

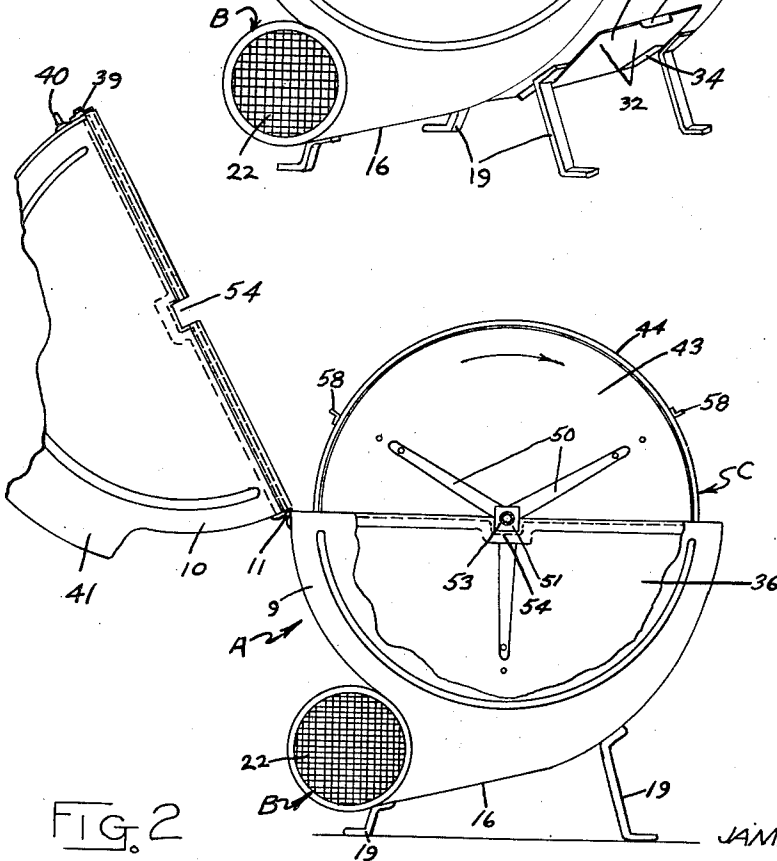
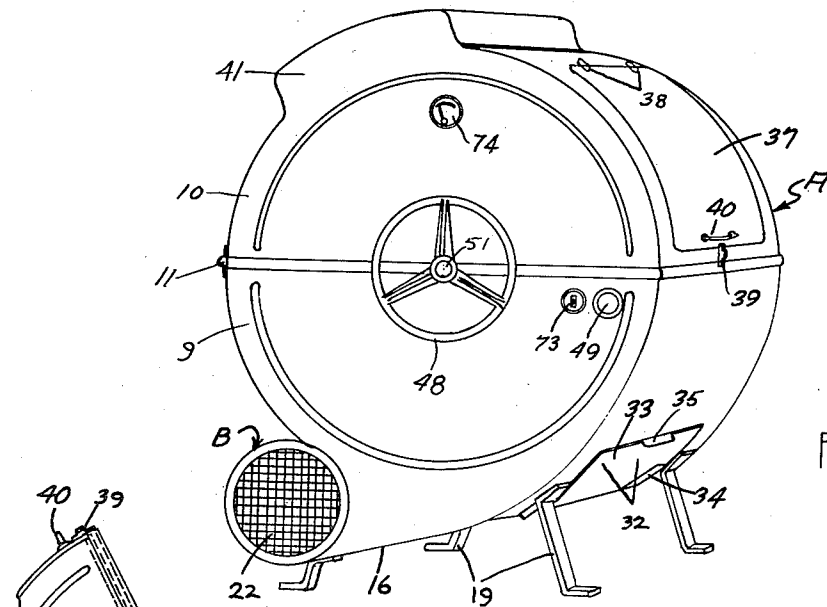
Sept. 18, 1945.

J. R. MOORE

2,385,222

CLOTHES DRYING MACHINE

Original Filed April 23, 1936 4 Sheets-Sheet 1



INVENTOR.
JAMES R. MOORE
BY *G. H. Braddock*
ATTORNEY.

