No. 654,587. Patented July 31, 1900.

A. ASHWORTH.

CLOTH STRETCHING MACHINE.

(Application filed Aug. 4, 1899.)

(No Model.) 2 Sheets—Sheet 1.

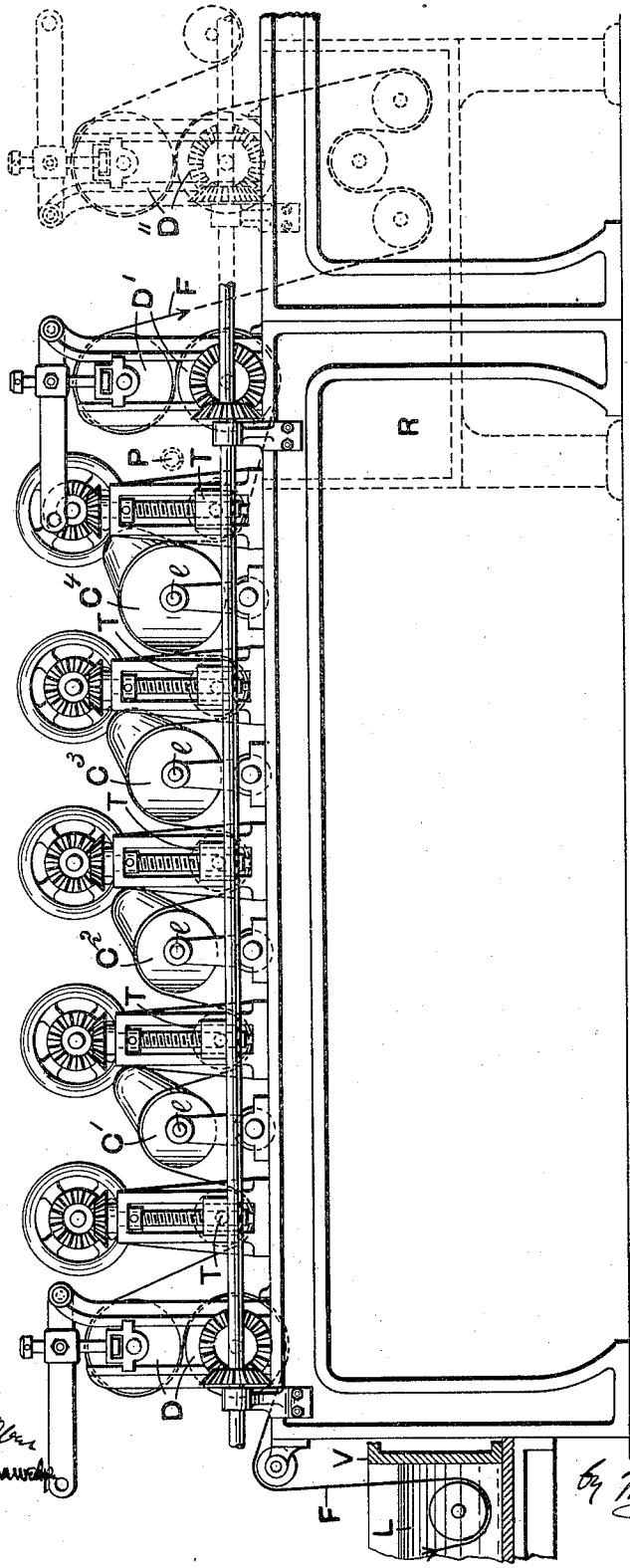


FIG. 1.

