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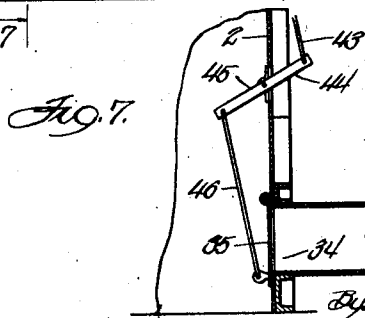
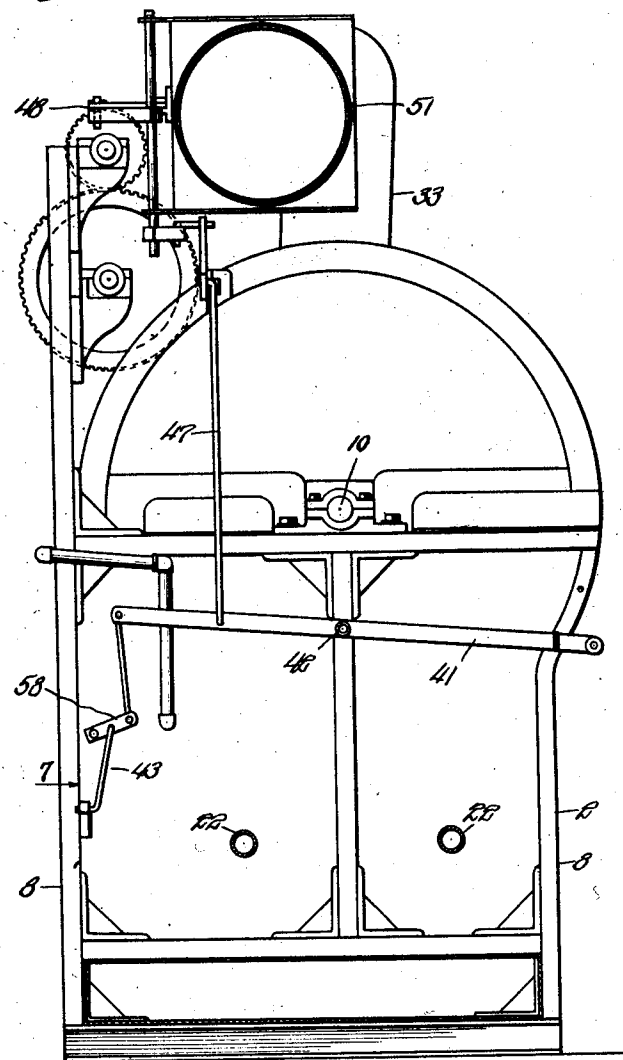
C. W. KELLMAN

CLOTHES DRIER

Filed Oct. 10, 1925

4 Sheets-Sheet 1

Fig. 1.



