July 3, 1928. 1,676,091

W. W. KEMP

DRYING APPARATUS

Filed March 16, 1925 3 Sheets-Sheet 1

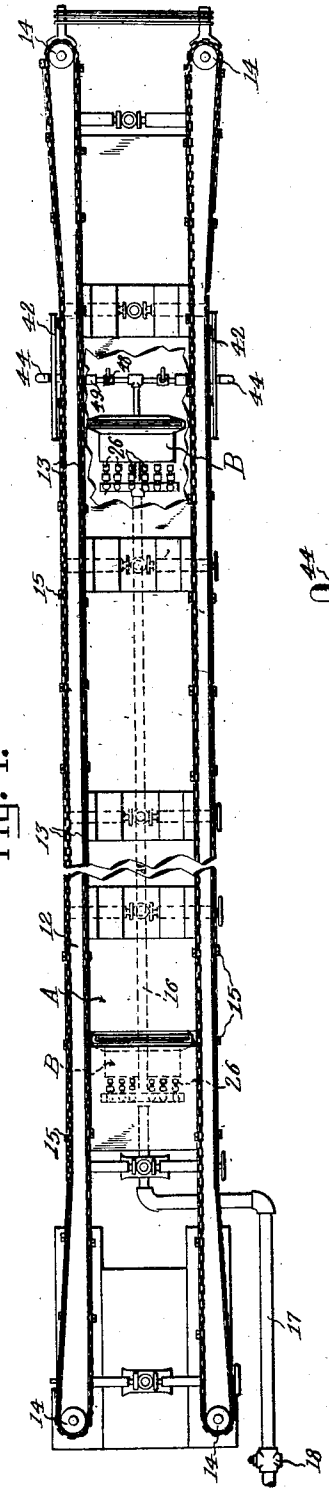


Fig. 1.

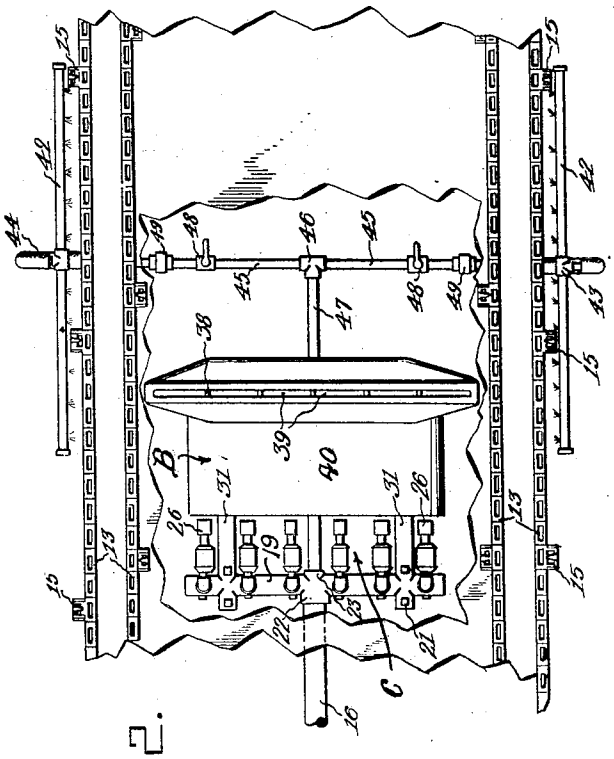


Fig. 2.

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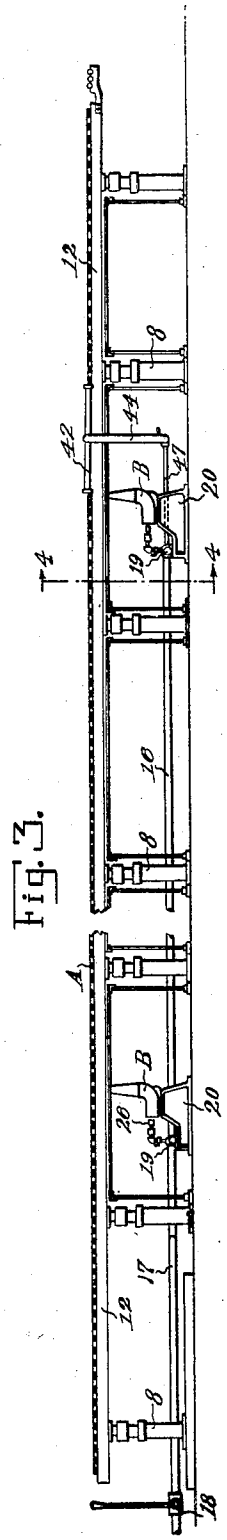


Fig. 3.

