

Dec. 9, 1941.

W. H. RIDLEY

2,265,313

TEXTILE DRIER

Filed July 31, 1940

2 Sheets-Sheet 1

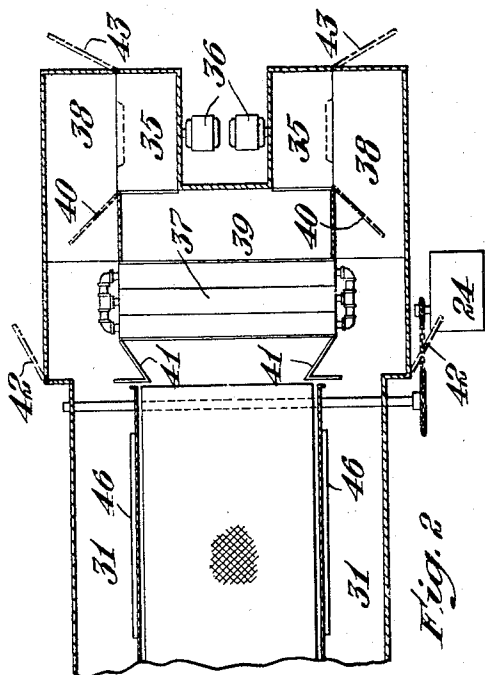


Fig. 2

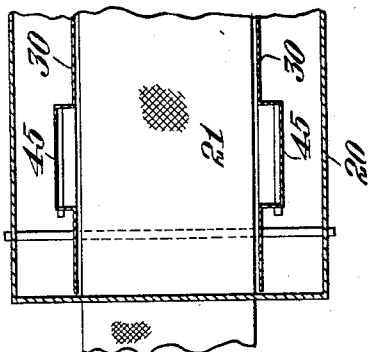


Fig. 3

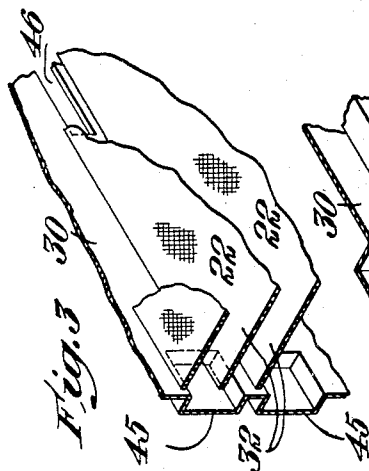


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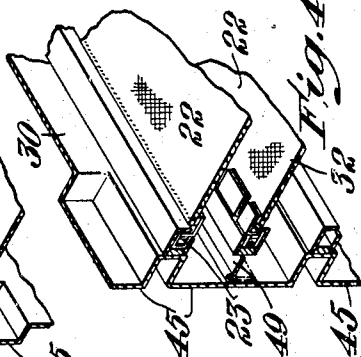


Fig. 5

Fig. 6

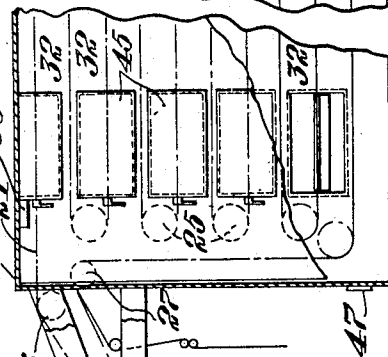


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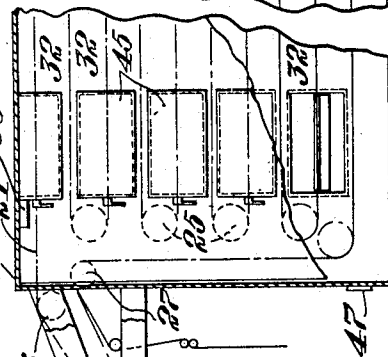


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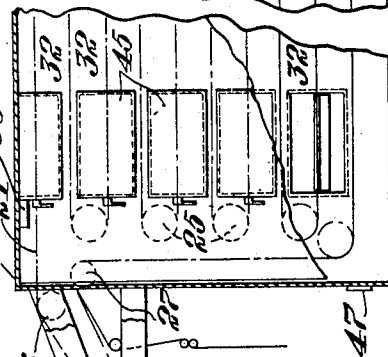


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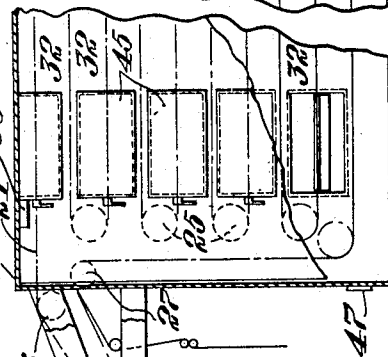


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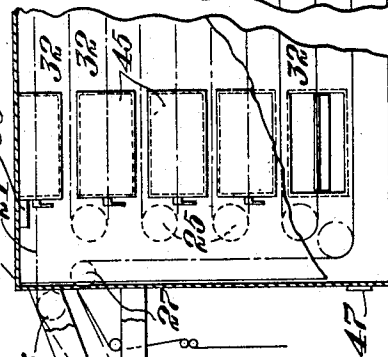


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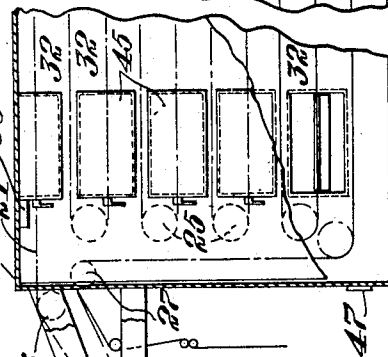


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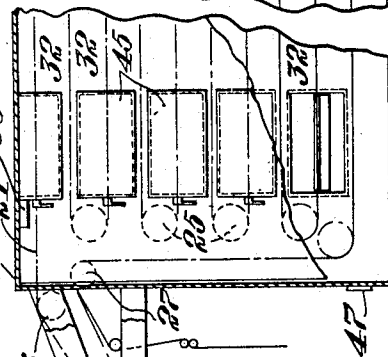


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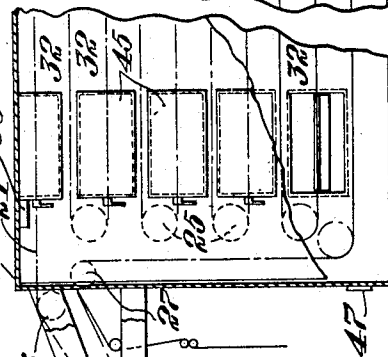


Fig. 21

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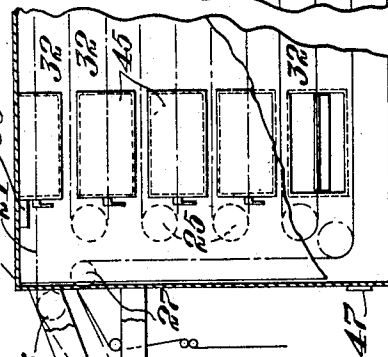


