Nov. 27, 1945. B. R. ANDREWS 2,389,586

DRYING APPARATUS

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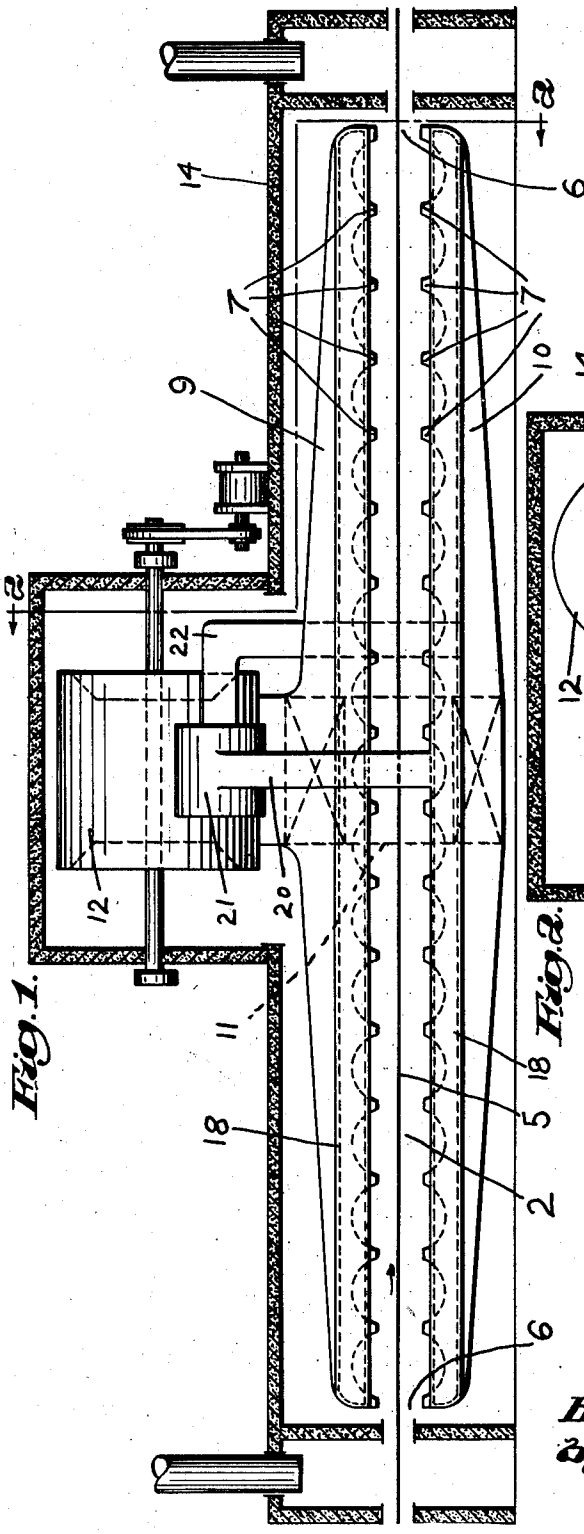


Fig. 1.

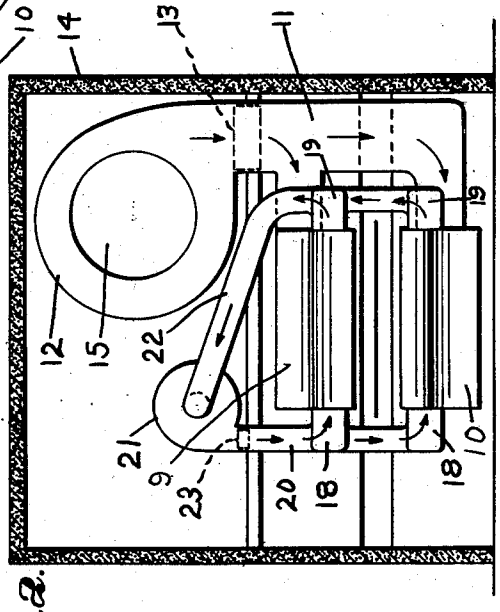


Fig. 2.

Inventor:
Bernard R. Andrews,
by Heard Smith & Tennant
Attorneys

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Fig. 3.