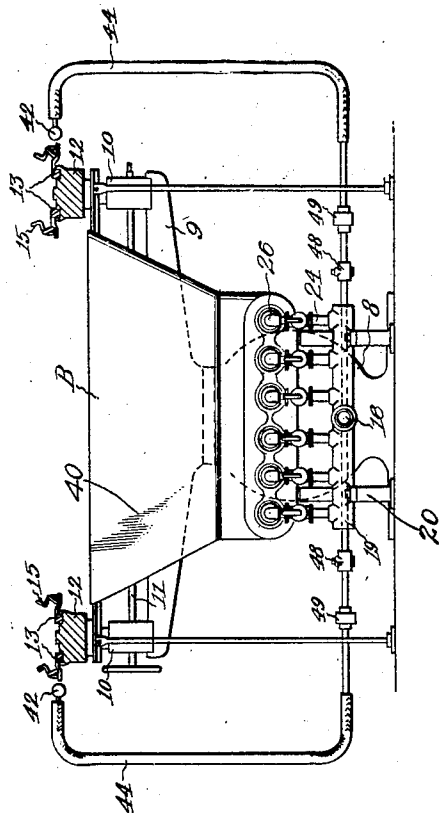


Fig. 4.

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Fig. 6.

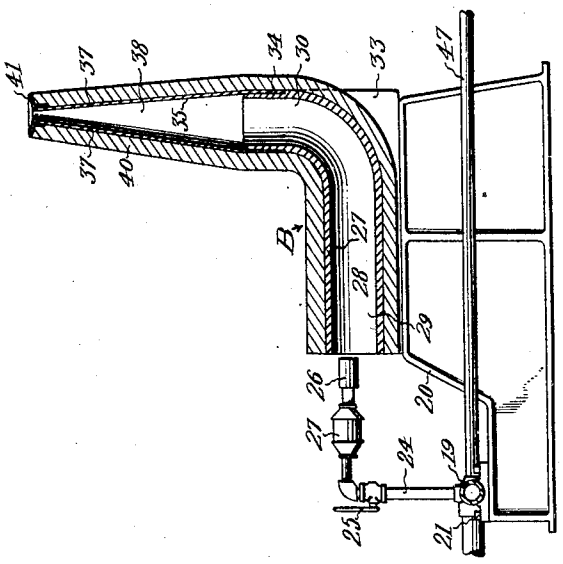
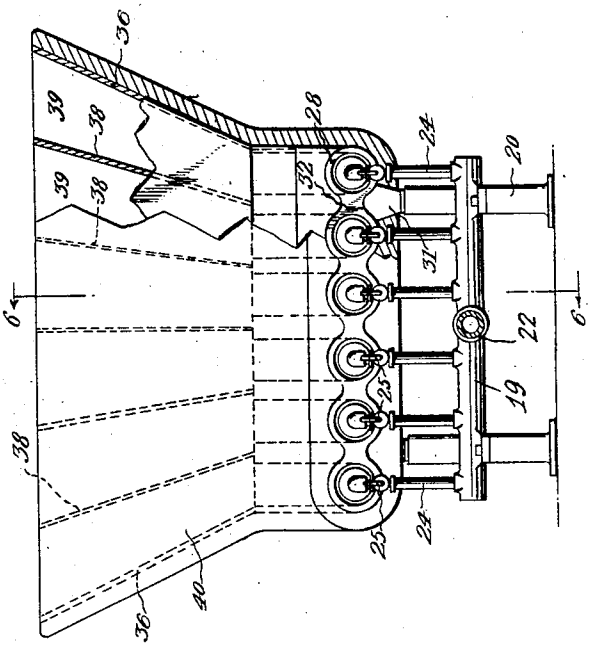


Fig. 5.



