Nov. 6, 1928. 1,690,439

H. H. WIGGLESWORTH

DRYING MACHINE

Filed April 29, 1924 3 Sheets-Sheet 1

FIG. I.

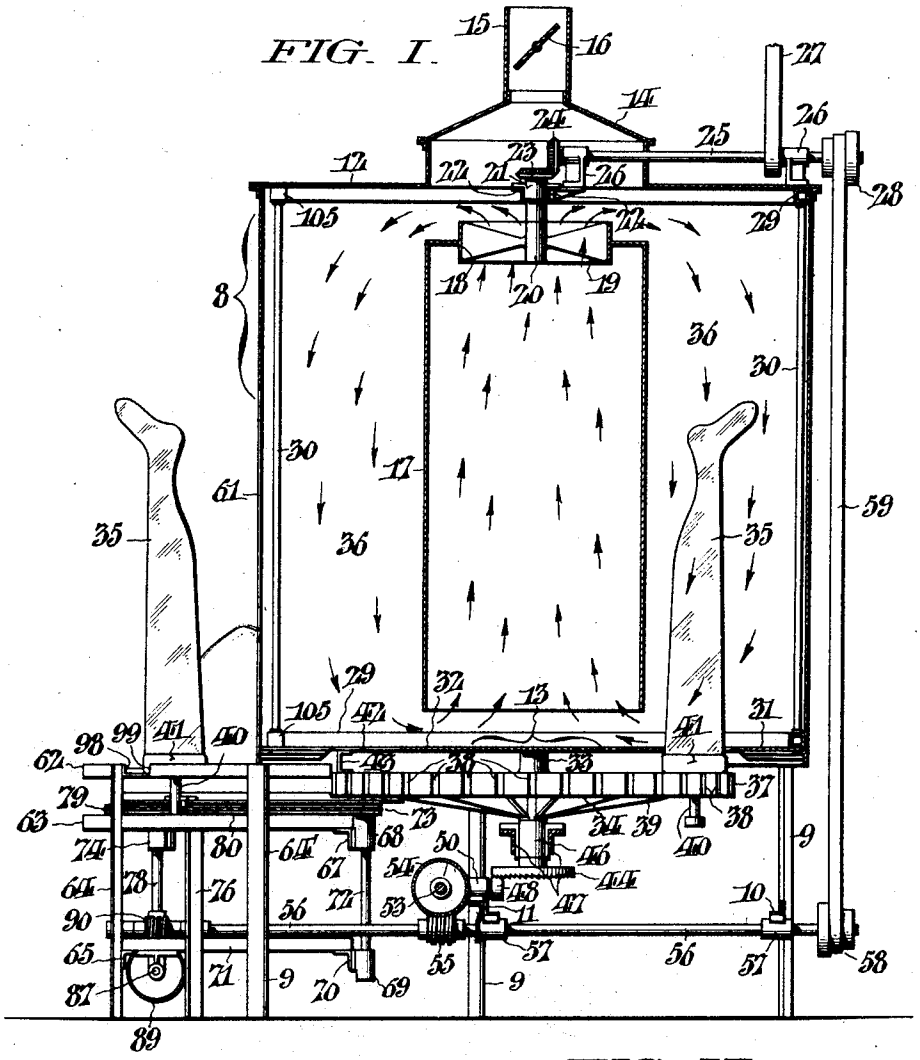


FIG. V.

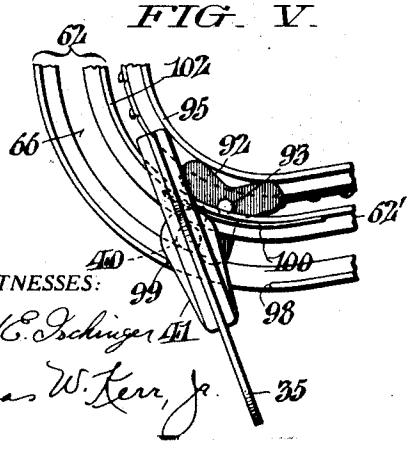
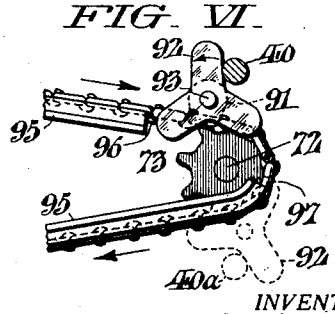


FIG. VI.



