

Sept. 18, 1945.

J. R. MOORE

2,385,223

CLOTHES DRYING MACHINE

Filed Oct. 21, 1938

3 Sheets-Sheet 1

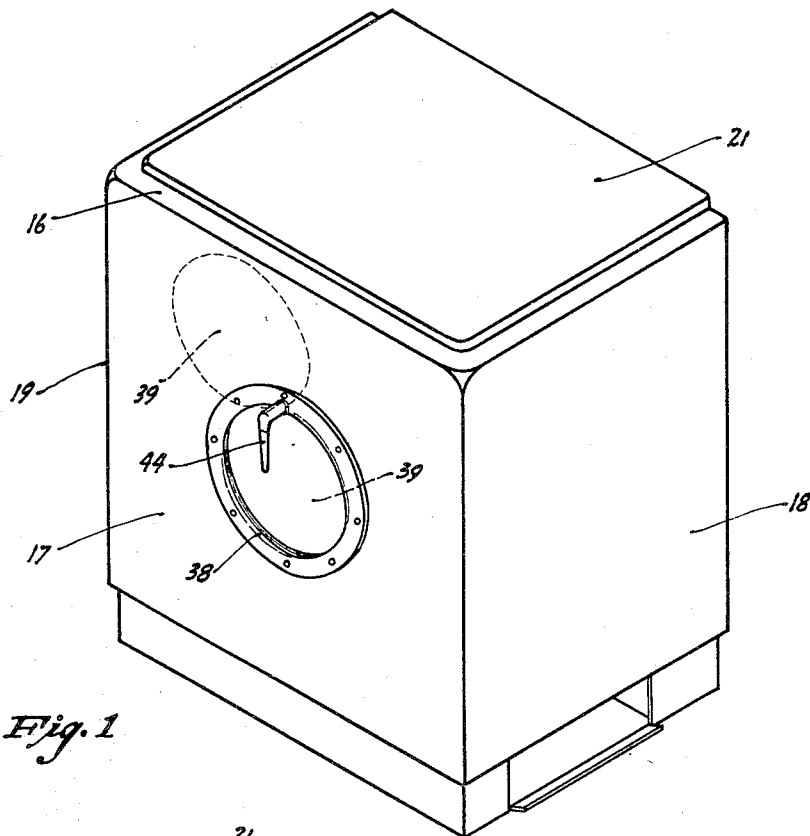


Fig. 1

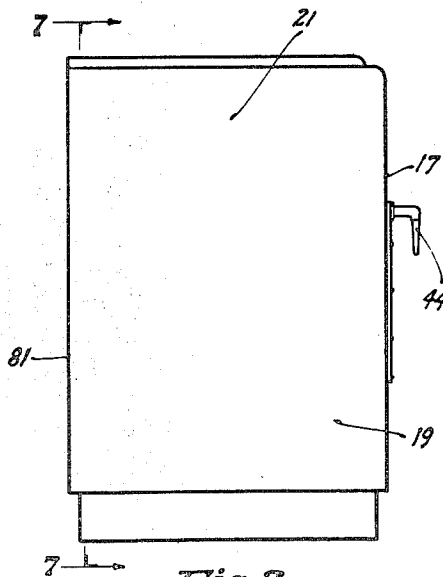


Fig. 2

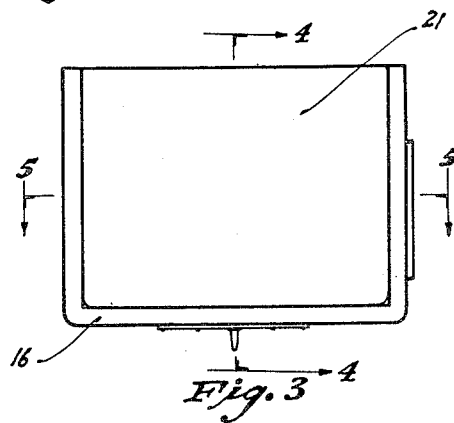


Fig. 3

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3 Sheets-Sheet 2

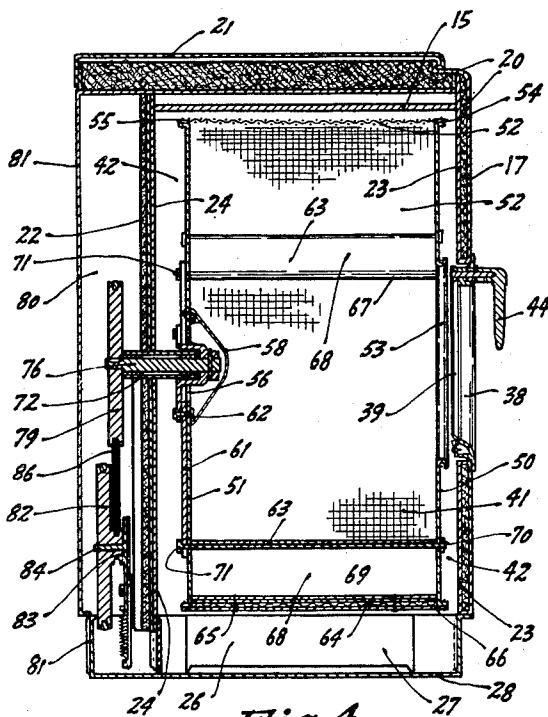


Fig. 4

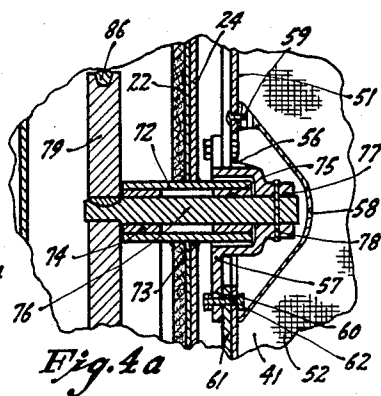


Fig. 4a

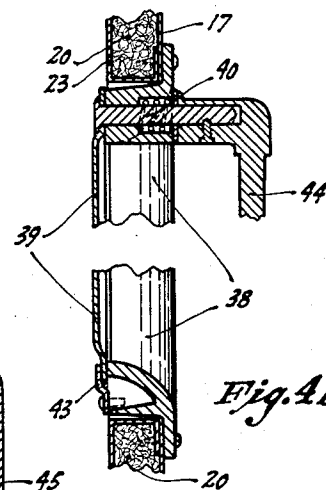


Fig. 4b

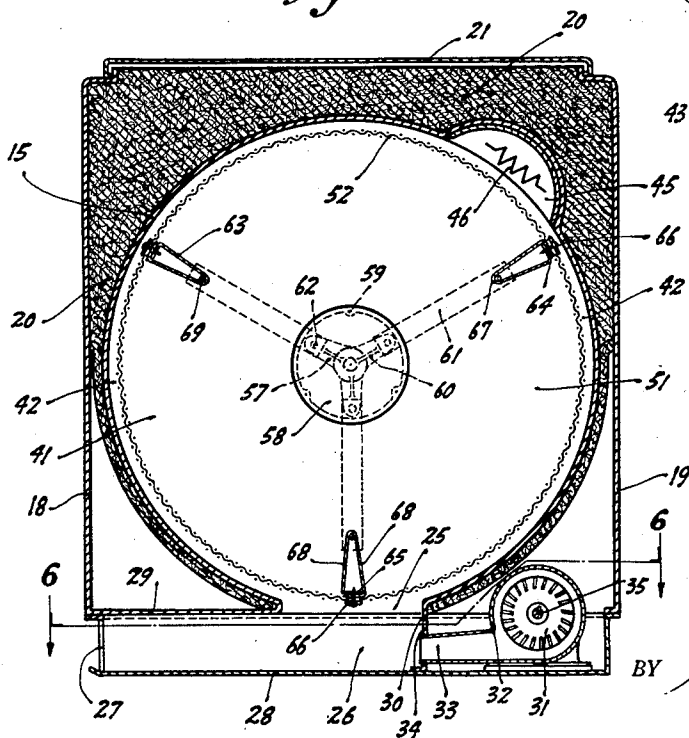


Fig. 5

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3 Sheets-Sheet 3

