outwardly about one-half an inch. Then, when shaft 111 is driven, all of the screws 35 will be rotated through rotation of gear 44, but will not move about the central axis. During a drying operation, the chain 128 is removed and the gears 30 and 113 are held in mesh. The means provided for normally holding the bearing 21 and gear 44 against rotation is shown in Figure 15 and comprises a pin 129 that is mounted in a bushing 130 threaded into the bearing portion 131 of sub-frame 22 within which the bearing 21 is located and which is adapted to seat at its inner end within a key slot 134 in the bearing 44. A spring 135 bears against a shoulder 136 on the pin to hold it seated, but this may be depressed by pulling outwardly on the pin and the pin held disengaged from the key slot by rotating it so as to cause a stud 138 therein, which normally is disposed within slots 139 in the bushing 1, to seat against its end.

Having thus described our invention, what we claim as new therein and desire to secure by Letters-Patent, is:

1. In a drying machine of the character described, a drying chamber and can end advancing means whereby each can end delivered into the chamber is caused to be revolved about the axis of the advancing means and also to rotate about its own axes, and means for causing air to be drawn into the chamber and delivered laterally through the stacks.

2. In a drying machine of the character described, a drying chamber and means for advancing can ends therethrough in stacks and for revolving the stacks about the axes of the advancing means and about their own axes as they are advanced, and means for causing air to be drawn through the stacks.

3. In a drying machine of the character described, an annular drying chamber, means for delivering can ends to the drying chamber and a can end elevating means for advancing the can ends through the drier in vertical stacks and whereby the stacks are caused to revolve bodily about the axes of the drying chamber and to rotate on their own axes as they revolve and to move lengthwise from the receiving to

the discharge end of the chamber, means for heating air within the stacks and means for causing the heated air to be drawn out through the stacks.

4. In a can end drying machine, a plurality of threaded shafts arranged circularly and in parallel relation about a common axis, means for rotating said shafts and for revolving them bodily about the axis.

5. In a can end drying machine, a plurality of threaded lifter shafts arranged circularly and in parallel, spaced relation about a common axis, means for revolving the shafts bodily about the axis and for rotating them as they revolve and means for feeding can ends between the shafts as they revolve.

6. In a can end drying machine, a plurality of threaded lifter shafts arranged circularly and in parallel relation about a common axis, means for revolving the shafts bodily about the said axis, means for delivering can ends between the shafts as they are revolved and means for rotating the shafts once with each revolution thereof.

7. In a can end drying machine, a drying chamber having a receiving opening, a plurality of threaded lifter shafts arranged circularly and in parallel relation about a central axis within said chamber, means for revolving the shafts bodily about said axis, means for rotating the shafts as they revolve and means for delivering can ends into the chamber through said receiving opening and between successive shafts as they pass said opening.

8. In a can end drying machine, a cylindrical drying chamber having a receiving opening at its lower end and a drive shaft mounted coaxially of said chamber, a plurality of threaded lifter shafts supported by and arranged circularly about said shaft, means for revolving said shafts bodily about the drive shaft, means for rotating the lifter shaft on their axes as they revolve, means for feeding can ends through said receiving opening between successive lifter shafts as they pass the opening and means for removing the can ends from between the several shafts as said ends reach the top of the chamber.

9. A can end drying machine comprising a plurality of can end lifter units disposed concentrically about a common axis, each unit embracing a pair of spaced, rotative threaded lifter shafts and a gear train to rotate said shafts on their axes and to revolve said units about said common axis.

10. A can end drying machine comprising a plurality of can end lifter units disposed concentrically about a common axis, each unit embracing a pair of spaced, rotative threaded lifter shafts and a gear train to rotate said shafts on their axes and to revolve said units about said common axis;

said lifter shafts being adjustable toward or from each other to adapt the machine to can ends of various diameters without requiring adjustment of the gear train.

5 11. In a can end drying machine, a plurality of can end lifting units comprising a central shaft, a plurality of threaded lifter shafts arranged circularly about the central shaft, a driving gear on the central
10 shaft, a fixed gear coaxial of the central shaft, a driving gear for each of the lifter shafts supported from the driving gear of the central shaft and operating in mesh with the fixed gear.

15 12. A can end drying machine comprising a plurality of can end lifter units disposed concentrically about a common axis, each unit embracing a pair of spaced, rotative threaded lifter shafts and a gear train to
20 rotate said shafts on their axes and to revolve said units about said common axis, said lifter shaft gears and said fixed gear being of equal pitch diameter whereby one revolution of the lifter shafts bodily about the central shafts causes them to rotate once on
25 their own axes.