Fig. 23

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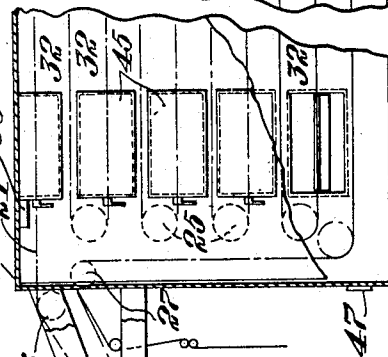


Fig. 25

Fig. 26

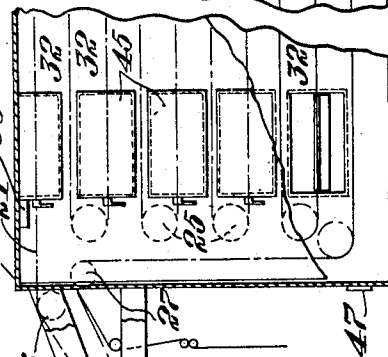


Fig. 27

Fig. 28

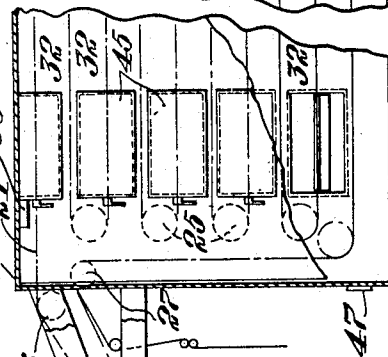


Fig. 29

Fig. 30

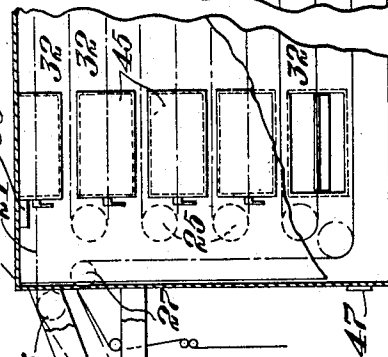


Fig. 31

Fig. 32

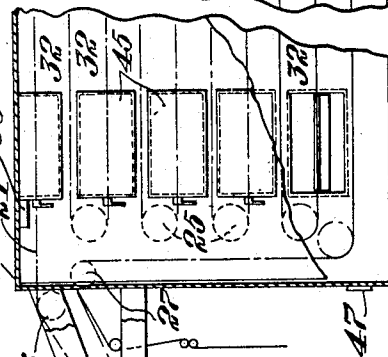


Fig. 33

Fig. 34

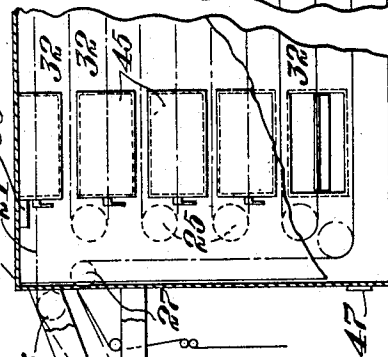


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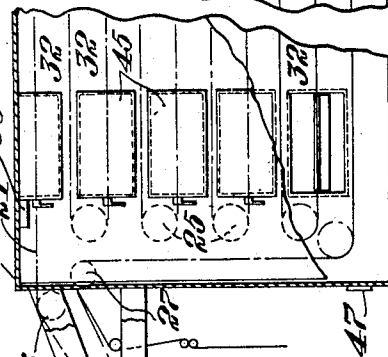


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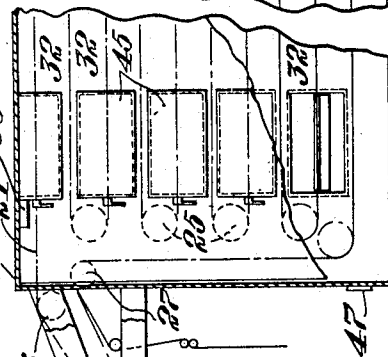


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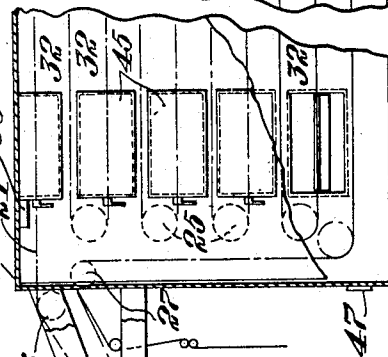


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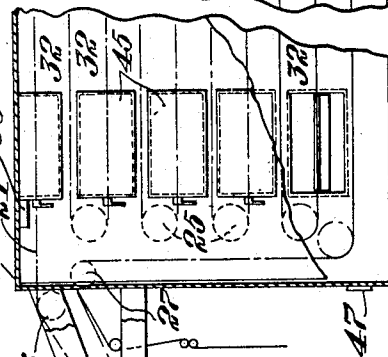


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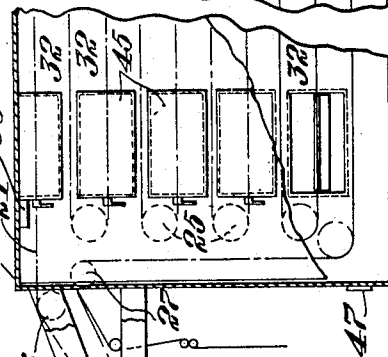


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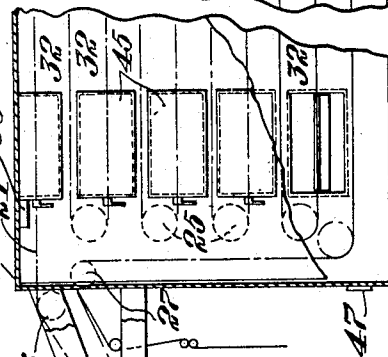


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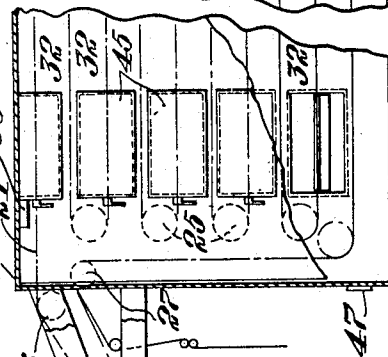


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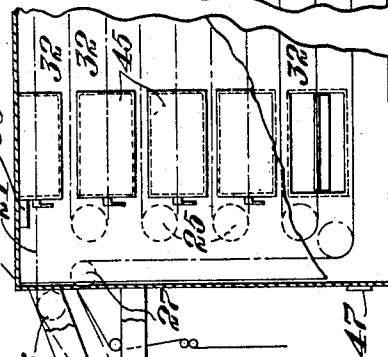