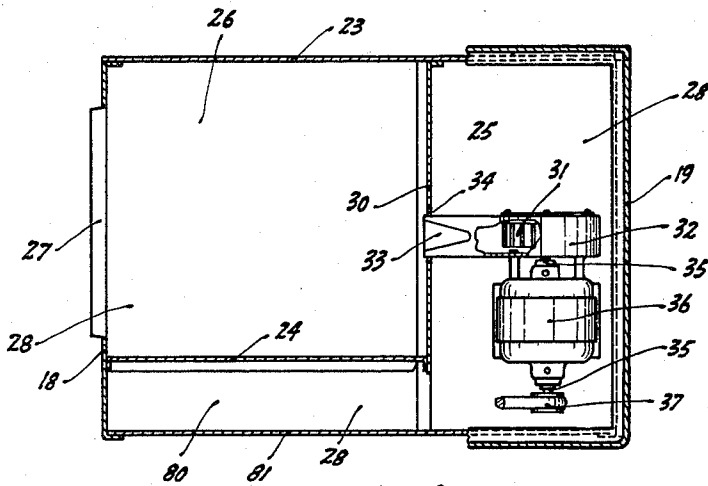


Fig. 6

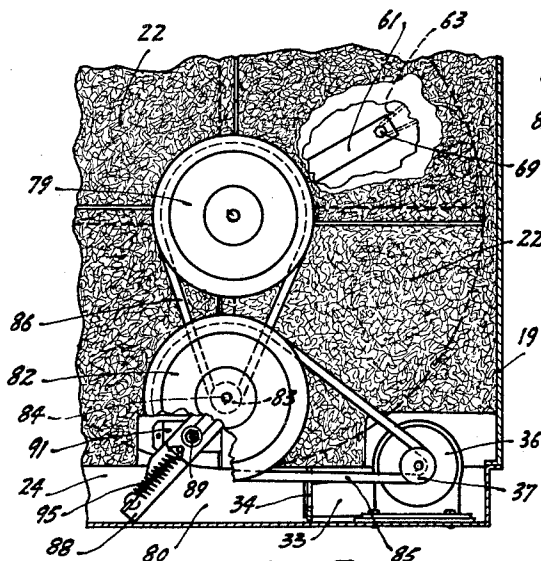


Fig. 7

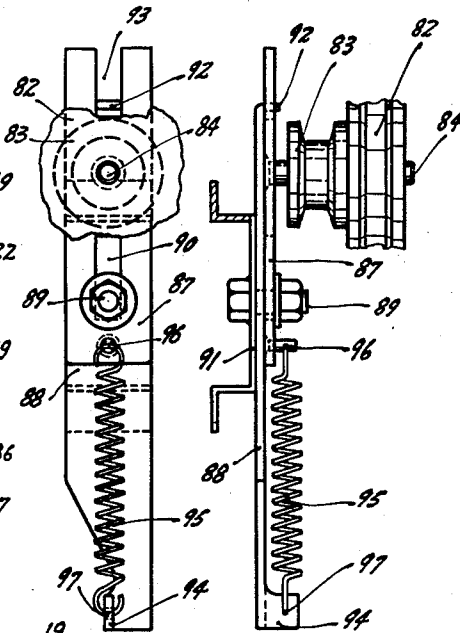


Fig. 8

Fig. 9

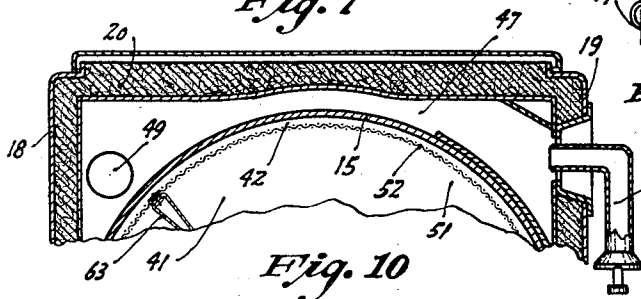


Fig. 10

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UNITED STATES PATENT OFFICE

2,385,223

CLOTHES-DRYING MACHINE

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mesne assignments, to Stanley G. Harwood,
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Application October 21, 1938, Serial No. 236,189

6 Claims. (Cl. 34—133)

This application is a continuation in part of my pending application Serial No. 177,123, for Clothes drying machine, filed November 29, 1937.

The present invention has relation generally to equipment for drying articles or material, and, in the disclosure as made, relates to a machine designed to be more especially useful to the purpose of causing clothes or other fabric articles or material to be dried.

An object of the invention is to provide a machine or equipment for drying clothes or other articles or material which will be adapted to production of maximum drying action upon the clothes, articles or material to be dried by expenditure of minimum in heat energy.

