

May 25, 1937.

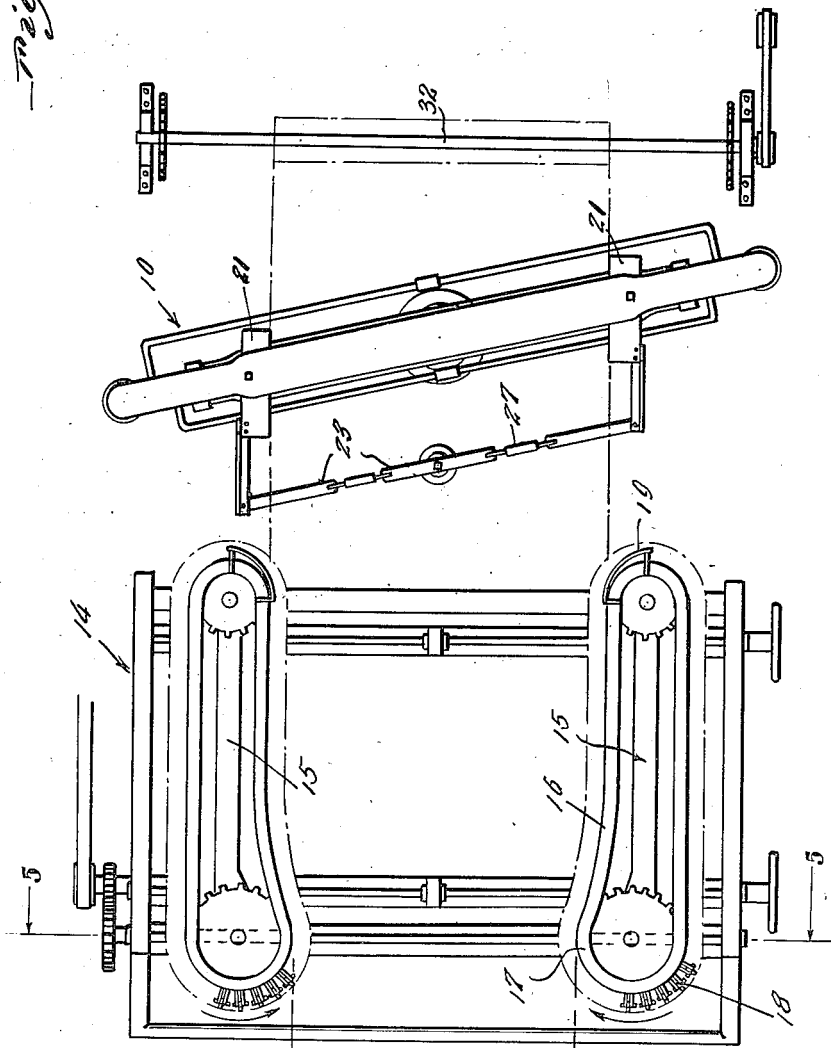
J. J. McCANN, JR

2,081,461

FINISH FOR FABRIC FOR TEXTILE INDUSTRY

Original Filed March 11, 1932 4 Sheets-Sheet 1

*Fig. 1.*



Inventor

*J. J. McCann, Jr.*

By *Clarence A. O'Brien*  
Attorney

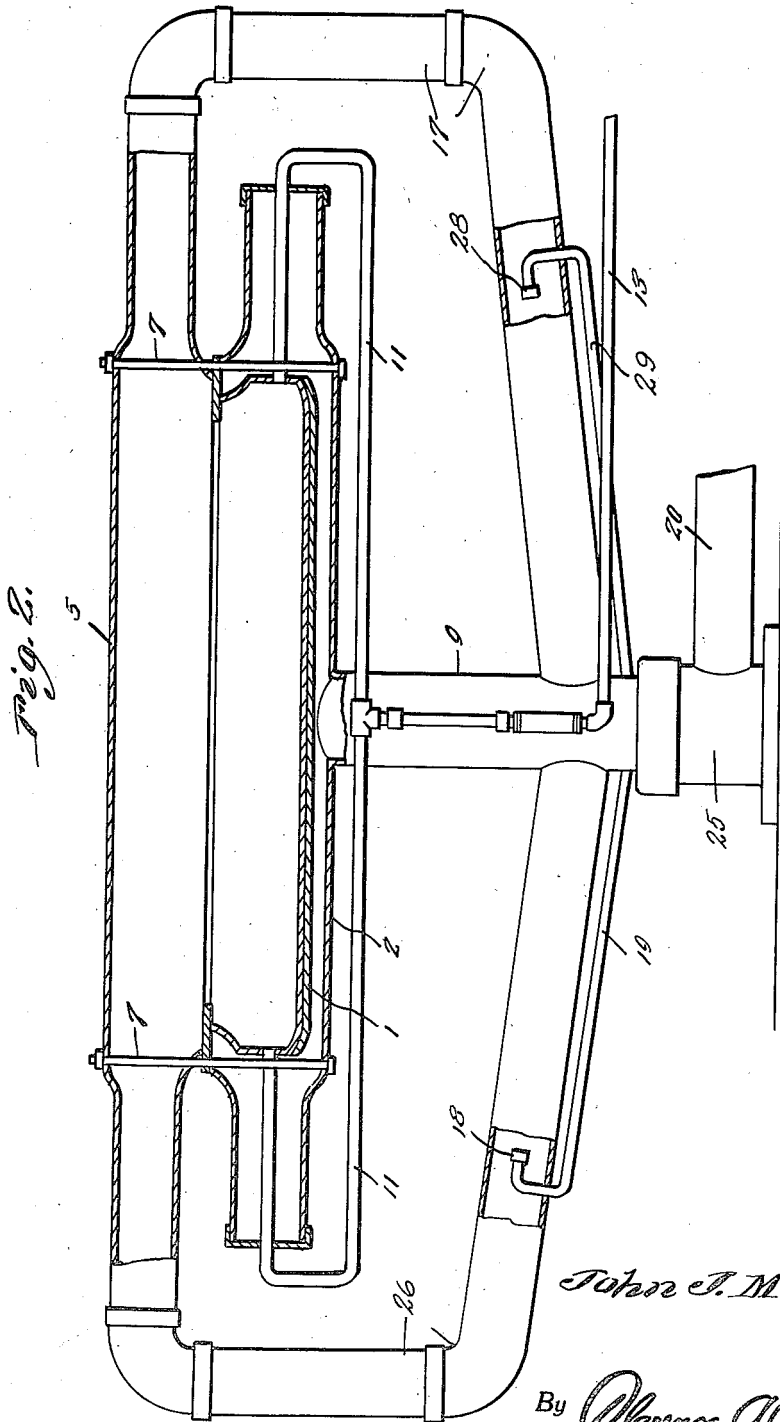
May 25, 1937.