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FIG. II.

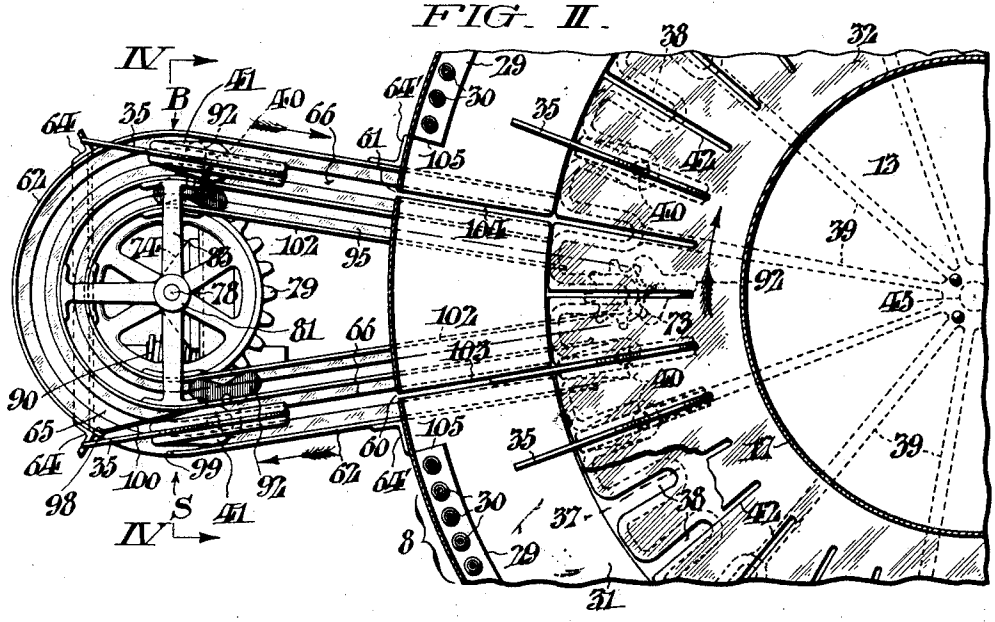
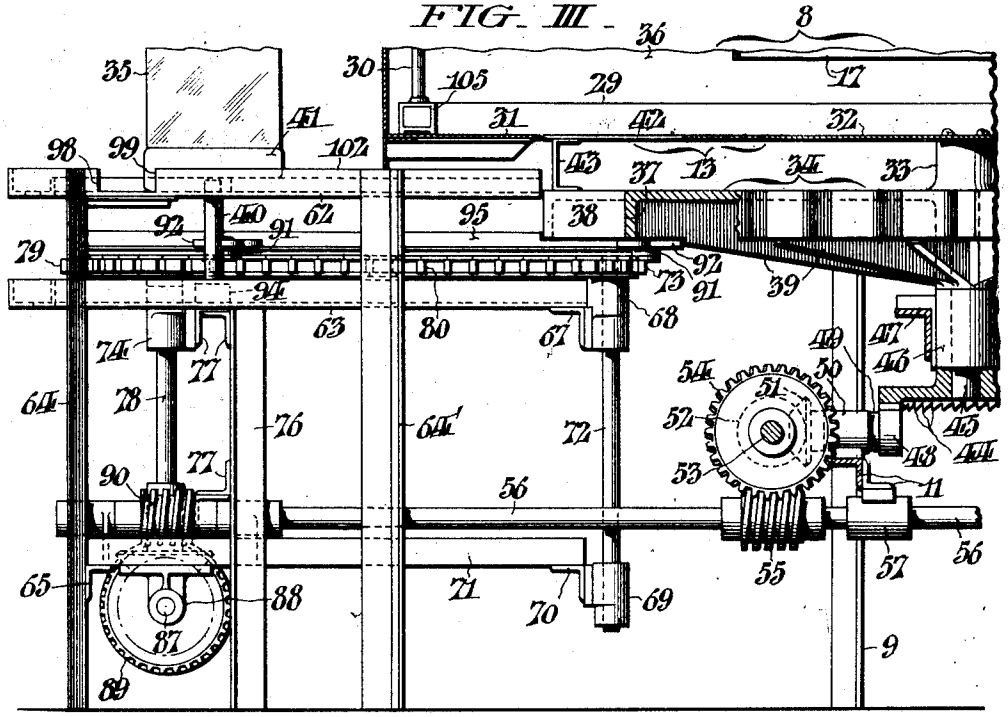


FIG. III.



