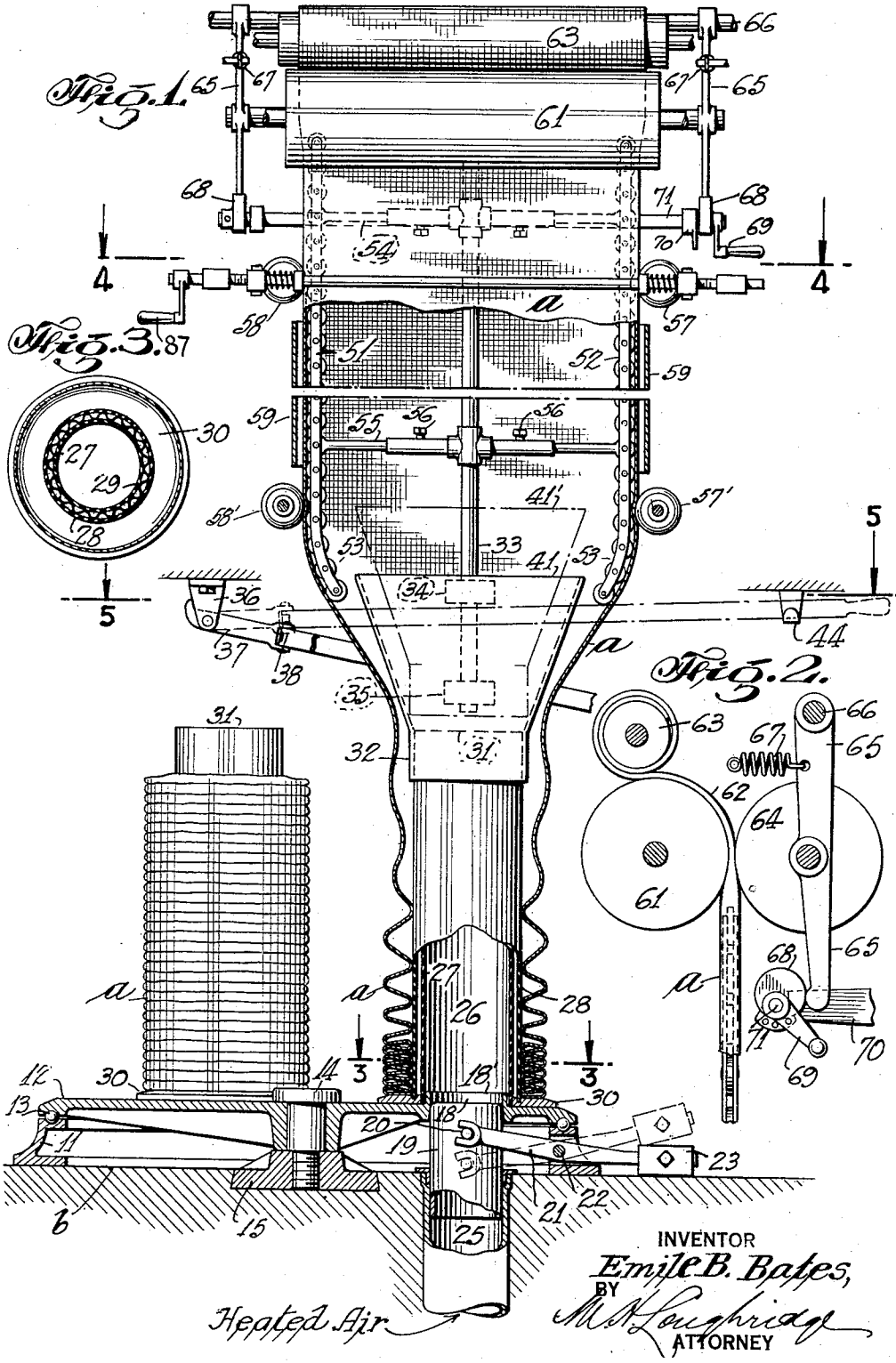
June 9, 1931. E. B. BATES 1,808,879

FABRIC DRYING AND FINISHING MACHINE

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Fig. 4.