A further object is to provide a machine or equipment of the present character which will include a drying chamber adapted to receive wet, damp or moist clothes or other articles or material to be dried, means for heating said drying chamber, and a construction and arrangement through the instrumentality of which substantially all heat applied to said drying chamber by said means can be effectively utilized to the accomplishment of drying action upon clothes, articles or material placed in said drying chamber.

A further object is to provide a machine or equipment for drying clothes or other articles or material which in its entirety will be of novel and improved construction.

And a further object is to provide a machine or equipment of the present nature wherein will be incorporated various improved features and characteristics of construction novel both as individual entities of said machine or equipment and in combination with each other.

It is also an object to provide a novel method of drying laundry.

With the above objects in view, the invention comprises the construction, arrangement and combination of parts as now to be fully described and as hereinafter to be specifically claimed, it being understood that the disclosure herein is merely illustrative and intended in no way in a limiting sense, changes in details of construction and arrangement of parts being permissible so long as within the spirit of the invention and the scope of the claims which follow.

In the accompanying drawings forming a part of this specification,

Fig. 1 is a front perspective view of a clothes drying machine including the features and characteristics of the invention;

Fig. 2 is a side elevational view of the clothes

drying machine as it would appear from the left side of Fig. 1;

Fig. 3 is a plan view, on a reduced scale, of the clothes drying machine of Fig. 1;

Fig. 4 is an enlarged vertical central transverse sectional view, taken on line 4—4 in Fig. 3;

Fig. 4a is a detail sectional view of the mounting for the article supporting device or drum of the machine;

Fig. 4b is a detail sectional view of a door of the clothes drying machine for allowing access to the article supporting device or drum of said machine;

Fig. 5 is a vertical central longitudinal sectional view, taken on line 5—5 in Fig. 3;

Fig. 6 is a horizontal sectional view, taken as on line 6—6 in Fig. 5;

Fig. 7 is an enlarged fragmentary sectional view, partially broken away, taken on line 7—7 in Fig. 2;

Fig. 8 is an enlarged plan view detailing power transmitting mechanism of the machine;

Fig. 9 is an edge view of the disclosure of Fig. 8; and

Fig. 10 is a fragmentary sectional view, corresponding generally with the disclosure of Fig. 5, illustrating a clothes drying machine of slightly modified construction made according to the invention.

The clothes drying machine in the disclosed embodiment of the invention is externally of generally rectilinear conformation and internally of generally cylindrical conformation. More explicitly, an inner cylindrical housing 15 of the machine is provided in spaced relation to outer upper, front and side or end walls, denoted 16, 17, 18 and 19, respectively, thereof, and insulating material 20 is suitably disposed between said housing 15 and said walls 16, 17, 18 and 19. The housing 15 and the walls 16, 17, 18 and 19 desirably may be composed of sheet metal. A removable metal cover 21 is arranged over an opening in the upper wall 16. The insulating material 20 may be of any composition suitable to its purpose. A rearward wall 22 of the machine may be of any suitable material. As disclosed, the major portion of the rearward wall 22 is composed of asbestos. The front end wall 23 of the cylindrical housing 15 is in contiguous relation with insulating material 20 and the rear end wall 24 of said housing 15 is in contiguous relation with the rearward wall 22. In use, the clothes drying machine may rest upon any suitable supporting surface therefor, as, for example, the floor of a laundry or basement.

The cylindrical housing 15 communicates through a passageway 25 at its lower portion with an outlet passageway 26 below said housing 15 and leading to an outlet 27 from the clothes drying machine at a lower portion of the side or end wall 18 thereof. The passageway 25 is coextensive in width with the housing 15, and the outlet passageway 26 is coextensive in width with said passageway 25. A horizontal wall 28 constitutes the lower wall of the outlet passageway 26, as well as the lower wall of the machine. A horizontal wall 29 parallel with, in spaced relation to and above the wall 28 constitutes the upper wall of said outlet passageway 26. Said wall 28 meets the front end wall 23, extends past the rear end wall 24, and meets the side or end walls 18 and 19 of the machine. Said wall 29 meets the front end wall 23, rear end wall 24, and the side or end wall 18. The edge of the wall 29 opposite said wall 18 meets a lower portion of the cylindrical housing 15 at the adjacent side of the passageway 25. The side of said passageway 25 opposite the horizontal wall 29 is defined by a vertical wall 30 which extends downwardly from the housing 15. The vertical wall 30 is disposed transversely of the clothes drying machine and extends between the front end wall 23 and the rear end wall 24 of said housing 15. The lower edge of said vertical wall 30 meets the wall 28.