Fig. 51

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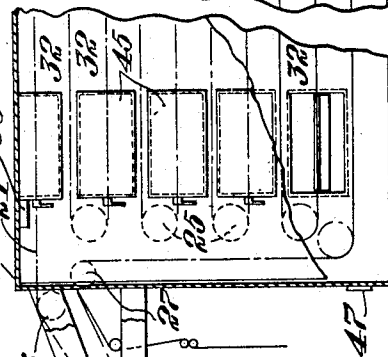


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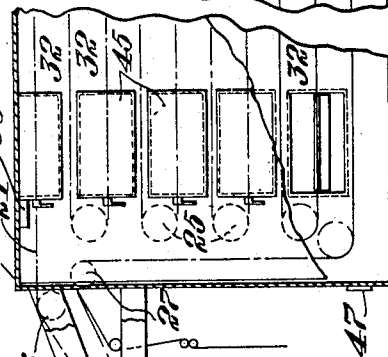


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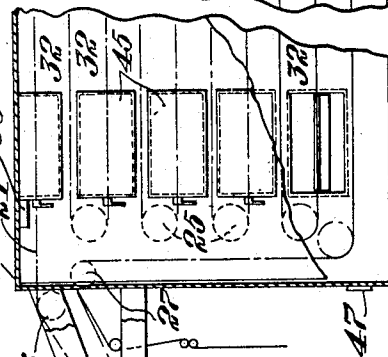


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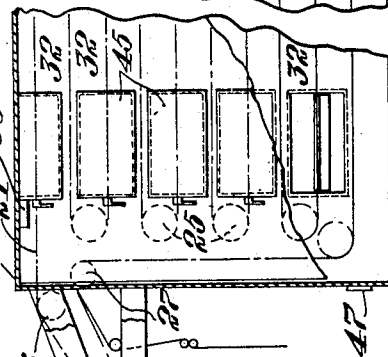


Fig. 59

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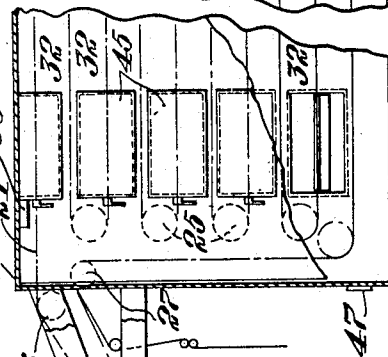


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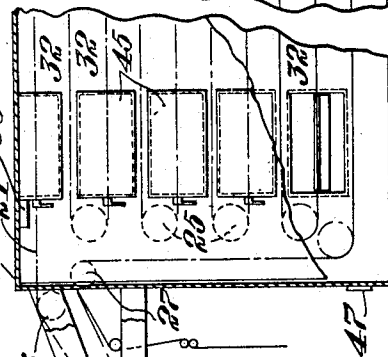


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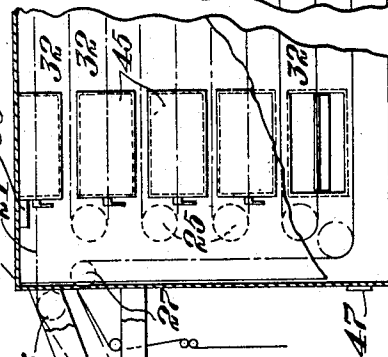


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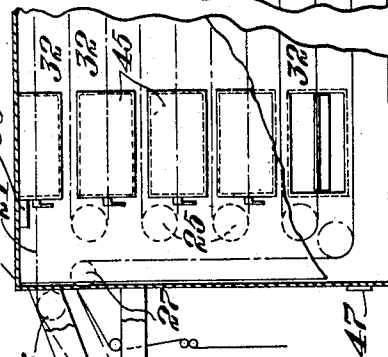


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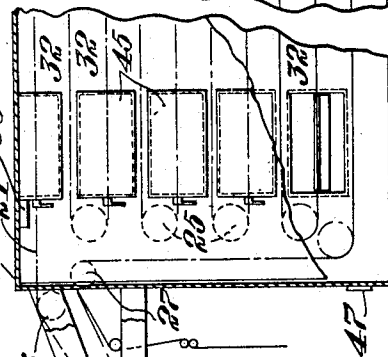


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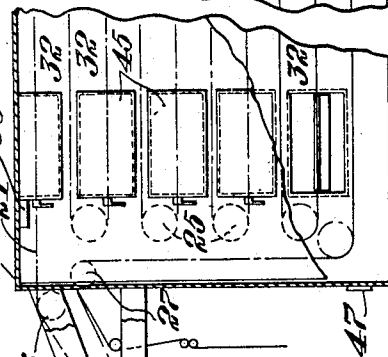


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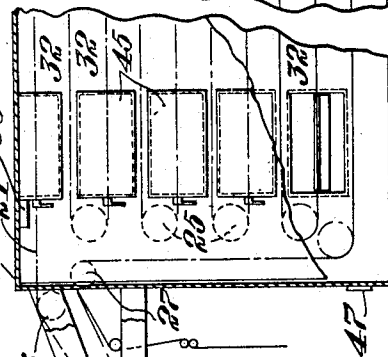


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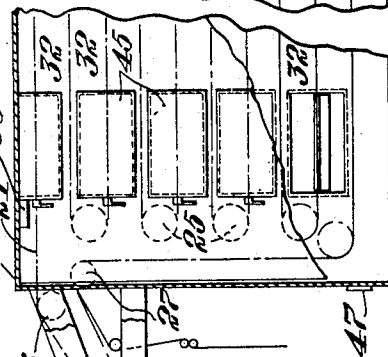


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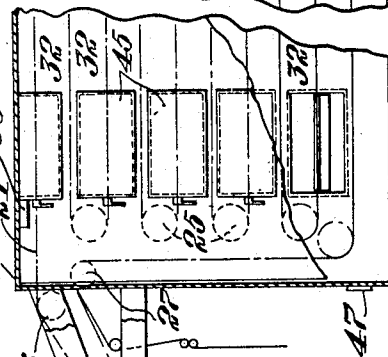


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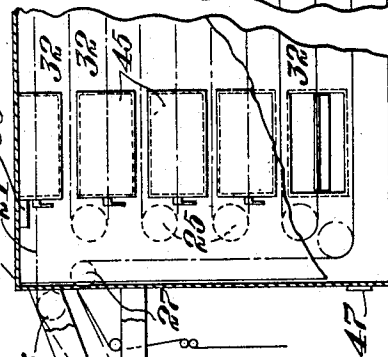


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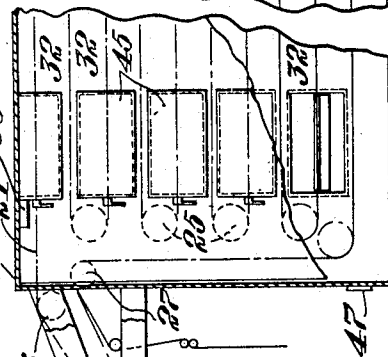