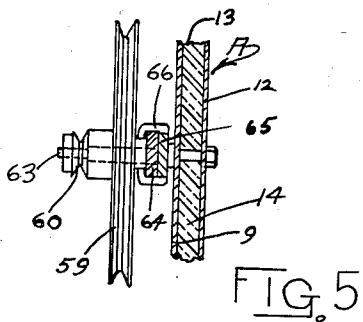
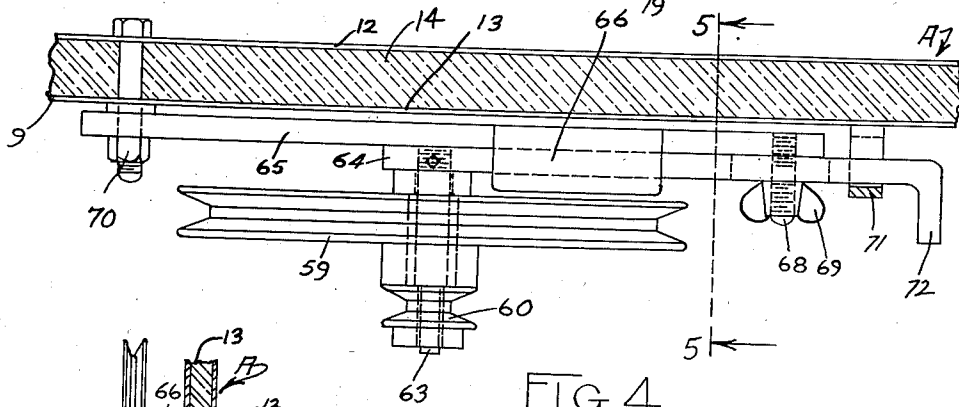
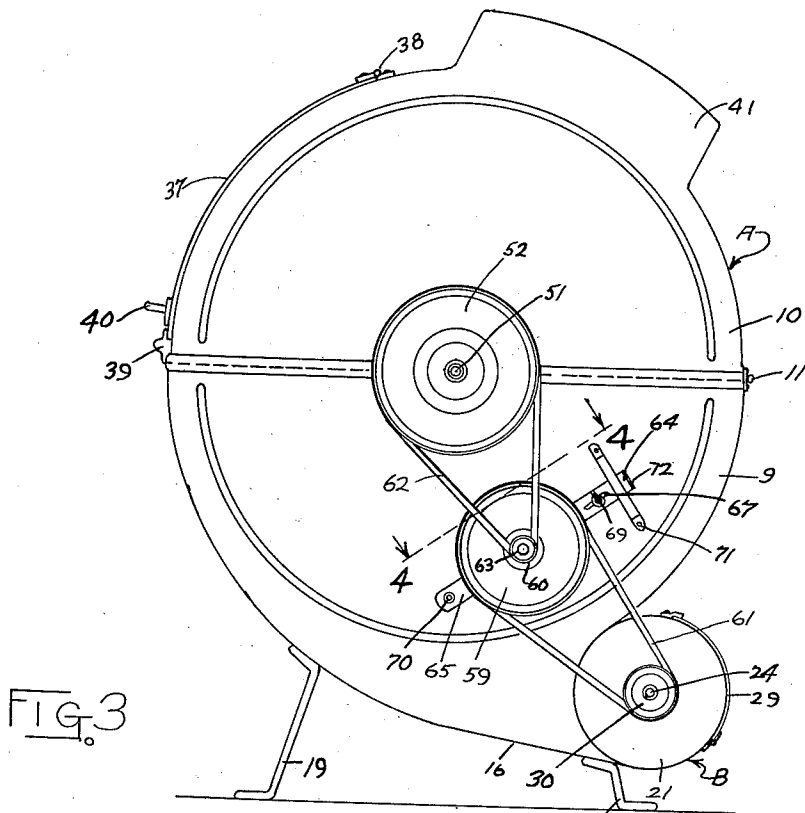
Sept. 18, 1945.

J. R. MOORE

2,385,222

CLOTHES DRYING MACHINE

Original Filed April 23, 1936 4 Sheets-Sheet 2



INVENTOR.
JAMES R. MOORE
BY *G. H. Braddock*
ATTORNEY

Sept. 18, 1945.