J. J. McCANN, JR

2,081,461

FINISH FOR FABRIC FOR TEXTILE INDUSTRY

Original Filed March 11, 1932 4 Sheets-Sheet 2



*Fig. 2.*

Inventor

*John J. McCann, Jr.*

By *Alanson A. O'Brien*

Attorney

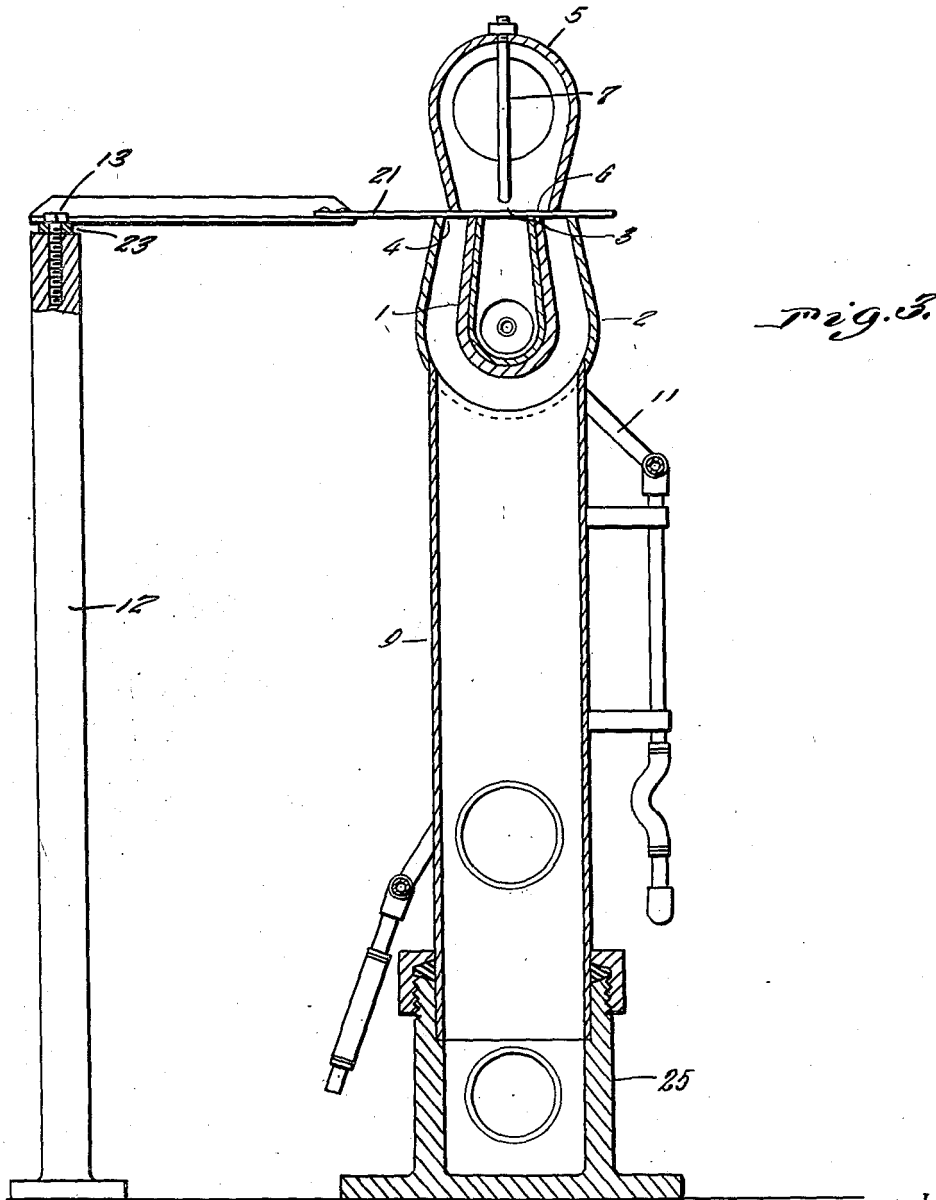
May 25, 1937.