Fig. 81

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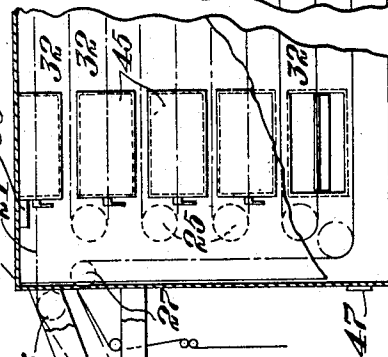


Fig. 83

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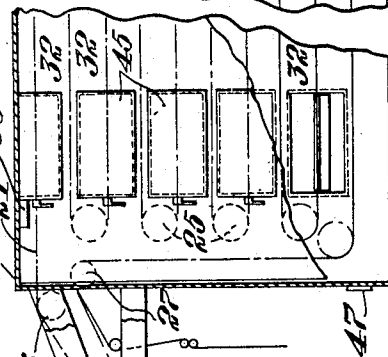


Fig. 85

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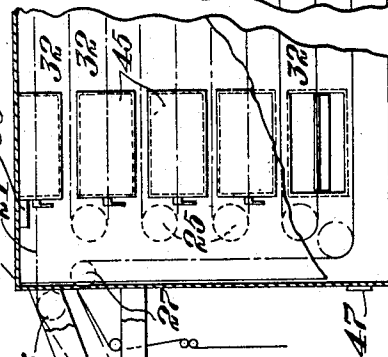


Fig. 87

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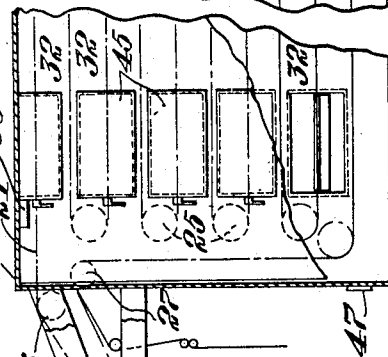


Fig. 89

Fig. 90

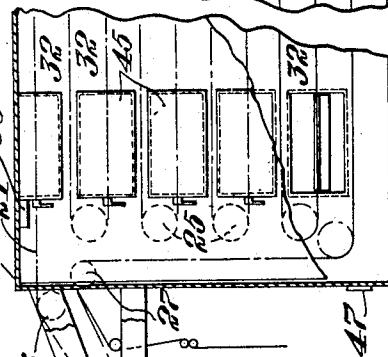


Fig. 91

Fig. 92

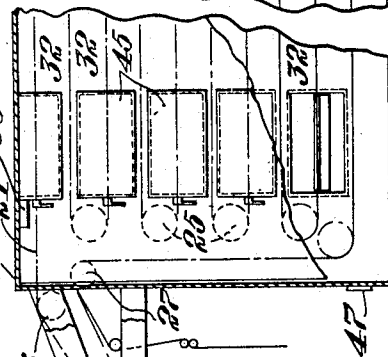


Fig. 93

Fig. 94

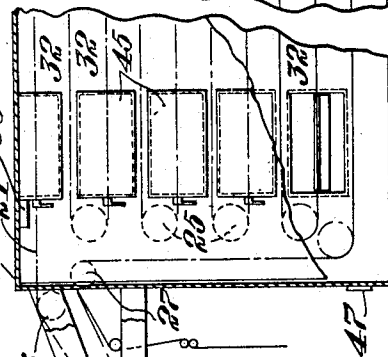


Fig. 95

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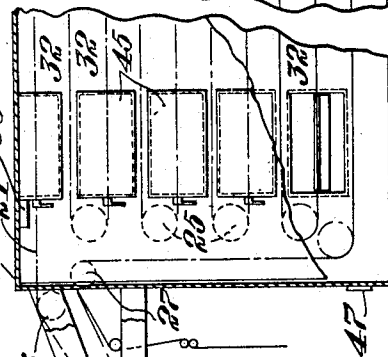


Fig. 97

Fig. 98

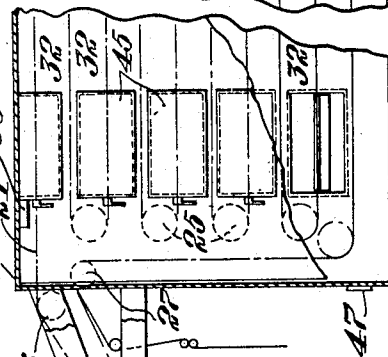


Fig. 99

Fig. 100

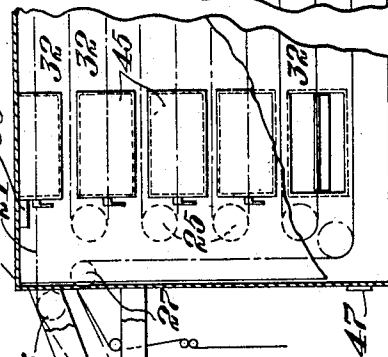


Fig. 101

Fig. 102

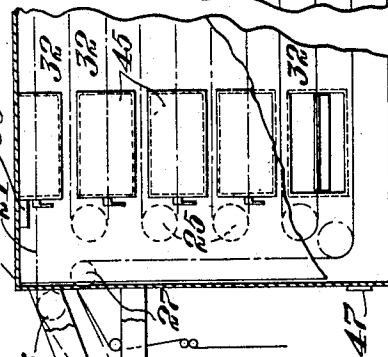


Fig. 103

Fig. 104

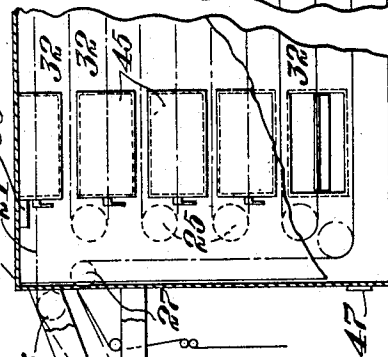


Fig. 105

Fig. 106

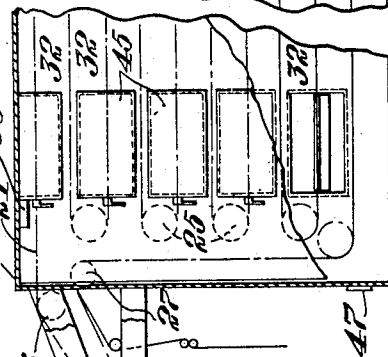


Fig. 107

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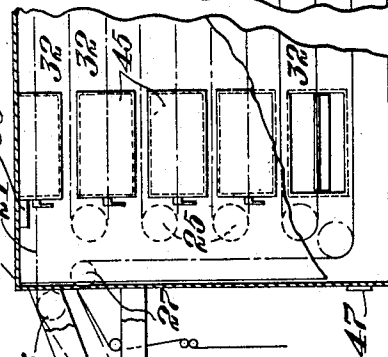


