APPARATUS FOR DRYING CLOTH WITH AIR


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8 Claims. (Cl. 34—159)

1. This invention relates to apparatus for drying textile materials including cloth and the like.

Many kinds of cloth are damaged if exposed to a high temperature for any appreciable length of time. Fibers, such for example, as wool fibers contain a central canal containing oily material which is destroyed when the fiber is unduly heated, spoiling the texture and quality of the fiber and impairing its useful life.

Heretofore in the treatment of cloth, as in drying it for the finishing step, after it comes for example from a dye bath and washer, resort has been had to various drying steps preliminary to the finishing operation, and in all these steps the maximum temperature employed has been on the order of 175°-350° F. Such steps have included subjecting the cloth to the action of squeezing rolls or to the suction of vacuum tubes. By such means, the moisture of the cloth has been brought down to say 60% of the weight of the cloth.

Further drying steps have included festooning the cloth in a chamber heated by radiation from closed heated steam pipes.

The cloth has thus heretofore been introduced into the drying and finishing chamber in a very moist condition and the time required to bring the cloth down to the degree of dryness desired before it leaves the dryer, in which means for finishing the cloth, such for example as a tenter frame is usually included, has been very substantial and uncertain. The substantial period of time required for the drying of the cloth in the finishing chamber has been a factor materially limiting the speed with which cloth can be processed and thus seriously affecting the output of a mill or requiring a finishing chamber of great length occupying a disproportionate share of floor space.

Accordingly an object of this invention is to provide an improved method and apparatus for drying textile material, including cloth and the like.

Another object of the invention is to provide a two stage drying operation, exposing the cloth during the first drying stage and while it has a high moisture content, to a stream of attempering air or other gas heated to a temperature which would be destructive of the material during its second drying stage.

Another object of the invention is to provide improved drying method and apparatus whereby temperatures far in excess of those heretofore used may be safely employed without damaging the cloth, thereby accelerating the speed at which the cloth may be processed and effecting a substantial saving in factory space.

Another object of the invention is to provide method and apparatus for drying cloth whereby exposure of the cloth, as by festooning of the material, is avoided, and the cloth may be protected from contact with oil, grease and the like during the entire drying operation.

Another object of the invention is to provide economical means for pre-drying cloth whereby the finishing of the cloth may be facilitated.

Another object of the invention is to provide an improved method and apparatus for drying cloth and the like whereby the cloth is dried uniformly, both within the body of the cloth and on its surfaces.

Another object of the invention is to provide method and apparatus whereby evaporation of moisture from the cloth may be maintained, to keep the cloth at a temperature below that which is injurious to the cloth, while subjecting the cloth to an attempering atmosphere which would seriously injure the cloth in the absence of said evaporation.

Another object of the invention is to provide a method and apparatus for drying a strip of cloth utilizing a single pressure creating means in a closed chamber, or (1) drawing air into the chamber, (2) exhausting air from the chamber, and (3) circulating and recirculating air within the chamber.

Another object of the invention is to provide flexible conditioning of the air in a drying chamber, and which will be responsive to changes in the speed of travel of the cloth through said chamber.

Another object of the invention is to provide simple, practical and efficient drying means whereby the size of the finishing chamber may be materially reduced and whereby the speed of travel of cloth through the finishing chamber may be greatly accelerated.

Other objects will be in part obvious or in part pointed out hereinafter.

The invention accordingly consists in the features of construction, combinations of elements, arrangements of parts, and in the several steps and relation and order of each of said steps to one or more of the others thereof, all as will be pointed out in the following description, and the scope of the application of which will be indicated in the following claims.

The terms “air” and “gas” employed herein for the attempering medium are used in a broad sense and are each intended to include ordinary
leaving chamber B may be on the order of from 160° to 175°.

It will be obvious at once that the pre-drying operation carried out in chamber A speeds and facilitates the treatment in chamber B by lessening the water content of the cloth which needs to be removed in chamber B, and this makes it possible to advance the continuous strip of material S at a much faster speed than would otherwise be possible without greatly increasing the length of chamber B which is undesirable in view of the large amount of factory space which, prior to this invention, has commonly been devoted to finishing.