J. J. McCANN, JR

2,081,461

FINISH FOR FABRIC FOR TEXTILE INDUSTRY

Original Filed March 11, 1932 4 Sheets-Sheet 3



*Fig. 3.*

Inventor  
*John J. McCann, Jr.*

By *Clarence A. O'Brien*  
Attorney

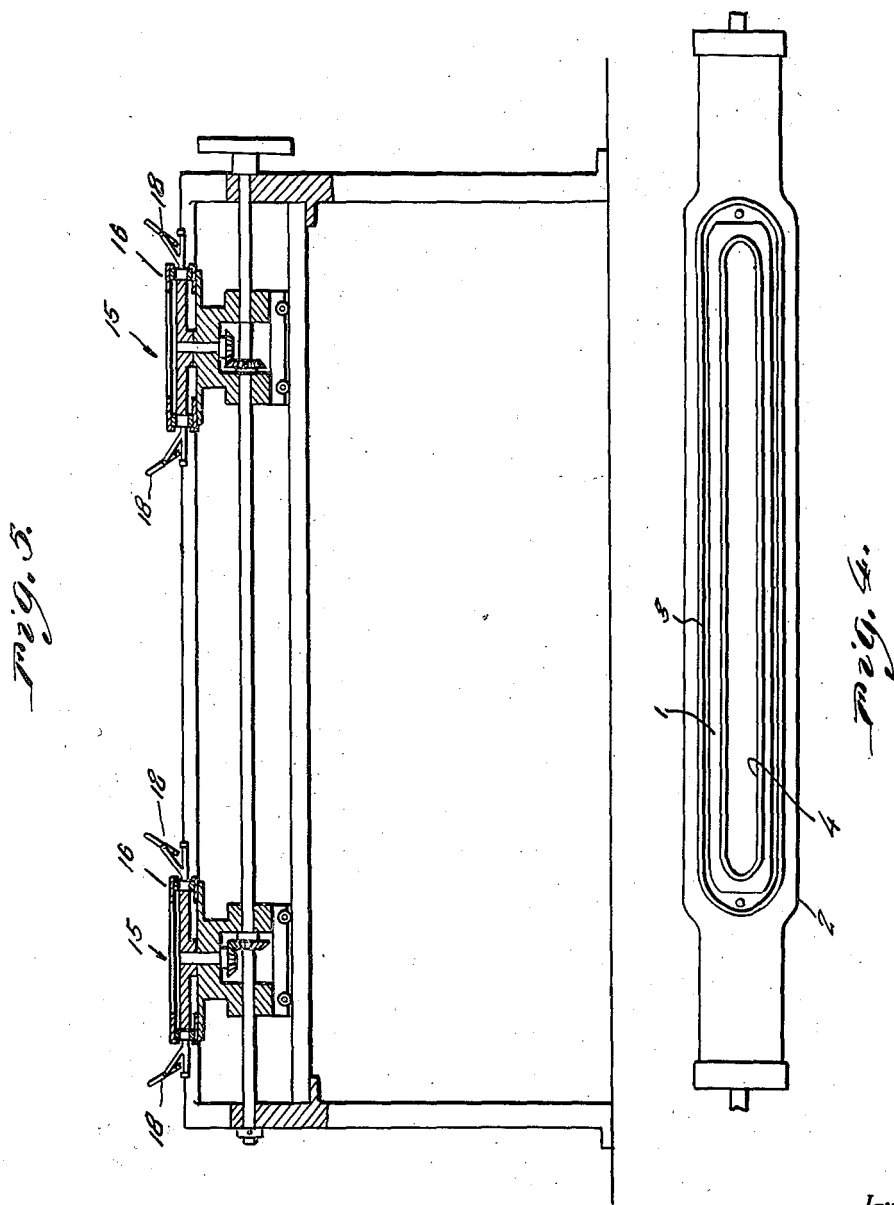
May 25, 1937.