Fig. 109

Fig. 110

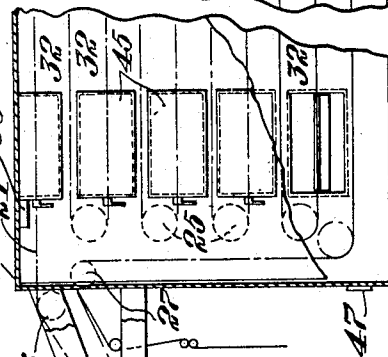


Fig. 111

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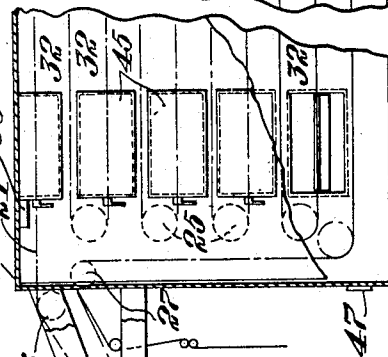


Fig. 113

Fig. 114

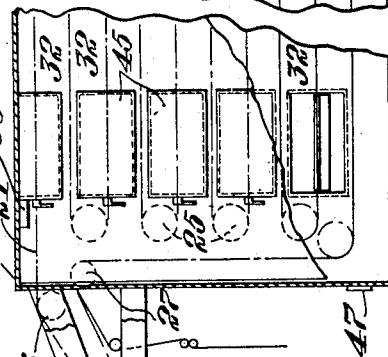
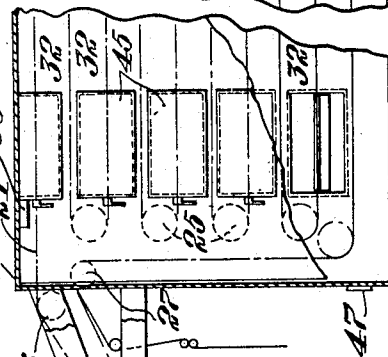


Fig. 115

Fig. 116



Dec. 9, 1941.

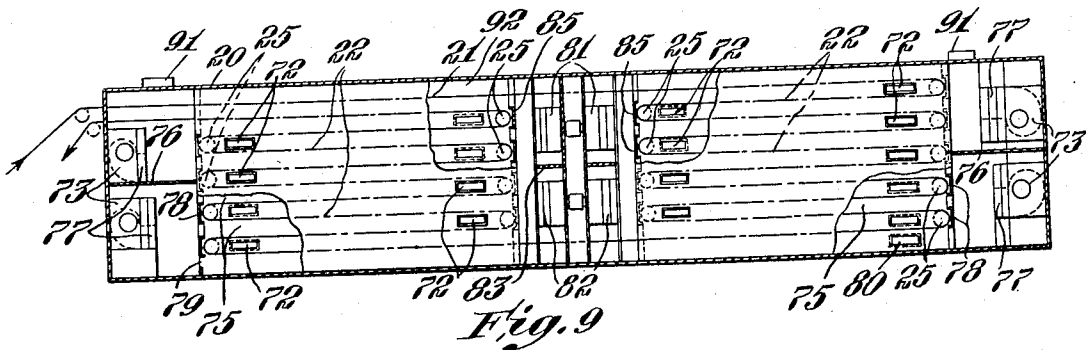
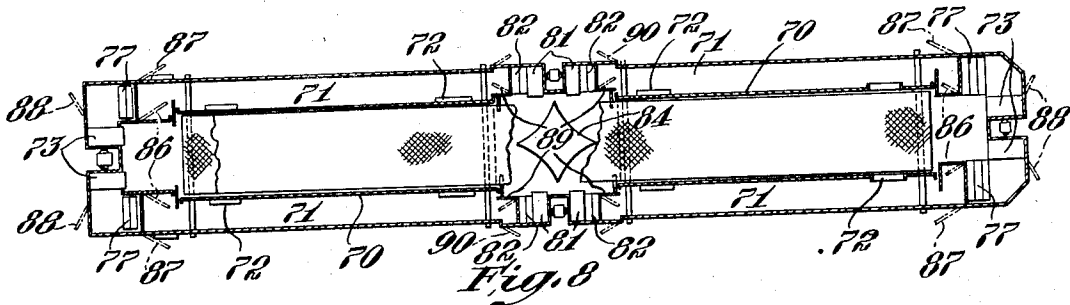
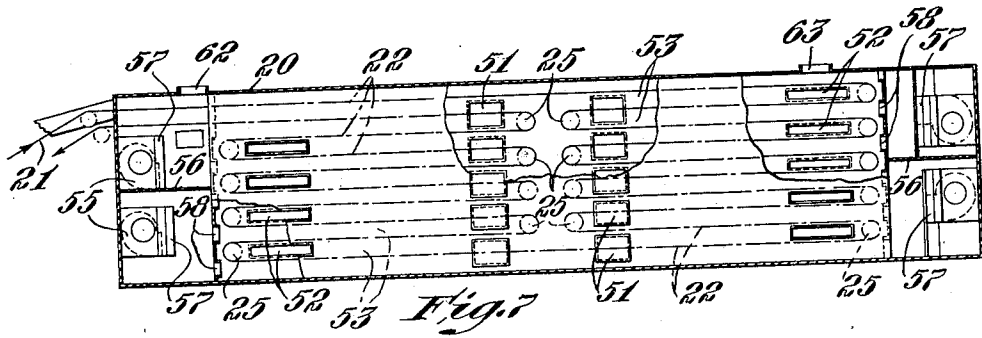
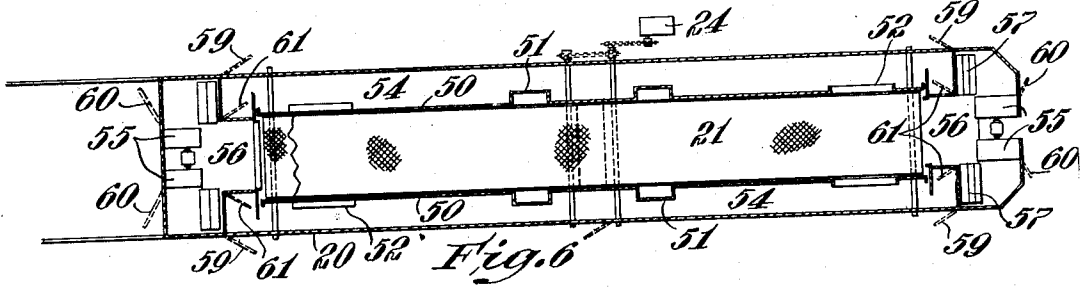
W. H. RIDLEY

2,265,313

TEXTILE DRIER

Filed July 31, 1940

2 Sheets-Sheet 2



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Walter H. Ridley
by Robert Cushman Woodbury
Att'ys.