J. R. MOORE

2,385,222

CLOTHES DRYING MACHINE

Original Filed April 23, 1936 4 Sheets-Sheet 3

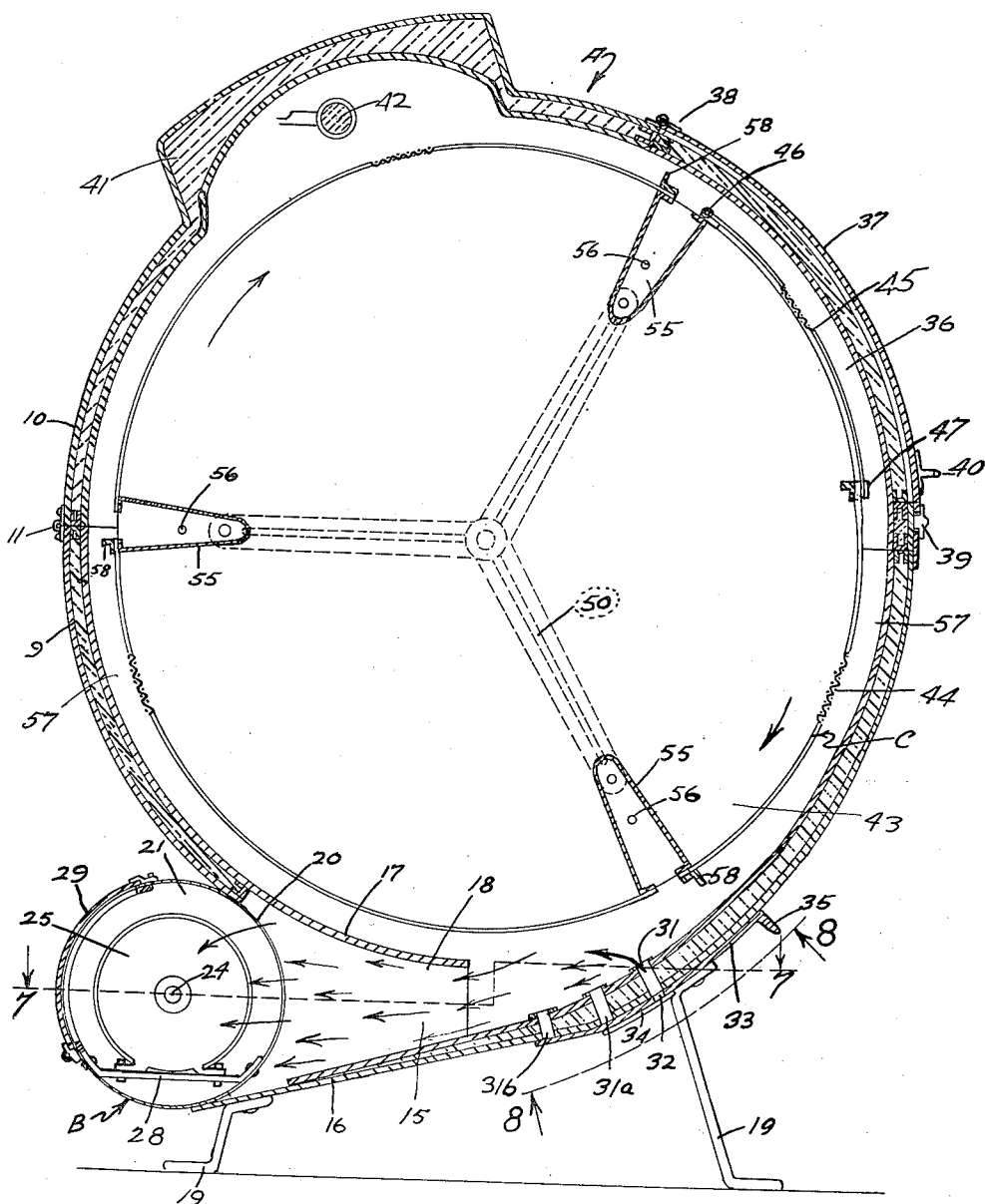


FIG. 6

INVENTOR.
JAMES F. MOORE
BY G. H. Braddock
ATTORNEY

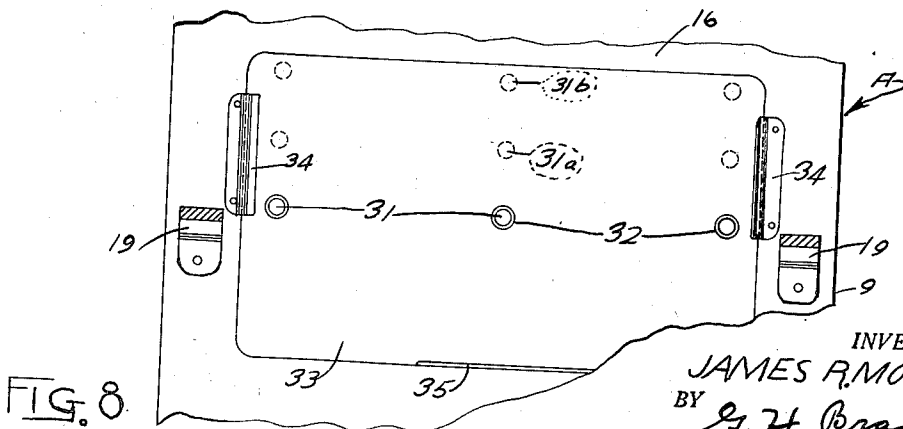
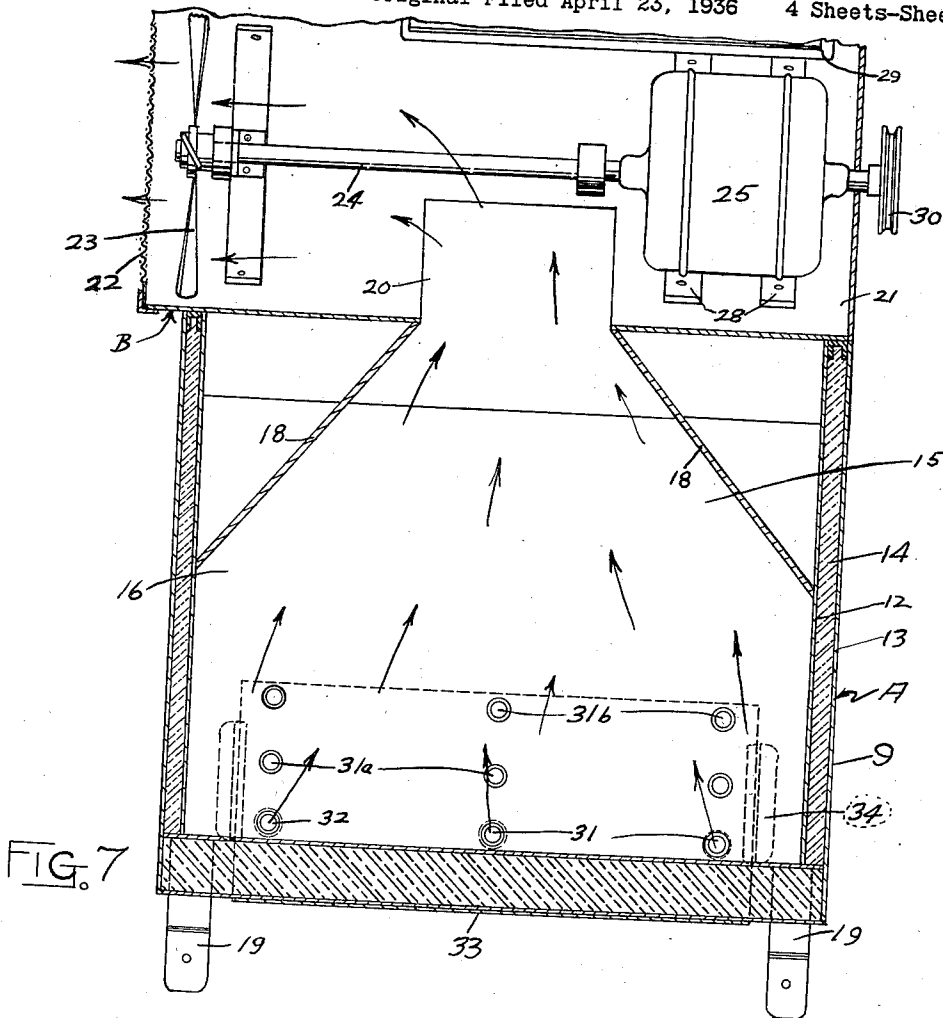
Sept. 18, 1945.

J. R. MOORE

2,385,222

CLOTHES DRYING MACHINE

Original Filed April 23, 1936 4 Sheets-Sheet 4



INVENTOR.
JAMES R. MOORE
BY
G. H. Braddock
ATTORNEY

UNITED STATES PATENT OFFICE

2,385,222

CLOTHES-DRYING MACHINE

James R. Moore, Minneapolis, Minn., assignor,
by mesne assignments, to Stanley G. Harwood,
Minneapolis, Minn.

Continuation of application Serial No. 76,047,
April 23, 1936. This application November 29,
1937, Serial No. 177,123