J. J. McCANN, JR

2,081,461

FINISH FOR FABRIC FOR TEXTILE INDUSTRY

Original Filed March 11, 1932 4 Sheets-Sheet 4



Inventor

John J. McCann, Jr.

By *Alamoc O'Brien*  
Attorney

## UNITED STATES PATENT OFFICE

2,081,461

## FINISH FOR FABRIC FOR TEXTILE INDUSTRY

John J. McCann, Jr., Lowell, Mass.

Application March 11, 1932, Serial No. 598,265  
Renewed November 10, 1933

8 Claims. (Cl. 26—60)

This invention relates broadly to what is known in the industry as a "finish" for fabric, or to provide in a fabric definite characteristics, and the primary object of the invention is to provide a "finish" having certain unique and distinctive characteristics distinguishing it from other known "finishes".

A further object of the invention is to provide a method and apparatus for "finishing" fabric which eliminates a material number of operations now required in present known methods and apparatus and which will, further, produce a "finish" free of certain objectionable defects which characterize "finishes" now obtained by the use of said present known methods and apparatus.

A still further object of the invention is to provide a finish, and a method and apparatus for obtaining such a finish, wherein (1) the selvages of the cloth are straightened out at the same time as (2) a permanent and uniform width is given to the fabric, and (3) a balanced tension is secured between the warp and filling threads of woven fabrics (by increasing the width of the fabric and correspondingly decreasing the length thereof), so that they will not assume any other relative position when subjected to normal and abnormal conditions of moisture, tension, heat or chemical treatment after the fabric has been made into garments.

Another object of the invention is to provide for the "steaming", "drying" and "setting" of the threads of the fabric with a minimum of distortion and for the elimination of other "setting" operations which (1) destroy the "round" of the threads and thereby produce an objectionable flattening of the threads which makes the fabric hard and thin, and consequently subject to objectionable lustre known as "shine"; and (2) reduce the natural resiliency of the threads so that the fabric creases easily and has an objectionable grey cast.

A further object of the invention is to provide a means and method of obtaining a "finish" for the fabric which will not tend to reduce all the individual threads of the fabric to one thickness and thereby emphasize yarn defects, but which will, on the contrary, allow each thread ample opportunity to protrude from the front and back faces of the fabric to an extent depending upon the amount of yarn in such individual thread.

A still further object of the invention is to provide a "finish" which will leave the cloth with a full woolly feel, and free of "shine", streaks and uneven press or distortion of the tension between the threads of warp and filling. In my im-

proved "finish" the individual fibers protruding from the front and rear faces of the fabric are flattened back against themselves by subjecting the fabric to the action of superheated steam, and as a result a smooth, even "finish" or setting of the fabric is produced.

A still further object of the invention is to provide an improved method and apparatus for producing a "finish" without destroying certain characteristics of the fabric produced when twisting or weaving the yarn.