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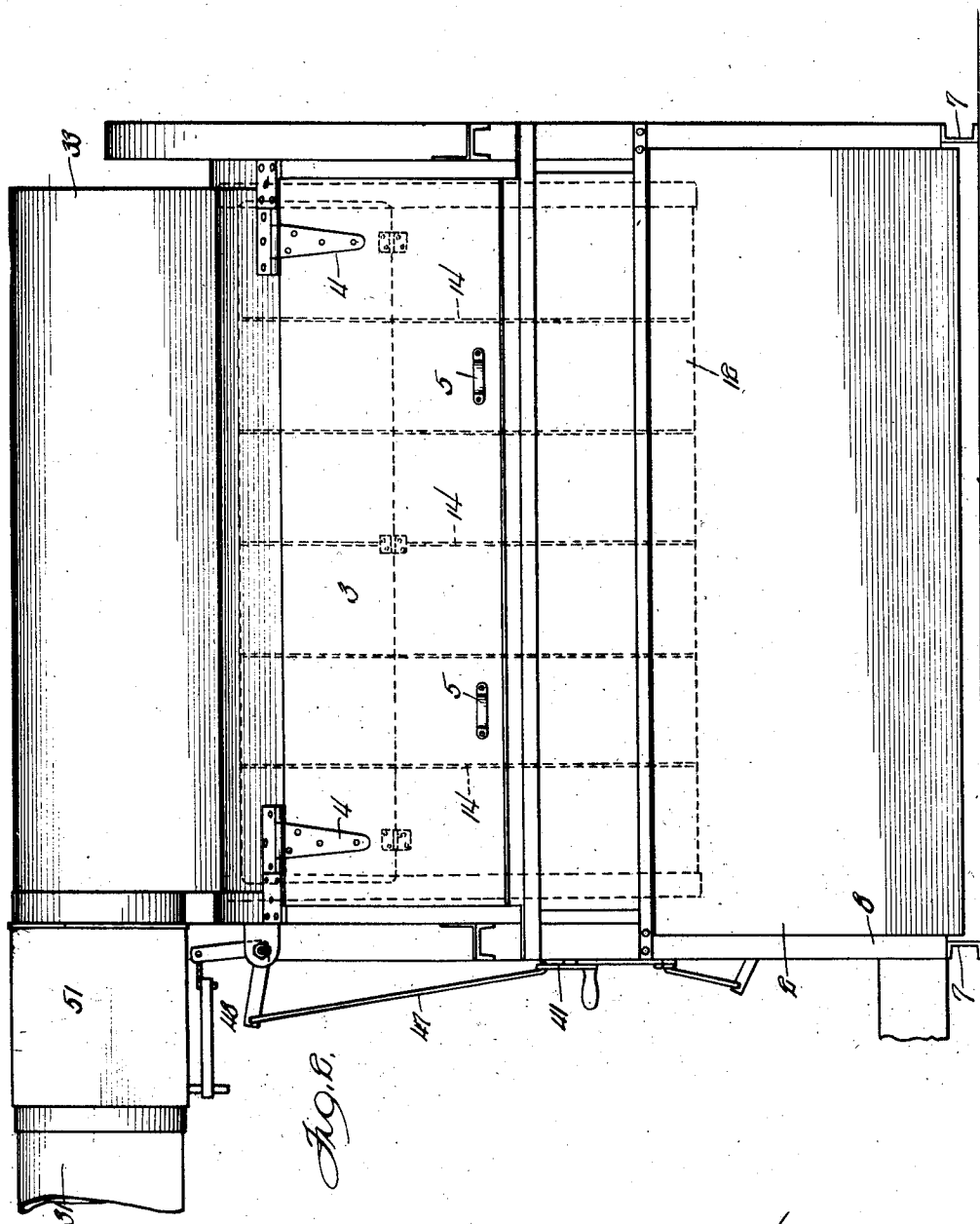
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C. W. KELLMAN

CLOTHES DRIER

Filed Oct. 10, 1925

4 Sheets-Sheet 2



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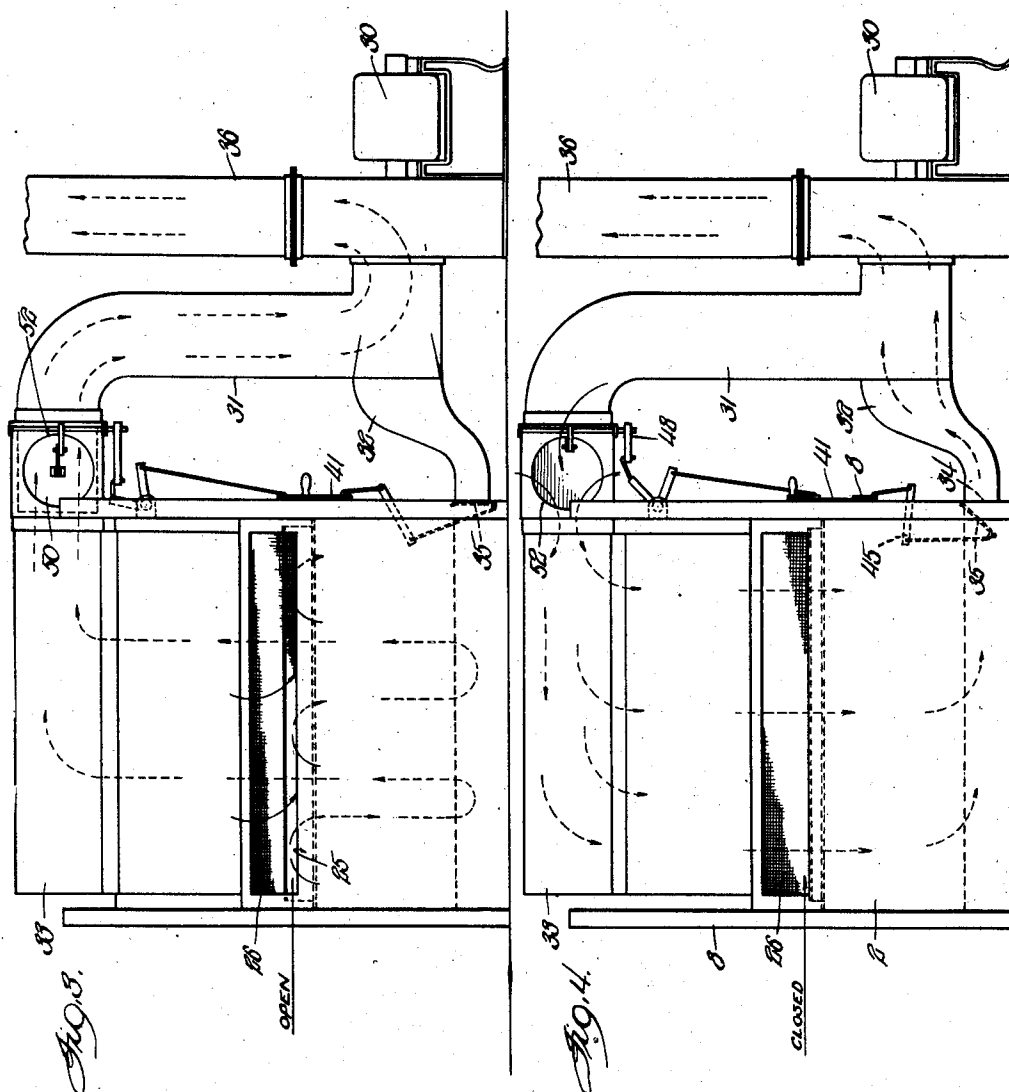
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CLOTHES DRIER