7 Claims. (Cl. 34-140)

This invention relates to clothes drying equipment for laundry and domestic use and the primary object is to provide a machine of this character which is not only comparatively simple and practical in construction, but which is also efficient and economical in operation and will produce a maximum drying action with a minimum expenditure of heat volume or energy. Primarily the present construction differs from other driers which have come to attention in that it does not provide for or require a direct circulation of preheated air through the chamber or basket containing the clothes or other materials to be dried, but rather heats the contents of the chamber, to accelerate vaporization of the moisture to be removed, meanwhile tumbling the articles to be dried in such manner that all parts thereof are subjected to the heat. At the same time an air flow which is not in itself preheated is provided to act as a carrier current to remove or evacuate the vapor from the machine. It may be here noted that driers which remove moisture by a direct heated air current through the clothes are objectionable or impractical for several reasons, among which the following may be mentioned. In such machines a large total volume of air must be passed through the clothes before all of the moisture can be removed therefrom since all of the heat in the machine is supplied solely by the air, and to adequately warm this air volume and thereafter discharge it at a temperature much higher than the room temperature, particularly where an electric heating element is employed, requires such a great amount of current consumption to produce the necessary heat that the cost of operation is almost invariably prohibitive. Another serious objection is that when the air so heated has momentarily and not too effectively served its purpose it must be either conducted to the outside of the building, where it becomes entirely wasted, or if returned or recirculated into the laundry room it undesirably raises the room temperature and humidity and thereupon also interferes with the otherwise normal action of the machine by returning to it air that has an undesirably high moisture content. The retention of the moisture by the room atmosphere is particularly great because of the high temperature condition which prevails under such circumstances.

In the present instance, on the other hand, the heat developed or created within the machine is not dissipated into a rapidly moving and discharged air current, but is to a substantial degree retained and conserved within the drying chamber so as to continuously heat the clothes and

cause vaporization of their moisture content, while a tumbling or mechanical action is employed to subject the materials uniformly to the heat and a tangential and comparatively cool carrier current is utilized for removal of the moisture laden air from the machine. These conditions are of course particularly conducive to economy in operation because of the small current or fuel consumption required. Moreover, under the circumstances noted the vented air may, in view of its low heat content, be discharged directly into the room without materially increasing the room temperature.

A machine embodying the aforementioned and still other structural features and operative advantages is described in the following specification, reference being had to the accompanying drawings, in which:

Fig. 1 is a perspective elevation of the machine showing the front and left hand sides thereof;

Fig. 2 is a side elevation of the machine as shown in Fig. 1, but with the upper housing section swung open and with various parts broken away for purpose of illustration;

Fig. 3 is an elevation of the right hand side of the machine showing the speed reduction pulley arrangement, with the protecting cover therefor removed;

Fig. 4 is an enlarged detail section on line 4-4 in Fig. 3;

Fig. 5 is a sectional detail view on line 5-5 in Fig. 4, but on a reduced scale;

Fig. 6 is an enlarged sectional elevation taken centrally through the machine from front to back thereof;

Fig. 7 is an enlarged detail sectional view on line 7-7 in Fig. 6; and

Fig. 8 is a detail plan view, partly in section, on line 8-8 in Fig. 6.

Referring to the drawings more particularly and by reference characters, A designates an outer, substantially cylindrical housing, formed in lower and upper sections 9 and 10, respectively, hingedly connected as at 11 so that the upper section may be swung open, as shown in Fig. 2. The housing walls are preferably formed of inner and outer sheet metal plates 12 and 13 between which is disposed a substantially thick layer of insulating material 14 which has for its purpose to conserve heat within the housing which is supported on legs 15.

The housing A communicates, through a tangential passageway 16, with a transversely extending cylindrical casing B which is secured to and arranged at the lower rear part of housing

section 9. The passageway 15 is defined by an inclined bottom or floor 10, of section 9, an arcuate plate 17, extending forwardly from the rear wall of section 9 (see Fig. 6), and a pair of converging side plates 18 (see Figs. 6 and 7), all directing the passageway into an opening 20 in the cylindrical casing B. The casing B is closed at one end by a plate 21, but at its opposite end is only covered by a protecting screen 22 so that air may be circulated from the opening 20 and out through the screen as indicated by the arrows in Fig. 7. The air circulation just referred to is produced by the action of a fan or blower 23 mounted on a shaft 24 driven by a motor 25. The shaft 24 is journaled in a bearing 26, mounted in the cylinder B, and may have a universal joint 27 between such bearing and the motor. The motor is secured in the casing by brackets 28 and access to the motor for purpose of oiling and repairing is had through an openable casing door 29. The motor shaft 24 at one end extends through the casing plate 21 to support and drive a pulley 30, for operating the drier drum as will presently be set forth.

An air inlet for the drier housing is provided in the form of transverse rows of apertures or perforations 31, 31a and 31b, any selected one of which rows may be opened or exposed to the atmosphere when registering with a single row of corresponding perforations 32 in a plate 33. This plate is slightly arcuate in form, to conform with the outer contour of the adjacent housing section 9, and is slidably secured to such section by lateral guide members 34. The plate is provided with a handle, here in the form of an end flange 35, and when the plate is adjusted back and forth to selectively open the housing perforations 31 different drying effects can be had, as may be desired under different operating conditions.