These and other features of the invention will be best understood and appreciated from the following description of a preferred embodiment thereof, selected for purposes of illustration and shown in the accompanying drawings, in which

Fig. 1 is a somewhat diagrammatic plan view of the apparatus employed in connection with the present invention;

Fig. 2 is an elevation, partly in section, of a combined vacuum water extractor and superheated steam drying portion of the apparatus;

Fig. 3 is a vertical transverse section thereof;

Fig. 4 is a plan view of two pipes of the combined extracting, steaming and drying device, the pipes being arranged one within the other; and

Fig. 5 is a vertical transverse section taken on line 5—5 of Fig. 1.

In accordance with the present invention, the piece of fabric to be "finished" is in wet condition first passed through what may be termed a compensating expanding device which, in the present instance and as shown in Fig. 1 and designated generally by the reference character 14, is that type of such a device as forms the subject matter of my Patent No. 2,002,096 dated May 21, 1935. This compensating expanding device 14, as will be hereinafter made manifest, serves to straighten the selvages of the fabric and give to the fabric a permanent definite width, and also automatically to feed the fabric to a combined vacuum water extracting and superheated steam treating device, also shown in Fig. 1 and designated by the reference character 10.

As more fully hereinafter described, the fabric, when passing through the device 10, has one side thereof subjected to a vacuum with the relatively opposite side exposed to the atmosphere, and superheated steam is thereafter caused to flow through the fabric. The vacuum treatment serves to remove the free water from the fabric, and the superheated steam, due to its own inherent velocity and its own high degree of conductivity, thereafter causes so rapid a degree

of penetration and creates a condition of heat so unbalanced from its own normal condition that it quite substantially dries the fabric by picking up much of the moisture left therein and changing the same into steam, which steam is thereupon quickly removed. Steam is either dry or wet, depending upon its temperature and pressure, and both are used in all practical textile operations. Steaming a fabric is the passing of steam, either dry or wet, therethrough. Steam, in either state, will act both to steam and set a fabric, but dry or superheated steam performs these operations better than wet or low quality steam, this being particularly true of the "setting" of the fabric since it is the heat in the steam that performs this operation. In continuing its passage through the device 10, the fabric is again subjected to a vacuum treatment wherein air, passing again therethrough, absorbs most of the moisture left by the steam. At the completion of this last operation, the fabric passes on to any suitable device, such as a suitably driven roll or rod 32, shown in Fig. 1, and is for some purposes in condition for inspection and shipment, to be subsequently made up into articles of clothing or the like.

Only those parts of the compensating expander 14, with which the present invention is particularly concerned, will be herein described. Such parts comprise parallel, oppositely-shiftable carriages 15, each of which is provided with a substantially loop-shaped guide 16. Traveling within each guide is a chain carrying an endless series of fabric engaging and releasing clips 18 of such construction that they not only serve to grip the cloth for carrying it through the device 14, but also serve to uncurl any felted or curled edges thereof. Thus, the fabric, when delivered from the device 14 to the device 10, will have its selvages perfectly flat. Preferably, the type of clips 18 employed in this instance is identical with that type of clip forming the subject matter of my Patent No. 1,982,683, dated December 4, 1934.

Also, it will be noted that at the discharge end of the device 14, adjacent to the device 10, each guide 16 is provided with a suitable means 19 for automatically opening the clips 18 to release the fabric piece so that it may pass into and through the device 10.

It will be noted that the two guides 16 are closest together at the entrance 17 of the path provided therebetween, the opposed clips 18 which are controlled thereby being also closest together at this location. From this point inwardly, the guides gradually diverge away from each other until they become straight and parallel, this straight and parallel portion preferably remaining constant to the exit end of the guides. Since the guides control the chains which carry the clips, the clips move along and adjacent to the guides, as shown in Fig. 1. The clips are engaged with the edges of the fabric 30 at the entrance end of the said path and as the fabric is moved along the edges are gripped and drawn outwardly and the fabric thus expanded in width. Also, the clips 18 on each chain are closer together at the straight portions of the guides than at the curved portions thereof and, for this reason, the fabric is permitted to contract in length simultaneously with the expansion in width thereof. Otherwise expressed, it will be apparent that the clips engage the fabric while passing around the

curved portions of the guides, that the speed of the clips is greater at such portions than at the straight portions, and that the longitudinal feeding speed of the fabric is, therefore, decreased as the clips pass from the curved to the straight portions of the guides, thereby stretching the fabric a definite amount widthwise and simultaneously decreasing the length thereof a proportionate amount. Thus it will be seen that a balanced condition of tension on the threads of the fabric is produced, that is, a more equal tension on the warp and filling threads in the final setting operation is obtained so that the fabric will not shrink when subjected to the drying action of the superheated steam in the device 10 or to other conditions of heat, moisture, chemical treatment, or tension when the fabric has been made into a garment.