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DRYING MACHINE

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FIG. IV.

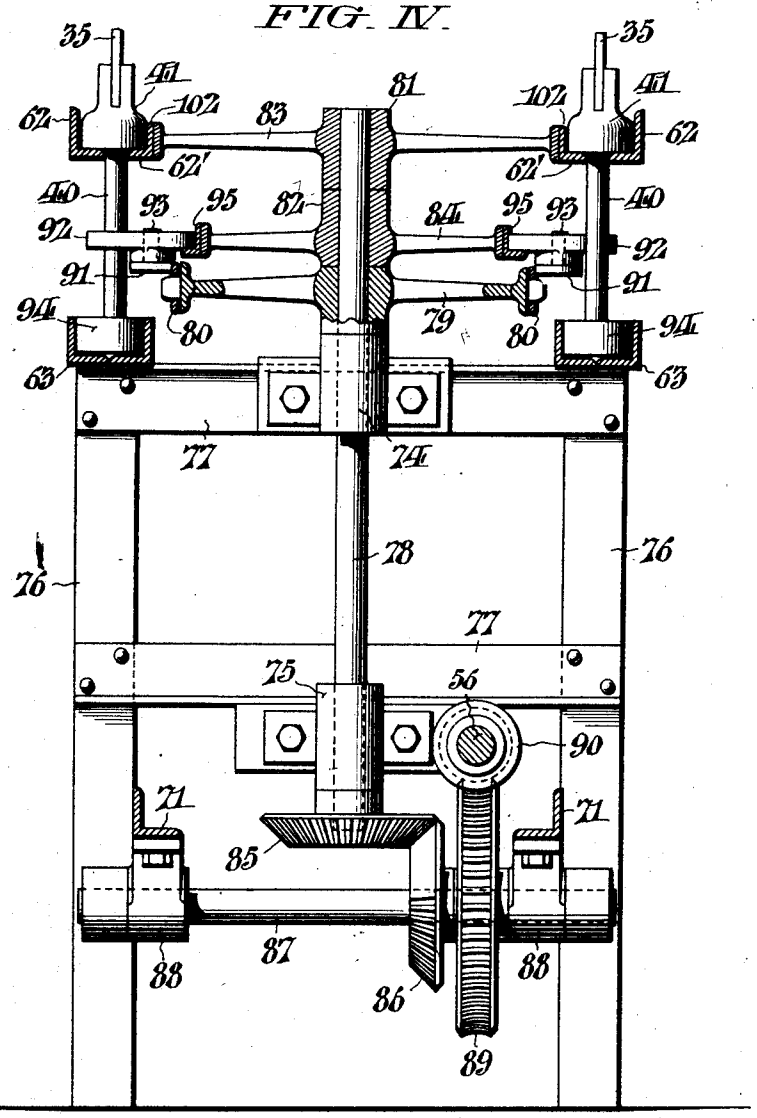
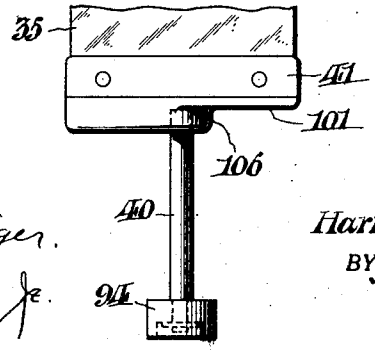


FIG. VII.



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Patented Nov. 6, 1928. 1,690,439

UNITED STATES PATENT OFFICE.

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DRYING MACHINE.

Application filed April 29, 1924. Serial No. 709,751.

This invention relates to drying machines, and it is more particularly directed to machines embodying an annular drying enclosure provided with means for transporting separate article-carrying forms therethrough—in closely allied relation—with provision for egress and ingress at definite stations, whereby the necessary operations of "stripping" and "boarding" may be efficiently accomplished.

An object of this invention is to provide a novel means whereby the separate article-carrying forms are withdrawn with precision from the drying enclosure for stripping and reclothing, and returned into said drying enclosure automatically.

Another object is to provide means whereby the separate article-carrying forms receive a half-turn at the "stripping" location, so as to be in proper directional position for re-entry into the drying enclosure after being reclothed.

Further objects of this invention are to provide a compact drying machine which is comparatively cheap to construct, automatic in operation, and very efficient in use.