Under the action of the fan 23, air is drawn in through the perforations 31 and is discharged through the casing B, as indicated by the arrows in Fig. 6. This is the so-called carrier or moisture removal current which carries the vapor discharge from the heated chamber out of the machine through the outlet screen 22. The suction produced in the opening of the chamber 36 by the action of the fan effects a positive withdrawal of the vapor as it is generated within the chamber.

The upper housing section 10, which cooperates with the lower section 9, to define the heating and drying chamber 36, is substantially semi-cylindrical in form, and is provided in its front wall with an arcuate door 37, hinged as at 38 and releasably secured by a latch 39. This door may be opened by a handle 40 to give access to the drier drum without necessitating opening the relatively heavy section 10 on its hinges 11. The section 10 is further formed with an interiorly recessed enlargement 41 in which the heating element 42 (Fig. 6) is mounted. The element as here indicated is of the electric type although it is to be clearly understood that gas, oil, alcohol, or other forms of fuel and/or burners may be used.

Attention is now directed to the drier drum C, in which is placed the clothes or other fabric articles to be dried, and which is rotated to tumble the clothes about in the heated chamber 36 to secure the desired vaporizing and moisture expelling action. This drum is formed of two circular sheet metal end walls 43 which are peripherally connected by a cylindrical, perforated or screen member 44. The member 44 is provided

with a suitable door 45, hinged as at 46 and latched as at 47, which when in register position may be opened, after the housing door 37 is first opened, to permit articles to be placed in and removed from the drum. The drum C may be manually rotated by a hand wheel 48 until the doors are in registering positions, at which time a latch designated generally at 49 (Fig. 1) releasably secures the drum until it is again to be rotated.

The plates 43 closing the ends of the drum C are reinforced and supported by cast spiders 50 having stub shafts 51, one of which carries the hand wheel 48, while the other carries a pulley 52 (Fig. 3). The shafts 51 are journaled in bearing blocks 53 which are in turn seated in recesses 54 of adjoining side edges of the housing sections 9 and 10, as shown in Fig. 2, with a result that when the housing is opened the entire drum unit C may be lifted out for cleaning, repairing or other purpose, and without unscrewing or otherwise operating on the bearing structure.

Within the drum C are provided a series of transversely extending tumbler ribs or plates 55 which extend between the end plates 43 and project radially inwardly, as shown in Fig. 6, while being disposed immediately adjacent to the screen element 44. These ribs are substantially U-shape in cross section, for strengthening purposes and also of course serve to reinforce the drum as a unit. It may be noted that the drum and plates 43 are provided with perforations 56 opening to the interior of each rib which, it is found, have a tendency to discharge warm air, heated by the ribs, outwardly in a lateral direction against the housing walls, and this in turn tends to retard the accumulation of condensation on the inner faces of the housing walls.

It may here also be noted that there is an annular space 57 between the drum C and housing walls, and that a series of peripherally spaced flange members 58 extend from the outer surface of the drum into this space. The purpose of this flange is to create a comparatively slow circulation of air through the space or passage 57 and in a direction circularly toward the passageway 15 and the carrier current therethrough as will presently be described.

Attention is also directed to Figs. 3, 4 and 5, wherein is illustrated the mechanism for reducing and transmitting power from the motor shaft 24 to the drum stub shaft 51 having the pulley 52. In order to transmit power from the motor pulley 30 to the drum pulley 52 at a sufficiently reduced speed, an idler pulley unit including a relatively large pulley 59 and a substantially smaller pulley 60 is employed. A belt 61 passes over pulleys 30 and 59, and a second belt 62 operatively connects or passes over pulleys 60 and 52. In order to equalize the belt tension between the two belts and also to provide for belt adjustment to take up necessary slack, the pulley unit 59-60 is mounted on a stub shaft 63, which shaft is fixed in a bar 64 of an extensible lever including a second bar 65. The bar 64 is slidably secured to the bar 65 by a pair of channel forming flanges 66 which extend outwardly from the upper and lower edges of the bar 65. The bar 64 has a slot 67 which slidably engages a threaded bolt 68 that is fixed in bar 65 and has a wing nut 69 which when tightened will rigidly secure the two bars together.

When the nut 69 is loosened, the bar 64 may be moved longitudinally with respect to the bar

65, which in turn will move the stub shaft 63 with respect to the center line between shafts 24 and 51, and thus serve to tighten or loosen the belts 61 and 62 as may be found necessary. When the desired adjustment is secured the nut 69 is again tightened.