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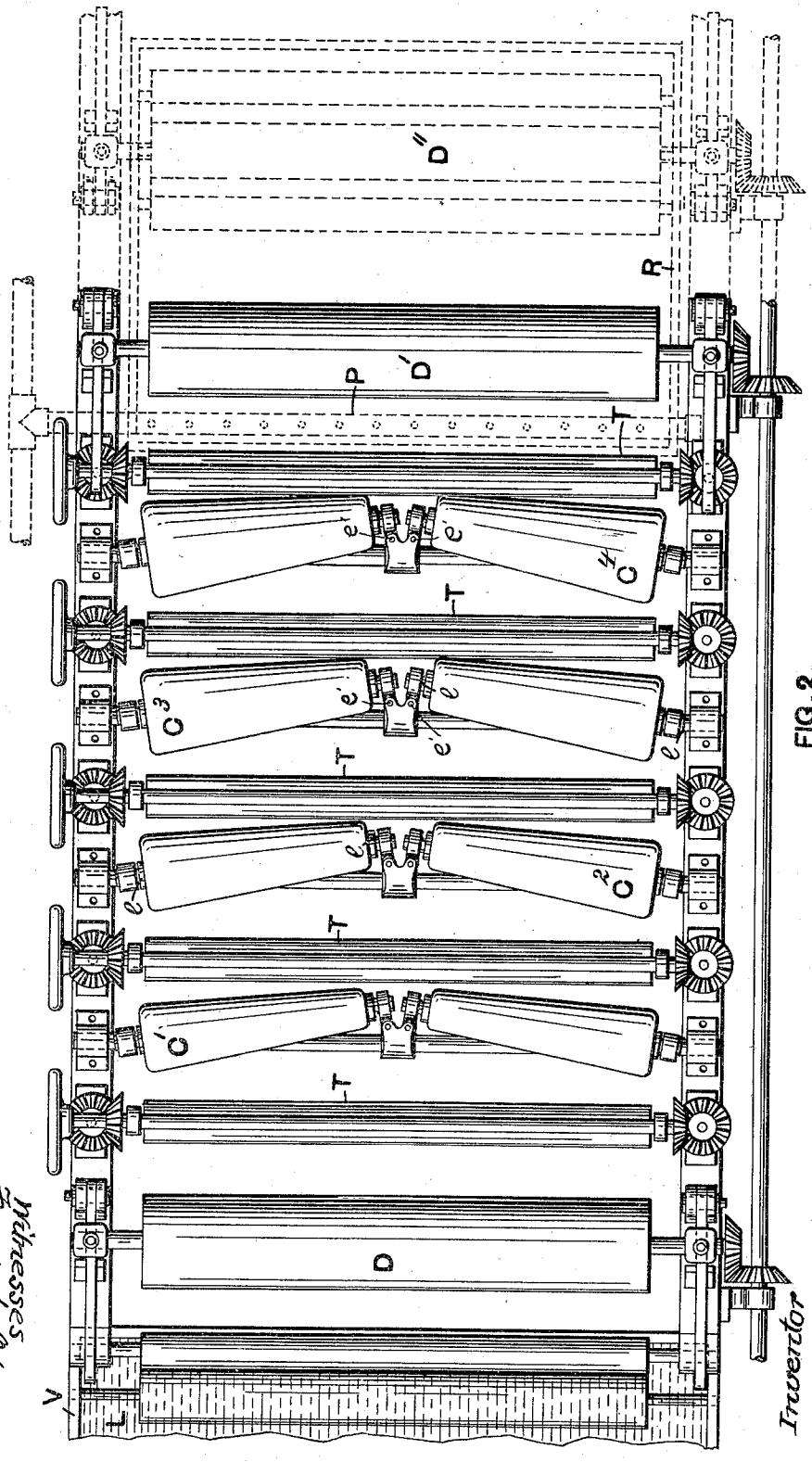


FIG. 2.

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UNITED STATES PATENT OFFICE.

ARTHUR ASHWORTH, OF BURY, ENGLAND.

CLOTH-STRETCHING MACHINE.

SPECIFICATION forming part of Letters Patent No. 654,587, dated July 31, 1900.

Application filed August 4, 1899. Serial No. 726,121. (No model.)

To all whom it may concern:

Be it known that I, ARTHUR ASHWORTH, a citizen of the British Empire, residing at Bury, in the county of Lancaster, England, have invented certain new and useful Improvements in Cloth-Stretching Machines, of which the following is a full, clear, and exact description.

This invention relates to an apparatus for stretching textile fabrics transversely and longitudinally in a damp or wet condition—as, for example, in connection with bleaching, dyeing, mercerizing, sizing, or finishing processes. In the apparatus which I employ there are, first, a pair of drawing (or mangle) rollers by which the cloth is led into the machine, then a series of pairs of conical rollers arranged with their produced axes meeting at an angle inclined upward and in the direction of the motion of the cloth, a series of tension-rollers individually intercalated between the pairs of conical rollers, and, lastly, a second pair of drawing (or mangle) rollers. These, mounted upon suitable framing, constitute a single element of the machine, which may comprise as many of such elements or sections as may be desired. In many cases the second pair of drawing-rollers in each section but the last may act as the first pair of drawing-rollers for the next-following section. In such apparatus as at present constructed and used I have found, since all the drawing-rollers have the same surface speeds and all the conical rollers have similar dimensions, that the maximum stretching effect is attained at an early stage in the passage of the cloth and too quickly for light fabrics, which are frequently damaged or torn. I have also found that in certain processes—as, for example, in the production of a silky effect by mercerizing and analogous processes—it is important that the cloth should first be gradually stretched and then gradually relaxed. By my present improvements, as hereinafter described, I effectively provide for and overcome these difficulties.

I will describe the improvements with reference to the accompanying drawings, in which—

Figure 1 shows in side elevation and in full lines the first section of the machine, and Fig. 2 a plan of the same.

In each of the figures, V indicates the vessel in which the fabric F is treated with the liquid L; D D′, the pairs of drawing (or mangle) rollers; C′ to C⁴, the pairs of conical rollers, and T T the adjustable tension-rollers.

