June 7, 1932. H. W. BUTTERWORTH, JR 1,861,490

METHOD AND MEANS FOR MERCERIZING

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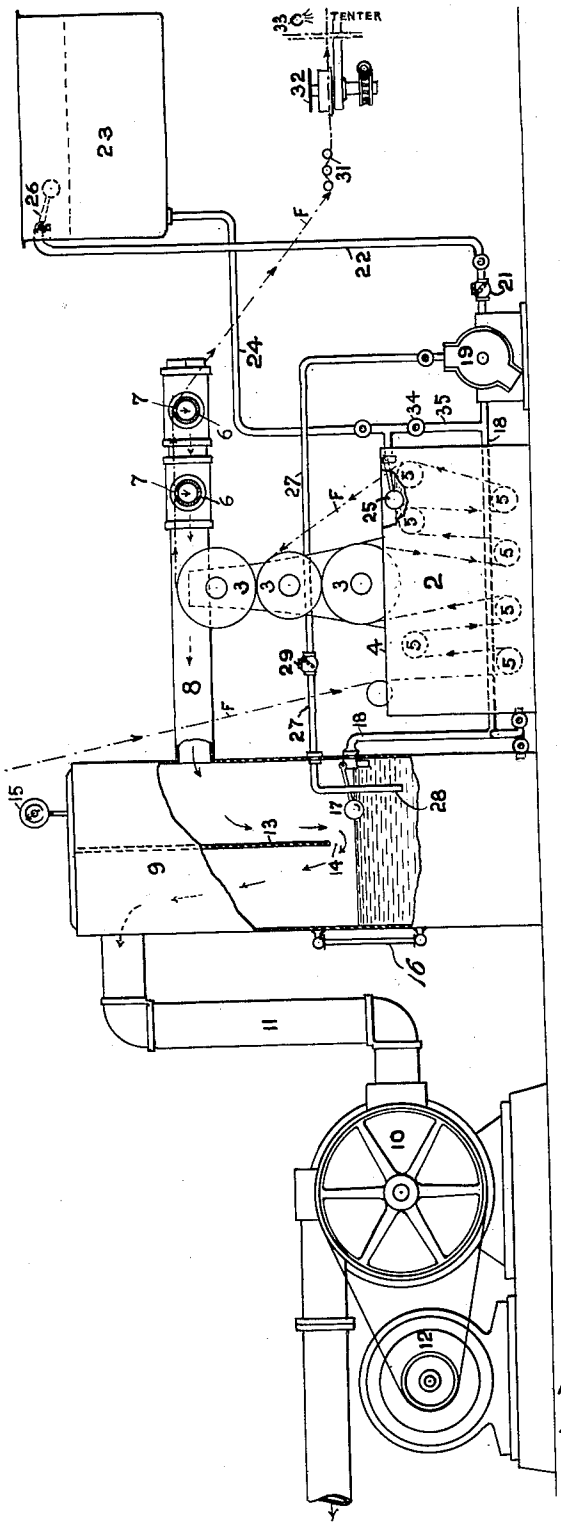