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UNITED STATES PATENT OFFICE.

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DRYING APPARATUS.

Application filed March 16, 1925. Serial No. 15,968.

This invention relates to drying apparatus, and, in the present instance, is disclosed in connection with a swing tentering machine employed for drying, stretching and otherwise finishing fabric.

An important object of the invention is to provide a drying device which will heat air to be directed upon fabric to a very high temperature in order to effect rapid drying of the fabric, whereby the speed of the tentering machine can be increased, resulting in increased production of the machine.

Another important object of the invention is to provide a device of the above character by which the width of a heated air blast can be adjusted or varied to accommodate the width of the fabric to be treated, and by which the temperature of the heated air blasts can be varied at will, whereby the fabric can be dried with gradually increasing temperature.

Another important object is to provide means for warming or heating the clamps which grip the fabric, prior to the same engaging the fabric, whereby the portions of the fabric covered by the clamps will be dried; so that no wet or damp spots will appear upon the material after treatment.

A further object of the invention is to employ burners, rather than any other form of heating means, for drying fabric; said burners being constructed and arranged so as to only occupy the minimum space.

In the drawings forming part of the application, and wherein like numerals are employed to designate like parts throughout the several figures,

Figure 1 is a top plan of a tentering machine with my invention applied thereto.

Figure 2 is an enlarged fragmentary plan of a part of the tentering machine, showing one set of burners for drying the fabric and a second set of burners for preheating the chain clamps.

Figure 3 is a side elevation of Figure 1.

Figure 4 is an enlarged transverse section of the machine taken on the line 4—4 of Figure 3,

Figure 5 is an elevation of one of the heating elements, with parts broken away to illustrate the interior construction thereof, and

Figure 6 is a section thereof taken on the line 6—6 of Figure 5.

By way of example only, the invention is herein shown applied to a tentering machine. This tentering machine, illustrated and designated broadly by the letter A, is the type known generally to the art, as a swing tentering machine, which consists, broadly, of a pair of endless tentering chains which are adapted to engage the fabric to be treated and move it longitudinally of the machine. The distance between these chains can be varied by relative movement thereof to accommodate fabrics of different widths. Usually, the distance between the two chains at the delivery end of the machine is greater than the distance between the chains at the opposite or feeding end of the machine for well known reasons; but the distance between the chains over the major portion of the machine is uniform, as will be understood by those familiar with the art. It will also be understood that the side rails of the machine supporting these tentering chains may be alternately reciprocated in the customary manner, by any suitable means not illustrated, for giving to the fabric a crinkly or wavy effect. It is to be understood that the invention is not restricted to use in connection with this particular type of tentering machine or to this particular art, since it will be appreciated that the invention is capable of use in other arts.

In carrying out the invention, a plurality of heating elements are suitably spaced apart longitudinally of the machine and are arranged beneath the fabric moved longitudinally thereby. These heating elements discharge blasts of heated air upon the fabric to thoroughly dry the same, and it has been found that by employing burners, rather than any other form of heating device, and arranging them in proximity to the travelling fabric on the machine, the air to be discharged against the fabric can be heated to a very high temperature; which, in conjunction with the fabric travelling rapidly over the machine, causes production to be materially increased.

The invention also contemplates the preheating of the means engaging the material to move the same; in the present illustration, said means being the ordinary clamps carried by the tentering chains, so that the fabric arranged between the jaws of the clamps will be effectively dried, as well as

the remaining portions of the fabric which are subjected to the drying effect of the heat from the burners.

Referring now, more in detail to the drawings, the numeral 8 designates a plurality of floor stands secured to the floor and arranged suitable distances apart along the center of the tentering machine. These floor stands each carry a cross arm 9 upon each end of which is slidably mounted a saddle block 10 through which extend a right and a left hand screw shaft 11 in the usual manner, whereby these blocks can be moved relatively by turning the screw shaft to adjust the machine to the width of the fabric to be treated. Any suitable means can be used for turning the screw shafts but I have illustrated one end of each shaft as being provided with a hand wheel and the other end thereof as being polygonal for the reception of a hand crank or other suitable tool. A pair of side rails 12 extend longitudinally of the tentering machine and are mounted in the usual manner upon the saddle blocks 10 for supporting and to form guides for the tentering chains 13. These side rails 12 may be alternately reciprocated by the usual means, not shown, since the invention does not reside in the construction of the tentering machine.