Referring now to chamber A, Figures 1 and 3, it will be seen that a closed chamber is provided having entrance and exit openings 11 and 15 for a length of cloth in open condition. The cloth may if desired be passed through chamber A in a straight line but is preferably passed through a path describing three sides of a rectangle, rollers 16, 18, 19 and 15 being provided for this purpose and mentioned within chamber A. As illustrated, one or more of said rollers may be positively driven from any suitable source of power, preferably from the same source of power as fan 21 referred to below. An air inlet port 17, is provided, preferably adjacent and below the cloth exit opening 15, and an air outlet port 18 is provided, preferably adjacent and above the cloth entrance opening 11. As illustrated herein, the exhaust port 19 is an elongated port extending substantially parallel with the first, and as illustrated herein, the upwardly extending portion of the path of the cloth within the chamber A described in passing from roller 15 to roller 14, the air exhausted through port 18 being discharged through exhaust conduit 18.

A stream of attempering air or other gas is brought into contact with the strip of cloth moving through chamber A. This attempering air or other gas may, if desired, be heated externally of chamber A and introduced into chamber A, and into contact with the moving strip of cloth S at the desired temperature, which may be controlled, as by known thermometric equipment, in respect of whether the heating is performed internally or externally of chamber A. In the embodiment of the invention shown herein, however, the means for heating the attempering air or other gas is contained within chamber A and the heating means, and the means for maintaining a desired circulation of air in chamber A, and into and out of chamber A, and the path of the cloth through chamber A, are devised and coordinated so that they cooperate, and are mutually dependent one upon another to provide useful and novel features resulting in advantages and economies as will be described.

Within chamber A a heater 20, of any suitable desired kind, a source of pressure, which conveniently may be a double inlet type of fan such as fan 21, and an air distributing casing 22, are provided, which, as illustrated herein, are all positioned on the same side of a length of cloth passing through chamber A. Thus in the embodiment of the invention shown herein the heater 20 is below the path of the cloth between rollers 14 and 15, and is between and substantially below the vertically extending portions of the path of the cloth, between rollers 13 and 14, and rollers 18 and 19, respectively. The heater 20 is located preferably adjacent and below the air inlet port 17 in position to receive the outside air, and, after heating it, to deliver it to the fan 21.
which as illustrated herein is placed adjacent and substantially below the cloth entrance opening 11. In alignment with the heater 20, and spaced from the side wall of chamber A, the air from the heater 20 may flow readily into the fan side inlets 21a and 21b. Fan 21 may be driven by any source of power such for example as an electric motor (not shown).

The air distributing casing 22 is positioned between fan 21 and the path of the cloth through chamber A. Casing 22 has an opening 23 communicating with the outlet of fan 21 whereby air is delivered into casing 22 from fan 21 at a definite pressure. The surface of casing 22 is provided with a plurality of elongated ports 24 extending toward the cloth at spaced intervals, each of said ports projecting outwardly from the main body of the casing and decreasing in width toward the discharge end thereby forming a series of elongated nozzle-like apertures adapted to direct a multiplicity of streams of air directly against one surface of the cloth.

As illustrated herein the ports 24 are provided on three sides of casing 22 to conform to the path of cloth S which is illustrated herein as describing substantially three sides of a rectangle. It will be noted that between adjacent ports 24 substantially U-shaped or trough shaped channels 25 are formed extending laterally the full width of the cloth. The extremities of the ports 24 are somewhat spaced from cloth S, the aperture as illustrated herein being on the order of six inches, to permit an increment of the air striking the surface of cloth S and which does not pass through the cloth, to be deflected along the surface of the cloth, and into the channels 25 on either side of a given port 24 and to thus be returned for recirculating as will be described.

The rollers 14 and 15 are mounted so that they are somewhat spaced from the top of chamber A to provide an air space above the length of cloth S, and the chamber is of a size such that air spaces or passages are provided between the lateral edges of the cloth and the side walls of the chamber. Adjacent the path of the cloth within chamber A a perforated backing 26 is provided, substantially co-extensive with the path of the cloth, and of a width on the order of the width of the cloth to limit deflection of cloth S due to the pressure of air directed at it from the ports 24, and to act as a guide for the cloth to continue it moving through the chamber in a relatively smooth, continuous manner.