Filed Oct. 10, 1925

4 Sheets-Sheet 3



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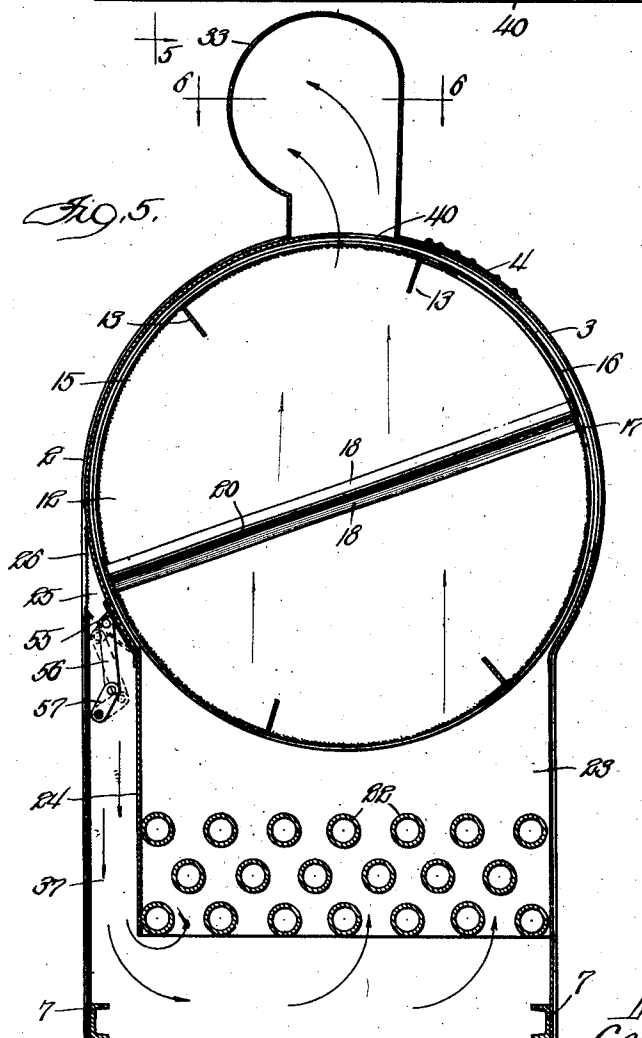
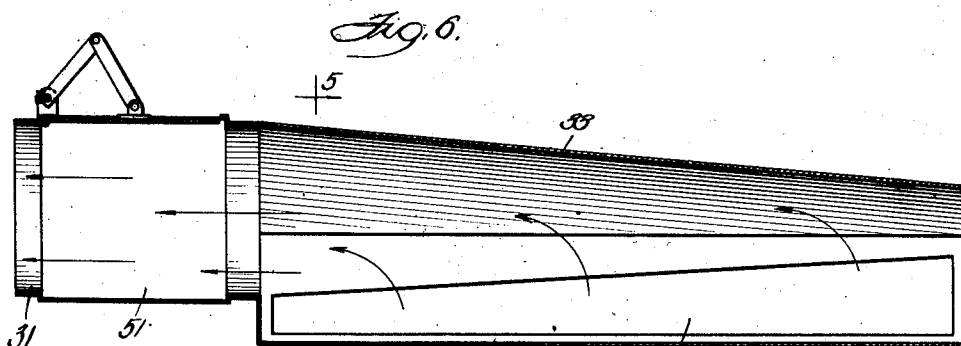
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CLOTHES DRIER

Filed Oct. 10, 1925

4 Sheets-Sheet 4



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UNITED STATES PATENT OFFICE.