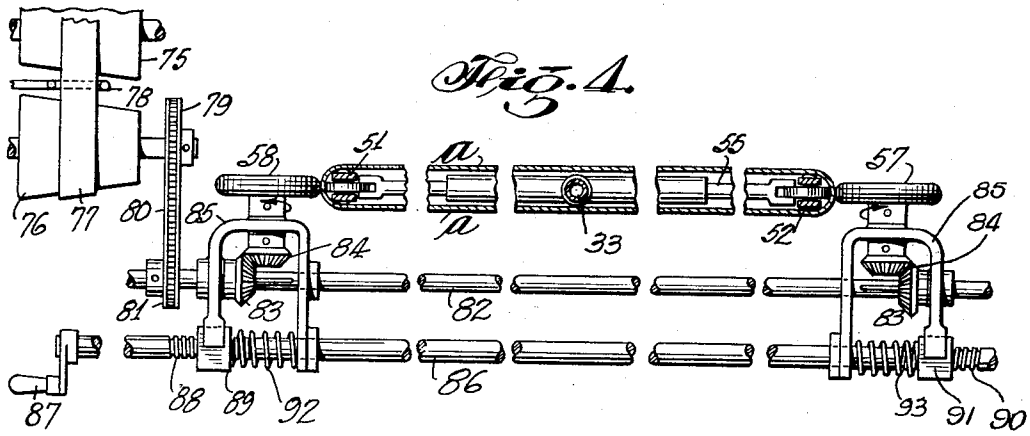


Fig. 5.

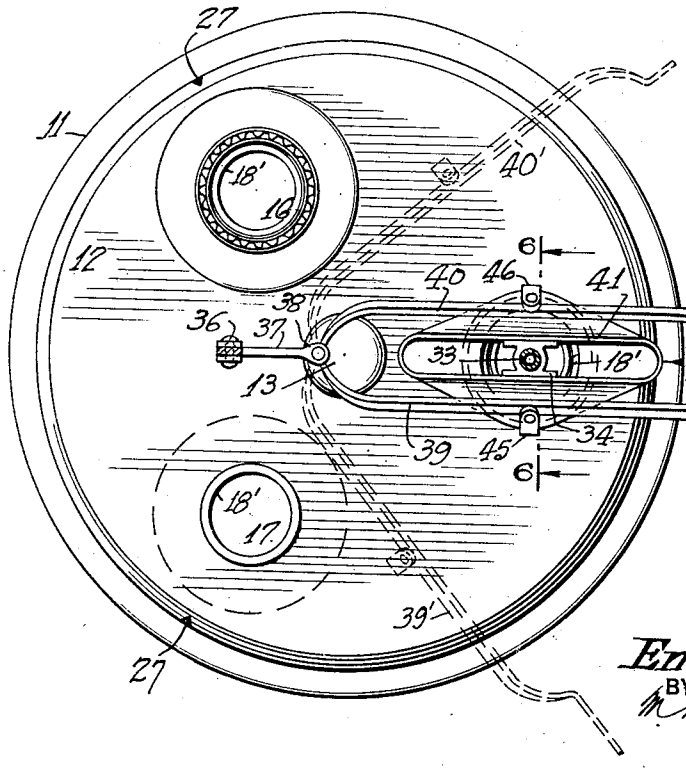


Fig. 6.

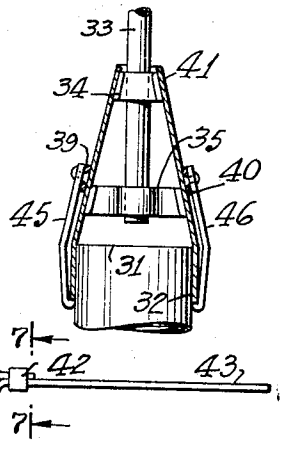
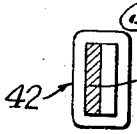


Fig. 7.



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UNITED STATES PATENT OFFICE

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FABRIC DRYING AND FINISHING MACHINE

Continuation of application Serial No. 341,799, filed February 21, 1929. This application filed June 5, 1930. Serial No. 459,370.