The lower or left end of the lever 64-65, as shown in Figs. 3 and 4, is pivotally secured to the side wall of the housing section 9, as by a bolt 70, which is anchored in the housing wall. At the other end of the lever a guide bracket 71 is secured to the housing wall and forms a slot for the outer end of the lever bar 64 to guide the latter. Outwardly of this bracket 71 the bar is preferably provided with an angular end portion 72 which may serve as a handle to make necessary longitudinal adjustments when the nut 69 is loosened. The handle end of the lever 64-65 is free to move vertically, however, and has a floating action with respect to the pivot point 70, with a result that the pulley unit 59-60 is free to adjust itself in response to belt tension, and consequently the tension of the two belts 61 and 62 will counteract each other and be equalized under normal operating conditions.

As previously noted, it is customary to provide a guard screen or cover over the pulley and belt transmission mechanism. This guard has been omitted in the present instance, however, not forming an essential part of the present invention.

The operation of the machine may be described as follows: To insert the clothes or other articles to be dried the housing door 37 is first opened and then the drum C is turned by handwheel 48 until the drum door 45 is exposed and may be opened, and at which time the device 49 may be employed to releasably hold the drum against rotation. When the proper amount of clothes has been inserted the two doors 45 and 37 are closed and secured, the latch 49 is released, and a switch 73 (Fig. 1) is closed. This switch controls the circuit to the motor 25, and, when electric heat is used, also to the heating element 42. As the motor shaft 24 is rotated it operates the fan 23, and also drives through the transmission elements 30, 61, 59, 60, 62, 52, and 51, to revolve the drum C. The action of the fan 23 is such as to set up or create an air circulation from housing perforations 31 to and through casing B, and in tangential relation with respect to the drum C and the annular passage or chamber 57 thereabout.

The heating unit 42 may be of any suitable type or form, but in any event operates by both radiation and convection to heat the chamber 36 within the housing, including the space 57 outside the drum as well as the entire interior of the drum and its contents, the foraminous or perforate character of the drum cylinder readily permitting this to occur. The wet clothes or other fabric articles to be dried also become heated and the moisture which the articles hold is converted into steam or warm vapors which tend to free or liberate themselves from the fabric materials. The heating of the fabrics is accentuated by the fact that the heat is not discharged under the direct action of the fan, and this condition not only facilitates and accelerates vaporization but also serves to sterilize the material against germs and other impurities. There is also less opportunity for dust, soot, or other undesirable foreign matter to reach the articles during the drying process

than in other machines or where clothes are hung up to dry.

As the drum rotates the drying and sterilizing process is greatly assisted by the tumbling action, the ribs 55 functioning to intermittently lift and drop the clothes in the drum. Thus as the hot and wet or damp articles drop down they spread out and are thus uniformly subjected to the heat. The moisture laden atmosphere in the heated chamber is positively drawn or sucked out of the chamber by the action of the fan and mixes with the relatively drier and cooler current and passes with it out of the machine. However, the suction is relatively light and is therefore sufficient to create a flow withdrawing the vapor as it is generated but insufficient to cause any large ingress of air into the chamber during the course of drying, such as would be required were the heat in the chamber being supplied by means of an air current. In other words, the suction is capable of inducing a flow from the chamber substantially at a rate no higher than is necessary to carry away the vapor generated therein. Thus, any large inflow of air into the chamber will be prevented since the chamber pressure will not be reduced substantially below atmospheric pressure. This action is supplemented or augmented by the movement of the flanges or blades 58 which tend to carry the moisture laden atmosphere downwardly into the carrier current. Neither the tumbling process nor the rotary movement of the drum, however, is effective to substantially lower the temperature of the housing chamber proper, and as there is no preheated air current passing through the housing or drum proper it will be evident that a minimum current or fuel consumption will be amply sufficient to maintain the high degree of heat and sterilization temperature that is required for the most efficient and desirable results. A thermometer 74 (Fig. 1) may be secured in the housing wall to indicate the internal temperature, and it may be desirable to control the circuit to element 42 by a switch other than control switch 73 so that the heating action may be started and stopped independently of the drum. Thus, and under certain circumstances, it may be desirable to develop the internal drying temperature before starting the motor, and, when the drying temperature is abnormally or unnecessarily high it will be desirable to deenergize the heating element without necessarily stopping the drum rotation.

The opening from the drying chamber 36 into the air passageway 15 being located at the bottom of the chamber permits any lint from the laundry produced by the tumbling and drying to fall by gravity into the passageway where it is carried out of the machine. Thus the lint will be prevented from collecting on the laundry and from being blown into the heating element 42 where it would constitute a fire hazard if in sufficient quantity.