The section of the machine shown by the drawings, assuming the fabric to be traveling in the direction indicated—that is to say, from left to right—is supposed to be one in which the tension of the cloth is gradually increased from D to D′. This increase in the tension is obtained by the combination of two constructive and working conditions, the first of which consists in giving to the cloth as it passes over the successive pairs of conical rollers progressively-larger areas of surface contact and the second in giving to the rollers D′ a greater surface speed than that given to the rollers D. For a section in which it is required to relax existing tension in the arriving cloth the reverse arrangement is employed. This reverse arrangement and operation will be seen from the drawings if it be assumed that the fabric is traveling from right to left instead of from left to right. Of course the condition remains that the axes of the conical rollers must, as before described, be inclined upward in the direction of the travel of the cloth. Thus the cloth will have progressively-smaller areas of surface contact on the conical rollers and the end pair of drawing-rollers will have a smaller surface speed. Where in any section of the machine it is required that the tension shall be maintained simply it will suffice generally that the cloth shall have the same area of surface contact on each pair of conical rollers and that the drawing-rollers shall have the same surface speeds.

For the fulfilment of the first condition—that is to say, in order to provide that the fabric shall have a progressively greater or less area of contact on successive pairs of conical rollers—I construct these rollers with progressively larger or smaller diameters. Thus in the section illustrated the pair of conical rollers C′ may have a base or major diameter of nine inches; C², ten inches; C³, eleven inches, and C⁴ twelve inches, the minor diameters being in proportion. All the conical rollers have their journals *e e* mounted in pivoted bearings, as shown at *e′*, which enable them to be

readily removed in order that any pairs may be quickly replaced by others of a different size. It is to be understood that the above-given dimensions for the rollers are illustrative only and that they may be varied for different requirements; nor is it necessary that the increase or decrease in size should be regularly or successively progressive. For example, a good result may be obtained with the following successive major diameters: nine, ten, ten and one-half and eleven inches, or nine, nine, ten, ten inches.

For the fulfilment of the second condition—that is to say, in order to insure that one pair of drawing-rollers shall have a greater or less surface speed than its preceding or following pair—I may use driven rollers having diameters in proportion to the required speeds or I may drive them by suitable gearing at relatively higher or lower speeds. The more convenient arrangement is to have rollers of proportionate diameters; but inasmuch as changing these rollers for required alterations in tension would be a source of trouble I may clothe these rollers with suitable material—as, for example, by winding upon them a sufficient length of textile fabric—and obtain the temporarily-required diameter by adding to or removing part or all the clothing. For increasing the longitudinal tension the surface speed of each of these rollers should be slightly in excess of the surface speed of the cloth arriving from the preceding pair of conical rollers.

By way of example, I will describe the method of using the apparatus in the production of a silky luster on cotton cloth by the mercerizing process. As is well understood, in carrying out this process the goods are well wetted with a strong cold solution of caustic alkali and are stretched and washed or neutralized while still wet with the alkali. The tension in the cloth is then relaxed. I may therefore use a machine having two or more sections. In the first section (see drawings) the fabric is gradually stretched by being passed over progressively-larger pairs of conical rollers and between two pairs of drawing-rollers, of which the pair D′ has a greater surface speed than the pair D. Just before the cloth reaches the drawing-rollers D′ it may be thoroughly swilled with hot water or with acidulated water to remove or neutralize the alkali. This water may issue from the transverse perforated pipe P and be received in a receiver such as R, (shown in dotted lines,) or in substitution for the swilling or washing from the pipe P the cloth may be led downward and under and over rollers in the tank R, whence it may return to the drawing-rollers D′ or to a supplementary pair of such rollers D″. The next section of the machine commences with the rollers D′ or D″, if the latter be used, and includes a series of pairs of conical rollers having progressively-smaller dimensions with intercalated tension-rollers the reverse of the first section and an end pair of drawing-rollers. The third section, if used, may have its conical rollers all of the same dimensions. As an alternative the first and second sections of the machine may be alike in all respects, or when no relaxation of tension is required all the sections may be repetitions of the first. If the earlier sections are alike, the washing or neutralization of the alkali is effected at the end of these sections—that is to say, at the end of the stretching effort. Obviously, also, other modifications may be introduced and the respective sections may individually include any convenient or suitable number of pairs of conical rollers.

Having now particularly described my said invention, I declare that what I claim is—

1. In a cloth-stretching machine, the combination of a series of pairs of conical rollers of various diameters, in combination with a pair of drawing-rollers located at the end of the series, substantially as described.

2. In a cloth-stretching machine the combination of a series of pairs of conical rollers of varying diameters, the approaching ends of the axes of each pair being arranged at an upwardly-inclined angle to each other, and a series of horizontal cylindrical tension-rollers intercalated between the pairs of conical rollers, for the purpose set forth.

3. In a cloth-stretching machine, the combination of a series of pairs of conical rollers of differing diameters and a pair of drawing-rollers at each end of the series, said pairs of drawing-rollers having different surface speeds, substantially as described.

In witness whereof I subscribe my signature in presence of two witnesses.

ARTHUR ASHWORTH.

Witnesses:
JAS. STEWART BROADFOOT,
WILLIAM GEO. HEYS.