CARL W. KELLMAN, OF CHICAGO, ILLINOIS.

CLOTHES DRIER.

Application filed October 10, 1925. Serial No. 61,657.

My invention relates to clothes driers and has for its object the provision of an improved apparatus of this type embodying a novel method of circulating the air through the tumbler whereby more even and rapid drying is accomplished.

My invention consists in arranging the heat coils and the tumbler in a manner resulting in a more efficient heating of the clothes, as well as the air which is drawn through the tumbler to dry the clothes, and consequently, a more direct effect of the heat radiation is obtained. In drying the clothes, the air is drawn upwardly from the heating chamber or coils into the rotating tumbler, and in this way the clothes are kept in a loose fluffy condition as compared to the condition of the clothes when dried by the prior art machines. By the prior methods, the clothes are packed in the bottom of the compartments as the result of the air being drawn downwardly.

An important object of my invention is in the provision of a construction which is simple and efficient, the velocity of the air suction throughout the entire length of the tumbler being maintained substantially equal, whereby the clothes may be dried evenly and in a minimum of time. For instance, the structure in its preferred form may comprise an exhaust opening cooperating with a fan or other means for exhausting the heated air, with a hood or the like interposed, this hood being so constructed and designed as to cooperate with the exhaust opening to equalize the air velocity the entire length of the tumbler. More specifically the hood is tapered to provide a greater volume at the end of the machine where the velocity would tend to be the greatest, and to provide a smaller volume where the velocity would tend to be the least. The amount of the taper is such that it will, when cooperating with a novelly formed opening, cause an equal velocity throughout the length of the tumbler. The opening, which is used to assist the conical hood in obtaining uniform velocity, is designed so as to have its smallest dimension at the end of the machine where the velocity of the air would tend to be the greatest and is gradually enlarged to a point at the end of the hood that is the narrowest and where the velocity of air with-

out this opening and this hood would tend to be the least.

Another object of my invention resides in the provision and arrangement of a structure having a plurality of openings therein which are adapted to be controlled by a number of dampers, doors or gates to effect a reversal of the flow of air through the apparatus, whereby it will be possible to cool the clothes before removing from the tumbler. It will be remembered that the use of such dampers, doors or gates allows the direction of the flow of air to be quickly changed without changing the rotation of the fan. Cold air may be admitted into the clothes drier and drawn through the tumbler before being passed through the heat coils, and as the flow of air during the cooling step is in the opposite direction, the heating coils do not hinder the operation, inasmuch as the cold air carries away the heat radiated thereby. A novel arrangement of air pipes connecting to the fan may be provided so as to cooperate with the aforesaid dampers in reversing the flow of air, and thereby bring into the tumbler unheated air before this air reaches the heating zone.

A further object of the invention is in the use of a sterilizer at the inlet opening whereby the air used for drying the clothes will be thoroughly cleansed or sterilized before reaching the tumbler.

A further object of my invention comprises the employment of a tumbler novelly constructed to provide a maximum number of compartments for individual family washings. Upper and lower divisions are made by means of a diametrically disposed reticulate screen which may be removably carried so as to provide access to the lower division when the cover is open.

The invention further consists in certain novel features of construction and arrangement of parts which will be readily understood by reference to the description of the drawings and the claims hereinafter given.

In the drawings:

Figure 1 is an end elevation, with portions omitted, of a drier embodying the features of the present invention, this view illustrating mainly the arrangement of the levers for controlling the aforesaid dampers;

Fig. 2 is a side elevation of the machine;

Fig. 3 is an elevation of the opposite side of the machine, illustrating the position which the dampers assume during the process of drying;

Fig. 4 is a similar view, but illustrating the position of the dampers when the air currents are reversed to cool the clothes in the tumbler;

Fig. 5 is a transverse sectional view through the machine;

Fig. 6 is a horizontal section of the hood looking downwardly at the opening, the section being taken on line 6—6 of Fig. 5; and

Fig. 7 is a sectional detail view of a damper at the lower end of the machine comprising part of the mechanism employed to reverse the flow of air through the tumbler.