When air is forced from fan 21 into casing 22 and through ports 24 against one surface of cloth S, which as illustrated herein is the under surface of the cloth, a volume of air, depending on the pressure within casing 22, and the weave of the cloth, will be forced directly through the cloth and through perforated plate 26 into the space 27 on the far side of the cloth from casing 22, and it will be observed that all of the air thus passing through the portion of the cloth passing between rollers 15 and 14, which is the portion of the cloth nearest the entrance end of chamber A is the wettest portion of the cloth within chamber A, will be discharged directly through exhaust port 18 and carried away through exhaust conduit 19. Thus the air passing through the wettest portion of the cloth within chamber A is immediately removed from chamber A and is replaced by air admitted into chamber A through port 17. The air passing through the remainder of the strip of cloth within chamber A, including both the portions of the cloth passing between rollers 14 and 15, and between rollers 16 and 17, will be deflected by the walls of chamber A, and redirected downwardly and along the side walls of chamber A to be mixed with newly admitted outside air from port 17, and is reheated by heater 20 and returned to fan 21 to be redirected against the moving strip of cloth.

If dampers 34, controlling the closure which receives the attempting air from air distributing casing 22 as will be described, are not substantially closed, any portion of the air directed by ports 24 against the surface of cloth S which is not forced through the cloth is deflected by the surface of the cloth and will flow laterally of the cloth through the trough-like channels or conduits 25, and down along the sides of casing 22, and between the casing 22 and the side walls of the chamber, to be also mixed with newly admitted outside air, and reheated by heater 20, and returned by fan 21 to be redirected against the strip of cloth through the ports 24 of casing 22.

Partition walls 23 are provided intermediate the side walls 29 of casing 22 and the side walls 30 of chamber A, as illustrated in Figure 3 forming, with side walls 28 of casing 22 and the upwardly, horizontally and downwardly extending flights of a strip of material S, a closure adapted to receive attempting air from air ports 24 of air distributing casing 22. It will be understood that during the operation of the apparatus the foresaid portions of a strip of material S will be deflected against backing 26 and will thus extend between and be substantially a continuation of the imperforate lateral margins of backing 26 which in turn join and are preferably integral with the upper ends of partition members 28, as illustrated in Figure 3. Dampers 34 are provided, between the sides 29 of casing 22 and partition members 28 respectively, by which the escape of attempting air from said closure, except by passing through the portion of the strip of cloth S which is cooperating in forming said closure, may be controlled and the pressure within said chamber regulated to increase or decrease the volume of air forced through the cloth within a given interval of time. The spaces between partition walls 28 and the side walls of casing 22, and the side walls 30 of chamber A, respectively, provide separate passages, for the return of the non-exhausted portion of the air which is passed through cloth S, and for the air which is returned after being deflected from the inner or lower surface of the cloth S. To further control the recirculation of air within chamber A and the admission and exhaustion of air from chamber A the damper 31 is provided to control the admission of outside air through inlet port 11, damper 32 is provided to control the exhaustion of air through exhaust port 18, dampers 33 are provided to control the return flow of air which is passed entirely through cloth S in the passage formed between the partition 26 and the side walls 30 of the chamber, and dampers 34 serve also to control the return flow of air which has been deflected from the surface of the cloth S, between the side walls 29 of casing 22 and the partition 28 in addition to controlling the pressure built up in the closure comprised by the casing 22, the partition members 28, and a portion of a strip of cloth S, as illustrated in Figures 1 and 3. These dampers may be controlled manually, or by known automatic control...
means to control the volume of air admitted to chamber A, the amount exhausted, and the proportion recirculated, in accordance with the condition of the cloth and its speed of travel through the chamber.

