E. HEBERLEIN.

APPARATUS FOR MERCERIZING TEXTILE FABRICS.

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978,883.

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FIG_1_

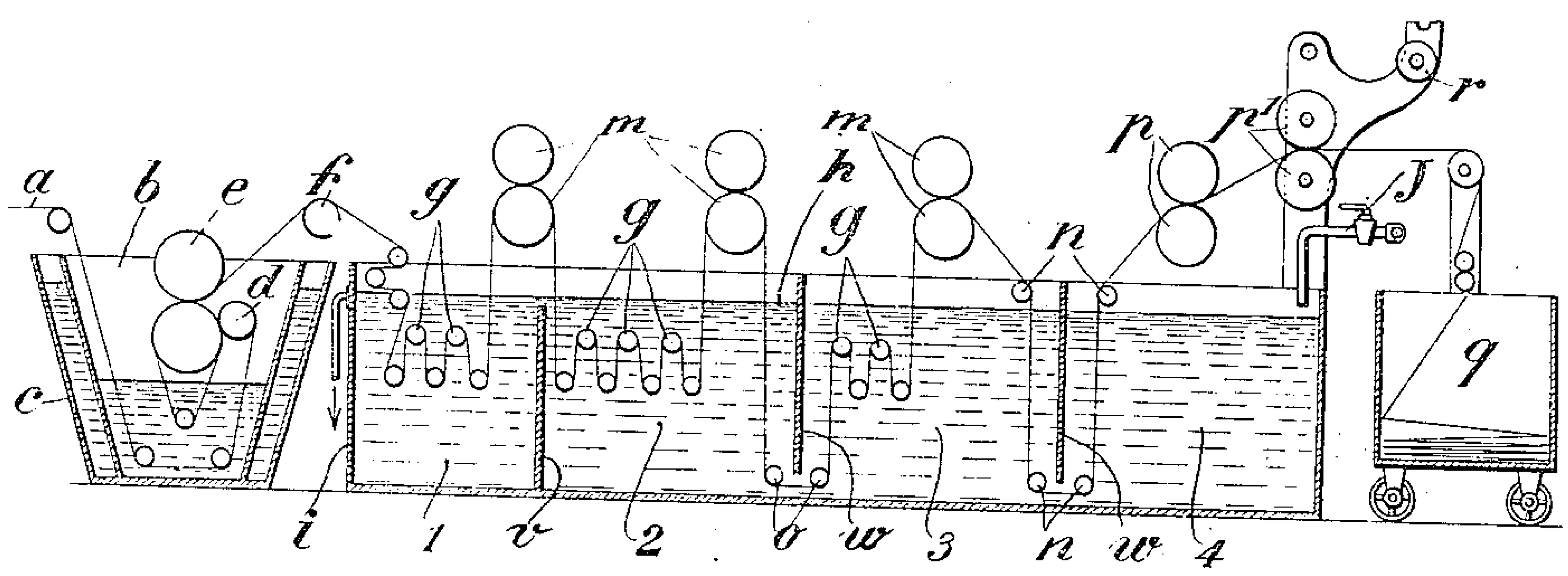


FIG_2_

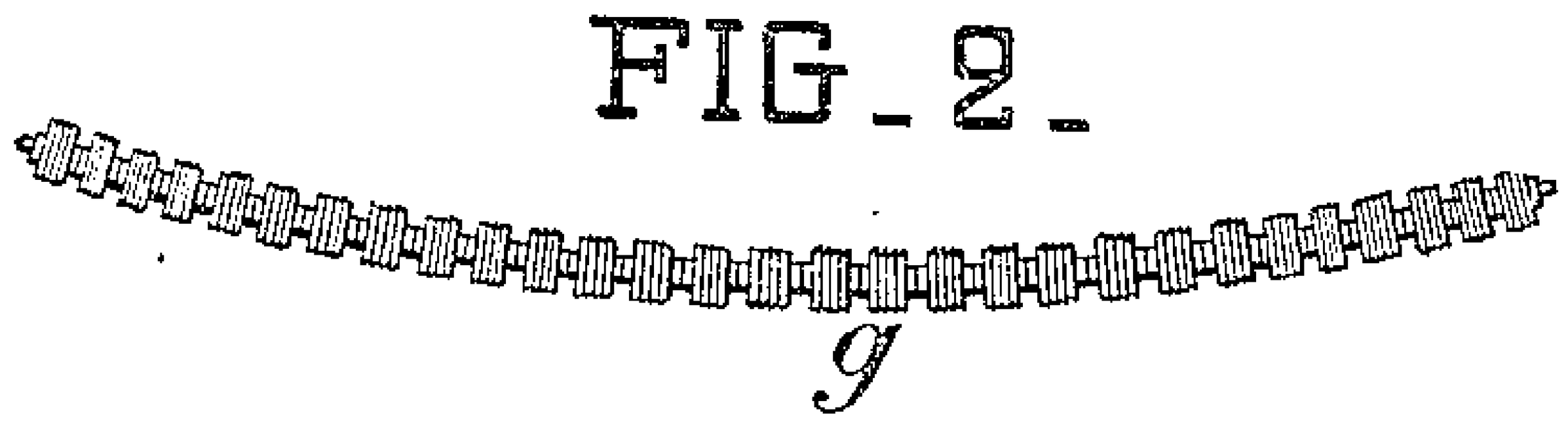
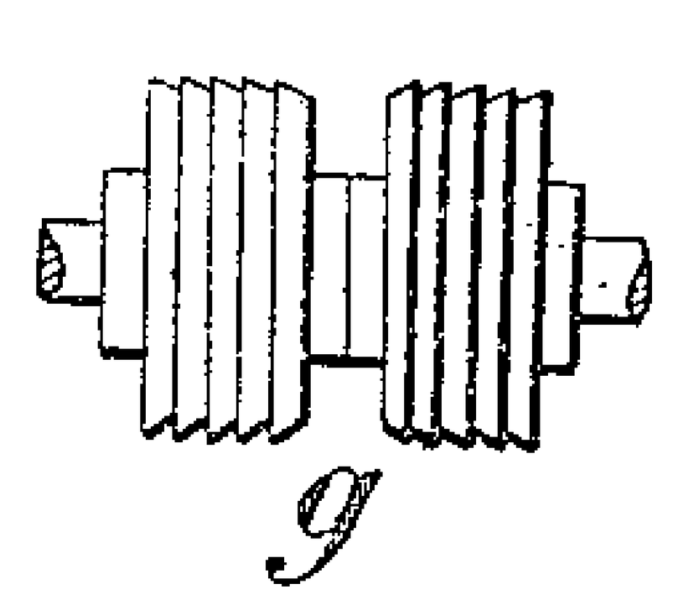