Further, since such treatment provides for a corresponding decrease in the length of the cloth relative to the expansion in width thereof, subsequent shrinking of the fabric, which is otherwise liable to take place when the cloth is subjected to conditions such as outlined above or additional conditions as, for example, pressing, sponging, steaming or the like, as is now common in the industry, is mostly eliminated.

Only such parts of the extracting, steaming and drying device 10 will be herein specifically referred to as are essential to an understanding of the present invention, and these parts are, pipes 1, 2 and 5. Pipe 1 is arranged within pipe 2 and both of these pipes are open or slotted longitudinally as at 3 and 4 at the top sides thereof. The pipe 5 is arranged in slightly spaced parallelism with pipes 1 and 2 and at the bottom thereof is open or slotted as at 6, which slot 6 is slightly wider than the slot 3 and slightly narrower than the slot 4 so that, as shown in Fig. 3, the slot 4 opens the interior of the pipe 2 to the atmosphere as well as to the interior of pipe 5, the purpose of which will be hereinafter made manifest.

The pipes 2 and 5 are secured in assembled relation by means of bolts or other elements 7. The pipe 2 is connected intermediate its ends with the upper end of a vertical pipe 9, which may be rotatably mounted in a cylinder 25 connected by a pipe 20 to a water and air pump (not shown) of any desired or well-known type. Pipe sections 26 connect pipe 9 with the ends of pipe 5. Arranged in the pipe section 26 are spray nozzles 28 connected with pipes 29 leading to a suitable source of water supply. The nozzles 28 act as condensers to the steam that is supplied to the pipe 1 through the medium of conduit pipes 11 branching from a pipe 13 leading to a suitable source of steam supply (not shown) and preferably having therein a well-known type of commercial superheater (also not shown).

Between the slots 3 and 4 and the slot 6 there are provided what may be termed adjustable ends, in the nature of plates 21. These plates are connected through the medium of a suitable connecting device which, among other parts, includes rod sections 23 connected by turn buckles 27 to an intermediate section 23 pivotally mounted at 13 on a standard 12. This connection permits an adjustment of plates 21 to compensate for any slight decrease or increase in width of the fabric passing through the device 10. It should be noted that the inner edges of the plates 21 are at all times parallel to the selvage of the fabric.

The fabric piece 30 leaving the expander 14

front or top face downward and saturated with as much water as it can carry passes through the device between the slots in the pipes 1, 2 and 5. It will be apparent that the cloth, in thus passing through the device from left to right, will first pass over an edge portion of the slot 4 of the largest pipe 2. At this point, the back of the fabric is exposed to the air and its front face is exposed to the evacuated space within the pipe 2. Atmospheric pressure forces air into the evacuated space through the fabric. This air breaks the surface tension of the free water held by the fabric and carries it into the largest pipe 2, from which it is removed by the vacuum pump.

The cloth then passes over the edge of the slot 6 of the medium-sized pipe 5, within which is also a partial vacuum, maintained by the water jets and vacuum pump hereinbefore referred to. At this point 6, the pipes 2 and 5 act as a lock between the air currents just passed through the fabric and the superheated steam current that is about to enter. Steam at a fairly high temperature is allowed to blow through a commercial superheater, referred to hereinbefore, thereby superheating the steam and reducing its pressure. This superheated steam is then conducted into the smallest pipe 1 and, in turn, blows out through its slot 3.

The fabric, in its continuous movement, passes over the slot 3 and at this point comes into contact with the current of superheated steam. This steam passes through the fabric from the front face to the back face thereof as the fabric passes over the slot. The superheated steam, in passing through the fabric, comes into contact with the moisture still left therein and immediately picks up this moisture and converts it into steam, which steam is thereupon substantially removed by the vacuum maintained by the jet condensers 18 and the vacuum pump. It will be apparent that this action of the superheated steam is due to its own inherent velocity and high degree of conductivity which causes a high degree of rapid penetration and creates a condition of heat quite unbalanced from the normal.