In the drawings, I have illustrated a preferred form of my invention. The machine shown comprises a suitable casing 2 preferably cylindrical, the cylindrical wall of which is provided with a door 3 connected to the body portion of said casing by means of hinges 4, said door being provided with a plurality of handles 5 by which it may be opened when it is desired to gain access to the interior of the casing. A suitable frame may be provided to support casing 2. Base channel irons 7 are provided to carry the vertical uprights 8 by means of which the casing 2 may be suitably supported. It is obvious that the exact details of the supporting structure shown herein need not be necessarily adhered to when it is desired to embody my invention in a clothes drier. These details may be varied according to the design desired. Each end of the casing 2 is provided with suitable bearings adapted to receive the trunnions 10 carried by the end plates of the rotary cylinder 12. Rotary cylinder 12 is adapted to be revolved about the axis of said trunnions 10 within the casing 2. The end plates are connected together by a plurality of angle members forming blades 13, these members extending from one end plate to the other at the peripheries thereof.

Interposed between the end plates are a plurality of partitions 14 dividing the cylinder into a plurality of compartments, each adapted to receive the wash of a separate family or individual so that the various washings will not be mixed during the process of drying. The entire cylinder is enclosed by means of a perforated jacket 15, preferably made of wire screen extending from one end plate to the other and through which air may freely circulate through the various compartments formed within cylinder 12.

Peripheral wall 15 of cylinder 12 may be provided with a door 16 connected thereto by hinges 17, this door either being covered with a wire screen, or other perforated ma-

terial, or if so desired this door may be made of wood or metal inasmuch as it covers a small portion of the compartments and would not interfere with the circulation of air through cylinder 12. It will be apparent that door 16 provides convenient access to the compartments of this cylinder. One of the features of this invention resides in the use of a novel partition for dividing the vertical partitions 14, so as to obtain a maximum number of individual compartments for separate family washings. The arrangement comprises spaced bars 18 mounted on vertical partitions 14 so as to receive removable partitions 20 located substantially diametrically within the cylinder. The novelty of providing such partitions resides in the fact that these partitions may also be made of screen-like material, which allows the air to freely pass from one compartment into the other during rotation of the cylinder or tumbler, and also in the fact that when door 16 is open these partitions 20 may be quickly removed to permit access to the lower compartments. When the tumbler is at rest, partitions 20 form the floor of the upper compartments and as soon as the clothes are removed from these upper compartments, the partitions may be removed to allow the clothes in the lower compartments to be removed. Normally the partitions 20 are held in position by the door 16 in its closed position.

Below the container 12, I provide a series of heating coils or pipes 22 carried by opposite sides 23 which may be supported within the casing 2 in any suitable manner. Heating pipes 22 are led through one of the end walls of casing 2, as shown in Figure 1, to any suitable source of heat. I prefer to partially enclose heating pipes 22 by means of a wall 24, as shown in Figure 5, so as to cause the air currents entering inlet opening 25 to descend to the lower portion of casing 2. From there, these currents will move upwardly coming into contact with the heating coils 22 where the air will be heated before circulating through container 12. A sterilizer or sterilizing screen 26 may be inserted in opening 25 to purify the air before entering casing 2.

I have not illustrated in detail the power mechanism employed to rotate the cylinder 12. It will be understood, of course, that, as the cylinder rotates on trunnions 10, the air is drawn upwardly through the screen-like periphery of container 12 into the compartments thereof, so as to come in direct contact with the clothes therein for efficiently drying the same and leaving them in a loose fluffy condition. Blades 13 function to gently lift the clothes to the top of each compartment as cylinder 12 rotates. As the clothes return to the bottom of the compartment by gravity they are met by the warm

air moving upwardly through the cylinder 12. As a consequence they are fluffed and left in a loose condition and are not packed against the floor of the compartment as was heretofore done by prior art machines.