This invention relates to fabric drying and finishing machines and has for an object to stretch, dry and finish fabrics in one continuous operation; another object of the invention is to prevent the drying of the fabric under moist heat or under conditions that would give the fibres a permanent set before the fabric is stretched and finished; another object of the invention is to facilitate the reloading of the machine when it is in use. Other objects of the invention will be more particularly understood from the following specification and the accompanying drawings which are largely diagrammatic, in which

Fig. 1 is an elevation of a tentering machine embodying the features of my invention which is partly sectioned to show the construction;

Fig. 2 is a diagram of the finishing rollers;

Fig. 3 is a horizontal cross section of the loading cartridge;

Fig. 4 is a plan view of the fabric feeding mechanism;

Fig. 5 is a plan view of a turntable used in connection with reloading the machine;

Fig. 6 is a sectional elevation of the nozzle applied to the air duct for distributing the air to the tenter frame, and

Fig. 7 is a detail, partly sectioned, of part of the mechanism that may be used to raise and lower the tenter frame.

The present machine may be used with woolen, cotton, silk, or fabrics of a similar kind and comprises a loading cartridge upon which the wet stock is placed; a tenter frame above this cartridge upon which the stock is stretched and dried in a flat formation, and above the tenter frame one or more finishing rollers are provided which may be used to calender the fabric before it is ultimately baled upon a receiving roller. The machine is particularly adapted for use upon fabrics of a tubular character which enclose the loading cartridge and the tenter frame. When the stock is liable to twist the cartridge is rotatably mounted. Where the original stock is supplied in plain webs it is customary to stitch the edges of webs together to make a tubular fabric that can be finished on machines of this type.

Fabrics are usually washed and dyed and in this process are taken in a saturated state from a vat and placed in a dehydrating machine, usually of the centrifugal type, in which the surplus moisture is forced from the fabric without the application of heat. The wet fabric is then taken from the dehydrator and placed on the loading cartridges for use on this machine. These cartridges are tubular with heat insulated walls and provided with a flanged base. The loaded cartridge is then placed over a pipe supplying heated air which passes through the interior of the cartridge. The upper end of the cartridge is provided with a removable top which changes the tubular section of the cartridge to an elongated slot with the purpose of directing the air current in this form into the fabric stretched on the tenter frame above the cartridge.

The tenter frame comprises a vertical rod supported by the removable top of the cartridge and to which, as shown in the drawings, a pair of parallel frame members are adjustably attached, preferably provided with a series of rollers so that the fabric can be stretched and moved over these rollers with comparatively little friction. At the upper end of the tenter frame the finishing rollers are provided, which are of a type customary in machines of this character, arranged to apply pressure to the fabric which can be manually adjusted, and the rollers themselves may be internally heated according to the class of finish desired.

The purpose is to substantially complete the drying of the fabric while it is stretched on the tenter frame and, as the time necessary for this operation varies with the character of the fabric itself, the atmospheric conditions and the amount of heated air supplied, the tenter frame is usually of considerable length running from six to eighteen feet and the speed of the machine may be varied to allow sufficient time for the fabric to dry as it passes over this frame. It is necessary in certain cases to provide a feeding mechanism that will automatically feed

the fabric on the tenter frame, relieve the stresses on the fibres of the fabric and maintain it at a substantial uniform tension. This is secured by one or more sets of opposed rollers which clamp the fabric by a spring engagement against the tenter frame. These rollers are driven by a variable speed mechanism so that the operator can adjust the speed of the roller to prevent wrinkling of the fabric or prevent undue tension arising. These rollers are brought to bear upon the tenter frame on opposite sides by a right and left hand screw arrangement so that the tenter frame is maintained centrally above the cartridge.

To facilitate reloading the machine the cartridges are mounted upon a turntable which can be rotated to bring the loaded cartridge into the operative position below the tenter frame and remove the empty cartridge for replacement. In this operation a sleeve is provided below the turntable which connects the core of the cartridge with the air supply and a lever arrangement is provided for removing the top of the cartridge and raising the tenter frame when the turntable is to be operated.