Air is adapted to travel downwardly from the interior of the housing 15 through the passageway 25 and the outlet passageway 26 to and out of the outlet 27. A fan or blower 31 is disposed within the machine at the side of the vertical wall 30 opposite the outlet passageway 26. A casing for the fan or blower 31 is denoted 32. An inlet is provided for admitting air to the fan or blower casing 32, and an exhaust 33 from said casing extends through an opening 34 in the vertical wall 30. The exhaust 33 terminates in the outlet passageway 26 at location beneath and centrally of the passageway 25 and is as disclosed situated between the front and rear walls 23 and 24, in spaced relation to each of said front and rear walls and in alignment with the outlet 27. The fan or blower 31 forces air out of the exhaust 33, past the central portion of the passageway 25, through the outlet passageway 26, and from the machine out of the outlet 27.

Said fan or blower 31 is fixed upon a horizontal shaft 35 driven by an electric motor 36 suitably mounted upon the lower wall 28 and situated within the machine. The motor shaft 35 includes a portion thereof extending in direction from the motor 36 opposite the fan or blower which fixedly carries a drive pulley 37.

Save for the passageway 25 leading from the interior of the cylindrical housing 15 at the lower portion thereof into the outlet passageway 26 said housing is adapted to be completely closed when the machine is in operation.

As illustrated, the front wall 17 and the front end wall 23 of the machine include a substantially centrally situated opening 38, circular as shown, and said opening 38 is adapted to be covered by a circular door 39 which is rotatably supported, as at 40, upon the front walls 17 and 23. The door 39 when open allows access to an article supporting device or drum 41, presently to be described, of the machine. Said article supporting device or drum 41 is within the cylindrical housing 15 and said housing constitutes a drying chamber 42 of the machine about the article supporting device or drum. The door 39 is of course closed during operation of the

machine. When in closed position, said door 39 is situated in back of a flange 43 upon the interior surface of the front end wall 23, and when the door is open it is situated within the chamber 42 above the opening 38, about as disclosed in dotted lines in Fig. 1. A manually manipulable handle 44 is for the purpose of opening and closing said door 39.

An upper portion of the cylindrical housing 15 includes an off-set or recess 45 in which a heating element 46 is situated. The heating element 46 shown in Fig. 5 is an electrical resistance element adapted to be energized from any suitable source (not shown). While the heating element 46 may be located anywhere within the chamber, it is preferably placed at or near the top, since if located near the bottom, the articles being dried might be scorched, should the motor drive for the drum be accidentally disabled.

In Fig. 10 the upper portion of the housing 15 is regular, or continuously curved, and a gas burning chamber 47 is disposed within the machine and above said housing 15. A gas line 48 leads into the chamber 47, and an exhaust outlet 49 leads from said chamber. Save for the different types of heating elements or members employed, the disclosures of Figs. 5 and 10 are substantially similar. Heaters of types other than as disclosed may of course be utilized.

The article supporting device or drum 41 is adapted to receive articles or material of any nature, such as clothes, or other fabric articles, or, in fact, any articles or material, to be dried, the articles or material being placed in said article supporting device or drum 41 through the opening 38 while the door 39 is open.

Means is provided for mounting the article supporting device or drum 41 in the drying chamber 42 so that said device or drum can be rotated in said drying chamber while the latter is being heated by the heating element or member of the machine. The heat applied by the heating element or member of course provides the desired vaporizing action upon moisture in the clothes, articles or material which are being dried.

The article supporting device or drum 41 includes a forward circular sheet metal end wall 50, a rearward circular sheet metal end wall 51, and a cylindrical perforate or screen member 52. The forward end wall 50 includes a central circular opening 53 which aligns with the opening 38. Each of the end walls 50 and 51 includes an outwardly extending marginal flange, denoted 54 and 55, respectively, and the opposite side edge portions or margins of the perforate or screen member 52 overlap said flanges 54 and 55 and are suitably and conveniently secured thereto. The rearward end wall 51 includes a central circular opening 56 which receives a substantially cylindrical portion of a spider 57 in such manner that said cylindrical portion is situated within the article supporting device or drum 41, beneath a substantially conical cover member 58 for the cylindrical portion of the spider suitably and conveniently secured to and against the inner surface of said rearward end wall 51, as at 59. Legs 60 of the spider 57 are positioned in contiguous relation with the outer surface of the rearward end wall 51. As shown, said spider has three legs 60 spaced at 120 degrees apart. A metal strap extends radially from each leg 60 and is disposed in contiguous relation with said rearward end wall 51. The inner end of each metal strap 61 is secured to the rearward end wall 51 by a bolt, rivet or fastener 62 which also secures