UNITED STATES PATENT OFFICE

2,265,313

TEXTILE DRIER

Walter H. Ridley, Chelmsford, Mass., assignor to
Riggs & Lombard, Inc., Lowell, Mass., a corporation of Massachusetts

Application July 31, 1940, Serial No. 348,704

10 Claims. (Cl. 34—158)

This invention relates to an improvement in textile driers and more particularly in driers of that type in which webs having a plurality of horizontally extending runs are treated.

The primary object of this invention is to provide a drier wherein the webs are dried by streams of heated air which travel at a predetermined speed in contact with both surfaces of each run of the web to remove the surface moisture therefrom, such drier preferably having means whereby the travel of the drier streams can be altered according to the texture or moisture contents of the webs, and including ducts by which each stream of heated air traveling over one surface of a web in a direction opposite to that in which the web is traveling is guided around the edges of the web so that it returns to the source of supply in contact with the other surface of the web.

A further object of this invention is to provide in a drier comprising a housing through which the web travels in horizontal runs, partitions at the side edges of the webs, which partitions are spaced from the side walls to form compartments and which together with the runs define a plurality of parallel channels open alternately at forward and rearward ends, means for setting up streams of heated air which travel forwardly in the channels open at the rearward ends and rearwardly in the channels open at the forward ends, guide chutes in the partitions through which air traveling in the channels open at the rearward ends is deflected to the channels open at the forward ends and openings in the partitions through which the air in the last named channels is guided into the compartments between the partitions and the side walls of the housing.

These and other objects will appear from a consideration of the following description of certain embodiments of the invention, and of the accompanying drawings wherein

Fig. 1 is a view in side elevation with parts broken away of a drier embodying this invention;

Fig. 2 is a sectional plan view of the drier shown in Fig. 1;

Fig. 3 is a fragmentary perspective view illustrating the circulation of the drying air in such embodiment;

Fig. 4 is a perspective view on a larger scale illustrating the tenter chain by which the web is advanced and the guide chutes through which air is conducted from one horizontal channel next below;

Fig. 5 is an enlarged sectional view illustrating

a port in a partition through which air passes from one channel into a side compartment;

Figs. 6 and 7 are sectional plan and side elevational views respectively of another embodiment of the invention; and

Figs. 8 and 9 are views similar to Figs. 6 and 7 of still another embodiment of the invention.

The drier housing 20 is adapted to contain a textile web 21 arranged in a plurality of horizontal runs 22. Tenter chain means 23 of any well known type driven by a motor 24 advance the web through the housing over a plurality of rollers 25. As shown in Fig. 1 the web 21 enters the housing over a roller 26 and leaves the housing over a roller 27. This is true of each of the embodiments illustrated and hence the same reference characters will be employed herein.

In the embodiment shown in Figs. 1 to 5 inclusive the web 21 travels between a pair of partitions 30 at the side edges of the web which form with the walls of the housing a pair of compartments 31. The partitions 30 are associated with the tenter chain means 23 as shown in Fig. 4 and are adjustable laterally with the chains to accommodate webs of various lengths. The means for insuring such adjustment are not here shown because they are old and well known and form no part of this invention.

The horizontal runs 22 of the web coast with the partitions 30 to define a plurality of parallel, horizontal channels 32 each open at one end and, with the exception of the upper channel, closed, at the other by a roller 25. The upper channel is substantially closed at its forward end by a bar 33. The channels obviously alternate the upper channel being open at the forward end and the adjacent channel being open at the rearward end. The bottom channel 32, however, is not only closed at the rearward end but is practically closed at the forward end.

Mounted at the rearward end of the housing are a plurality of blowers or fans 35 driven by motors 36 and heating coils 37. The air streams created by the blowers 35 are heated by the coils 37 and enter those channels 32 which are open at the rearward end. The blowers are supplied with air from passages 38 which are extensions of the compartments 31 and are at all times in direct communication therewith. The chamber 39 between the blowers 35 and heating coils 37 is normally separated from the passages 38 by doors 40. Inclined walls 41 direct the air stream into the portion of the housing between the partitions 30. Doors 42 and 43, in the walls of the

housing and normally closed, afford access into the drier when required.

The channels 32 are grouped in pairs beginning at the top of the housing and each pair is connected near its forward end by ducts 45 formed in the partitions 30 preferably but not necessarily integral therewith as shown in the drawings (Figs. 3 and 4). The ducts 45 guide the air driven into the channels 32 open at the rearward end around the side edges of the web in the lower channels of each pair. Adjacent the rearward ends of such lower channels are formed ports 46 in the partitions 30 through which the air traveling in the channels escapes into the compartments 31. The movement of the air through each pair of channels is thus directly initiated by the blowers 35 and continued by the blowers as they act through the passages 38 and compartments 31 upon the air passing from the channels through ports 46. Thus the air flowing forwardly in the upper channel of each pair over the surface of the runs 22 exposed in such channels, is deflected into the lower channel by ducts 45 and after flowing rearwardly in that channel over the surfaces of the runs there exposed, returns through ports 46, compartments 31 and passages 38 to the blowers. Fresh air may be admitted to the passages 38 by regulating the doors 43. In the front wall of the housing is a port 47 which, as desired may be wholly or partially uncovered to admit fresh air into the housing 20 between the partitions 30. Mounted on the top of the housing 20 over the chamber 39 and connected thereto is an exhaust outlet 48 through which excess air may escape and by which any undue increase in pressure is counteracted. Suitable means such as dampers 49 may be provided to control the passage of air through the ducts 45.

As the web travels through the housing the blowers 35 and heating means 37 initiate streams of drying air in alternate channels 32. As the streams approach the ends of these channels they are deflected by ducts 45 into the adjacent channels along which they continue their travel back to the blowers leaving the channels through ports 46 and thence proceeding through compartments 31 and passages 38. By adjusting the dampers 49 the flow of air through the ducts 45 can be regulated as desired, and if preferred the ducts 45 can be completely closed so that all the drying air must pass through the web from upper to lower channels.

The web to be treated in the embodiment of the invention illustrated in Figs. 6 and 7 is guided over the rollers 25 of the housing 20 in such manner that two vertical tiers of parallel horizontal runs 22 are formed. The web runs between partitions 50 having ducts 51 and ports 52 which coact with pairs of horizontal channels 53 formed by the runs 22 and partitions 50. The ports 52 lead to compartments 54 formed between the partitions 50 and the walls of the housing. The circulation of the drying air is controlled by a plurality of blowers 55 arranged at opposite ends of the housing. As here shown the blowers 55 are arranged in pairs, two pairs at each end separated horizontally by plates 56.

The channels 53 are arranged in pairs open at alternate ends. The air from the blowers 55 enters the lower channel of each pair, which channels are open at the ends adjacent the blowers, travels along such channels to the ducts 51 by which it is deflected to the upper channels of each pair, travels along those channels to the

ports 52 and thence along compartments 54 to heating means 57 and through such means to the intake side of the blowers 55. The ducts 51 may also be provided with dampers similar to the dampers 45 by which the passage of air there-through is controlled.