In the operation of this machine it is desired to prevent the fibres of the fabric being subject to moist heat. This will be understood by considering the effect of moist heat as used in applying permanent hair waves in which the hair is baked under a condition of moist heat and retains the deflections artificially imparted to it. It has been found that wool, cotton and other fibres, when subjected to moist heat, take a permanent set in drying which remains in the fabric afterwards and gives it a cockled appearance and it has also been found that moist heat or prolonged heat is injurious to certain dyes and changes their shade. It is highly important therefore, that the drying operation takes place only when the fabric is stretched and that this drying operation is applied uniformly throughout the fabric.

Tentering frames have been used on drying machines prior to U. S. Patent 1,789,093 of January 13, 1931, of which the present application is a continuation, but these machines do not contemplate the drying of the fabric only in its stretched condition, further, the machines of the prior art have been constructed with tentering frames made in a circular or similar form instead of a flat form. A circular tentering frame engages the fabric only in the form of a hoop at spaced intervals with the result that it is not uniformly stretched and dried and machine marks and distortion usually appear on the finished goods.

When the wet fabric is placed upon an uninsulated receiver through which an air current is passing, the portions of the fabric adjacent the wall of the receiver are dried while the outer portions remain wet. This generates moist heat and unequal drying, also, owing to the time required to run a length of fabric through the machine, the lower portions are subject to drying for a longer period than the upper portions, thus producing unequal effects which this invention avoids. In practice, it is possible with the present machine, to finish striped or barred stock in which the strips remain straight and uniform and the fibres of the fabric itself are so set that it retains its flat, smooth condition and is substantially free from creases and irregularities.

These results are due to the fact that the fabric on the loading cartridge does not receive any heat from the air supply until this air is delivered into the tentering frame where it spreads uniformly throughout the interior of the tubular fabric. The tubular fabric is closed at the upper end where it engages the finishing roller so that the air gradually penetrates the fabric and escapes. A funnel is provided around the body of the tentering frame so that the escaping air is confined around the fabric and rises through this funnel towards the top of the machine.

The established practice at the present time in this industry is to take the wet fabric to drying rooms where it is suspended from horizontal bars without any stretching process during the drying operation. This practice takes considerable time and occupies considerable space which machines constructed according to this invention avoid. Moreover, the irregularities in width and conditions arising from the former methods cause considerable trouble in subsequent finishing operations which this machine prevents.

In the drawings, 11 is the floor plate which supports the turntable 12 through the ball bearings 13 and the center stem 14 mounted on the base 15. The turntable is provided with apertures at 16, 17 and 18 which terminate in raised ledges as indicated at 18′ upon which the loading cylinders are mounted. In the operative position the aperture 18 registers with the air conduit 25 which is connected with this aperture by the sleeve 19. This sleeve is provided with diametrically opposite pins at 20 which are engaged by the fork 21, pivoted at 22 and controlled by the weight 23. By this arrangement the sleeve 19 can be raised to make a continuous connection for the air conduit between 25 and 26 and it can be lowered to release the turntable for bringing the other cylinders into the operative position. The turntable may be provided with indexing marks as at 27, Fig. 5, registering with 27′ in base 11, whereby the operator can determine the position of the turntable relative to sleeve 19.

The loading cylinder or cartridge comprises the inner tube 27 and the outer tube 28 which are spaced by a heat non-conductor, such as the corrugated cardboard at 29. These tubes are supported vertically by the flanged base 30 which also makes a support for the wet fabric *a* which is folded in layers on the outside of the cartridge but which is shielded from the heated air within the cartridge by the non-conducting walls. These walls are preferably made of vulcanized fibre and have a continuous, cylindrical, uniform surface in engagement with fabric and for the air current.