Between heater 20 and fan 21 the baffle or shield member 28 is provided extending vertically substantially to the top of fan 21 but spaced from the side walls of chamber A so that the highly heated air from heater 20 will not flow directly against the hood of fan 21 but will be deflected around either side of the baffle 28 and drawn into fan 21 from either side through the ports 21a and 21b of the fan. Extending from the top of baffle 28, rearwardly of chamber A and inclined downwardly toward heater 20, baffle or guide plate 38 may be provided, terminating somewhat above the top of heater 20 and serving both to direct the flow of heated air from heater 20 to fan 21, and to direct the return flow of air to a point above the heater adjacent the air inlet port 17 so that the return air and the newly admitted air will be mixed and heated together and delivered to fan 21. Dampers 31, 32, 33 and 34 may be adjusted manually, or if desired, automatically. Preferably exhaust damper 32 is left open and damper 31 for the admission of air is controlled by any suitable known means to operate in accordance with the movement of the strip of cloth S. Temperature control means, such as a thermostatically controlled means, for regulating the flow of fuel to the heater is provided, the flow of fuel being synchronized with the movement of the cloth as will be described. Thus damper 31 will open when the strip of cloth is moving, and in accordance with the speed of movement of the cloth, and will be closed when no cloth is moving through the chamber. Dampers 33 and 34 may be operated to control the proportion of the air passing through the cloth.

The air directed against the cloth through ports 24 in casing 22 may be heated to temperatures far in excess of those heretofore used in drying cloth. Thus in accordance with the invention the air directed against the cloth in chamber A may be heated to a temperature which will usually be above 200° F., preferably above 300° F. and which may be on the order of 700°-800° F. or even higher. If the cloth itself were to attain such high temperatures it would be destroyed or seriously impaired in quality and the use of such temperatures in the attenuating chamber is made possible by the conditioning of the air within chamber A which is achieved in the manner described above and which results in continuous evaporation of moisture from the surface of the cloth whereby the temperature of the cloth, despite the high temperature of the air to which it is subjected, is maintained below temperatures damaging to the quality and condition of the cloth, and which in the embodiment of the invention described herein is controlled as desired within a range having 60°-200° F. as its upper limit.

Due to the extremely high temperature of the air which is directed against the cloth in chamber A, and the rapid evaporation achieved in chamber A, the time required for reducing the water content of the cloth is thus materially reduced in the case of the treatment of woolen and worsted cloth may be on the order of 20 to 30% water content, is only a fraction of the time heretofore required for the same operation.

It will be also readily understood that the pre-drying step performed in chamber A requires much less space than has been the case with the pre-drying steps heretofore used wherein the cloth was festooned throughout a substantial portion of its length in a chamber heated, by steam coils or otherwise, to a temperature having 300° F. as substantially its upper limit, due to the fact that the temperatures in excess resulted in impairment and deterioration of the quality of the cloth.

Furthermore it will be seen that the arrangement of the air ports 24 in chamber A, whereby the cloth is led through a substantially rectangular path while all portions of it are subjected to the impact of a highly heated attenuating medium such as air results in a further economy of space.

The forcing of air directly into the cloth in accordance with the invention has the great advantage of promoting even and uniform drying even on the interior of the fibers of the cloth which have commonly not been dried uniformly with the fiber through the methods of drying heretofore practiced. And such unevenness in drying has raised problems in keeping the cloth smooth which has complicated the work of finishing the cloth, which step has also been previously complicated by the far greater proportion of the drying operation which has customarily had to be performed with the finishing operation.

From chamber A the strip of cloth S passes into chamber B, which is preferably also a closed chamber having cloth inlet and exit openings 31 and 38, and air inlet port 39 preferably located adjacent cloth exit opening 38, and exhaust port 40 preferably located adjacent the cloth entrance opening 37. Within chamber B there is provided heating means 41 and a source of air pressure, such as fan 42, which communicates directly with the upper air conduit or header 43, and the lower air conduit or header 44, through connecting conduits 45, which as illustrated in Figure 4 form a continuous circular connection with the upper and lower headers 43 and 44. A tenter frame of known construction extends into and through the interior of chamber B, and comprises the endless chains 45 supported on sprockets 47 rotatably mounted on bases 48a and 48b respectively. The bases 48a and 48b are engaged by worm gears 48c and 48d, respectively, with a shaft 48e oppositely threaded from its respective ends to the middle, mounted between support members 48f and 48g, and rotatable, as by a control wheel 48h, to move the opposite members of pairs of sprockets toward or away from one another to control the width of the tenter frame as may be desired. The chains 46 are driven at a synchronized speed by any suitable source of power, such as an electric motor (not shown), which speed will be the same as that of the cloth passing through chamber A. The strip of material S before entering into chamber B is attached at its lateral edges respectively to chains 48 in any suitable way as by tenter hooks 49 of any suitable kind supported on chains 48. The tenter frame construction is well known and forms no part of the present invention.