The fabric now passes over the other edge of the pipe 1 and into a vacuum lock between pipes 1 and 5 which is identical with the one which preceded the superheated steam treatment. The fabric then passes over a second slot between pipes 5 and 2, where air is drawn through the fabric and absorbs a substantial portion of the steam that has been left therein from the superheated steam treatment. The fabric now passes from the device 10 over and onto the roller 32, which latter serves to keep the piece of fabric under sufficient tension to move it through the machine and hold it in spread-out condition suitable for the finishing treatments thereon.

It is, of course, to be understood that the amount of moisture left in the fabric when it passes from the device 10 can be controlled by the adjustment of suitable valve means (not shown) for controlling the supply of steam.

From the foregoing then, it will be seen that the piece of fabric passing through the device 10 is subjected to a vacuum means for extracting the free water from the fabric and also, acting in conjunction with the vacuum means, superheated steam blown through the fabric serves as a steaming and drying medium. It will also be noted that the fabric, in passing through the device 10 in a wet state, has one face thereof subjected to a vacuum with the relatively opposite face thereof exposed to the atmosphere, this being followed by

the subjecting of the fabric to a vacuum on both sides of the fabric which, in turn, is followed by superheated steam being blown through the fabric, after which the first two operations to which the fabric is subjected upon initially entering the machine are again carried out but in inverse order.

In accordance with the present invention, when the fabric passes from the machine or device 10 onto the roller 32, it may, in some cases, after being inspected, be shipped without undergoing any further operation, since the desired finish for the fabric is completed.

From the foregoing then, it will be seen that any and all fabric undergoing a treatment comprehended by the present invention will have a "finish", the characteristics of which are (1) straighter selvages; (2) permanent width; (3) balanced tension of threads of woven goods; (4) threads not flattened down; (5) threads not reduced to one thickness and yarn defects, therefore, not emphasized; (6) an appropriate amount of moisture left in the fabric.

As compared to one of the old methods of providing a "finish" for worsted serges, in the textile industry, and one of the many with which I am familiar, my invention eliminates the following operations: (1) crab (or setting), (2) cloth drying, (3) ironing out of selvedge, (4) examining, (5) tentering, (6) pressing, (7) dewing, and (8) sponging.

Although the mechanism illustrated may, in many cases, be used for cloth drying purposes only, the advantages thereby gained will still exist in the fabric after the fabric has been subjected to other manufacturing operations to gain other desired characteristics.

In accordance with my method, the cloth, as it comes from the kettle and while in a wet state and after being sheared to remove protruding fibres, is passed through the compensating expander 14. This mechanism not only serves to feed the cloth to the device 10 but also in a single operation flattens the selvedge and gives to the cloth a balanced tension and a definite and permanent width. From the expander 14, the fabric is passed through the combined vacuum water extractor and superheated steam dryer and steamer and water remover 10, where the moisture is removed to an amount desired, after which the cloth is inspected, wound onto a board or the like to make a bolt of cloth, and shipped to a customer, ready to be made into garments.

If fabric held under tension is subjected to an influence that will permit the threads to relieve themselves of tension, they will do so. For instance, if a fabric is stretched in width on the usual tenter frame and is afterwards passed over a steamer, the tension on the threads is released and an uneven shrinkage of the fabric to points approaching its original width results, the uneven shrinkage being due to the varying lengthwise and warpwise tensions on the fabric. In accordance with my invention, a balanced tension on the warp and filling threads is obtained by reducing the tension between these threads to a point closely approaching zero. The fabric is first stretched widthwise and decreased a corresponding amount lengthwise, and in this condition is passed into the device 10 and the steam passed therethrough. This treatment causes all the shrinkage that is to take place in the fabric and thus a setting of the fabric but, because of the proportional amount of widthwise stretching and lengthwise shrinking the fabric under-

went when passing through the expander, the widthwise shrinkage at 10 will be uniform and not such as to cause the fabric unevenly to approach its original width. In actual practice it will be found that the shrinkage upon passing through the device 10 will be uniform and controlled in accordance with the balanced tension on the lengthwise and warpwise threads, and the shrinkage will be full and complete to a point admitting of no further subsequent shrinkage when the fabric is afterwards sponged or subjected to any other similar treatment. In brief, it may be stated that my invention produces a full shrinkage of the fabric with a resulting controlled width, whereas certain methods heretofore known and used have produced a controlled shrinkage and a definite width, the latter permitting a further shrinkage when the fabric is thereafter sponged or subjected to similar treatment.