It is understood that suitable modifications may be made in the structure as disclosed, provided such modifications come within the spirit and scope of the appended claims.

The present application is a continuation of application Serial No. 76,047 filed April 23, 1936 by applicant and Fred C. Kohagen.

What is claimed is:

1. A drier of the character described comprising a housing having a chamber with a bottom opening, means for heating the chamber, a perforate drum rotatably mounted in the chamber for containing and tumbling the articles to be

dried while subjected to the heat of such chamber, and means for directing a continuous current of air toward and transversely under the chamber opening to carry off moisture impelled downwardly from the articles under the tumbling action of the drum, said drum being spaced from adjacent housing walls to form an annular space therebetween, and means carried on the periphery of the drum and for movement in said annular space tending to circulate vapors therein toward said carrier current.

2. A laundry drier comprising a substantially cylindrical housing having its axis disposed horizontally, a perforate drum rotatably mounted in the housing, means for heating the drum and its contents, a casing secured to a lower part of the housing and communicating therewith through a passageway generally tangential with respect to the drum, means for admitting air to the housing at a point below the level of the drum axis, and a fan in the casing for drawing such admitted air through the passageway, said passageway being generally tapered in form with its widest end extending lengthwise of the housing and with its narrow end in communication with an opening in said casing.

3. A laundry drier comprising a substantially cylindrical housing having its axis disposed horizontally, a perforate drum rotatably mounted in the housing, means for heating the drum and its contents, a casing secured to a lower part of the housing and communicating therewith through a passageway generally tangential with respect to the drum, means for admitting air to the housing at a point below the level of the drum axis, and a fan in the casing for drawing such admitted air through the passageway, said passageway being generally tapered in form with its widest end extending lengthwise of the housing and with its narrow end in communication with an opening in said casing, and an arcuate plate extending below the drum and over a portion of the passageway.

4. A drier of the character described comprising a housing having a chamber with a bottom opening, means for heating the chamber, a perforate drum rotatably mounted in the chamber for containing and tumbling the articles to be dried while subjected to the heat of such chamber, whereby moisture from the articles will, under the tumbling action, be impelled downwardly from the drum and through the chamber opening, said chamber opening being disposed in parallelism with the drum axis and of a length substantially equal to the length of the drum whereby the impelled moisture from the entire surface of the drum will pass directly into the opening, said housing having an inlet for admitting outside air at a point adjacent said cham-

ber opening, and suction creating means for drawing said admitted outside air in a current under and past said opening, to carry off said impelled moisture and without circulating such admitted air within the drum chamber proper.

5. A laundry drier comprising, in combination, a chamber to receive the laundry to be dried and provided with a vapor outlet, means within the chamber for supplying heat thereto to vaporize the moisture content of the laundry, means mounted externally of the chamber for withdrawing the vapor from the chamber by suction, and rotatable agitating means within the chamber to uniformly subject the laundry to the heat and having peripherally located flange means operable to augment the suction means in discharging the vapor from the chamber.

6. A drier of the character described comprising a housing having a chamber with a bottom opening, means for heating the chamber, a perforate drum rotatably mounted in the chamber for containing and tumbling the articles to be dried while subjected to the heat of such chamber, and means for directing a continuous current of relatively cool air toward and under the chamber opening to carry off moisture impelled downwardly from the articles under the tumbling action of the drum, said drum being spaced from adjacent housing walls to form an annular space therebetween, and means carried on the periphery of the drum and for movement in said annular space tending to circulate vapors therein toward said carrier current.

7. A drier of the character described comprising a housing having a substantially cylindrical wall and end walls forming a chamber with a bottom opening, means for heating the chamber, a perforate drum rotatably mounted in the chamber for containing and tumbling the articles to be dried while subjected to the heat of such chamber, and means for directing a continuous current of relatively cool air toward and under the chamber opening to carry off moisture impelled downwardly from the articles under the tumbling action of the drum, said drum being peripherally spaced from the cylindrical wall of the housing to form an annular space between drum and housing, a hollow baffle extending lengthwise of the drum and projecting inwardly from the periphery thereof to facilitate the tumbling action, said baffle opening therealong at the periphery of the drum into said annular space and opening at its opposite ends adjacent to the end walls of the housing, and a blade carried on the periphery of the drum for movement in said annular space, said blade being disposed immediately at the rear of said baffle and tending to cause the heated air therein to move endwise therefrom against the end walls of the housing.

JAMES R. MOORE.