FIG. 1

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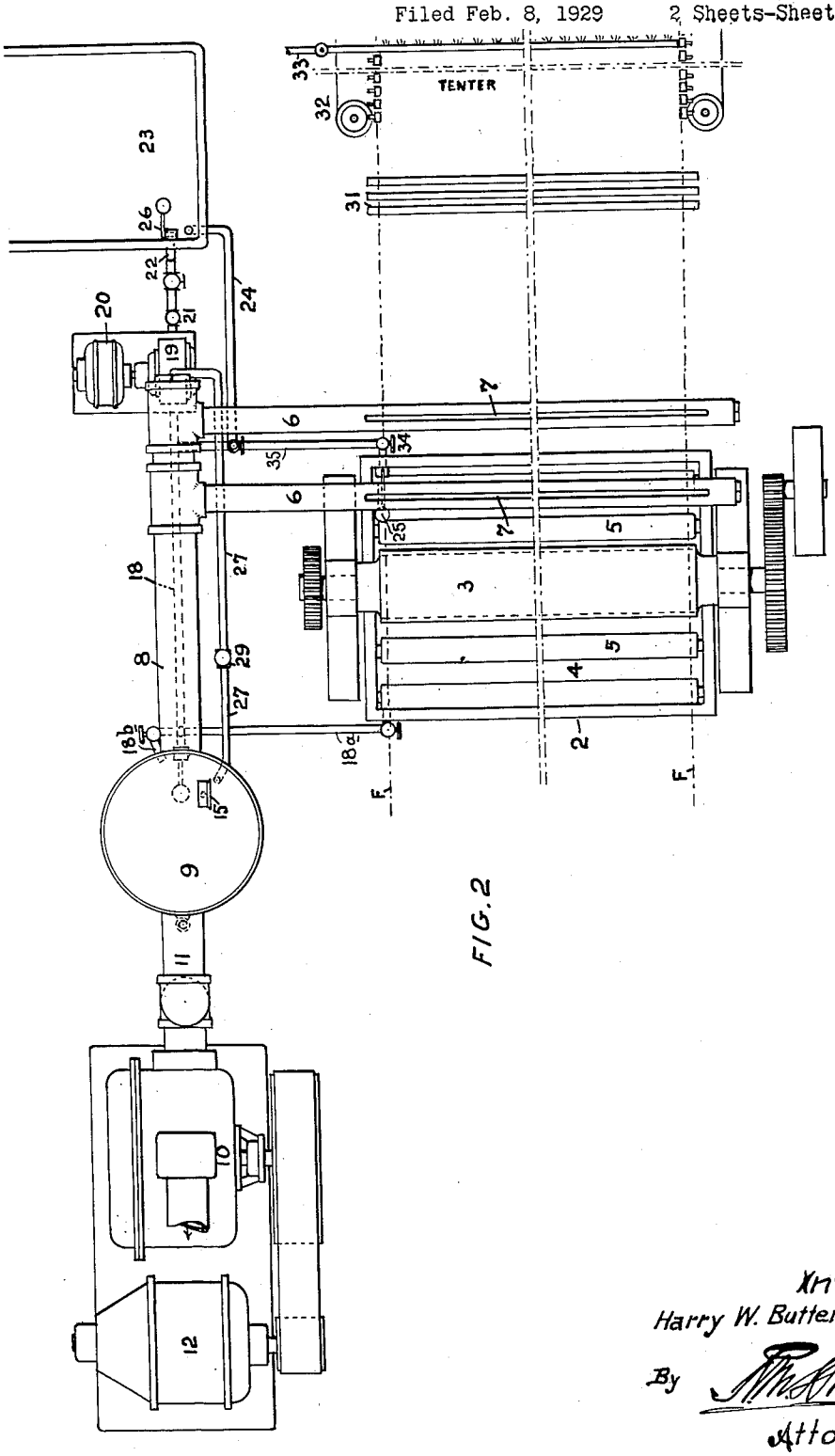


FIG. 2

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UNITED STATES PATENT OFFICE

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METHOD AND MEANS FOR MERCERIZING

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Heretofore, it has been customary in mercerizing textile fabrics to subject the fabric to a mercerizing operation in a padding machine and immediately pass the mercerized fabric, saturated with the caustic alkali of full strength, to mercerizing treatment in a tentering machine but wherein the fabric is ultimately subjected to water sprays whereby the caustic alkali therein is greatly diluted and washed from the fabric, the weak caustic alkali solution so provided being of approximately 2% to 3%. The weak caustic alkali so produced may be utilized, as far as possible, in the kiers wherein the fabric is treated to a boiling operation with the caustic alkali of this strength preparatory to bleaching and dyeing operations. In this practice, there are two main objections, namely: one being due to the fact that an excessive amount of fresh strong caustic alkali for mercerizing is required under the treatment in the padding machine; and the other due to the fact that this excess of high density caustic alkali solution is required to be diluted in passing through the tentering machine, with the result that the dilute caustic of the low strength of 2% to 3% is produced in quantity greatly in excess of the kier requirements, and which excess must be reconcentrated.