The headers 43 and 44 are provided at spaced intervals with the transversely extending elongated ports 50 and 51 respectively, which pro-
fect toward opposite surfaces of cloth S and may be similar to ports 24 of casing 22 in chamber A but which are preferably, but not necessarily, arranged as illustrated so that the ports 50 of header 43 are directly opposed to the ports 51 of header 44. The force of the air jets from ports 50 is thus balanced by the force of the air jets from ports 51 and the strip of cloth S is maintained substantially in equilibrium in its passage between headers 43 and 44 and will be deflected in the space between headers 43 and 44.

Because of the large reduction in moisture content of the cloth accomplished in chamber A the remaining increment of moisture, which it is desired to remove from the cloth before it reaches the end of chamber B, in order to provide the best condition for finishing the cloth being treated, may be speedily removed at the comparatively low temperature employed in chamber B, and at the higher speed of travel of the cloth through chambers A and B made possible by this invention.

In the embodiment of the invention disclosed herein the speed of travel of the cloth is controlled to insure that the cloth upon reaching the end of the finishing chamber B will have the desired moisture content. This control may of course be accomplished manually by an operator as by providing any known speed control means for regulating the speed of travel of the cloth and having the operator adjust this speed control means after noting the difference in reading between dry and wet bulb thermometers which may desirably be placed respectively in the attacking air current, before it contacts the strip of cloth S, and in the return flow of air, just after it has contacted the strip of cloth.

In Figures 5 and 6 of the drawings automatic control means are indicated; for regulating the extent to which the attacking air is heated, in both chambers A and B respectively; for indicating the drop in temperature of the attacking air or other gas employed due to its contact with the strip of material; and for regulating the speed of travel of the material through chambers A and B in accordance with the drop in the temperature of the attacking air due to its contact with the strip of cloth S.

In connection with chamber A the thermometers 52 and 53 are shown positioned respectively in the stream of attacking air, or other attenuating gas employed, just prior to its contact with the strip of cloth S, and in the current of air just after it has contacted the strip of cloth S. Thus the thermometer 52 will record the temperature of the air or other attenuating gas just before its contact with the strip of cloth to be dried, and will give what is termed the dry bulb reading, and the thermometer 53 which, as illustrated, is positioned in the stream of air which has passed entirely through the strip of cloth S in chamber A, will give the temperature of the air or other attenuating gas after it has taken up moisture due to its contact with the strip of cloth S, and has given up heat in so doing, and will give what is termed the depression reading. The thermometers 52 and 53 are employed herein as thermostatic elements, and may be connected in any of several well known ways with any one of a number of different types of control devices, such for example, as an "Air-O-Line" controller 54. The control means 54 shown herein is indicated schematically, but as is well known to those skilled in this art such controller means is equipped with recording pens p1 and p2 adapted to make a continuous record on a chart, which is moved slowly past the pens, as by clock mechanism, so that a given relative longitudinal movement of the chart may be accomplished in each twenty-four hours during which angular movements of the recording pens p1 and p2, respectively on the chart, due to changes in the temperature reading of the thermometers 52 and 53, will be recorded on the chart as continuous record curves. The thermometers 52 and 53 are connected with pens p1 and p2 by means of the air conduits 52a and 53a respectively, and in the expansion and contraction of the air within these conduits cause and determine the angular movement of the pens p1 and p2 transversely of the chart on which they are recording. Movement of the pens may be utilized to control other apparatus and as illustrated herein variations in the reading of thermometer 53 reflected by the movement of pen p2 serve to control valve 55, which as indicated herein is a diaphragm type of valve connected to controller 54 by an air line or conduit 68. In this type of valve compressed air from any suitable source, such for example as a Spencer blower (not shown), is supplied, as through conduits 57 and 57a, to the interior of valve 55, and this air, contained within valve 55, is actuated to open and shut valve means controlling the flow of fuel to heater 29, through fuel conduit 29a, by movement of the diaphragm of valve 55 due to expansion and contraction of the gas in conduit 56 which in turn is caused and determined by the position of pen p2.

It will be understood that the control means shown herein in connection with a gas heater installation is merely exemplary, and that any other desired heating means may be employed including fuel oil, steam, hot water, and electricity, and control means suitable to the type of fuel may be employed.