the corresponding leg 60 to said rearward end wall. A plurality of tumbler members or ribs 63 extend transversely of the article supporting device or drum 41 between the forward and rearward end walls 50 and 51 thereof. As shown, there are three tumbler members or ribs 63, one corresponding to each metal strap 61, and each tumbler member or rib is approximately V-shape in cross-section. That is, each member or rib 63 includes an outer base 64 at the inner side of the perforate or screen member 52 secured to said perforate or screen member by rivets 65 which also secure a retaining member 66 for the tumbler member or rib against the perforate or screen member at the outer side thereof. The retaining members 66 as shown extend the full width of the article supporting device or drum 41. Each tumbler member or rib 63 includes an inner base 67 and divergent side walls 68 connecting said bases 64 and 67. Cross rods 69 extend between the end walls 50 and 51, including a cross rod 69 at the inner side of each tumbler member or rib 63 in adjacent relation with or contiguous relation with the inner base 67 of the corresponding tumbler member or rib. The opposite end portions of each cross rod 69 are mounted in and extend outwardly beyond the forward and rearward end walls 50 and 51, respectively, of the article supporting device or drum. The forward end of each cross rod 69 threadably receives a nut 70 which is drawn up against said forward end wall 50. The rearward end portion of each cross rod 69 is arranged in the outer end portion of a corresponding metal strap 61 at the rear side of the rearward end wall 51, and the rearward end of each cross rod threadably receives a nut 71 which is drawn up against said corresponding metal strap 61. Obviously, the cross rods 69 and the nuts 70 and 71 cooperate with the transverse members or ribs 63 and the retaining members 66 to maintain the walls 50 and 51 in fixed, spaced apart relation, cooperate with the rearward end wall 51 to rigidly secure the outer ends of the metal straps 61 to said rearward end wall, and cooperate with the forward end wall 50 and the rearward end wall 51 to fix the positions of the transverse members or ribs 63 within the article supporting device or drum 41 and relatively to the perforate or screen member 52.

A mounting for the article supporting device or drum 41 includes the substantially cylindrical part of the spider 57. A horizontal hollow bearing 72 is supported, as at 73, in the rear end wall 24 and the rearward wall 22 and extends inwardly beyond and outwardly beyond said walls 24 and 22, respectively. The inner portion of the hollow bearing 72 is disposed within the cylindrical part of the spider 57 between its legs 60, and the inner end of said bearing 72 is as shown in proximate relation to the inner end of said cylindrical part of said spider. The horizontal bearing 72 supports a bushing 74 in the outer portion thereof and a bushing 75 in the inner portion thereof. A horizontal stud shaft 76 is suitably and conveniently mounted in the bushings 74 and 75 to extend beyond both the inner and outer ends of the hollow bearings 72. The inner end portion of the stud shaft 76 snugly enters an opening 77 in the cylindrical part of the spider 57 and perpendicular to the plane of the rearward end wall 51, and a cross pin 78 is arranged in said cylindrical part of said spider and extends through the stud shaft to fixedly secure the spider upon the inner end portion of the stud shaft. The

outer end portion of said stud shaft 76 fixedly carries a drive pulley 79 arranged in proximate relation to or contiguous relation with the outer end of the hollow bearing 72.

The construction includes mechanism for transmitting power from the motor shaft 35 and its drive pulley 37. As shown, said power transmitting mechanism is situated within a space 80 of the machine between the rearward wall 22 and an outer vertical closure wall 81 at the rear of said rearward wall 22 and in spaced relation thereto. The rearward edges of the side or end walls 18 and 19 meet the closure wall 81 to close the space 80 at the rear of the machine, and said space 80 is open at location above and adjacent to vertical wall 30 to the space of the machine which houses the electric motor 36.