The object of my invention is to modify the practice heretofore in vogue, that a great reduction in cost of mercerizing fabrics is assured and the production of low density caustic alkali due to dilution in the tenter is reduced in quantity so as to be substantially only sufficient to meet the requirements of treatment in the kier, thereby eliminating the cost of concentrating the heretofore great excess of dilute caustic alkali.

My object is, primarily, to recover to a large extent, the caustic alkali of high density or strength employed in the mercerizing operation and before the fabric is delivered to the tenter and subjected to the diluting results practiced therein, the said recovery taking place intermediate of the mercerizing treatment in the padding machine and the delivery to the mercerizing tenter in which the washing treatment takes places, the recovered caustic alkali of full strength being returned, without concentration, for further use in the padding machine and tenter. In this manner, the quantity of caustic alkali of high density for treatment of a given quantity of fabric is greatly reduced over what has heretofore been necessary.

Means for putting my improved method for recovering caustic alkali of full or substantially full strength from the fabric, after passing from the padding machine and before being received in the tenter, comprises slotted or perforated pipes or hollow conduits having slots or openings over which the fabric travels, and in which pipes or conduits a vacuum is maintained so that the caustic alkali solution is largely sucked out of the fabric during its passage to the tenter, and the caustic alkali so recovered is returned to a storage tank from which it may be supplied to and employed over again in the tank of the padding machine.

The improved method and means comprising my invention are more fully described hereinafter in connection with the drawings forming a part of the specification and are more particularly recited in the claims.

Referring to the drawings: Fig. 1 is an elevation showing my improved means adapted for treating mercerized fabrics and recovering undiluted caustic according to my improved method; and Fig. 2 is a plan view of the same.

2 is the mercerizing padding machine and may be made of the usual construction, having a plurality of squeeze rolls 3 arranged above a tank 4, and the latter provided with upper and lower guide rolls 5 about which the fabric F is guided and subjected to tension during treatment therein to the caustic alkali of as high a density as can be conveniently obtained, namely, at or about 52° Twaddell, in the customary manner. By being treated in the mercerizing padding machine in this manner, the fabric has absorbed concentrated caustic to an extent substantially equal to double the weight of the fabric itself, and instead of this large quantity of caustic alkali passing to the mercerizing tenter 32, to be diluted and washed out of the cloth, as heretofore practiced, the said cloth is, on its

way to the tenter, conveyed over transversely arranged suction pipes or conduits 6 having a plurality of parallel slits 7 in their upper portions, and by reason of which the fabric in passing over the successive slits 7 causes suction impulses in rapid succession as the fabric travels over said slits 7, and whereby the excess quantity of the caustic alkali absorbed in the fabric is sucked out of the said fabric into the suction pipes, the said recovery of the caustic alkali being from 50% to 60% of the entire caustic absorbed in the fabric during its passage through the mercerizing padding machine, and this means a recovery approximately equal in weight to the weight of the fabric being treated.

The horizontal suction pipes 6 extend laterally from a suction main 8, the latter communicating with a tank 9 in which a partial vacuum is maintained by a vacuum pump 10 with which it communicates by a suction pipe 11. The vacuum pump 10 may be of any character and driven by an electric or other motor 12, as will be readily understood.