A fan 30 is provided to draw the air through cylinder 12. Pipes 31 and 32 are provided with dampers between fan 30 and casing 2, the pipe 31 extending upwardly to the upper part of this casing and communicating with a hood 33. Pipe 32 leads downwardly to the lower end of casing 2 and communicates therewith by means of an opening 34 in this casing. Opening 34 is normally closed by means of a damper 35, while the pipe 31 remains in communication with the interior of the casing 2. The heated air exhausted from the casing 2 is drawn through pipe 31 and passed upwardly through a discharge pipe 36. The air enters casing 2 through the sterilizer 26 located in opening 25 and travels downwardly as indicated by arrows in Figs. 3 and 5 through a passage 37. When at the lower end of passage 37, the air is circulated upwardly about the heating coils 22. It will be remembered that I prefer to locate these heating coils in close proximity to the cylinder 12 and preferably at the bottom thereof so that the clothes in the cylinder get the direct effect of heat radiation from these coils in addition to the heating of the clothes by means of the suction caused by the fan drawing the heated air through the cylinder.

The machine is designed so as to get substantially the same velocity of air suction throughout the entire length of the cylinder. This is accomplished by the use of a peculiarly shaped opening at the upper end of casing 2 and a conically shaped hood 33 which is placed over this opening, and through which the air is drawn when exhausted from the casing. It will be noted in Figs. 5 and 6 that this conical hood is tapered so as to give a greater volume at the end of the machine where the velocity of the air would tend to be the greatest and the smallest volume at the end of the machine where the velocity of the air would tend to be the least. The amount of taper is so arranged that it will, together with an opening 40, cause the velocity of the air to be equal throughout the length of cylinder 12. Opening 40, which is used to assist the conical hood in obtaining this uniform velocity is designed so as to have its smallest dimension at the end of the machine where the velocity would tend to be the greatest and where the volume of the heat is greatest, and is gradually enlarged to a point at the opposite end of the hood which is the narrowest and where the velocity of the air, without this opening and without this hood, would tend to be the least. In other words, it will be apparent that the tapered opening and the

conical hood serve to give an equal suction of air throughout the entire length of the cylinder. I consider this of considerable importance because it permits more even and rapid drying as well as accomplishing the drying in a minimum of time.

My machine is designed, as heretofore stated, to cool the clothes after they are dried. This is accomplished by reversal of the flow of air through the cylinder so that the air passes through the cylinder 12 before striking the heating zone. The reversal of the flow of air is effected without changing the rotation of the fan. A series of doors, dampers or gates are employed to close the openings of casing 2 which are normally open and to open certain other openings that are normally closed during the process of drying, thereby causing a reversal of the flow of air. By referring to Figures 1, 3, 4 and 5 it will be observed that these dampers are so connected that by operation of a single lever 41 the entire set of dampers are manipulated to cause this reversal of the flow of air. Lever 41 is pivoted intermediate its ends at 42 to the frame of the machine, while the opposite end is connected by a series of links 43 to damper 35 at the lower end of casing 2. It will be noted in Figure 7 that links 43 include a pivotally mounted bar 44 entering the casing 2 at the point 45 and at the opposite end connecting by means of a link 46 to damper 35. Damper 35 may be pivotally connected on the inside of casing 2 so that it will be adapted to swing to its closed position over opening 34 when the damper is released by lever 41. As will be noted in detail in Figure 1, the lever 41 is fitted with a vertical connection 47, which extends upwardly to connect with a second series of links 48, these latter links serving to manipulate a damper 50. At the point of connection between hood 33 and pipe 31 a casing 51 is interposed for carrying damper 50. Casing 51 may be provided with an opening 52, which, during the process of drying is closed by damper 50. The series of links 48 are arranged pivotally to swing damper 50 over said opening 52, or are adapted to swing this damper 50 backwardly into the casing 2 to close off pipe 31. If it is desired to cool the clothes by drawing the air through opening 52 and downwardly through the machine the inlet opening 25 should be closed. This is accomplished by means of a damper 55 connected to a lever 56 which is carried at one end by means of a bell crank lever 57. Bell crank lever 57 extends through the side of casing 2 and connects with a strap 58 forming part of the series of levers 43.