Other objects and attendant advantages associated with this invention will—in part—be hereafter particularized, or become obvious, from the following description; but it is to be clearly understood that said invention is not restricted thereto, nor to the specific aggroupments of parts herein shown, except in so far as the same are limited by the scope of the subjoined claims.

In the further disclosure of the invention, reference will be had to the accompanying sheets of explanatory drawings, illustrative of one practical embodiment thereof, and in which corresponding parts are designated by like indices in all the views.

Fig. I, is a vertical sectional elevation of a drying machine conventionally embodying my invention.

Fig. II, is an enlarged fragmentary plan mainly illustrative of the means for effecting egress and ingress of the article-carrying forms relative to the drying chamber.

Fig. III, is a side elevation of the preceding figure.

Fig. IV, is an enlarged sectional elevation taken substantially on the line IV—IV in Fig. II.

Fig. V, is a fragmentary plan view showing the manner in which the article-carrying forms receive a half-turn at the stripping location.

Fig. VI, is a detail plan of the means effective to transfer the article-carrying forms from the drying enclosure conveyor to the exterior progressing means; and,

Fig. VII, is a detail view of one of the drying form supports.

Before entering upon a detailed description of the specific devices constituting the subject matter—per se—of the present invention, it will be noted that the drying machine illustrated is more particularly adapted as a hosiery drier and comprises a cylindrical enclosure 8 of conventional construction. This enclosure 8, is supported by an appropriate framework of standard section verticals 9, 9 braced by transverse angles 10, 11 to afford a rigid under structure for the accommodation of certain instrumentalities hereinafter fully described; while the roof and bottom of said enclosure are respectively designated 12, 13.

Concentric with the roof 12 there is provided a funnel shaped dome 14 affording an exhaust outlet 15 under control of an adjustable butterfly damper 16.

Appropriately supported co-axially within the enclosure 8 is a cylindrical conduit or air-duct 17, the upper end whereof is partially closed in to afford an opening 18, in which is located a horizontally rotatable fan 19, the shaft 20 whereof is journaled in a bearing 21 supported by transverse angles 22 rigidly secured to the aforesaid roof 12. Rotary motion is imparted to the fan 19 by means of a miter gear 23 on the shaft 20, meshing with a complemental gear 24 at the inner end of a radially disposed countershaft 25 journaled in bearings 26, 26. This countershaft 25 is, in turn, rotated by means of a belt drive 27; and, it is also provided at its overhanging end with a cone pulley 28, for a purpose later on explained.

Arranged concentric within, and in close juxtaposition to the roof and bottom 12, 13, respectively, of the enclosure 8 are annular headers 29, 29 connected by vertical pipes 30, through which the heating medium is circulated in accordance with prevailing practice.

The drying enclosure bottom 13, as best seen by Figs. I–III, comprises an outer annular section 31, and a concentric disc 32, which is attached to an embossment 33, on the upper surface of a turntable or spider 34 functional—as hereafter explained—to progress separate or individually disconnected article-carrying forms 35 through the annular drying space 36 intervening the inner wall of the enclosure 8 and air-conduit 17. This turntable or spider 34, as best appreciated by Figs. II and III, is of substantial construction and formed with a perimetrical flange 37 and series of radial pockets 38, arranged at equal intervals thereabout; while said spider is reinforced by ribs 39 in the well known way. Incidentally it is noteworthy that the perimetrical flange 37 is coextensive with or includes the wall of the pockets 38 and thereby affords substantial guidance for a pivot pin or stud 40—Figs. IV and VII—integral with or attached to the carrier shoe 41 clamped at the bottom portion of each article-carrying form 35. It is also to be particularly noted that the disc portion 32 of the enclosure bottom 13 is supported by, and rotates with the turntable or spider 34, while it is provided with a series of narrow radial slots 42 in alignment with—but spaced relative to—the longitudinal centers of the aforesaid pockets 38. The width of the slots 42 is of a dimension to freely accommodate the thickness of the forms 35, and it will be readily apparent that when the forms are engaged in said slots they will be positively held in relative radial relation. Further, the tongues of material intervening the radial slots 42 are sustained in rigid parallel relation relative to the turntable or spider 34 by short channel sections 43, fixed therebetween in any of the well known ways.