An idler unit of the power transmitting mechanism includes a relatively large pulley 82 and a considerably smaller pulley 83. The large pulley 82 and the small pulley 83 constitute a single rigid structure rotatably mounted upon a post 84. A belt 85 rides upon the pulleys 37 and 82 and a belt 86 rides upon the pulleys 79 and 83.

To equalize belt tension between the two belts 85 and 86 and to provide for belt adjustment to take up slack, the post 84 which carries the pulley unit 82, 83 is fixed in a bar 87 of an extensible lever including a second bar 88. The bar 87 is slidably secured to the bar 88 by means of a headed and nutted bolt 89 which passes through said bar 88 and through an elongated slot 90 in the bar 87. The headed and nutted bolt 89 is mounted or supported in a member 91 itself suitably and conveniently fixed to the rearward wall 22 of the machine. Evidently, the bolt 89 oscillatably supports the extensible lever consisting of the two bars 87 and 88 upon the rearward wall 22. Said bars 87 and 88 may be retained in alining relation with each other through the instrumentality of a flange 92 upon one end of the bar 88 arranged in a longitudinal end slot 93 in the bar 87. As disclosed, the post 84 is situated upon the bar 87 at location between the longitudinal end slot 93 and the headed and nutted bolt 89 and extends away from the surface of said bar 87 which is opposite the bar 88. A flange 94 upon the end of the bar 88 opposite the end of said bar having the flange 92 is disposed in spaced relation to the bolt 89 at the side thereof opposite the post 84 and in alining relation with said post, and a coil spring 95 secured to the adjacent end portion of the bar 87, as at 96, and to the flange 94, as at 97, resiliently urges said bar 87 toward said flange 94 and away from the pulleys 37 and 79 and thus resiliently urges the pulley unit 82, 83 in direction to preclude the possibility of slack in each of the belts 85 and 86. The arrangement is such that the tension upon said belts 85 and 86 is equalized, the extensible lever 87, 88 oscillating or moving to position compatible with equalization of belt tension upon the different belts 85 and 86. Stated differently, the pulley unit 82, 83 is free to adjust itself in response to belt tension so that the tension upon the belt 85 will counteract the tension upon the belt 86, and vice versa.

As hereinbefore stated, clothes or other articles or material to be dried are placed in the article supporting device or drum 41 through the openings 38 and 53, and when a desired quantity of clothes or articles or material has been inserted into said article supporting device or drum, the door 39 is closed. The heating element or member, as in Fig. 5, or as in Fig. 10, is of course

made operative to impart heat to the drying chamber 42. Upon energization of the electric motor 36 the shaft 35 is rotated to actuate the fan or blower 31 and to also drive or rotate the article supporting device or drum 41 through the instrumentality of the transmission as illustrated and described. The fan or blower 31 creates flow of air through the outlet passageway 26, past the passageway 25, and from the outlet 27.

The heating element, member or unit employed operates to raise the temperature within the drying chamber 42, as well as within the article supporting device or drum 41, so that moisture laden articles to be dried become heated. Thus, the moisture is converted into steam and/or hot vapor which tend to be removed from the articles.

Rotation of the article supporting device or drum 41 results in a tumbling action upon the clothes or articles, due to the action of the tumbler members or ribs 63 which function to lift and drop the clothes or articles as said article supporting device or drum rotates. The tumbling action assists the drying effect, and said tumbler members or ribs 63 obviously function or operate to produce a tendency toward a general spreading out of the clothes or articles in the supporting device or drum 41 so that said clothes or articles readily will be dried.

Because of the fact that the atmosphere within the chamber is stirred by the rotation of the drum, the opening 25 may, of course, be placed at any point in the periphery of the chamber. However, since the heater is preferably located at the top, it is better from a practical standpoint to locate the opening 25 generally opposite the heater. Moreover, from a manufacturing standpoint, it is preferable to locate the evacuation mechanism in the lower part of the structure and consequently to place the opening 25 at the bottom.

Because of the fact that the heating element, member or unit is at or adjacent an upper portion of the drying chamber, air at higher location or elevation in said drying chamber would tend to have a temperature greater than that of air at lower location or elevation in the drying chamber. However, because of the stirring action of the drum and the articles therein, there is a definite tendency to diffuse the heat generated and thereby equalize the air temperature in all parts of the chamber.