The operation of the machine is as follows:

The door 3 of the casing 2 is open and then by opening the door 16 access is ob-

tained to the various compartments of the rotary cylinder 12. Access to the lower compartments is obtained by removing the partitions 20. Various washings are separated 5 and each different washing is inserted in the lower compartments. The partitions 20 are then replaced and additional washings placed in the upper compartments. Hence, it will be observed that the capacity of the 10 present machine has been doubled by means of these partitions 20 without sacrificing the efficiency of the machine because these partitions are perforated to permit the air to continue through the cylinder from the lower 15 compartment to the upper compartment. When door 16 is closed, partitions 20 are held in proper position. Power is applied through proper driving mechanism (not shown) to rotate the cylinder 12 about the 20 axis of the trunnions 10. As the cylinder 12 revolves about its axis, the various inwardly extending blades 13 will engage with the clothes and lift them to the upper part of the cylinder where they are permitted to 25 drop by gravity into the lower part at the same time that rotary motion is imparted to the drier cylinder 12. The heated air is circulated upwardly through the perforated periphery of the cylinder so as to act upon the clothes within the various compartments. 30 It will be noted that the clothes when dropping by gravity to the lower part of each compartment will be carried upwardly again by the heated air, and, as a consequence, these 35 clothes are maintained in a loose, fluffy condition as compared to a compact mass which resulted heretofore when the heated air was brought downwardly through the machine. As soon as the clothes in the 40 various compartments have become thoroughly dry, the lever 41 is operated to reverse the flow of air through the machine. The damper 50 will be swung inwardly to close the pipe 31 and to open the opening 52. 45 The opening 34 is opened simultaneously by the damper 35 swinging to its upper position, as shown in dotted lines in Figure 4. The damper 55 also swings downwardly to its dotted line position, as shown in Figure 5. 50 With the dampers in these positions the cold air is brought inwardly from the outside of the machine and drawn through the rotary drier cylinder 12 by means of fan 30. The circulation of the air during cooling has 55 been shown by the arrows in Figure 4. The air passes through the drier cylinder 12 and moves past the heating pipes 22 to carry away the heat, which normally would tend to rise and heat the clothes in the cylinder. 60 This air then passes through the opening 34 and outwardly up through the exhaust pipe 36. The novel location of the heating pipes 22 makes it possible immediately to cool the clothes by this reverse flow of air, 65 because, in its reverse movement, the air

first contacts with the clothes in the cylinder and then passes through the heating zone to carry away the heat radiated by the pipes 22. After the clothes have been thoroughly cooled, the machine is shut down to permit 70 the cover 3 to be opened and then the cover 16 on the cylinder 12. It will be found that the clothes will be in a loose fluffy condition in the upper compartments. When these upper compartments are empty, the parti- 75 tions 20 are removed and access is then had to the lower compartments. In these lower compartments the clothes will also be in a loose, fluffy condition. Due to the equal velocity of the flow of air through the entire 80 length of the cylinder during the process of drying, as well as during the cooling, I find that it takes less time for a single run in a machine embodying my invention than in other types of machines. Of course, this 85 result is also due to other factors, such as the novel location of the heating pipes, the proper ratio of the velocity of air in the machine to the volume of the machine, etc.

It is believed that from the foregoing 90 operation many other advantages of the invention will be apparent without any further description.

I claim:

1. A clothes drier comprising in combina- 95 tion a casing having a plurality of openings therein, a clothes container in said casing, means for establishing air currents in a definite direction for drying the clothes in said container, means for first heating said air 100 currents, and damper mechanism cooperating with said openings for changing the direction of said air currents whereby cold air is admitted into said casing to cool the clothes and to carry heat from said heating 105 means away from said clothes.

2. A clothes drier comprising in combination, a casing having a plurality of openings therein, a clothes container in said casing, means for establishing air currents in a defi- 110 nite direction for drying clothes in said container, means for heating said air currents, dampers for each of said openings, and means for connecting said dampers whereby they co-jointly operate to open certain of 115 said openings and to close the other openings, to reverse the direction of said air currents for cooling the clothes and for carrying heat from said heating means away from said clothes. 120

3. A clothes drier comprising in combination, a casing having a plurality of openings therein, each of which is fitted with damper means co-jointly acting to close certain of said openings while others are open, 125 a clothes container in said casing, heating means for heating the air before passing through said container to dry the clothes therein, means for drawing the air through said casing, and means connecting certain 130

of said openings with said means whereby said damper means may be operated to close the openings that are open and to open the openings that are closed, thereby reversing the flow of air through said casing to cool the clothes before removing from said container.

4. A clothes drier comprising in combination, a casing having a plurality of openings therein, one of which is adapted to remain closed during the normal drying operation, a clothes container, heating means for heating the air before circulating through said container, means for circulating the heated air through said container, and means operable to open said normally closed opening and to simultaneously intercept the flow of heated air whereby to reverse the flow of air through said casing for cooling the clothes after drying.