The means operative to rotate the turntable or spider 34 and bottom disc portion 32 and effect progression of the separate forms 35 through the annular drying space 36, comprises a crown gear 44 attached to the lower end of the spider pivot stud 45 journaled in a bearing 46, supported by parallel transverse angles 47 in accordance with conventional practice. Adapted to intermittently rotate the crown gear 44 is a single tooth pinion 48—Fig. III—at one end of a stub shaft 49 journaled in a bearing 50; and said shaft is fitted with a miter gear 51 meshing with a complemental gear 52 on a countershaft 53, in turn driven through the medium of a worm wheel 54, and worm 55 on a transverse shaft 56 journaled in bearings 57 mounted at suitable locations below the drying enclosure 8. The transverse shaft 56 is fitted with a stepped pulley 58 and it is driven by a belt 59 from the cone pulley 28 on the radial countershaft 25 hereinbefore referred to.

To afford egress and ingress for the article-carrying forms 35 out of, and into, the annular drying space 36, I have provided the enclosure shell with spaced vertical openings 60, 61, said openings being of sufficient width to ensure free passage of clothed forms 35 edge on, as hereafter fully explained.

Having set forth the conveying means for progressing the forms 35 through the drying space 36, I will now describe the associated means effective to withdraw successive forms therefrom, and transport the same exteriorly for "stripping" and reclothing prior to subsequent return into said drying space. The mechanism and instrumentalities involved comprise superposed tracks 62, 63 supported by verticals 64, 64′ of standard sections the former of which are rigidly braced by a transverse tie 65, of like section. As shown, the upper track 62 embraces spacedly opposed angle sections affording a raceway 66, aligning with the vertical openings 60, 61, and said track is inwardly extended into juxtaposed relation with respect to the perimetrical upper edge of the turntable or spider 34. On the other hand, the lower track 63, comprises closely abutting opposed angle sections, and it is extended somewhat further inwardly below the turntable or spider 34 with its free ends connected by an angle section 67, to which a bearing 68 is rigidly secured. This bearing 68, in conjunction with a similar bearing 69—mounted on an angle section 70, in turn secured to transverse members 71, 71 rigidly attached to the aforementioned verticals 64—afford journal for a vertical shaft 72 to the upper end whereof is keyed or otherwise attached a sprocket wheel 73.

Journaled in bearings 74, 75 rigidly sustained by a subframework of standard section verticals 76 and attached horizontals 77, is a vertical shaft 78, to which is keyed a relatively large sprocket wheel 79, co-planal with, and adapted to transmit rotary motion to the hereinbefore referred to shaft 72 through the medium of a chain drive 80 for a purpose later on fully set forth. At this juncture it is well to note that the shaft 78, is also afforded bearing in the hubs 81, 82, of upper and lower three-armed spiders 83, 84 respectively. The spider 83, it will be remarked, and best observed by an examination of Figs. II and IV, is functional to brace and sustain the inner member of the aforesaid track 62, rigidly co-planal with respect to the outer member thereof—while the purpose of the spider 84 will be later on referred to—and at the same time prevent the curvature of said track from distortion incident to temperature variations.

Intermittent rotary motion is imparted to the vertical shaft 78 by means of a bevel gear 85 at the lower end thereof co-operating with a dwell spaced bevel gear 86, splined on a short transverse shaft 87, journaled in bearings 88, afforded support by the members 71 above referred to. This shaft 87 is also pro-

vided with a worm-wheel 89 constantly rotated by a worm 90 on the transverse shaft 56.

In order to withdraw each successive article-carrying form 35 from the intermittently moved turntable or spider 34, and progress same exteriorly of the drying enclosure 8, I provide the chain drive 80 at intervals with laterally disposed lugs 91, to each of which is pivoted a three-point star or attachment 92, by means of a vertical stud 93. These three-point star attachments 92, it will be observed, engage—as hereafter fully explained—the rods or pivot pins 40 below each article-carrying form 35; and each said rod or pin 40 is fitted at its lower end with an anti-friction roller 94 adapted to traverse the lower track 63. Furthermore, the three-point star attachments 92 are afforded lateral guidance by an auxiliary track 95 which is supported at the outer end by the three armed spider 84, and at the inner end in any convenient manner by the bearing 68 or angle brace 67, to afford a clearance intermediate the points 96, 97—Fig. VI.