As is customary, an endless tentering chain 13 is provided for each side rail 12, and the looped portions thereof extend around sprocket wheels 14, arranged at the ends of the tentering machine and are rotated so that the inner runs of the two chains move along the side rails in the same direction, from the entry end of the machine toward the delivery end thereof. Each of these endless tentering chains is provided at spaced intervals throughout their length with a plurality of automatic clamps 15 of the well known construction, and which are adapted to automatically open, in the customary manner, at the entry end of the machine to receive the selvage edges of the fabric to be treated, after which the clamps automatically close to grip the fabric and cause it to be moved lengthwise of the machine.

The means employed for heating the air to be directed upon the fabric and the means for directing this heated air, consist of a plurality of heating elements, indicated in their entirety by the letter C, which are arranged at suitable intervals throughout the length of the tentering machine and transversely thereof. All of these heating elements are supplied with gas or fuel from a common supply pipe 16, which extends longitudinally and centrally of the machine, as shown. This supply pipe has an offset portion therein adjacent the delivery end of the machine to dispose a portion 17 of the supply pipe to one side of the machine. In this portion 17 is located a quick opening gate valve 18, whereby the flow of fuel to the various heating elements may be controlled.

At suitable spaced points in the supply pipe 16, where the heating elements are to be located, burner pipes 19 are interposed, and are secured upon stands 20 for the various heating elements by means of suitable clamping devices 21 transversely of the tentering machine. Intermediate the ends of each burner pipe 19, a threaded nipple 22 is provided for connection with the common supply pipe and also a threaded nipple 23 for connection to a continuation of the supply pipe, whereby fuel may flow to the various burner pipes of all of the heating elements.

As the burners and heating elements are identical, a description of one will suffice for all. Each burner pipe 19 is provided with a plurality of upright pipes 24, six being provided in the present illustration. Each of these pipes 24 is provided with a valve 25 whereby the flow of gas may be controlled at will, for a purpose which will be hereinafter described. To each of these pipes 24 is connected a horizontally disposed burner or jet 26, between which and its respective pipe 24, is disposed a fire check 27.

In order to direct heated air upon the fabric, a casing, designated in its entirety by the letter B, is secured to each stand 20. This casing includes generally a plurality of passages corresponding in number to the number of burners 26 provided, whereby an individual passage will be provided for the flame and heated air from each burner. These passages are arranged in alignment with their respective burners, and include offset or angular portions so that the heated air from the burners will be deflected so as to impinge onto the fabric undergoing treatment.

It will be noted that the casing B is arranged slightly in advance of the burners 26, and that flames from these burners will be projected into their respective passages of the casing and will create suction to entrain air into the passages to mix with the combustion gas and flames.

This casing B comprises an inner casting 27 of substantially L-shaped configuration, having a plurality of tubular passages 28 formed therein, one passage being provided for each burner 26. These passages, too, have an L-shaped course, the horizontal portion 29 of which is arranged in alignment with its respective burner, while the vertical portion 30 of each passage is directd upwardly, as clearly shown in Figure 6. This casting is rigidly supported upon its stand 20 by means of a pair of brackets 31 secured in a pair of recesses 32 in the bottom of the

casting, and which are formed by the web portions connecting the individual passages of the casting. These brackets are equipped with upstanding parts 33, which are fastened to the back of the vertical part of the casting, as shown in Figure 6.

The upper end of the vertical part of the casting 27 is reduced or rabbeted, as shown at 34 in Figure 6, to receive the lower end of a metallic nozzle 35, which has its end walls 36 arranged in upwardly diverging relationship, whereby the heated air will be caused to spread transversely of the fabric. The side walls 37 of this nozzle converge upwardly, as clearly shown in Figure 6, to cause the heated air to be concentrated and directed upwardly in a relatively narrow path or blast. This nozzle is provided with a plurality of upwardly diverging partition walls 38, having their lower ends resting upon the walls of the casting 27 dividing the same into a plurality of independent passages, so that the heated air in the individual passages 28 will be confined to their respective individual passages 39 in the nozzle defined by the partitions 38.