It will be noted that the heating means 57, here shown as heating coils, vary in size and efficiency, those associated with the blowers 10 which first act upon the web (at the upper right-hand corner of Fig. 7) being the strongest and those associated with the blowers which finally act upon the web (at the upper left-hand corner of Fig. 7) being the weakest. The entry of the 15 drying air into the various channels from the blowers is through ports 58.

Various conditioning means for regulating the temperature and moisture content of the heating air are provided. Doors 59 may be adjusted to mix fresh air with the air returning along the compartment 54. Exhaust outlets 62 and 63 permit the escape of air from the drier housing. Doors 60 and 61 are normally closed and afford access to compartments of the drier.

The operation of this embodiment is similar 25 to that of the first embodiment in that the stream of air set up in alternate channels is for the most part deflected by ducts into adjacent channels, and returned to the blowers through ports at the ends of the second channels and compartments defined by the housing walls and the partitions between which the web travels, or the ducts may be closed so that all the air must pass into the upper channels through the web. By separating, 30 the web runs into two vertical tiers, and providing blowers and heating means for each tier, a more accurate control of the drying operation is attained.

The embodiment of the invention shown in 40 Figs. 8 and 9 is a further development of the embodiment shown in Figs. 6 and 7. As in that embodiment the horizontal runs 22 of the web 21 are arranged in two vertical tiers in the housing 20 and the web travels between pairs of partitions 45 70 which form with the walls of the housing compartments 71. In the partitions 70 are formed a plurality of ports 72, one adjacent each end of each roller 25. At opposite ends of the housing are mounted pairs of blowers 73 by which air is introduced into those channels 75 formed by the runs 22 which are open at the ends of the housing adjacent the blowers. The pairs of blowers are separated by plates 76 and associated with each blower at the intake side thereof is heating means 77 shown in the drawings as heating coils. The web as it passes over the rollers 25 is protected from the direct impact of the heated air by shields 78. The lowest shield at the right end (Fig. 9) is extended to the bottom plate to close one end of the space between that plate and the bottom run of the web. The corresponding shield at the left end has an opening 79 therein which leads into that space. Ports 80 in the partitions 70 near the right end of the space connect that space with the compartments 71.

Mounted in the housing between the two tiers of runs are blowers 81 and heating means 82 similar to the blowers 73 and heating means 77 mentioned above. The blowers 81 are separated by a plate 83 which supports columns 84 having longitudinally concave faces for the purpose of directing the air into the channels 75 formed by the runs 22. Shields 85 serve, like the shields 78, to protect the web as it passes around the rollers 25. Doors 87 and 90 permit a regulation

of the drying operation in any well known manner. Exhaust outlets 91 also assist in such regulation. The doors 86, 88 and 89 afford access to various compartments of the drier and are normally closed.

As the web travels through the housing the blowers 73 and 81 set up streams of air through the various channels 75 to the ports 72 to the compartments 71. The compartments 71 are in open communication through the heating means 77 and 82 with the suction sides of the blowers. Thus a circulation of drying air is set up through the various channels 75 to dry the web. It will be noted from an inspection of the drawings that the heating means 77, through which air passes to the blowers 73 which act upon the upper runs of the right tier, has the greatest capacity and the heating means 77 through which air passes to the blowers 81 which act upon the upper runs of the left tier, as well as the heating means 82 associated with the blowers 81, have the smallest capacity. Thereby the drying air which acts upon the wettest web is the warmest and the drying air which acts upon the driest web is the coolest. In addition to setting up circulation of drying air through the channels 75, streams of air are set up in the space 92 between the incoming web and the top plate of the housing, the space between the lowest run and the bottom plate and over the outgoing web.

It will be noted that in accordance with this invention the drying air is forced to travel longitudinally of the web through channels defined by the coaction of horizontal runs of the web and the partitions between which the web is advanced, air in the adjacent channels traveling in opposite directions, so that the stream of air in contact with one face of the web moves in the same direction as that in which the web travels while the stream in contact with the other face of the web moves in a direction opposite to that in which the web travels, that the drying air, after having lost much of its heat to the web and having absorbed moisture therefrom, returns to the blowers through compartments formed by the partitions and the walls of the housing so that little or no heat is transmitted to the walls of the housing, thereby insuring efficient and economical drying, and that, moreover, various dampers and doors are provided whereby the temperature and moisture content of the drying air is regulated and such fresh air as may be required is admitted.

While certain embodiments of the invention have been shown and described in detail, it will be understood that the invention is not limited to such embodiments since changes may be made therein and since other embodiments of the invention may be made all without departing from the spirit and scope of the invention, as set forth in the following claims.

I claim:

1. A web drier comprising a housing within which the web to be dried travels, guide rollers mounted in said housing for supporting the web in a plurality of horizontally extending runs superposed with respect to each other, partitions at the sides of the web and between which the web travels, said partitions coacting with the horizontally extending runs to define a plurality of horizontally extending channels, said partitions being spaced inwardly of the side walls of the housing and coacting with such walls to define compartments, means for creating streams of drying air in said channels, said means being

also in communication with said compartments, the streams in adjacent channels traveling in opposite directions whereby the stream of drying air in contact with one face of a horizontally extending run moves in the same direction as that in which the web travels and the stream of drying air in contact with the other face of that run moves in a direction opposite to that in which the web travels, ducts connecting each of the channels into which the streams of drying air are directly fed by the stream creating means, to an adjacent channel and ports in the partitions connecting said last-named channels to the compartments through which ports the drying air enters the compartments and returns there-through to the air stream creating means.

2. A web drier comprising a housing within which the web to be dried travels, guide rollers mounted in said housing for supporting the web in a plurality of horizontally extending runs superposed with respect to each other, partitions at the sides of the web and between which the web travels, said partitions coacting with the horizontally extending runs to define a plurality of horizontally extending channels, said partitions being spaced inwardly of the side walls of the housing and coacting with such walls to define compartments, means for creating streams of drying air in said channels, said means being also in communication with said compartments, the streams in adjacent channels traveling in opposite directions whereby the stream of drying air in contact with one face of a horizontally extending run moves in the same direction as that in which the web travels and the stream of drying air in contact with the other face of that run moves in a direction opposite to that in which the web travels, ducts connecting each of the channels into which the streams of drying air are directly fed by the stream creating means, to an adjacent channel, dampers in said ducts by which the flow of air is regulated and by which such flow can be cut off so that the air entering the adjacent channels passes through the web, and ports in the partitions connecting said last-named channels to the compartments through which ports the drying air enters the compartments and returns therethrough to the air stream creating means.