Referring once again to the article-carrying form shoes 41, and in order to impart a half-turn thereto at the stripping station, it will be best understood, from an examination of Figs. II and V more particularly, that the outer vertical flange of the track 62 is cut away between the points 98, 99, while the inner vertical flange is fitted with a spring tongue or switch 100. Incidentally it may be noted that the carrier shoe 41 is undercut at 101—Fig. VII—to clear the switch 100 and relatively lower vertical wall 102 of the inner track member 62′; while the longitudinal walls of said shoe relatively converge to automatically assist the half-turn above referred to.

As best shown in Fig. II it will be seen that the annular section 31 of the drying enclosure bottom 13 is provided with egress and ingress slots 103, 104—respectively registering with the complemental vertical slots 60, 61—and it will be readily understood that each successive partial rotation of the turntable or spider 34 moves an article-carrying form 35 into co-alignment therewith. Still further it may be remarked that the headers 29, 29 terminate at 105 on the outboard side of each vertical slots 60, 61 in order to afford free egress and ingress for the forms 35, as well as to prevent wastage of the heating medium during the period of time said forms are exterior to the drying enclosure.

In operation, and assuming that the drying machine is, as illustrated, intended for service as a hosiery drier, and that an operative is stationed at "S" for stripping the dried articles from the forms 35, and a second operative is located at "B" for boarding or reclothing said forms with wet articles to be treated, the sequence of operations may be briefly summarized as follows. Motion being imparted to the counter-shaft 25, the fan 19, and transverse shaft 56 will be continuously rotated by the means hereinbefore described. Rotation of the transverse shaft 56 will, through the worm gear 55, 54; and, single tooth pinion 48 and crown gear 44 impart an intermittent rotary movement to the turntable or spider 34, whereby the article-carrying forms 35 are progressed through the drying space 19, in radially disposed relatively stationary relation. Simultaneously with the movements just set forth the short transverse shaft 87 will be continuously driven through the medium of the worm gear 89, 90 by the transverse shaft 56, and as a result thereof the vertical shaft 78 will receive an intermittent partial turn through the medium of the dwell spaced gear 86, and bevel gear 85. At this juncture it may be well to note that the meshing relation of the gears 85, 86 is in the ratio of two to one; or, in other words the gear 85, having a full complement of teeth, the dwell spaced gear 86 will be provided with only one half the number, with one-half of its operative surface stripped and in blank. This relative relation of the gears 85, 86, however, may be otherwise proportioned but the ratio specified is particularly adapted for the machine assemblage illustrated.

Concurrent with the intermittent partial rotation of the vertical shaft 78, rotary motion will be transmitted to the vertical shaft 72 by means of the chain drive 80 and sprocket wheels 79, 73. Note is here made, that one-half revolution of the sprocket wheel 79 will effect withdrawal of an article-carrying form 35 from the drying space 36, and its return thereinto by three successive lateral movements with a "dwell" or stationary period intervening after each said movement as hereafter explained.

Now, in so far, as the successive lateral movements just referred to are concerned, and assuming that a form 35 is in aligning registration with the egress slots 103, 60, it will be readily comprehended that one of the radial limbs of the three-point star 92 is in engagement with the pivot pin 40 thereunder. Intermittent travel of the chain drive 80, as hereinbefore set forth, will progress the form 35 outwardly relative to the enclosure 8 through the slots 103, 60, to the station "S" along the raceway 66, radial aligning guidance being afforded by the vertical walls of the track 62. As the shoe 41 of the form 35 approaches the station "S"—whereat the dried stocking is removed—and by reference to Fig. II, it will be readily understood that one of its converging walls engages the switch 100, whereby said form will be retained temporarily at rest. The succeeding partial rotation of the vertical shaft 78, will progress the stripped form 35 from the station "S"

to station "B" whereat it is reclothed by an operative with a fresh wet hose. It is however to be particularly noted, that concurrently with the last mentioned progressive movement of the form 35, and at the commencement thereof, said form will receive a complete half-turn about its pivot pin 40 by frictional rolling action set up between the rounded end 106 cooperating with the spring switch 100, and coaction of the form 35 at the points 98, 99, of the track 62, successively. This half-turn is essential in order to reposition the successive forms 35, which leave the drying space 36 toe foremost, so that they shall always re-enter with the heel inwardly directed. The next succeeding partial turn imparted to the vertical shaft 78, will progress the reclothed form 35 from station "B" back into the drying space 36, where it will be deposited by its pivot pin 40 in a radial pocket 38 of the turntable or spider 34, and held radially stationary within a superposed registering slot 42 of the concentric disc 32. Incidentally, it is to be remarked that, the next intermittent travel of the chain drive 80 will swing the three-point star 92 firstly in a counter-clockwise direction until the arm thereof is freed from contact with the pivot pin 40, as best understood on reference to Fig. VI. To accommodate this necessary turn of the star 92, the auxiliary track 95 is cut away to afford the interval between the points 96, 97, and it will be obvious that said star completes a one third turn before being stationarily re-engaged by the track 95 for cooperation with the pivot pin designated 40^a in Fig. VI, of the successive forms 35 to be transferred from the turntable or spider 34 for exterior progression, as aforesaid.