While I have herein shown and described the preferred embodiment of the invention, it is to be understood that the same is susceptible of changes, modifications and improvements coming within the scope of the appended claims.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A method of finishing fabric in the piece, which consists in simultaneously straightening the selvage and stretching the fabric widthwise while permitting a decrease in length proportional to the increase in width, and thereafter successively treating the fabric in said stretched condition by (1) subjecting one face of the fabric to vacuum with the relatively opposite face exposed to the atmosphere, (2) subjecting the fabric to a vacuum on both sides thereof, and (3) causing superheated steam to flow through the fabric whereby is produced a superior and more uniform fabric having a balanced thread tension and a set to permanent and uniform width.

2. A method of finishing fabric in the piece, which consists in simultaneously straightening the selvage and stretching the fabric widthwise while permitting a decrease in length proportional to the increase in width, and thereafter successively treating the fabric in said stretched condition by (1) subjecting one face of the fabric to vacuum with the relatively opposite face exposed to the atmosphere, (2) subjecting the fabric to a vacuum on both sides thereof, (3) causing superheated steam to flow through the fabric, and (4) finally repeating the second and third-named steps in inverse order whereby is produced a superior and more uniform fabric having a balanced thread tension and a set to permanent and uniform width.

3. A method of finishing fabric in the piece, which consists in stretching the fabric in a wet state widthwise while permitting a decrease in length proportional to the increase in width, and thereafter successively treating the fabric in said stretched condition by (1) subjecting one face of the fabric to vacuum with the relatively opposite face exposed to the atmosphere, (2) subjecting the fabric to a vacuum on both sides thereof, (3) causing superheated steam to flow through the fabric, and (4) finally repeating the second and third-named steps in inverse order whereby is produced a superior and more uniform fabric having a balanced thread tension and a set to permanent and uniform width.

4. A method of finishing fabric in the piece, which consists in applying a balanced condi-

tion of tension on the warp and filling threads of the fabric while the latter is in a wet state, and thereafter successively treating the fabric in said stretched condition by (1) subjecting one face of the fabric to vacuum with the relatively opposite face exposed to the atmosphere, (2) subjecting the fabric to a vacuum on both sides thereof, (3) causing superheated steam to flow through the fabric, and (4) finally repeating the second and third-named steps in inverse order whereby is produced a superior and more uniform fabric having a balanced thread tension and a set to permanent and uniform width.

5. A method of finishing fabric in strip form, consisting of stretching the fabric in wet condition widthwise and simultaneously therewith allowing a proportional contraction thereof lengthwise, and thereafter successively treating the fabric in said stretched condition by (1) subjecting the strip to a vacuum treatment to remove free water therefrom, and (2) thereafter subjecting the vacuum treated strip to the action of superheated steam to advance the finishing and drying thereof whereby is produced a superior and more uniform fabric having a balanced thread tension and a set to permanent and uniform width.

6. A continuous method of finishing fabric in strip form, consisting of moving the strip longitudinally along a predetermined path, stretching the strip in wet condition widthwise and simultaneously therewith allowing a proportional contraction thereof lengthwise along a portion of said path, and thereafter successively treating the fabric in said stretched condition by (1) subjecting the strip to a vacuum treatment at a later portion of said path to remove free water therefrom, and (2) thereafter subjecting the vacuum treated strip to the action of superheated steam at an adjacent portion of said path to advance the finishing and drying thereof whereby is produced a superior and more uniform fabric having a balanced thread tension and a set to permanent and uniform width.

7. A continuous method of finishing fabric in strip form, consisting of feeding the fabric longitudinally along a predetermined path, stretching the fabric to increase its width and simultaneously therewith allowing a proportional contraction of the fabric lengthwise at a predetermined portion of said path, and thereafter blowing superheated steam through the fabric to simultaneously steam, dry and set the fabric at another portion of said path whereby is produced a superior and more uniform fabric having a balanced thread tension and a set to permanent and uniform width.

8. A continuous method of finishing fabric in strip form, consisting of feeding the fabric longitudinally along a predetermined path, holding the fabric gripped at its two edges and stretching the fabric to increase its width at a predetermined portion of said path and simultaneously therewith decreasing the longitudinal feeding speed of the fabric an amount allowing a longitudinal contraction of the fabric proportional to said increase in width, and thereafter blowing superheated steam through the fabric to simultaneously steam, dry and set the fabric at another portion of said path whereby is produced a superior and more uniform fabric having a balanced thread tension and a set to permanent and uniform width.