13. In a can end drying machine, a plurality of can end lifting units comprising a central, driven shaft, a plurality of threaded
30 lifter shafts arranged circularly about the driven shaft and adjustable from and toward the same to receive can ends of various diameters, a driving gear on the central shaft, a gear coaxial of the central shaft
35 and fixed against rotation, a driving gear for each of the lifter shafts carried by the driving gear of the central shaft in mesh with the fixed gear, and a driven gear operating in mesh with the driving gear of the
40 central shaft.

14. In a can end drying machine, a plurality of can end lifting units comprising a central, driven shaft, a plurality of threaded
45 lifter shafts arranged circularly about the driven shaft and adjustable from and toward the same to receive can ends of various diameters, a driving gear on the central shaft, a gear coaxial of the central shaft and
50 fixed against rotation, a driving gear for each of the lifter shafts carried by the driving gear of the central shaft in mesh with the fixed gear, and a driven gear operating in mesh with the driving gear of the central shaft and flexible driving connections
55 between said lifter shafts and their driving gears to compensate for adjustment of the said shafts toward or from each other.

15. In a can end drying machine, a cylindrical drying chamber, a shaft mounted
60 centrally of the chamber, a turret fixed on the shaft adjacent the base of the chamber having a plurality of radially directed slots therein, bearings mounted in said slots and adjustable from and toward the central
65 shaft, can end lifting shafts mounted in said

bearings in parallel relation circularly about the central shaft, a driving gear fixed to the central shaft, a gear coaxial of the driving gear and fixed against rotation, stub shafts mounted in the driving gear, gears fixed on
70 said stub shafts in mesh with said fixed gear and universal connections between the lower ends of the lifter shafts and said stub shafts.

16. A can end drying machine comprising a plurality of can end lifter units disposed
75 concentrically about a common axis, each unit embracing a pair of spaced, rotative, threaded lifter shafts, means for revolving said shafts about the common axis and for rotating them on their axes as they revolve, a drum encircling said lifter units, and forming a drying chamber, means for feeding
80 can ends to the lifter units at a common point at the base of the chamber and for removing them at a common point at the top of the chamber.

17. A can end drying machine comprising a plurality of can end lifter units disposed concentrically about a common axis, each unit embracing a pair of spaced, rotative,
90 threaded lifter shafts, means for revolving said shafts about the common axis and for rotating them on their axes as they revolve, a drum encircling said lifter units, and forming a drying chamber, means for feeding
95 can ends to the lifter units at a common point at the base of the chamber and for removing them at a common point at the top of the chamber and a chute for receiving the ends as they are delivered from the
100 top of the chamber.

18. In a can end drying machine, a drying chamber, a driven shaft centrally thereof, a plurality of threaded can end lifter shafts arranged circularly about and supported
105 from the central shaft, means for revolving the shafts bodily about the central shaft, means for rotating the shafts as they are thus revolved, means for feeding can ends to the lifter shafts and a heating device within
110 the chamber.

19. In a can end drying machine, a drying chamber, a driven shaft centrally thereof provided with a central bore and lateral openings from said bore, a gas burner disposed about the shaft and communicating
115 with said bore through said openings, a gas supply pipe connected with said bore to supply said burner and a plurality of can end lifter units carried by and adapted to be
120 rotated by said driven shaft within the drying chamber.

20. In a can end drying machine, a frame structure, a drum on said frame, forming a drying chamber, a shaft supported from its
125 lower end to extend centrally of the drying chamber, a plate fixed to the upper end of the shaft to revolve therewith and to close the upper end of the chamber, a turret fixed to the lower portion of the shaft to revolve
130

therewith, a plurality of threaded lifter shafts arranged circularly about the central shaft in parallel, spaced relation, means for revolving the central shaft and lifter shafts and for rotating the lifter shafts as they revolve, means for heating the chamber, means for feeding can ends to the lifter shafts at the base of the chamber, and means for removing them as they reach the top of the chamber.

21. In a can end drying machine, a rigid frame structure, a drying chamber, a ring fixed horizontally within the top of the frame structure, a driven shaft supported from its lower end coaxially of the chamber, a circular end plate fixed to the shaft to close the upper end of the chamber, rollers mounted in said ring and operable against the periphery of the plate and a plurality of can end lifter units supported from the shaft and revoluble thereby in the drying chamber.

22. In a can end drying machine, a base structure, a rigid, cylindrical drying chamber mounted on said base, a ring carried within the upper end of the drying chamber, rollers carried by said ring, a shaft mounted coaxially of the chamber, a circular end plate fixed to the shaft and closing the upper end of the chamber and operable on said rollers; said plate having openings therein, a turret mounted on the shaft toward its lower end, a plurality of threaded lifter shafts arranged circularly about the central shaft and rotatably mounted at their upper and lower ends respectively in said end plate and turret and operable for the lifting of can ends upwardly between them and through said top plate openings.