From the foregoing, it is thought that the progressive course of the several clothed forms 35 through the annular drying space 36 will be clearly understood without further explanation, but it is desired to note that they will be constantly subjected to the action of a drying medium following a looped directional course as indicated by the arrows on Fig. I; while the escape of said medium through the openings 60, 61, and around the rotary bottom 32 is purely negligible.

Furthermore, it is desired to specially stress the synchronous intermittent movements of the turntable or spider 34 and chain drive 80, whereby the successive operations of form transference are positively effected with alternating dwell periods, so that "stripping" and "boarding" consecutive detached forms 35 is accomplished with ease and precision.

Another feature of particular note is the manner, and means, whereby each form 35 receives a half-turn subsequent to "stripping" concurrently with initial progression from stripping location to reclothing position.

From the foregoing description and explanation of the operations involved, it is believed that the numerous advantages associated with my improved drying machine will be obvious without further elaboration; and, although one practical embodiment thereof has been described in detail, it is not to be limited thereto, or more liberally interpreted than the scope of the appended claims permits.

Having thus described my invention, I claim:—

1. In a drying machine having a cylindrical drying chamber; a rotatable closure therefor adapted to progress detached form carriers, the form portions whereof traverse said chamber and are held against relative positional displacement by said closure; means functional to radially withdraw and return successive carriers for form stripping and clothing; and means to impart a half-turn to each successive carrier intermediate the periods of radial movement so that it re-enters the machine with non-reversed directional displacement.

2. In a drying machine having a cylindrical drying chamber; a rotatable closure therefor adapted to progress detached form carriers, the form portions whereof traverse said chamber and are held against relative positional displacement by said closure; means functional to radially withdraw and return successive form carriers with intervening dwell periods for stripping and clothing; and means operative to impart a half-turn to each form carrier intermediate withdrawal and return so that the form re-enters the drying space with non-reversed directional displacement.

3. In a drying machine having a cylindrical drying chamber; a rotatable closure therefor adapted to progress detached form carriers, the form portions whereof traverse said chamber and are held against relative positional displacement by said closure; means functional to radially reciprocate successive carriers with intervening dwell periods for stripping and clothing the forms; and means operative to impart a half-turn to each form after stripping so that it is returned into the machine with non-reversed directional displacement.

4. In a drying machine having a cylindrical drying chamber; a rotatable closure therefor adapted to progress detached form carriers, the form portions whereof traverse said chamber and are held against relative positional displacement by said closure; means functional to radially withdraw and return the form carriers by equal progressive stages with intervening dwell periods to effect stripping and clothing; and means operative to impart a half-turn to each successive carrier so that the attached form is returned into the drying machine with non-reversed displacement.

5. In a drying machine having a cylindrical drying chamber; an intermittently rotat-

able closure therefor adapted to progress detached form carriers, the form portions whereof traverse said chamber and are held against relative positional displacement by said closure.

6. In a drying machine having a cylindrical drying chamber; a rotatable conveyor and spaced closure therefor, said conveyor having a series of radial pockets adapted to engage detached form carriers, and the closure portion having radial slots effective to receive the form portions and prevent relative positional displacement thereof during progression through the drying chamber.

7. In a drying machine including an enclosure, a turntable having a series of peripheral pockets for progressive detached forms through said enclosure, and a superposed concentric rotatable bottom for said closure having radial slots aligning over the aforesaid pockets, said slots being effective to hold the forms in predetermined directional relation during such progression.

8. In a drying machine including means for progressing detached form carriers therethrough, means functional to radially withdraw and return successive carriers with intervening dwell periods, said latter means comprising an intermittently progressed chain having rotatable attachments at intervals for cooperation with a projection on each form carrier.