The cartridge is provided with a removable top which develops the cylindrical section of the cartridge into an elongated slot as indicated at 32 and 41 and in section in Fig. 6. This top telescopes at 32 upon the end of the cartridge 31 and rests upon the edge of the cartridge at 31 and is provided with axially centered brackets 34 and 35 in which the tubular stem 33 is vertically mounted and is integrally movable with the top 32. The stem 33 is provided with adjustable transverse brackets 54 and 55 which slide in sleeves and are secured by set screws 56. These brackets support the outer members of the tenter frame 51 and 52 and are adjustable for the width of fabric used. They may be deflected inwardly at the lower end as indicated at 53 to receive the fabric from the cartridge and, if desired, they can be adjusted with a taper throughout their length with the object of compensating for stretch in the fabric as it dries on the frame. The tenter frame is placed between the finishing rollers 61 and 64 and releases the fabric close to the periphery of these rollers so that it may not be distorted before being taken up by these rollers.

The finishing rollers are indicated at 61 and 64, Fig. 2. The fabric passes between these rollers as indicated at 62 and is baled upon the removable roller 63. It is necessary to adjust the pressure on these rollers and also to separate them so that the tenter frame can be elevated between the rollers and also to permit the fabric to be started on the rollers. A typical way of securing this result is indicated in Fig. 2 in which the depending arms 65, pivoted at 66 and normally held to the left by the springs 67, carries the roller 64 which is thereby held in spring tension against roller 61. These rollers may be separated by the cams 68, mounted on shaft 71, in frame 70 and engaging the extended arms 65 as the handle 69 is rotated or adjusted.

In order to replace the cartridges it is necessary to raise the top 32 and the tenter frame secured thereto. One arrangement that may be used for this purpose comprises a lever clamp which can be clamped around the top to hold it in alignment and by which it may be raised and held in the raised position as the turntable is rotated to bring a reloaded cartridge into position. This comprises the lever 37 which is pivoted at 36 and, by the jaw 38, pivotally supports the arms 39 and 40 which are clamped around the head by a sliding clamp at 42. The end of lever 43, when in the raised position, is latched at 44 and thereby the head is held above the cartridge. When the machine is in operation the clamp 42 is released and the arms 39 and 40 are spread away from the fabric to the position indicated at 39′ and 40′. This lever arrangement may be made to engage the top as indicated in Fig. 6 in which the hook 45 secured to arm 39 and the hook 46 secured to arm 40 engage the collar 32 of the top so that it can be lifted or lowered, and at the same time the arms 39 and 40, engaging the flat side of the top, hold it in alignment.

The feed mechanism for the tenter frame will be understood from Fig. 4 in which the driver cone pulley 75, by the belt 77, drives the corresponding cone pulley 76 at a variable speed as regulated by the position of the belt on these pulleys as controlled at 78. The chain belt 80 connects wheel 79 on the shaft of 76 with the corresponding wheel 81 on the splined shaft 82. This shaft has splined thereon the bevelled gear 83 engaging the bevelled gear 84 on the shaft of the rubber tired wheel 58 mounted on frame 85 to engage the fabric *a* and clamp it against the tenter frame 51. A corresponding bevel gear 83, engaging bevel gear 84 on the shaft of wheel 57, mounted in frame 85, clamps the fabric against the opposite side of the tenter frame. The wheels 57 and 58 are thus driven at a speed, which is adjustable, and in correspondence with the speed of the machine, to raise the fabric on the tenter frame. As indicated in Fig. 1, a second set of feed wheels indicated by 57′ and 58′ and driven by a mechanism similar to that described but not shown in the drawings may be used when the tenter frame is unusually long or the fabric unusually heavy.

In addition to driving the wheels 57 and 58 they are held by spring pressure in engagement with the tenter frame and are manually adjusted towards and away from the center shaft 33 to the same extent by the operation of the handle 87 on the shaft 86 which is provided with a right hand thread 88 engaging nut 89 and a left hand thread 90 engaging nut 91. The nuts 89 and 85 which slide on the splined shaft 82, and these nuts by springs 92—93 engage frames 85 to hold the feed wheels 57 and 58 in 91 are prevented from turning by the frames spring engagement with the tenter frame as described. These feed wheels also serve to hold the tenter frame vertical and to prevent

swinging during the operation of the machine.