FIG_3_



WITNESSES:

[illegible]

[illegible]

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by [illegible]

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UNITED STATES PATENT OFFICE.

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APPARATUS FOR MERCERIZING TEXTILE FABRICS.

978,883. Specification of Letters Patent. Patented Dec. 20, 1910.

Application filed February 8, 1910. Serial No. 542,740.

To all whom it may concern:

Be it known that I, EDUARD HEBERLEIN, doctor of philosophy and manufacturer, a citizen of the Swiss Republic, and resident of Wattwil, canton of St. Gall, Switzerland, have invented a new and useful Apparatus for Mercerizing Textile Fabrics, of which the following is a full, clear, and exact specification.

The present invention consists in an apparatus whereby fabrics of all kinds may be mercerized uniformly and so as to produce goods of fine appearance with a minimum amount of damage to the fabric.

It has already been proposed to mercerize textile fabrics by washing the fabric previously impregnated with alkali lye without the employment of means for preventing the shrinkage of the fabric, and by stretching the said fabric transversely during the washing process. This mercerizing process has, however, not been employed up to the present and no apparatus is known which would be capable of performing it in a satisfactory way, because when this process is performed with the usual stretching devices, such as tentering chains, tentering nippers and the like, the fabric suffers so much damage, in consequence of the forcible transverse stretching, that the process is not applicable for light fabrics. I have now found that this damaging effect upon the goods in the said mercerizing process arises from the fact that the fabric impregnated with alkali lye possesses a variable and so great an extensibility during the washing process that such a forcible transverse stretching, as has been produced by the means hitherto tried in this process, is not at all necessary, but that it is sufficient to lead the previously impregnated tissue or fabric, during the washing operation, over a certain number of arched rotatable rollers known *per se* as fabric distending means from Mycock's United States Letters Patent No. 687847, dated December 3d 1901, and which, as the result of their rotation under the pull of the fabric, push the shrunken fabric without undue strain from the middle toward the edges and thus bring it back to its original width without exercising a forcible action.

The drawing illustrates one form of the new apparatus.

Figure 1 is a diagrammatic view of the apparatus as a whole; Fig. 2 shows one of the stretching rollers; and Fig. 3 two elements of the roller on a larger scale.

The fabric *a* (Fig. 1) passes through the trough *b* which is filled with soda lye and surrounded by a cooling jacket *c*. The fabric is first squeezed at *d*, then passes again through the lye in the trough *b* and is squeezed under powerful pressure by the roller *e*. It then travels over a guide roller *f* and is afterward passed over several groups of arched stretching rollers *g* disposed alternately at different heights and displaced with relation to one another, said rollers being mounted parallel to each other and arranged in groups. These rollers are arranged either wholly or in part within a washing bath *h* which serves to wash the fabric at the same time. On leaving each group of said stretching rollers *g* the fabric is passed through a pair of squeezing rollers *m* and if necessary is also led by guide rollers, such as *o* between the second and third groups of tentering rollers. Each of the stretching rollers *g*, which are known *per se* by United States Letters Patent 687847, consists of a number of roller elements (Figs. 2 and 3) slipped over an arched shaft and provided with annular ribs of saw-tooth section; they are also coupled together so that they revolve together on their shaft under the pull of the fabric. In this way, owing to the divergent position of their roller elements relatively to the fabric, the stretching rollers cause the fabric to stretch laterally, uniformly on the whole width of the fabric, since the greater the distance of the roller elements from the longitudinal middle line of the web, and therefore the more oblique their rotation to the longitudinal direction of the web, the more is the latter pushed from the said middle line toward the edges and therefore stretched. Since this lateral stretching is effected in the washing bath *h* and therefore during the washing process, at a particular moment of which the fabric exhibits its greatest extensibility, it is effected very easily and quickly and with little injury to the fabric. The number of the stretching rollers varies with the nature of the fabric and the degree of stretching required. The larger the total surface of contact between the fabric and the stretching rollers, the more powerful is the effect. The greater the degree to which