9. In a drying machine including means for progressing detached form carriers horizontally therethrough, means functional to radially withdraw and return successive form carriers with intervening dwell periods for stripping and reclothing, said means comprising an intermittently progressed endless chain having pivoted tappets for cooperation with a stud on each form carrier.

10. In a drying machine including a conveyor for progressing form carriers therethrough, the combination of an intermittently progressed chain having pivoted tappets adapted to radially withdraw and return successive form carriers by engaging a stud on each said carrier, and means normally preventing rotation of the tappets.

11. In a drying machine including a conveyor, for progressing form carriers therethrough, an endless chain adapted to radially withdraw and return successive form carriers by equal progressive movements with intervening dwell periods, spaced tappets pivoted on said chain for engagement with a stud on each said carrier, means affording exterior guidance for the form carrier from, and return to, the conveyor aforesaid, and means normally preventing rotation of the tappets.

12. In a drying machine including a conveyor for progressing form carriers therethrough; an endless chain adapted to radially withdraw and return successive form carriers by equal progressive movements with intervening dwell periods; tappets pivoted on the endless chain for engagement with a stud on each said carrier; means affording lateral support and guidance for the carrier from, and return to, the conveyor; and an auxiliary guide normally preventing rotation of the tappets.

13. In a drying machine including a conveyor for progressing form carriers therethrough; an endless chain adapted to radially withdraw and return successive form carriers by equal progressive movements with intervening dwell periods; tappets pivoted to said chain for coaction with a stud on each said carrier; and superposed tracks effective to supportingly guide the form carriers exteriorly of the machine, one of said tracks being traversed by an anti-friction roller on, and the other serving as a raceway for, the form carrier studs.

14. In a drying machine comprising a cylindrical drying chamber; a rotatable conveyor without said chamber for progressing radially retained forms therethrough, and an associated means for radially withdrawing and returning successive forms for stripping and reclothing, flexible means effective to impart a half turn to each form carrier after stripping and prior to reclothing.

15. In a drying machine including an enclosure, a conveyor for progressing form carriers horizontally therethrough, an associated means for radially withdrawing and returning the form carriers for stripping and reclothing at intervals during progression over an exterior track, said track having an interruption and an opposedly related spring tongue effective to impart a half-turn to each successive form carrier after stripping and prior to reclothing.

16. In a drying machine including an enclosure, and an intermittently rotatable form conveyor, the combination of an endless chain for radially withdrawing and returning successive forms, said endless chain having spaced three-point pivoted tappets adapted to co-act with a stud on each form, and an auxiliary track affording normal non-rotatable guidance for the three-point tappets, said track having an interruption whereat each tappet is rotatable about its pivot to engage successive forms, and thereby effect its removal from, and return to, the conveyor aforesaid.

17. In a drying machine comprising an annular drying enclosure, a conveyor for progressing form carriers therethrough, an endless chain with rotatable attachments for radially withdrawing and returning said form carriers for stripping and reclothing, and means adapted to intermittently progress the conveyor and endless chain with positive synchronism.

18. In a drying machine of the type de-

scribed, the combination of a series of form carriers each having a rounded end and inwardly converged side walls, an axial stud, and a laterally rotatable anti-friction roller on said stud.

19. In a drying machine of the type described, the combination of superposed tracks affording external guidance for form carriers to stripping and reclothing locations, the upper of said tracks constituting a raceway and being provided with an interruption and an opposed spring tongue, for the purpose specified.

20. In a drying machine comprising an annular enclosure, the combination of a rotatable radially slotted bottom, and means transporting a series of form carriers—projecting freely through the slotted bottom into the annular enclosure—with capacity for direct radial ejection and retraction for stripping and after reclothing, respectively.

21. In a drying machine having an annular enclosure, the combination of a horizontally rotatable radially-slotted bottom, and means transporting a series of vertically disposed form carriers—projecting upwardly through the slotted bottom into the annular enclosure—with capacity for direct lateral ejection and retraction for stripping and after reclothing, respectively.

22. In a drying machine having an annular enclosure, the combination of a horizontally rotatable radially slotted bottom, and means intermittently progressing a series of vertically disposed form carriers—projecting upwardly through the slotted bottom into said annular enclosure—with capacity for direct lateral ejection and retraction relative to the enclosure for stripping and after reclothing, respectively.

In testimony whereof I have hereunto signed my name at Philadelphia, Pennsylvania, this 25th day of April, 1924.

HARRY H. WIGGLESWORTH.