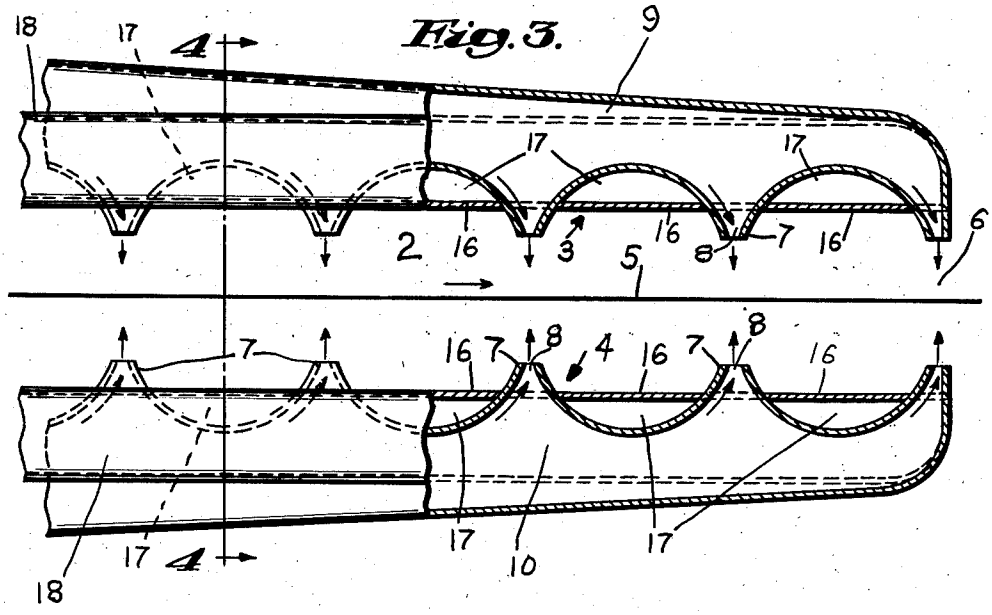
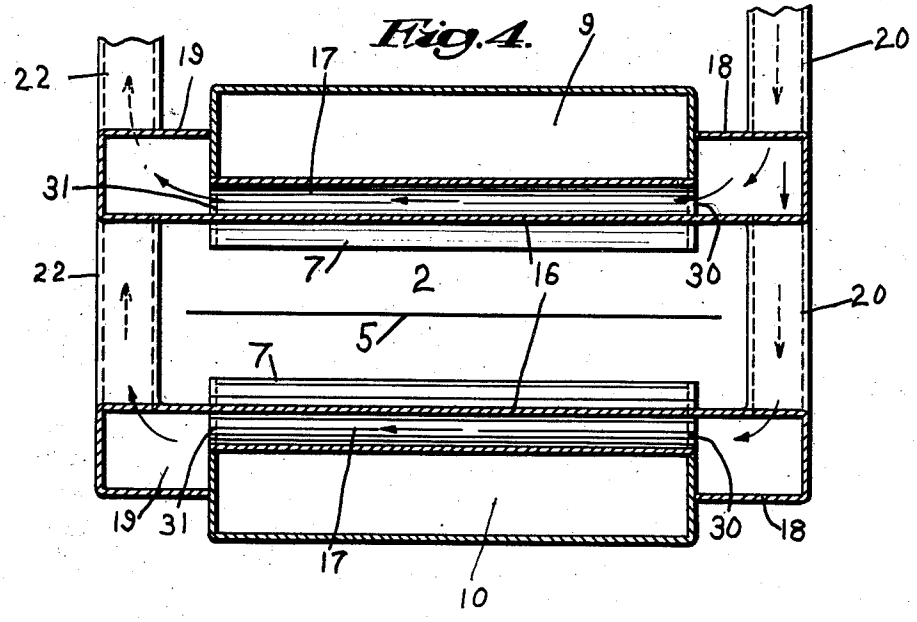


Fig. 4.



Inventor:
Bernard R. Andrews,
by Heard Smith & Tennant
Attorneys

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DRYING APPARATUS

Bernard R. Andrews, Braintree, Mass.

Application November 17, 1944, Serial No. 563,897

3 Claims. (Cl. 34—68)

This invention relates to a drying apparatus of that type which uses both radiant heat and circulating air currents for effecting the drying operation.