In starting the machine, the tenter frame is adjusted for the proper width of the tubular fabric, which is threaded over this frame and around the rollers 61 and 63. The handle 87 is then used to bring the feed rollers 57 and 58 into engagement with the tenter frame and the speed of these rollers is adjusted by shifting belt 77 until the fabric is evenly stretched on the tenter frame.

It will be observed that the heated air from the pipe 25 is released at the orifice 41 in an elongated column which uniformly fills the fabric on the tenter frame and thereby dries the fabric as it moves over this frame when in the stretched condition and the escaping air from the fabric is confined by the funnel 59 to the outer surface of the fabric.

I have described and illustrated one form of my invention which admits of application in a variety of ways within the scope of the appended claims.

Having thus described my invention, I claim:

1. In a drying machine for fabrics, the combiantion, a turntable, a plurality of cartridges arranged on said turntable, each having a hollow stem upon the outside of which the wet fabric is placed, a tenter frame arranged to receive the fabric from said cartridges for drying purposes, an air supply pipe below said turntable and an adjustable sleeve for connecting the stem of one of said cartridges with said air supply pipe and means for raising said sleeve and for holding it in the connected position.

2. In a drying machine for fabrics, the combination, a turntable, a removable cartridge on said turntable having a hollow stem upon the outside of which the fabric is placed, a tenter frame above said cartridge arranged to receive the fabric from said cartridge for drying purposes, an air supply pipe below said turntable, a movable sleeve for connecting the hollow stem of said cartridge with said air supply pipe and a lever extending outside said turntable for connecting and disconnecting said sleeve.

3. In a drying machine for fabrics, the combination, a turntable, a removable cartridge on said turntable having a hollow stem upon the outside of which the wet fabric is placed, a tenter frame above said cartridge arranged to receive the fabric from said cartridge for drying purposes, an air supply pipe and combined means for locking said turntable in position and for connecting said air supply pipe with the stem of said cartridge.

4. In a drying machine for fabrics, the combination, a turntable having an aperture, a removable cartridge on said turntable having a hollow stem aligning with the aperture of the turntable and upon the outside of which the wet fabric is placed, a tenter frame above said cartridge arranged to receive the fabric from said cartridge for drying purposes, a removable top for said cartridge supporting said tenter frame, an air supply pipe, a sleeve connecting the stem of said cartridge with said air supply pipe through the aperture of the turntable and means for releasing said sleeve from the turntable.

5. In a drying machine for fabrics, the combination of a turntable having a plurality of apertures with a projecting ledge on each aperture, a cylindrical cartridge with a flanged base upon which the wet fabric is placed arranged to fit over and to be held in position by one of said ledges, an air supply pipe, a tenter frame above said cartridge arranged to receive the fabric from said cartridge for drying purposes and means for supplying air to the fabric on said frame through the apertures in said turntable and through the cylindrical cartridge comprising a removable sleeve connecting the apertures with said air supply pipe.

6. In a drying machine for fabrics, the combination of a turntable having a plurality of apertures, a removable cartridge on said turntable having a hollow stem aligning with one of said apertures and upon the outside of which the wet fabric is placed, a tenter frame above said cartridge arranged to receive the fabric from said cartridge for drying purposes, an air supply pipe in line with said tenter frame, said turntable being arranged to move said cartridge into alignment with said air pipe and said tenter frame and a removable sleeve for connecting said air supply pipe with the hollow stem of said cartridge.

7. In a drying machine for fabrics, the combination, a turntable, a removable cartridge on said turntable having a hollow stem upon the outside of which the wet fabric is placed, a tenter frame above said cartridge arranged to receive the fabric from said cartridge for drying purposes, a removable top for said cartridge developed from a cylindrical form to an elongated slot, brackets axially centered in said top for supporting said tenter frame vertically and an air supply conduit for supplying air to the fabric on the tenter frame comprising a fixed pipe and the hollow stem of said cartridge.

8. In a drying machine for fabrics, the combination, a turntable, a removable cartridge on said turntable, having a hollow stem upon the outside of which the wet fabric is placed, a tenter frame above said cartridge arranged to receive the fabric from said cartridge for drying purposes, a removable top for said cartridge supporting said tenter frame and means for rais-

ing and supporting said top above said cartridge.