In any construction and arrangement including the principles of the invention, moisture air is adapted to be removed from said drying chamber by way of a passageway, such as 25, or equivalent, through the instrumentality of mechanically or artificially produced air currents, and air from the outside of the machine is adapted to enter said drying chamber through said passageway in replacement of the moisture air. That is, moisture air which is removed from the drying chamber is replaced as it is removed by drier air entering through the opening 25 of said drying chamber into the interior thereof.

Were the moisture air not removed in some manner or other from the drying chamber, and from the passageway adjacent the opening 25 of said drying chamber in the disclosed embodiment of the invention, after said moisture air had become saturated to be non-useful to the advancement of the drying operation, saturated, non-drying air would build up in the drying chamber and cause the drying action to be retarded. Desirably, air which has become saturated and non-drying constantly and continuously is removed

from location where it possibly can cause accumulation of moisture air within the drying chamber by provision of constant and continuous flow of a current of air, which aptly is termed a carrier current of air, past the opening 25 of said drying chamber.

The construction and arrangement preferably will be such that only saturated air which no longer is able effectively to further the drying operation will move to and through the opening 25. Thus, substantially all heat applied in said drying chamber effectually will be utilized to the accomplishment of drying action upon clothes, articles or material placed in the drying chamber to be dried, and saturated air removed from said drying chamber will cause no noticeable increase in temperature of atmosphere surrounding the drying chamber.

When the drying machine herein specifically illustrated and described is in operation, saturated air constantly and continuously is removed from the drying chamber 42 with a slow and gentle flow through the passageway 25 into the outlet passageway 26 containing air constituted as a carrier current of air constantly and continuously caused to travel through said outlet passageway 26 by operation of the fan or blower 31. Said carrier current of air constantly and continuously by an aspirating action removes the saturated air which is drawn into the outlet passageway 26 from the central portion of said outlet passageway 25 and from the drying machine, and air from the carrier current of air constantly and continuously travels from the outlet passageway 26 through the passageway 25, the end portions of which permit such inflow, into said drying chamber and replaces the saturated air as this becomes removed from said drying chamber.

What is claimed is:

1. A laundry drier comprising, in combination, a chamber to receive the laundry and having an opening but otherwise closed, means for directly applying heat to the contents of the chamber, means for agitating the laundry during the course of drying, and means for producing a current of air flowing across said opening exteriorly of the chamber to force relatively dry unheated air into the chamber and to carry away moisture laden air from the chamber as it is replaced by said relatively dry air.

2. A laundry drier comprising, in combination, a chamber to receive the laundry and having an opening but otherwise closed, means within the chamber for generating heat, means for agitating the laundry during the course of drying, and means for producing a current of air and having an outlet directing said air transversely across said opening exteriorly of the chamber to draw moisture laden air from said chamber and to supply relatively dry air thereto.

3. A laundry drier comprising, in combination, a chamber to receive the laundry and having an opening but otherwise closed, means for applying heat directly to the contents of the chamber, means for agitating the laundry in the chamber during the course of drying, and means for drawing moisture laden air from the chamber through one part of said opening and to supply relatively dry air to the chamber through another part of said opening.

4. A laundry drier comprising, in combination, a chamber to receive the laundry, means within the chamber for tumbling the laundry therein, means for applying heat directly to the laundry as it is being tumbled, said chamber being pro-

vided with an opening but being otherwise closed, and means for producing a current of air and having an outlet directing said air across a part of said opening to draw moisture laden air from said chamber and to permit relatively dry air being taken in through another part of said opening to supplant the air removed.

5. A laundry drier comprising, in combination, a chamber to receive the laundry and having an opening but otherwise closed, means within the chamber for generating heat, means for agitating the laundry during the course of drying, and means for producing a current of air and having an outlet directing said air across the central portion of said opening to draw moisture laden air from said chamber through said central portion leaving the end portions of said open-

ing free to permit the inflow into the chamber of relatively dry air to supplant the moisture laden air withdrawn through said central portion.

6. A laundry drier comprising, in combination, a chamber to receive the laundry to be dried and having an opening in the bottom thereof but otherwise closed, means within the chamber for tumbling the laundry therein, means for supplying heat directly to the laundry as it is being tumbled, and means for directing a current of air transversely across the central portion of said opening whereby moisture laden air will be withdrawn from the chamber through said central portion, the end portions of said opening being free to provide for ingress of air to supplant the air removed.

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