The tank 9 constitutes a receiving and separating tank for the caustic alkali solution. This tank may be divided by a vertical baffle plate or division 13 extending transversely downward to a point slightly above the liquid level therein and forming between its lower end and the level of the liquid a passage 14 for the air put in motion by the vacuum pump. Moreover, the pipes 8 and 11 communicate with the upper portions of the tank respectively on opposite sides of the transverse baffle or division plate 13, so that the caustic alkali laden air which is drawn from the suction pipes 6 and 8 is caused to pass in contact with the baffle and side walls, downward and through the passage 14 in contact with the caustic alkali in the tank 9 and thus cause its precipitation and accumulation in the tank. While the transverse plate 13 constitutes a baffle to induce the caustic alkali suspended in the air to be precipitated and remain in the tank 9, I do not confine myself to any particular detailed construction as to the baffle means which may be employed in the tank 9, as eliminators of that character are well known in air conditioning, steam separators, and other apparatus where moisture contents held in suspension are required to be eliminated for one purpose or another.

The tank may, moreover, be provided with a vacuum gauge 15 and a fluid level gauge 16, of any suitable constructions, to indicate the level of the caustic alkali in the tank. Moreover, the tank may be provided with a float controlled valve 17 for maintaining a constant level of caustic alkali within the tank so as to provide and maintain a substantially uniform passage 14 above the caustic alkali. The overflow from the tank 9 through the valve 17 may be delivered by a pipe 18 to a pump 19 driven by an electric motor 20, or otherwise, which discharges from said pump through a check valve 21 and pipe 22 into a reservoir tank 23 from which the caustic alkali may pass by a pipe 24 and float controlled valve 25 into the tank 4 of the mercerizing padding machine and whereby the level of the caustic alkali therein may be maintained.

The caustic alkali solution in tank 23 will be of 52° Twaddell, or other dense strength suitable for use in the padding machine or its equivalent, and may be used repeatedly, since it is not diluted below its initial strength. If the storage tank 23 became filled, the float operated valve 26 will automatically close the delivery thereto by pump 19 and pipe 22, and thereupon the pump will by-pass the caustic alkali received from the tank 9, through pipe 27 and extension 28 thereof to a point below the caustic alkali level in said tank, and thus avoid spraying the caustic into the air passing through the tank. The pipe 27 may be provided with a check valve 29 to prevent siphoning from the tank through pipes 27 and 28, due to any action of the pump when the by-passing operation is not required.

The tenter 32 may be of any suitable construction and hence no details of its construction will be required.

31 represents any suitable tension and stretching means to properly feed the mercerized fabric F to the cloth clamps of the tenter; and pipe 33 is intended to represent one of the water spray pipes used in connection with the tenter to dilute the strong caustic supplied with the fabric to the tenter.

It will be understood that the caustic alkali recovered in tank 9 may be automatically supplied directly to the padding tank 4 under the control of the float valve 25, if so desired, by opening valve 34 in pipe 35; and in this manner the use of the main storage tank 23 and pump 19 may be omitted during the normal operation. It is, however, important in a commercial apparatus to provide means for withdrawing all of the caustic out of circulation and storing it in the main storage tank 23 for future use.

While I can recover 50% to 65% (compared to the weight of the fabric) of the actual caustic alkali of full strength carried in the fabric in its passage from the padding machine to the tenter, the caustic remaining in the fabric would amount to 35% to 50%, and this, under the diluting operation before or when leaving the tenter, is just about enough, when diluted to a strength between 2% and 3%, to supply the requirements of the kier of the bleach house. It may be, that the bleach house in some instances would use more than this amount of caustic alkali, but in any event there would be a very large saving in caustic in a plant doing mercerizing, since the plant would be obtaining its

caustic alkali for mercerizing at practically no cost, and its excess would be recovered in its full strength and necessitate no concentrating, and the retained caustic alkali when diluted would be chargeable to the bleaching operation.

Aside from the economy in the method employed, it is also to be borne in mind that a caustic alkali recovery plant using the evaporating process, as heretofore employed, costs approximately ten times the cost of my improved simplified plant, and this insures an enormous saving both in initial cost of construction and in upkeep.

While my invention is specially intended for use in connection with mercerizing, as carried on with padding machines and tenters, I do not restrict myself to such use, because my improved method and means for recovering strong caustic alkali is also applicable to a chainless mercerizing machine such as where the fabric is passed through a mercerizing padder, thence over a multiple-bar "Mycock expander", and thence through a washing or recuperating plant.