In my U. S. Patent No. 2,071,015 February 16, 1937 there is illustrated a drying apparatus using circulating air currents which is very effective in drying cloth or other material in web form and which comprises two parallel walls forming between them a drying space through which the cloth or other web material is fed, each wall being provided with nozzle elements adapted to project high pressure jets of heated air or other gaseous drying medium against the cloth or other web material at substantially right angles thereto, thereby creating cyclonic circulating air currents which are carried across the face of the cloth.

It is one of the objects of the present invention to provide a drying apparatus such as above referred to with novel means for projecting radiant heat against the cloth while it is subjected to the action of the air jets. The action of radiant heat is to raise the temperature of the cloth or other web material, thereby facilitating the evaporation of moisture therefrom, and such radiant heat together with the circulating air currents produces a more effective drying apparatus.

A further object of the invention is to provide various improvements in drying apparatus of the above type which will be hereinafter described and set forth in the appended claims.

In the drawings wherein I have illustrated a selected embodiment of my invention,

Fig. 1 is a longitudinal section through a drying apparatus embodying the invention.

Fig. 2 is a cross section on substantially the line 2—2, Fig. 1.

Fig. 3 is an enlarged fragmentary sectional view on the line 3—3, Fig. 2.

Fig. 4 is a section on the line 4—4, Fig. 3.

In the drawings the drying space in which the cloth or other web material is dried is indicated at 2, said drying space being defined by two opposed parallel walls 3, 4 between which the cloth or other web material 5 to be dried is fed. This drying space 2 is open at the ends 6 for the admission and delivery of the web 5 and is also open at the sides.

The walls 3 and 4 are provided with nozzle elements indicated generally at 7 which are adapted to deliver heated air under pressure against the cloth or other web material 5, said nozzles being preferably so disposed that the jets of heated air are delivered against the cloth at right angles thereto. These nozzle elements 7 extend transversely across the space 2 and each may conveniently be provided with an elongated nozzle or eduction slot 8 which extends transversely across the space 2 and also transversely across the web 5. Means are also provided for delivering a jet of heated air through each nozzle slot 8, and while any suitable means for this purpose may be adopted, yet I have herein shown means for this purpose similar to that illustrated in my above-mentioned patent.

Each wall 3 and 4 is shown as forming one side of a duct which is supplied with heated air under pressure, the duct corresponding to the wall 3 being indicated at 9 and that corresponding to the wall 4 being indicated at 10. These ducts are connected through a conduit connection 11 to the discharge of a blower or fan 12 so that when the fan is operating, air under pressure will be delivered to each of the ducts 9, 10 and sheet-like jets of air will be delivered against the web through the slots 8 of the various nozzle elements 7. The duct 11 is preferably provided with a suitable heater element 13 by which the air delivered from the fan is heated before it passes into the ducts 9 and 10.

These ducts 9 and 10, the conduit 11, and the fan 12 are shown as enclosed in a housing 14, which will preferably be made of some suitable insulating material, and the sides of the drying space 2 are open to the interior of said housing as is also the inlet 15 for the fan 12. The fan will preferably be operated to deliver air under relatively high pressure into the ducts 9 and 10 so that the sheet-like jets of air issuing from the nozzles 7 will have a relatively high velocity. As stated above, these jets are delivered against the cloth at substantially right angles thereto and become converted into cyclonic air currents which move over the face of the cloth and pass out the open sides of the drying space 2 into the housing, and as the inlet for the blower 12 communicates with the interior of the housing, there will be a recirculation of the air within the housing as described in my above-mentioned Patent No. 2,071,015.

For generating and projecting radiant heat against the cloth while it is thus subjected to the action of the circulating air currents, I have provided chambers which are located between adjacent nozzles 7, each chamber having the wall thereof which is exposed to the drying space 2 made of some material having good heat conducting properties, such for instance, as sheet metal. Means are provided for delivering to each

of these chambers air which is at a temperature considerably higher than that which is delivered to the ducts 9 and 10 so that the walls of the chambers become relatively hot and thus radiate heat which is received by the cloth or other web material.

These chambers may be provided for in various ways without departing from the invention. In the construction herein shown the side walls of each two adjacent nozzle elements are connected by a partition wall 16 of sheet metal which is spaced from the wall of the corresponding duct 9 or 10 and which forms with said wall a chamber 17 that extends transversely across the drying space 2. As stated above, means are provided for delivering to each of the chambers 17 air which has been heated to a temperature considerably higher than that which is delivered to the ducts 9 and 10 with the result that each of the partition walls 16 will be highly heated and will, therefore, generate radiant heat which is projected on to the cloth.