5. A clothes drier comprising in combination a casing having openings therein, a clothes container in said casing, a pipe connecting to one of said openings, means communicating with said pipe for establishing heated air currents for drying clothes in said container, a damper associated with said pipe, said damper normally closing an opening in said pipe which affords communication with the atmosphere, and means for actuating said damper whereby to open said opening and to close said pipe in order to admit cold air into said casing for cooling the clothes before removing from said container.

6. A clothes drier comprising in combination a casing having a plurality of openings therein, one of which serves to admit air into the casing and another of which serves to exhaust the air therefrom, a clothes container in said casing, heating pipes for heating the air, air pipes connecting to two of said openings, and damper means associated with said pipes for reversing the flow of air through said casing whereby the clothes in said container are cooled after being dried by the heated air.

7. A clothes drier comprising in combination a casing having a plurality of openings therein, one of which serves to admit air into said casing and another of which serves to exhaust the heated air, a clothes container mounted in said casing, means for drawing air through said casing, means for heating the air before passing through said container, a pipe between said air exhausting means and said second opening, a second pipe in communication with said first pipe and a third opening in said casing, and means for reversing the flow of air whereby to admit the air into said container for cooling the clothes before being heated by said heating means.

8. A clothes drier comprising in combination, a casing, a rotatably mounted cylinder

having a screen-like periphery through which hot and cold air may pass, means for drawing air into said casing through an opening therein, and exhausting the air therefrom through a second opening therein, heating pipes in close proximity to said first opening, a pipe between said means and said second opening, a second pipe communicating with said first pipe and said means, said second pipe connecting to a third opening in said casing, and damper means for controlling the movement of air through said openings and said pipes whereby to reverse the flow for admitting air into said casing to cool the contents of said cylinder.

9. A clothes drier comprising in combination a casing, a rotatably mounted cylinder having a screen-like periphery, heating pipes disposed in said casing for heating the air moving through the casing and cylinder, said casing being provided with an opening therein through which air may be admitted into said casing, means for circulating the air through said casing and said cylinder, and means for reversing the circulation of the air.

10. A clothes drier comprising a casing having an opening in its wall, a hood secured to said wall and communicating with said opening, a rotatable cylinder drier mounted within said casing, and means for drawing air into said casing and through said opening into said hood, said hood and said opening being oppositely tapered, the taper of said hood being the smallest and the taper of said opening being the greatest at the farthest point from said means whereby to equalize the velocity of the air flow throughout the length of said cylinder drier.

11. A clothes drier comprising a casing, and a cylinder mounted to rotate therein, means for providing a plurality of vertical compartments in said cylinder, and a removable wall extending substantially diametrically through said cylinder for increasing the number of said compartments.

12. A clothes drier comprising a casing, a cylinder mounted to rotate therein, means for providing a plurality of compartments therein, a door for providing access to said compartments and partitional means dividing said compartments into additional compartments, said partitional means being removably carried to permit access to the additional compartments thus formed.

13. A clothes drier comprising a casing, a cylinder mounted to rotate therein, vertical partitions located in spaced relation throughout the length of said cylinder, removable partitions carried by said vertical partitions and located substantially diametrically in said cylinder to increase the number of compartments formed therein, and a swinging door for said casing arranged to close over said removable partitions to prevent their

displacement except when said door is open.

14. A clothes drier comprising a casing, a cylinder mounted to rotate therein, a screen-like periphery for said cylinder, vertically spaced partitions located lengthwise in said cylinder, guide plates disposed on said partitions, and screen-like members slidably carried by said guide plates to divide the space between said vertically spaced partitions into upper and lower compartments.
15. A clothes drier comprising a casing, a cylinder mounted to rotate therein, a screen-like periphery for said cylinder, vertically spaced partitions located lengthwise in said cylinder, a plurality of screen-like members carried in slidable relation by said vertically spaced partitions and dividing the space therebetween into upper and lower compartments, and a cover for said cylinder, said cover being arranged when in closed position to engage on edge of said screen-like mem-

bers and to disengage said edge when in open position to permit removal of said screen-like members and a consequent access to said lower compartments.

16. A clothes drier having in combination a casing, a rotatably mounted cylinder provided with a screen-like periphery, heating coils disposed within said casing in the path of air currents moving through said casing and said cylinder, means for driving air into said casing through an opening therein, air pipes connecting to the upper and lower parts of said casing and said means, and damper means for reversing the movement of said air through said casing to cool said clothes and to carry heat from said heating coils away from said clothes.

In witness whereof, I have hereunto subscribed my name.

CARL W. KELLMAN.