I have described my improved method and means in that particularity which I deem to be the best exposition of my invention, and that which I prefer in commercial practice, but I do not restrict or confine myself to the minor or secondary details, as such are susceptible of modification which may be resorted to as matters of mechanical skill and without a departure from the spirit of the invention.

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

1. The herein described method of mercerizing and caustic alkali recovery as part thereof, which comprises subjecting a fabric to a mercerizing treatment with a strong caustic alkali solution and then subjecting the mercerized fabric to pressure in a continuous manner along its length for removing the excess of caustic alkali, causing the fabric thus treated to be subjected to suction in the presence of air for removing from it a large further portion of the strong caustic alkali solution, thereafter mechanically treating the mercerized fabric and its reduced caustic alkali content to a washing treatment with water and producing thereby a weak caustic alkali solution suitable for use in a kier for preparing a fabric for bleaching and dyeing, and mixing the recovered strong caustic alkali solution with other similar solutions in further mercerizing treatment of fabrics.

2. The method defined in claim 1, wherein further, the mercerized fabric is subjected to suction by which the excess of caustic alkali solution is caused to be withdrawn in association with air from the fabric under the influence of a vacuum acting in a continuous manner along the length of the fabric, and in which further the fabric with the reduced quantity of strong caustic alkali is subjected to a tenter stretching action prior to its caustic being diluted to reduce it to a weak caustic alkali solution of approximately 2% to 3%.

3. The method defined in claim 1, wherein further, the fabric is passed through the strong caustic alkali in the form of a bath and subjected to pressure for squeezing out the surplus caustic, and wherein also, the fabric is caused to travel and during such travel caused to be acted upon by successive suction impulses by which the surplus caustic alkali is recovered in association with air.

4. Apparatus of the character stated, comprising means for feeding and guiding a textile fabric under tension through a caustic alkali solution vat and squeezing out the surplus solution from the saturated fabric, suction means over which the caustic alkali saturated fabric is moved and by which a further portion of the caustic alkali solution may be recovered from the saturated fabric while exposed to atmospheric conditions, vacuum creating means for providing a suction through the suction means over which the fabric is moved, means for returning the recovered caustic alkali solution to the vat, means for receiving and stretching the fabric after the recovery of caustic solution by the suction means, and means for washing the caustic alkali from the fabric while in the stretching means and greatly diluting the strength of said caustic alkali.

5. Apparatus of the character stated, comprising means for feeding and guiding a textile fabric under tension through a caustic alkali solution vat and squeezing out the surplus solution from the saturated fabric, suction means over which the caustic alkali saturated fabric is moved and by which a further portion of the caustic alkali solution may be recovered from the saturated fabric while exposed to atmospheric conditions, vacuum creating means for providing a suction through the suction means over which the fabric is moved, means for returning the recovered caustic alkali solution to the vat, means for receiving and stretching the fabric after the recovery of caustic alkali solution by the suction means, and means for washing the caustic alkali from the fabric while in the stretching means and greatly diluting the strength of said caustic alkali, and, wherein further, a receiving and separating tank is provided between the vacuum creating means and the suction means over which the fabric is moved, and a storage caustic alkali tank is also provided, together with pumping means for transferring the caustic alkali solution from the receiving tank to the storage tank and gravity means

for delivering caustic alkali solution from the storage tank to the caustic alkali solution vat, and means for squeezing out the surplus caustic alkali solution from the saturated fabric.

6. The invention according to claim 4, wherein further, the suction means over which the fabric is moved comprises a hollow conduit in which a vacuum is maintained and provided with a slot arranged transversely to the direction of travel of the fabric and of a length substantially equal to the width of the fabric to be treated.

In testimony of which invention, I hereunto set my hand.

HARRY W. BUTTERWORTH, JR.