While various ways of providing for the delivery of the highly heated air to the chambers 7 may be employed, I have herein illustrated a hot air supply duct 18 extending longitudinally of each of the ducts 9 and 10, said hot air supply ducts being situated opposite the ends of the chambers 17, the latter opening at one end into said hot air supply ducts as shown at 30 in Fig. 4. There is also provided two exhaust ducts 19 extending longitudinally of the ducts 9 and 10 on the opposite side thereof from the hot air supply ducts 18, the chambers 17 being open at their opposite ends into the exhaust ducts 19 as shown at 31.

The two hot air supply ducts 18, one for each of the ducts 9 or 10, are connected through a suitable conduit 20 to the discharge of a blower or fan 21, and the exhaust ducts 19 are connected through a conduit 22 to the inlet of said fan 21. A heater 23 of any suitable construction is shown as located in the conduit 20, this heater operating to heat the air delivered from the fan to a relatively high temperature before it is delivered to the supply ducts 18.

As an example of one way in which this apparatus may be used, it may be assumed that the heater 13 would be operated so as to heat the air which is delivered from the nozzle slots 8 to about 300 degrees F. while the heater 23 may be operated to heat the air delivered to the chambers 17 to about 500 degrees F. The circulation of this highly heated air through the chambers 17 will heat the partition walls 16 to a high temperature and the latter will then become radiant heat generators which will generate radiant heat at a high temperature and project it on to the cloth.

This radiant heat functions to raise the temperature of the cloth to a point where moisture therein will be rapidly evaporated, the water vapor thus produced being carried off by the circulating air currents. These circulating air currents are also effective in preventing the cloth from being overheated or burned by the radiant heat.

While I have referred above to temperatures of 300 degrees F., yet it is to be understood that these mentioned temperatures are for illustrative purposes only, and that the actual temperature of the air delivered to the ducts 9 and 10 may vary considerably depending upon the character of the web material and the requirements for drying, and it will also be understood that the temperature of the air delivered to the chamber 17 may be varied depending upon the amount of radiant heat which it is desired to project on to the web.

I claim:

1. A drying apparatus for drying web material comprising an elongated chamber, one wall of which extends substantially parallel to the web material to be dried and is provided with a plurality of nozzle elements directed towards said material, means to maintain said chamber filled with heated air under pressure whereby such air is delivered through said nozzle elements against the web, an imperforate partition wall of heat-conducting material connecting each two adjacent nozzle elements thereby forming therewith a hot air chamber, and means to deliver to said hot air chamber air having a temperature considerably higher than that delivered from said nozzle elements, whereby said partition walls become highly heated and project radiant heat of relatively high temperature against the web material.

2. A drying apparatus having two chambers defining between them a drying space through which cloth or other web material to be dried may be fed, the walls of said chambers which bound said space being provided with nozzle elements directed toward the web material, each of which nozzle elements has a nozzle opening in the form of a slot extending transversely of the web material, means for maintaining said chambers filled with heated air under pressure whereby such air is delivered through said nozzle slots against the web material, an imperforate partition wall of heat-conducting material connecting the sides of each two adjacent nozzle elements and forming therewith a hot air chamber, and means to supply to said chambers air which has been heated to a temperature considerably higher than that which is delivered through the nozzle slots, whereby said partition walls become highly heated and project radiant heat of relatively high temperature against the cloth.

3. A drying apparatus for drying web material comprising an elongated chamber, one wall of which extends substantially parallel to the web material to be dried and is provided with a plurality of nozzle elements directed towards said web material, air moving means to maintain said chamber filled with hot air under pressure whereby such air is delivered through said nozzle elements against the web material, an imperforate partition wall of heat-conducting material connecting each two adjacent nozzles thereby forming therewith a hot air chamber, a second air moving means connected to said hot air chambers and adapted to circulate air therethrough, and means to heat the air circulated by the second air moving means to a temperature considerably higher than that of the air delivered from said nozzle elements whereby said partition walls become highly heated and project radiant heat of relatively high temperature against the web material.

BERNARD R. ANDREWS.