the fabric is to be stretched the larger the support it should find on the roller elements of the stretching rollers and it is advisable to use a relatively large number of stretching rollers. The washing liquid employed for washing the fabric while being stretched in this way is preferably warm, and the actual stretching rollers *g* in the bath *h* are submerged in such a manner that the fabric does not emerge from the bath at or for the greater part of the time, during which the actual stretching operation is proceeding. After leaving the last pair of squeezing rollers *m* the fabric is returned to the washing bath for a final washing being led over guide rollers *n* in the tank. Thence it passes to the pairs of squeezing rollers *p*, *p*¹ and is finally delivered into *q* or rolled up at *r*.

In the drawing, the liquid used for washing the fabric is contained in a vat *i* divided by partitions *v*, *w*, that extend quite or partly down to the bottom, to enable the fabric to be washed by stages; or a number of separate tanks or vats can also be used for the same purpose. Or the vat may be omitted entirely and its place be taken by a number of spraying pipes discharging powerful jets of water against the fabric passing over the stretching rollers *g*. In all cases it is important that the fabric impregnated with soda lye should be subjected to the action of water from the commencement of its transition on to the parallel mounted arched stretching rollers, or immediately thereafter, and also during the whole period of its course over the same, that is to say throughout the entire stretching process; the lateral stretching will thus be effected simultaneously with the washing, and under more favorable conditions for protecting the fabric from injury. The compartment 4 of the vat *i*, from whence the fabric passes to the pair of squeezing rollers *p* is fed with pure water by the inlet tube *j*, while the adjacent compartment 3, containing the third set of stretching rollers, is fed with dilute lye from 4, compartment 2, containing the second group of stretching rollers being fed with less dilute lye from 3 and compartment 1, containing the first group of stretching rollers being fed with still less dilute lye from 2. By means of this graduated or methodical system of washing the alkali impregnated fabric by stages on the counter-current principle, an economical recovery of the mercerizing lye is insured.

What I claim is:

1. In an apparatus for mercerizing textile fabrics, the combination of a tank for containing alkali lye, and of means for passing the fabric through said tank in a transversely unstretched condition with a washing device for washing the fabric after passing through the said tank comprising a tank for containing the washing liquid provided with arched rotatable stretching rollers, arranged within the said tank to be immersed in the washing liquid and consisting of a number of roller elements slipped over an arched shaft and provided with annular ribs of saw tooth section, and with means for causing the fabric to pass over the stretching rollers while passing through the said washing device, for the purpose of causing the fabric passing through the washing device to be pushed without undue strain from the middle of the fabric toward the edges, in consequence of the rotation of the rollers under the pull of the fabric, and of thus stretching the fabric to its original width without the exercise of forcible action.

2. In an apparatus for mercerizing textile fabrics, the combination of a tank for containing alkali lye, and of means for passing the fabric through said tank in a transversely unstretched condition with a washing device for washing the fabric after passing through the said tank, comprising a tank for containing the washing liquid provided with arched rotatable stretching rollers, disposed alternately at different heights and displaced relatively to one another within the said tank to be immersed in the washing liquid and consisting of a number of roller elements slipped over an arched shaft and provided with annular ribs of saw tooth section, and with means for causing the fabric to pass over the rollers while passing through the said washing device for the purpose of causing the fabric passing through the washing device to be pushed without undue strain from the middle of the fabric toward the edges, in consequence of the rotation of the rollers under the pull of the fabric, and of thus stretching the fabric to its original width without the exercise of forcible action.

3. In an apparatus for mercerizing textile fabrics, the combination of a tank for containing alkali lye, and of means for passing the fabric through said tank in a transversely unstretched condition with a washing device for washing the fabric after passing through the said tank, comprising a tank divided into compartments provided with arched rotatable stretching rollers, disposed alternately at different heights and displaced relatively to one another and arranged in groups within the different compartments of the tank to be immersed in the washing liquid and consisting of a number of roller elements slipped over an arched shaft and provided with annular ribs of saw tooth section, with means for causing the fabric to pass over the stretching rollers while passing through the said washing device and with means for causing the washing liquid to flow in the reverse direction of the travel of the fabric, for the purpose of causing the fabric passing through the washing device

to be pushed without undue strain from the middle of the fabric toward the edges, in consequence of the rotation of the rollers under the pull of the fabric, and of thus stretching the fabric to its original width without the exercise of forcible action.

In witness whereof I have hereunto signed my name this 25th day of January 1910, in the presence of two subscribing witnesses.

EDUARD HEBERLEIN.

Witnesses:

RANDALL ATKINSON,

A. PHILLIPS.