3. A web drier comprising a housing within which the web to be dried travels, guide rollers mounted in said housing for supporting the web in a plurality of horizontally extending runs superposed with respect to each other, partitions at the sides of the web and between which the web travels, said partitions coacting with the horizontally extending runs to define a plurality of horizontally extending channels, said partitions being spaced inwardly of the side walls of the housing and coacting with such walls to define compartments, means for creating streams of drying air in said channels, said means being also in communication with said compartments, the streams in adjacent channels traveling in opposite directions whereby the stream of drying air in contact with one face of a horizontally extending run moves in the same direction as that in which the web travels and the stream of drying air in contact with the other face of that run moves in a direction opposite to that in which the web travels, ducts formed in said partitions connecting each of the channels into which the streams of drying air are directly fed by the stream creating means to an adjacent channel

and ports in the partitions connecting said last-named channels to the compartments through which ports the drying air enters the compartments and returns therethrough to the air stream creating means.

4. A web drier comprising a housing within which the web to be dried travels, guide rollers mounted in said housing for supporting the web in a plurality of horizontally extending runs superposed with respect to each other, partitions at the sides of the web and between which the web travels, said partitions coacting with the horizontally extending runs to define a plurality of horizontally extending channels, said partitions being spaced inwardly of the side walls of the housing and coacting with such walls to define compartments, means for creating streams of drying air in said channels, said means being also in communication with said compartments, the streams in adjacent channels traveling in opposite directions whereby the stream of drying air in contact with one face of a horizontally extending run moves in the same direction as that in which the web travels and the stream of drying air in contact with the other face of that run moves in a direction opposite to that in which the web travels, ducts formed in said partitions connecting each of the channels into which the streams of drying air are directly fed by the stream creating means to an adjacent channel, dampers in said ducts by which the flow of air is regulated and by which such flow can be cut off so that the air entering the adjacent channels passes through the web, and ports in the partitions connecting said last-named channels to the compartments through which ports the drying air enters the compartments and returns therethrough to the air stream creating means.

5. In a web drying housing within which the web to be dried travels, guide rollers mounted in said housing for supporting the web in a plurality of horizontally extending runs superposed with respect to each other, partitions at the sides of the web and between which the web travels, said partitions coacting with the horizontally extending runs to define a plurality of horizontally extending channels, said partitions being spaced inwardly of the side walls of the housing and coacting with the housing walls to define compartments, blowers by which streams of drying air are introduced into alternate channels, the suction sides of said blowers being connected to said compartments, ducts connecting the inner end of each said alternate channel with one end of an adjacent channel, and ports in the partitions at the other ends of said adjacent channels whereby streams of air travel through said alternate channels, are deflected by said ducts to the adjacent channels and then travel through said adjacent channels to the ports in the partitions through which they enter the compartments and return therethrough to the suction sides of the blowers.

6. In a web drying housing within which the web to be dried travels, guide rollers mounted in said housing for supporting the web in a plurality of horizontally extending runs superposed with respect to each other, partitions at the sides of the web and between which the web travels, said partitions coacting with the horizontally extending runs to define a plurality of horizontally extending channels, said partitions being spaced inwardly of the side walls of the housing and coacting with the housing walls to define compartments, blowers by which streams of drying air are introduced into alternate channels, the suction sides of said blowers being connected to said compartments, ducts connecting the inner end of each said alternate channel with one end of an adjacent channel, and ports in the partitions at the other ends of said adjacent channels whereby streams of air travel through said alternate channels, are deflected by said ducts to the adjacent channels and then travel through said adjacent channels to the ports in the partitions through which they enter the compartments and return therethrough to the suction sides of the blowers.

ments, blowers by which streams of drying air are introduced into alternate channels, the suction sides of said blowers being connected to said compartments, ducts formed in said partitions at the inner ends of said alternate channels and connecting said channels with the adjoining ends of adjacent channels, and ports in the partitions at the other ends of said adjacent channels whereby streams of air travel through said alternate channels, are deflected by said ducts to the adjacent channels and then travel through said adjacent channels to the ports in the partitions through which they enter the compartments and return therethrough to the suction sides of the blowers.

7. A web drier comprising a housing within which the web to be dried travels, guide rollers mounted in said housing for supporting the web in a plurality of horizontally extending runs superposed with respect to each other and grouped in two vertical tiers arranged end to end, partitions at the sides of the web and between which the web travels, said partitions coacting with said runs to define a plurality of horizontally extending channels, said partitions being spaced inwardly of the side walls of the housing and coacting with the housing walls to define compartments, blowers mounted at each end of the housing with their suction sides in connection with said compartments, said blowers being adapted to introduce streams of drying air into alternate channels of both vertical tiers, ducts carried by the partitions at the inner ends of said channels and connecting them with the adjoining ends of adjacent channels, and ports in said partitions connecting the other ends of the adjacent channels with said compartments and through which the streams of air enter the compartments and return therethrough to the suction sides of the blowers.

8. A web drier comprising a housing within which the web to be dried travels, guide rollers mounted in said housing for supporting the web in a plurality of horizontally extending runs superposed with respect to each other, substantially vertical partitions at the sides of the web and between which the web travels, said partitions coacting with the horizontally extending runs to define a plurality of horizontally extending channels, said partitions being spaced inwardly of the side walls of the housing and coacting with such walls to define compartments, means for creating streams of drying air, said means being also in communication with said compartments, means for directing said streams of drying air in alternate channels in the same direction and in the remaining channels in the opposite direction, and ports in the partitions through which the drying air streams enter the compartments and return therethrough to the air stream creating means.

9. A web drier comprising a housing within which the web to be dried travels, guide rollers mounted in said housing for supporting the web in a plurality of horizontally extending runs superposed with respect to each other, substantially vertical partitions at the sides of the web and between which the web travels, said partitions coacting with the horizontally extending runs to define a plurality of horizontally extending channels, said partitions being spaced inwardly of the side walls of the housing and coacting with such walls to define compartments, means for creating streams of drying air, means for directing said streams of drying air in alternate chan-

nels in the same direction and in the remaining channels in the opposite direction, said first-mentioned means comprising blowers and heating elements, the suction sides of the blowers being in connection with the compartments, and ports in the partitions through which the drying air enters the compartments and returns there-through to the suction sides of the blowers.

10. A web drier comprising a housing within which the web to be dried travels, guide rollers mounted in said housing for supporting the web in a plurality of horizontally extending runs superposed with respect to each other and grouped in two vertical tiers arranged end to end, substantially vertical partitions at the sides of the web and between which the web travels, said

partitions coacting with the horizontally extending runs to provide a plurality of horizontally extending channels, said partitions being spaced inwardly of the side walls of the housing and coacting with the housing walls to define compartments, means for creating streams of drying air, said means being also in communication with said compartments, means for directing said streams of drying air in alternate channels of both vertical tiers in the same direction and in adjacent channels of both vertical tiers in opposite directions, and ports in the partitions through which the streams of air enter the compartments and return therethrough to the suction sides of the blowers.

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