23. In a can end drying machine, a base structure, a cylindrical drying chamber mounted on said base, a ring carried within the upper end of the drying chamber, rollers carried by said ring, a shaft mounted coaxially of the chamber, a circular end plate fixed to the shaft and closing the upper end of the chamber and operable on said rollers, said plate having openings therein, a turret mounted on the shaft toward its lower end, a plurality of threaded lifter shafts arranged circularly about the central shaft and rotatably mounted at their upper and lower ends respectively in said end plate and turret and operable for the lifting of can ends upwardly between them and through said top plate openings, means for revolving the lifter shafts bodily about central shaft and for rotating them as they revolve, means for feeding can ends into the chamber to said shafts and means for dislodging the can ends from the top of the stacks as they are advanced through the top plate openings.

24. In a can end drying machine, a base structure having a circular opening, a cylindrical drying chamber mounted vertically

on the base about said opening, a sub-frame structure beneath the base, a shaft mounted coaxially of the drying chamber and rotatably supported at its lower end within said sub-frame structure, a plate fixed to the upper end of the shaft to close the upper end of the drying chamber and having openings therethrough, a turret fixed to the shaft adjacent its lower end, a plurality of threaded lifter shafts arranged circularly about the central shaft and supported at their upper and lower ends respectively in said end plate and turret, a table fixed to the shaft flush with said base and provided with openings through which said lifter shafts extend, means for revolving the central shaft and lifter shafts and for rotating the lifter shafts, means for feeding can ends onto said table and between the lifter shafts.

25. In a can end drying machine, a base structure having a circular opening, a cylindrical drying chamber mounted vertically on the base about said opening, a sub-frame structure beneath the base, a shaft mounted coaxially of the drying chamber and rotatably supported at its lower end within said sub-frame structure, a plate fixed to the upper end of the shaft to close the upper end of the drying chamber, and having openings therethrough, a turret fixed to the shaft adjacent its lower end, a plurality of threaded lifter shafts arranged circularly about the central shaft and supported at their upper and lower ends respectively in said end plate and turret, a table fixed to the shaft flush with said base and provided with openings through which said lifter shafts extend, means for revolving the central shaft and lifter shafts and for rotating the lifter shafts, means for feeding can ends onto said table and between the lifter shafts and guide rods revoluble with the lifter shafts whereby the ends are retained in contact with the shafts and the several stacks are guided through the openings in the end plate.

26. In a can end drying machine, a can end lifting device comprising a central, rotatably supported, vertical shaft, a turret mounted about said shaft near its lower end, a plate fixed to the upper end of the shaft, having studs fixed in the under face thereof, a plurality of rotatable, threaded lifter shafts arranged circularly about the central shaft and rotatably mounted at their lower ends in said turret and having axial bores in their upper ends for receiving said studs.

27. In a can end drying machine, a can end lifting device comprising a central rotatably supported shaft, a turret mounted on the shaft near its lower end, a plate mounted on the upper end of the shaft having a plurality of circularly arranged openings therethrough and provided with two

circularly arranged rows of sockets in its under face respectively outside and inside of said row of openings, a plurality of threaded can end lifting shafts supported in parallel spaced relation circularly about the central shaft by said turret and end plate and operable to advance can ends upwardly between the shafts and through the top plate openings, two circularly arranged rows of studs mounted on the turret in corresponding relation to the sockets of the end plate, and tubular can end guide rods disposed with their upper ends in said sockets and their lower ends about said studs.

28. In a can end drying machine, an upright drying chamber, a revoluble series of can end lifter units disposed concentrically about the axis of the chamber, a chute for receiving can ends dislodged from the upper ends of the units, and a dislodging device comprising an arm mounted to overlie the path of the revolving units and a pin extended downwardly therefrom to engage with the can ends to cause them to be advanced into the chute.

29. A device as in claim 28 wherein the arm is adjustably mounted toward or from the axial line of the drying chamber and the pin is adjustable therein to compensate for adjustment of the lifter units for ends of various diameters.

30. In a can end drying machine, an upright drying chamber, a revoluble series of can end lifter units disposed concentrically about the axis of the chamber, a chute for receiving can ends dislodged from the upper ends of the units, and a dislodging device comprising an arm mounted to overlie the path of the revolving units and a pin extended downwardly therefrom to engage with the can ends to cause them to be advanced into the chute; said pin being yieldable upwardly within its mounting.

31. In a can end drying machine, an upright drying chamber, a revoluble series of can end lifter units disposed concentrically about the axis of the chamber, a chute for receiving can ends dislodged from the upper ends of the units, and a dislodging device comprising an arm mounted to overlie the path of the revolving units, a bushing mounted in said arm, a pin mounted slidably in said bushing and extended downwardly therefrom to engage the can ends, a spring within the bushing and engaging the pin to yieldably retain it at its lower limit of travel and a nut on the pin for adjusting it vertically.