9. In a drying machine for fabrics, the combination, a turntable, a removable cartridge on said turntable having a hollow stem upon the outside of which the wet fabric is placed, a tenter frame above said cartridge arranged to receive the fabric from said cartridge for drying purposes, a removable top for said cartridge supporting said tenter frame and a lever detachably clamped to said top for raising and lowering said top and tenter frame.

10. In a drying machine for fabrics, the combination, a turntable, a removable cartridge on said turntable having a hollow stem upon the outside of which the wet fabric is placed, a tenter frame above said cartridge arranged to receive the fabric from said cartridge for drying purposes, a removable top for said cartridge developed from a cylindrical form to an elongated slot supporting said tenter frame and means for raising and lowering said top and for holding said top in a predetermined alignment.

11. In a drying machine for fabrics, the combination, a turntable, a removable cartridge on said turntable having a hollow stem upon the outside of which the wet fabric is placed, a tenter frame above said cartridge arranged to receive the fabric from said cartridge for drying purposes, a removable top for said cartridge having flat sides supporting said tenter frame and means for clamping the flat sides of said top for raising and lowering the top of the tenter frame.

12. In a drying machine for fabrics, the combination, a turntable, having a plurality of apertures, a plurality of cartridges, each having a hollow stem placed over the apertures of said turntable and having the wet fabric placed upon the outside of the stems, a tenter frame arranged above said cartridges to receive the fabric from one of said cartridges at a time, a fixed air pipe for supplying air to the fabric on the tenter frame through the apertures in said turntable and the hollow stem of the cartridge delivering the fabric to the tenter frame, a sleeve connecting said fixed air pipe with the apertures of said turntable and an index on said turntable showing when said cartridges register with said fixed air pipe.

13. In a drying machine for fabrics, the combination, a removable cartridge with a flanged base and a hollow stem upon the outside of which the wet fabric is placed, a removable top for said cartridge developed from a cylindrical form to an elongated slot, a plurality of brackets axially centered in said slot, a rod vertically supported by said brackets, a tenter frame supported by said rod for receiving the fabric from said cartridge for drying purposes and an air supply connected with said fabric on said tenter frame through said hollow stem.

14. In a drying machine for fabrics, the combination, a removable cartridge with a flanged base and a hollow stem upon the outside of which the wet fabric is placed, a removable top for said cartridge, means axially centered in said top, a rod vertically supported by said means, a tenter frame supported by said rod for receiving the fabric from said cartridge for drying purposes, finishing rolls for receiving the fabric from said tenter frame, a hinged clamp for raising and lowering said top and tenter frame and for maintaining said top in alignment with said finishing rolls and an air supply connected with the fabric on said tenter frame through said hollow stem.

15. In a drying machine for tubular fabrics, the combination, a removable cylindrical cartridge with heat insulated walls throughout and a flanged base upon the outside of which the wet tubular fabric is placed, a removable top for said cartridge having an elongated orifice, a flat tenter frame supported by said top in a vertical position above said cartridge for receiving and stretching the fabric from said cartridge, a pair of opposing wheels for pressing the edges of the tubular fabric against said tenter frame, means for driving said wheels in correspondence with the operation of the machine and heated air supplied to the fabric on said tenter frame through said cylindrical cartridge.

16. In a drying machine for tubular fabrics, the combination, a removable cylindrical cartridge comprising an outer and an inner tube with a heat insulating material between said tubes mounted upon a flange and having the wet tubular fabric placed around the outer tube, a removable top for said cartridge telescoping on said cartridge and resting upon the edge of said cartridge, a flat tenter frame supported by said top in a vertical position above said cartridge for receiving the fabric from said cartridge, finishing rolls for receiving the fabric from said tenter frame, means for feeding the fabric on said tenter frame in accordance with the speed of operation of the machine and heated air supplied to the fabric on said tenter frame through said cylindrical cartridge.

In testimony whereof I affix my signature.

EMILE B. BATES.