To prevent the loss of heat, both the casting 27 and the metallic nozzle 35 are provided with a jacket or housing of insulating material 40, and the top edges of this material at the top of the nozzle find reinforcement in a metallic cap piece 41, L-shaped in cross section.

The means provided for preheating the clamps of the tentering chains comprises, in the present instance, a pair of elongated burner pipes 42 arranged longitudinally of the tentering machine at opposite sides thereof. One burner pipe 42 is arranged at the outside of each tentering chain 13 and adjacent the run of said chain arranged outermost, and which travels toward the feeding or entering end of the machine. Each of these burners 42 is provided at its inner side with a plurality of apertures whereby the gas or fuel from the pipe may be ignited and directed toward the chains and clamps as they pass by.

The opposite ends of each burner pipe 42 are connected by a T-coupling 43, to which is connected one end of a pipe 44, the opposite end of each of these pipes being connected to a fuel supply pipe section 45 extending under the tentering machine and to the center thereof to be united by a T-coupling 46, which connects these pipes 45 to a main supply pipe 47, and which has threaded connection with the threaded nipple 23 of the burner pipe 19, arranged nearest the feeding or entry end of the tentering machine. Each of the pipes 45 is provided with a control valve 48 and a fire check 49, so that the flames at the burners will not ignite the gas back in the feed line.

In the operation of the device, the burners 42 are lighted so that the flames therefrom will be directed toward the tentering chains 13 to heat the clamps 15 thereof as they move toward the feeding end of the machine.

In case fabric of the maximum width is to be treated by the machine, the saddle blocks 10 will be disposed adjacent the ends of the cross arms 9, thereby spacing the side rails 12 and tentering chains the proper distance apart to accommodate the fabric. The pipe 44 may be a flexible hose in which event the burners 42 can be secured to the rails 12 in any suitable manner so that the burners may follow the movements thereof without hindrance of supply connections. The valve 25 in each burner pipe is opened, and all of the burners 26 are lighted whereby the heated air will be caused to issue from all of the passages 39 of each heating element B, so that the blasts of heated air will be as wide as the fabric to be treated.

If narrower fabric is to be treated by the tentering machine, the screw shafts 11 are turned to cause the saddle blocks, side rails 12 and tentering chains to move toward each other and toward longitudinal center of the machine, and should the fabric be of such width as to make it necessary to dispose the side rails 12 above any of the burners 26; these burners or any others which control heated air from the passages 39 not arranged directly under the fabric to be treated, are turned off, and only the burners which control the heated air from the passages 39 which are arranged under the fabric are permitted to burn. From this arrangement, it will be obvious that fabric of any width can be treated by the machine, and only such burners of each set as are necessary to cause the desired width of air blasts are lighted.

In treating certain classes of fabric, it is necessary to subject the same to gradually increasing temperature as it passes over the machine. When such operation is necessary, the burners of the heating element nearest the feeding end of the machine are regulated so that the temperature of heated air is below the maximum possible therewith, and the next succeeding heating element in the machine is adapted to be regulated by manipulation of the hand valves 25 so that the heated air from this second element is of slightly higher temperature than the preceding heating element. The other succeeding heating elements of the machine are also regulated to issue heated air at the desired temperature so that the temperature of the blasts of heated air may be successively increased from the feeding end of the machine toward the discharge end thereof. In this manner, it will be seen that as the fabric enters the machine it will be first subjected to an air blast of lower temperature than it receives from the succeeding blasts arranged lengthwise of the machine, and as the fabric travels

still further over the machine, the next succeeding air blast will be of a higher temperature than the preceding blast and so on throughout the length of the machine. It will be appreciated in cases where it is not necessary to gradually increase the temperature of the various blasts of air that the temperature of these blasts may be uniform, or may be varied in any manner to suit the particular fabric to be treated, without departing from the spirit of the invention.