Positioned, preferably on the outside of chamber B, adjacent its discharge end, another control device 60 is indicated, which may desirably be similar to control device 54. It may also be provided with recording pens which are indicated as p3 and p4. Pen p3 is shown connected with thermostatic element or thermometer 61 by air conduit 62, and pen p4 is shown connected with thermostatic element or thermometer 63 by air conduit 64. Thermometer 61, like thermometer 53, is positioned in the stream of air which has just contacted the strip of cloth S and is thus employed in carrying away moisture from the strip S. The thermometer 61 serves for chamber B, as thermometer 52 does for chamber A, to record the temperature of the attacking air employed, and is connected by air conduit 56a with the valve 55a, which may desirably be similar to valve 55, referred to above in connection with the control means for the heater 20 for chamber A, and serves to control and regulate the supply of fuel to the heaters 41 of chamber B through fuel conduits 41a and 41b respectively. Compressing air is supplied to the interior of valve 55a, as from a Spencer blower mentioned in connection with the control for heater 20, through conduits 67, and 67b. In the operation of the device the temperature of the attacking air, which as explained above will be different for chambers A and B, is ordinarily maintained constant for the particular cloth being dried. Thermometer 63 records the...
drop in the temperature of the air below the reading of thermometer 61 occasioned by its contact with the strip of material S, and the difference in reading between thermometers 63 and 61 thus provided being removed from the cloth. When the temperature differential between thermometers 61 and 63 is small it will be understood that very little moisture is left in the cloth and it will be desirable to increase the speed of travel of the cloth both to overcome condensation on the surface of the cloth itself, and for increased output within a given period of time. When on the other hand the temperature differential between thermometers 61 and 63 is large it will mean that a substantial amount of moisture still remains in the cloth and in this case it may be desirable to slow the speed of travel of the cloth in order that the desired amount of moisture will be removed from the strip of cloth by the time it reaches the end of chamber B.

In order to adjust the speed of travel of the cloth in accordance with the differential readings of thermometers 63 and 61, pen 94 is connected by means of a gas conduit 65 to any known speed control device, such as a Reeves speed control 66, indicated schematically, so that increased expansion of the gas in conduit 65 caused by the angular movement of pen 94 causes the sheaves contained therein, and on which chains 48 are supported, to be shifted laterally in one direction thus increasing the speed of travel of strip S, whereas contraction of the gas in conduit 65 causes the opposite movement. In this way a self-operating and wholly automatic means is provided for controlling the speed of travel of a strip of material S through chambers A and B in accordance with the temperature differential between thermometer 61, which is ordinarily maintained constant, and thermometer 63.

Thermometer 63 is preferably positioned in a stream of recirculating air which has been deflected from the strip of cloth S and is flowing between two adjacent elongated ports 58, as illustrated in Figure 5, and preferably it is provided with a shield 97, extending around the thermometer and enclosing it except at the lower end, so that thermometer 63 will not be contacted by air flowing directly from elongated ports 58, but only by air which has been in contact with strip of cloth S and has been deflected therefrom. The shield 97 may desirably have an aperture 98 which is preferably arranged in the center of the top of shield 97, just above the thermometer 63, so that the air bearing moisture from contact with the strip of cloth S will flow up and around thermometer 63 and will escape from shield 97 through port 58. Similar shield means may be provided if desired for thermometer 53 but such shield means is less desirable in connection with thermometer 53 because it will be noted that thermometer 53 is positioned in the stream of air which is being recirculated, after passing entirely through strip of cloth S in chamber A and is thus not in a position to be contacted by the attacking air. Shield means would be desirable if thermometer 53 were positioned as it may be in the stream of air deflected from the lower surface of the strip of cloth S in chamber A. Of course the positions of the thermometers 62 and 53, and 61 and 63, may be varied as desired provided that each pair of thermometers employed is positioned to record respectively the temperature of the attacking air before contact with the strip of cloth S and the temperature of the air just after it has contacted the cloth, and irrespectively of whether it has passed through or been deflected from the surface of the strip of cloth S.

By the two-stage drying described above, employing a percentage temperature far in excess of those heretofore used in drying cloth, the speed of travel of the cloth during drying may be increased several hundred per cent relative to speeds presently used in textile mills, and the space devoted to drying may be decreased by 50% or more.

