softer and more elastic, and consequently more inclined to stretch. This circumstance is happily offset by another—viz., cloth which is from its nature inclined to stretch (for example, light and loose goods) is only moderately gigged. It is, therefore, not so long exposed to the stretching process as cloth, which, in consequence of its denser texture and more compact felt, offers much greater resistance to the stretching.

In double-gig machines, the greater or less tension depends partially upon their construction. The finisher who has a number of them at his disposal can easily avoid trouble by choosing one best suited to the cloth. When the gigged cloth is submitted to a wet lustring (boiling) directly after having been napped, a slight stretching in length may be expected. This is due not so much to the rolling up of the cloth, which is generally accomplished with little tension, as to the subsequent rinsing, if the cloth, softened by the hot-water bath, is entered into the washing machine, in which it is often treated for some time in full water.

For piece-dyed goods, the operation of dyeing often causes a change in the dimensions, which increases with the degree of the felting capacity of the wool. The greatest change is produced by dyeing in the kettle. This is less frequently the case with vat blue goods, which are but little stretched in length, unless the antiquated method of drawing them through a board with a small opening is resorted to. In boiling, the cloth is apt to after-felt if the staple has any inclination to felting. This is due to the boiling up of the bath against the stuff firmly lying against the side of the kettle, which performs the mechanical labor. For this reason the cloth shrinks by boiling not only in length, but also in breadth. Still, the loss in length is generally restored again by stretching when rinsing the dyed stuff.

In order to prevent this change of dimension in the cloth by the boiling dyebath, as well as the formation of creases and cockles, and in napped goods the entangling of the nap, all the goods—at least those of a better class—to be dyed in the kettle are steam lustred previously, whereby the position of the wool fibres is fixed. If I may use the expression, the fibre is "killed" by the steam lustring—that is, it is deprived more or less of its shrinking capacity, after which it appears to be less inclined to change in form and position. The difference in behavior between sharply steam lustred and non-lustred cloth is very marked as regards its inclination to shrink during and after dyeing. It is true, the cloth will stretch in this steam lustring in consequence of its being wrapped tightly round the cylinder, which may, according to its elasticity, amount to 4 per cent., and this must be taken into account when deciding upon the extent to which the cloth is likely to shrink. Since the cloth is to be dried before steam lustring, some notice can at this time be taken of the stretching in length by the lustring. This can be counteracted by tentering the piece more in breadth than length. Besides this, in the case of light and loose stuffs when the finisher may count on a shrinkage in dyeing in spite of the steam lustring, an incidental difference may be avoided by tentering these stuffs a little more in breadth before the steam lustring. Experience and close observation only will enable the finisher to determine the exact amount. The treatment of piece dyed worsteds upon the crabbing machine answers the same purpose as steam lustring before dyeing.

Although incidental losses in breadth may be equalized again by the tentering and drying after the teaseling, still this cannot be applied nearly so extensively to-day—when the goods must be delivered ready for the needle—as it could formerly, when this stipulation was not regarded as so important. Nevertheless, small differences may always be corrected by the tentering, because according to the larger or smaller shrinkage capacity of a stuff, a part of the additional length or breadth caused by the tentering will remain after making ready for the needle. This takes place in a reverse ratio—that is, the less capacity the cloth has to shrink, the better it retains the stretch imparted to it. For instance,—

Let us take a piece of wool dyed, plain cloth, strongly fulled, and well gigged. It must, when ready, be 140 centimetres in breadth, but in the course of the different shrinkings it was, after teaseling, reduced to 138 centimetres. When we tenter this piece in the ordinary manner—that is, stretch it in breadth three or four centimetres, as is generally done, to smooth it well—it will very likely return to its original breadth of 138 centimetres when making it ready for the needle. But by spreading the piece double the quantity just stated—that is, from six to eight centimetres—we shall have it at least 140 centimetres wide finally.

More difficulty is experienced with stuffs of light fulling, the shrinking and felting capacity of which is not yet fully exhausted. They will shrink even while being made ready for the needle, and they must consequently be tentered very strongly, especially in breadth. It has happened to the writer that light cheviots and serges which before drying were fully as broad as demanded, a few pieces even exceeding the measure, after being made ready for the needle, had to be stretched again in breadth from ten to twelve centimetres to give the required width.

The proportions of length and breadth are best regulated by tentering with goods intended to be steam lustred before the last-named process. The cloth retains the greater part of the length and breadth imparted to it by drying by the fixing process of steam lustring, and often it preserves it permanently. It is even possible to restore cloth lacking a good deal in breadth, or which shrank too much in length by the fulling, to the dimensions required by strong tentering either in length or breadth and thorough steam lustring.

The effect of stretching in length and breadth is not so great on dry cloth as on wet. For this reason the tension in the shearing machine has little or no influence, at least upon heavy fulled goods, and alters them neither in length nor breadth. It is otherwise, however, with lighter stuffs. These contract more or less in breadth, due to the tension upon the shearing cylinder, which shrinkage will be proportionate to the extent to which they were stretched in breadth when tentered for drying. This circumstance must be duly taken into account in drying, and light and loose goods are to be tentered correspondingly more in breadth.

Finally, the treatment in the cylinder press very often causes a change of dimensions. This is principally due to the fact that the stuff still contains a certain percentage of moisture, whereby it is softened between the hot press faces and then carried along under tension, which under certain conditions causes it to stretch considerably. This is not of great moment in the case of cloths which are made ready for the needle after the pressing, since by this process the original proportions are restored, especially if the operation is performed upon the steaming table. Nevertheless, it may happen that in the steaming upon the roller the proper shrinkage will not occur, especially if the cloth after being wound is kept rather tight. Goods that are not to be delivered ready for the needle should not be treated in the cylinder press, as is sometimes done, but in the plate press. The goods are often stretched in length as much as from three to five per cent., and they also lose largely in weight, as their moisture is evaporated by the heated pressing faces—a fact readily observed in pressing.

IMPERFECT VAT DYEING OF WOOLEN PIECE-GOODS.

The difficulty of thoroughly dyeing all wool cloth compactly fulled is discussed in a German contemporary. The case presented involves the dyeing of a vat blue on military diagonal cloth, and various methods of overcoming the difficulty referred to and causing the dye to penetrate the cloth more perfectly are suggested. The writer says that it is not reasonable to expect that piece dyed vat-blue cloth will be dyed throughout as intensely as upon the face, especially in the case of white goods. The greater portion of the absorbed dyestuff will naturally be deposited on the face. However, with a rational treatment in fulling and dyeing, the body of the cloth need not necessarily remain entirely undyed. Such a result is in great part due to the fact that the cloth did not issue clean from the fulling mill, and still contains fat or soap residues, or, what is worse, yolk residues, in consequence of a defective washing of the wool. These residues, which occasionally render the absorption of the dye on the surface difficult, naturally all the more prevent its penetration into the body of the cloth.

With faultlessly clean goods, even when they have been milled