Assuming that the side rails 12 have been adjusted to accommodate the width of the particular fabric to be treated, and the burners 26 have been regulated in accordance with the foregoing, the fabric to be treated is fed into the tentering machine in the customary manner, and as it enters, is gripped by the automatic clamps 15, so that the tentering chains will draw the fabric lengthwise through the machine. The flames from the burners 26 will be directed into their respective passages 28 of the casings B and the heated air therefrom will be directed upwardly by the passages 30, and nozzles 35 in hot blasts against the fabric moving thereover. This heated air spreads out under the fabric and forms a stratum of hot air which moves along with the fabric until it is interrupted by the next succeeding blast. When the weave of fabric being treated is more or less open, some of this heated air which travels along with the fabric will, of course, pass therethrough, but when the fabric is closely woven, this stratum of heated air is maintained practically intact. When it is appreciated that the temperature of the blasts from the heating elements can be raised to approximately 1025° F., and with this stratum of intensely heated air being maintained throughout the length of the traveling fabric, it will be seen that the speed at which the machine ordinarily operates can be materially increased, thereby resulting in materially increasing the production heretofore possible with the same machine, to say nothing of the saving of fuel effected by this arrangement.

With the clamp heating burners 42 in operation, it will be apparent that the automatic clamps 15 of the tentering chains approaching the position where they will automatically grip the fabric, will become heated so that the portions of the fabric clamped between the jaws of these clamps will be dried from the heat given off thereby.

It is to be understood that I do not limit the invention to any particular type of tentering machine, nor to the exact arrangement, shape or size of the various parts of the device, otherwise than specified in the appended claims.

I claim:

1. In a tentering machine having tentering chains carrying clamps, a pair of burners arranged upon opposite sides of the machine for heating said clamps.

2. In a tentering machine, means for moving material, a plurality of independently controlled burners arranged transversely of the machine, and a casing having a plurality of independent passages to receive the flames from said burners, and means for deflecting said flames.

3. In a tentering machine, means for moving material, a plurality of independently controlled burners, a casing having a plurality of L-shaped passages to receive the flames from said burners, and a nozzle on the vertical portion of said casing and having a plurality of partitions defining passages arranged in alignment with said L-shaped passage.

4. In a tentering machine, means for moving material, a fuel supply pipe arranged longitudinally of the machine, a plurality of burner pipes arranged transversely of the machine at spaced intervals lengthwise thereof and communicating with said fuel supply pipe, a series of horizontal independently controlled burners connected with each burner pipe, and a casing for each series of burners for receiving the flames thereof and directing heated air upon the material.

5. In a tentering machine, means for moving material and a plurality of independently controlled burners arranged transversely of the machine for directing a blast of heated air of any desired width upon said material.

6. In a tentering machine, means for moving material, a plurality of burners arranged adjacent said means and having individual control means, and a casing having a plurality of individual passages in alignment with said burners for directing heated air upon the material.

7. In a tentering machine, means for moving material, a horizontal burner jet, and a casing having a passage to receive the flame from the burner and terminating in a vertical outlet to direct heated air upon the material.

8. In a tentering machine, means for moving material, a horizontal burner, a casing having a substantially L-shaped passage including a horizontal inlet to receive the flame from the burner, and a vertical outlet to direct heated air upon the material.

9. In a tentering machine, means for moving material, a plurality of independently controlled horizontal burners, and a casing having a plurality of L-shaped passages having horizontal portions in alignment with said burners and vertical portions directed toward the material upon the machine.

10. In a tentering machine, means for moving material, a plurality of burners arranged transversely of the machine, and casing means having an independent passage for

each burner to receive flames therefrom and to direct heated air upon said material.

11. In a tentering machine having tentering chains carrying clamps, a pair of burners arranged longitudinally of the machine and in proximity to the chains for heating the clamps thereof.

12. In a tentering machine, means for moving material, a burner, and a substantially L-shaped conduit adapted to receive flame from said burner and to direct the heated air upon said material.

In testimony whereof I have hereunto set my hand.

WILLIAM WALLACE KEMP.