32. In a can end drying machine, an upright drying chamber, a revoluble series of can end lifter units disposed concentrically about the axis of the chamber, a chute for receiving can ends dislodged from the upper ends of the units, and a dislodging device comprising an arm mounted to overlie

the path of the revolving units, a bushing mounted in said arm, a pin mounted slidably in said bushing and extended downwardly therefrom, a flattened conical head at the lower end of pin having a sharpened peripheral edge, means for yieldably retaining the pin against upward movement and means for adjusting the pin vertically.

33. In a can end drying machine, a plurality of can end lifting units comprising a central shaft, a plurality of threaded lifter shafts arranged circularly about and supported from the central shaft, a driving gear on the central shaft, driving gears for each of the lifter shafts supported by the gear on the central shaft, a gear mounted coaxially of the central shaft in mesh with the gears of the lifter shafts and a releasable locking device for normally retaining said central gear against rotation and means operable when said locking device is released for rotating said gear.

34. In a can and drying machine, a base structure, a driven shaft, a gear on said shaft, a sprocket wheel on said shaft, a drying mechanism comprising a base plate adjustable on said base structure, a plurality of can and lifter units carried by said base plate comprising a central shaft, a plurality of threaded lifter shafts arranged circularly about and supported from the central shaft, a driving gear fixed on the central shaft normally in mesh with the first mentioned gear but adapted to be disengaged therefrom by shifting the adjustable base plate, driving gears for each of the lifter shafts supported by the gear on the central shaft, a gear mounted coaxially of the central shaft in mesh with all the lifter shaft gears, a releasable locking device for the central gear whereby it may be held against rotation, a sprocket fixed to the last named gear in alinement with the first named sprocket to receive a driving chain thereabout.

35. In a can end drying machine, a plurality of can end lifting units disposed concentrically about a common axis, each unit embracing a pair of rotative, threaded lifter shafts, a gear train for rotating said shafts on their axes and to revolve said units about the central axis and means for effecting the rotation of said shafts without causing them to revolve about the central axis.

36. In a can end drying machine, a base structure, a central, driven shaft, a turret fixed on the shaft toward its lower end, an end frame fixed to the upper end of the shaft, a plurality of threaded lifter shafts arranged about the central shaft and supported at their ends by said turret and upper end frame and operable for lifting can ends upwardly between them; said upper end frame having cylindrical openings therethrough of substantial length alined with the lifting

units within which said ends will be delivered and stacked, and means for ejecting the ends from the stack as they advance from the said openings.

5 37. A can end drying machine comprising a plurality of can end lifter units disposed concentrically about a common axis, each unit embracing a pair of spaced, rotative, threaded lifter shafts, and a gear train to
10 rotate said shafts on their axes and to revolve said units about said common axis.

38. A can end drying machine comprising a plurality of can end lifter units disposed concentrically about a common axis, each
15 unit embracing a pair of spaced, rotative, threaded lifter shafts, a gear train to rotate said shafts on their axes and to revolve said units about said common axis, a drum enclosing said units and means for circulating drying air through said drum and
20 among can ends supported on the lifter shafts of said units.

39. A can end drying machine comprising a drum enclosing a drying chamber, means
25 for slowly raising cans in spaced, stack formation through said chamber, and means for discharging drying air laterally through the spaces between said can ends.

40. In a can end drying machine, a drying
30 chamber, means to lift the can ends there-through in vertically spaced stack formation, automatic means to dislodge can ends from the upper end of said stack formation, and a runway to receive said can ends and
35 direct them from the machine and provided at its receiving end with a flaring, inclined

chute to directly receive the dislodged ends and to deliver them to said runway.

41. In a can end drying machine, a drying chamber, means to lift the can ends there-
40 through in vertically spaced stack formation, automatic means to dislodge can ends from the upper end of said stack formation, and a downwardly inclined runway for said can ends provided at its upper end with an inclined chute adapted directly to receive can
45 ends as they are dislodged and to transfer them to said runway.

42. A can end drying machine comprising a plurality of can end lifter units disposed
50 concentrically about a common axis, each unit embracing a pair of spaced, rotative, threaded lifter shafts, a gear train to rotate said shafts on their axes and to revolve said units about said common axis, and means to
55 adjust the shafts of each pair towards and from each other to adapt the machine to can ends of different diameters.

43. A can end drying machine comprising a drying chamber having a top opening for
60 the inlet of air, an air heating device within the base of the drying chamber, means for delivering can ends upwardly through the chamber and means for withdrawing air from the chamber at the base to create a
65 downward circulation of air against the upwardly traveling column of heated air.

Signed at Seattle, King County, Washington, this 18th day of July, 1925.

NELSON TROYER.
MERTON L. DODGE.