It will thus be seen that there has been provided by this invention a method and apparatus in which the various objects heretofore set forth together with many thoroughly practical advantages are successfully achieved. As various possible embodiments might be made of the mechanical features of the above invention and as the art herein described might be varied in various parts, all, without departing from the scope of the invention, it is to be understood that all matter heretofore set forth or shown in the accompanying drawings is to be interpreted as illustrative and not in a limiting sense.

What we claim is:

1. Apparatus for conditioning and drying a strip of textile material which comprises a closed chamber having exit and entrance openings for the passage of the strip of material, a perforated backing plate extending from adjacent the inlet end to adjacent the exit end of said chamber, and support means for said strip of material adapted to guide the material adjacent one face of said perforated backing plate, a port for admitting air into said chamber, an air exhaust port, means for controlling the volume of air admitted into and exhausted from said chamber, air heating means positioned in said chamber adjacent the air inlet, and means for directing the heated air into contact with the material on the side of the material remote from said perforated backing plate, the said backing plate having angularly related lateral portions forming, together with said chamber side walls and the side walls of said means for directing the heated air, air passages, leading to said exhaust port, and to the one face of said perforated backing plate, and from below the lateral edges of a strip of material passing through the said chamber, respectively, back to said heating means, whereby air which has passed through the dryer portion of the material and air which has been deflected from the lower surface of the material is returned, mixed with incoming air, reheated, and recirculated, and individual means for controlling the flow through said passages.

2. Apparatus for treating cloth to dry it which comprises, a substantially closed chamber having exit and entrance openings for a length of cloth, means for advancing a strip of cloth continuously from end to end through said chamber, a perforate backing member positioned within said chamber so as to provide a channel for the passage of a length of cloth between itself and said cloth advancing means, said channel being positioned to one side of said chamber, an air inlet port positioned on the other side of said chamber, heating means positioned adjacent said air inlet port, and air distributing means adapted to direct a number of streams of attempering air against and through said strip of cloth passing through said channel, said channel and the wall of said chamber being so related to each other and to said exhaust port that a portion of said backing member and of the length
of cloth passing through said channel cooperate with the chamber wall and said exhaust port to provide a passage into which air passing through the wettest portion of said cloth is immediately received and exhausted from said chamber, and said backing member having lateral portions extending intermediate the chamber walls and said air distributing means whereby providing air passages around the lateral edges of said channel and facilitating the recirculation of air following its contact with said length of material, from the lateral edges of said channel back to a point where it is mixed with the incoming air from said air inlet port and entrained therewith for recirculation, and air impeller means, intermediate said air inlet and said air distributing means, adapted to suck air into said chamber through said inlet and to force it through said air distributing means against a length of cloth in said channel, whereby an increment thereof passes through the wettest portion of said cloth and is immediately exhausted from said chamber, and another increment thereof passes through the remaining portion of said length of cloth and is returned around the lateral margin of the cloth to be mixed with incoming air, and another portion thereof, which is deflected by its contact with said length of cloth, is also returned to be mixed with said incoming air.

3. Apparatus for heat treating a pervious material such as lengths of cloth and the like which comprises a closed chamber having exit and entrance openings for a length of material, means for continuously passing a length of material through said chamber, and air distributing means having a series of air ejector ports directed at the path of the length of material to be treated, air impeller means communicating with said air distributing means, air heating means positioned in said chamber on the opposite side of said air distributing means from the said path of the material and in communication with said air impeller means, a perforated backing member positioned adjacent the path of the material through said chamber, on the opposite side of the material from said air distributing means, said backing member and means being spaced from the side walls of the chamber to permit circulation of the air from both surfaces of the length of material between the lateral sides of said air distributing means and the respective chamber side walls back to said air heating means, and an exhaust port positioned adjacent the entrance of said material into said chamber, on the opposite side of said perforated backing member from said air distributing means, said air ejector ports projecting beyond the body of said air distributing means and extending across the path of the material in substantially parallel relation thus providing air channels leading to the lateral margins of a length of material traveling through said path and thus communicating with the spaces between the sides of said air distributing means and the lateral walls of said chamber.

4. Apparatus for treating cloth to dry it which comprises a closed chamber having entrance and exit openings for a length of cloth, and means for advancing a strip of cloth continuously from end to end through said chamber, said chamber having an exhaust port substantially paralleling the first portion of the path of the cloth in said chamber to exhaust moisture bearing air passing through the cloth within the said portion of the said path, means for directing a flow of attempering air against the cloth within said chamber, air heating means in communication with said air flow directing means, and a perforated backing member, spaced from said strip advancing means and serving with said cloth advancing means to provide a channel between them for the passage of the cloth, and being adapted to prevent the cloth from being seriously deflected from its line of travel by the impact of the attempering air against it, said backing support and said means for directing a flow of attempering air being spaced from the walls of the chamber leaving air spaces communicating with said air heating means.

5. Apparatus for drying a strip of textile material which comprises a closed chamber having exit and entrance openings for the strip of material, a perforated backing plate extending from adjacent the inlet end to adjacent the exit end of said chamber and having portions extending along the sides of said chamber but spaced from the top and sides of said chamber, and support means for said strip of material supported inside the material adjacent one face of said perforated backing plate, a port for admitting air into said chamber adjacent the exit for the air, an air exhaust port located adjacent the entrance for the material, means for controlling the volume of air admitted into and exhausted from said chamber, air heating means positioned in said chamber adjacent the air inlet, and means for directing the heated air against the surface of the material on the side of the material remote from said perforated backing plate, the said portions of the backing plate which extend along the sides of said chamber forming with said chamber side walls and the side walls of the means for directing said heated air, air passages leading, from the space beyond said perforated backing plate, and from the space between a strip of material passing through the said chamber and said air directing means, back to said heating means.

6. Apparatus for treating a length of cloth to attemper it which comprises, a chamber having air inlet and exhaust ports, means for advancing through said chamber a strip of cloth in continuous condition, a perforate backing member positioned in said chamber so as to provide a channel for the passage of a length of cloth between itself and said cloth advancing means, means for attempering the air in said chamber, air impeller means communicating with said air attempering means, and means communicating with said air impeller means and adapted to bring attempering air into contact with a length of cloth passing through said channel, said backing member having lateral projections extending between said last mentioned means and the side walls of said chamber and forming with said last mentioned means and said side walls air passages leading from the lateral edges of said channel back toward said air impeller means to facilitate recirculation of at least a portion of the air which has been brought into contact with a strip of cloth passing through said channel.

7. Apparatus for treating cloth to dry it which comprises a substantially closed chamber, means for passing a strip of cloth continuously through said chamber, a perforate backing member paralleling the path of the said strip of cloth and forming with said cloth advancing means a channel for the passage of the strip of cloth, a port for exhausting air from said chamber, means for attempering the air in said chamber, means for
directing attempering air against a strip of cloth passing through said chamber, located on the opposite side of said chamber from said port for exhausting air from said chamber, and means for supplying attempering air to said air directing means, said channel being arranged with respect to the chamber wall so that said perforate backing member and a strip of cloth passing through said channel cooperate throughout a substantial portion of their lengths to form with the chamber wall a passage co-acting with said port to immediately remove from the chamber substantially all air passing through the cloth during its travel through the initial portion of said channel.

3. Apparatus for drying cloth which comprises a closed chamber having air inlet and outlet means, a substantially rectangular air distributing means positioned within said chamber, means for advancing a strip of cloth through said chamber along a path forming three sides of a rectangle and extending in spaced relation to and substantially parallel with the ends and top respectively of said air distributing means, air heating means communicating with said air distributing means, and partition members extending in spaced relation to and substantially parallel with the sides of said air distributing means respectively, and forming, with said air distributing means and a strip of cloth being advanced along said path, a closure surrounding the ends, sides, and top of said air distributing means and adapted to receive air therefrom, and adjustable damper means between said air distributing means and said partition members whereby the air pressure in said closure may be controlled to increase or decrease the volume of air forced through the cloth within a given time interval, a perforated backing member positioned in said chamber adjacent to the said path of the cloth, and on the opposite side of the path from said air distributing means, said perforated backing member aiding in defining the path of said material while permitting the escape of at least a portion of the air forced from said closure through a strip of cloth while the strip is passing through the said path and forming a wall portion of said closure.

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