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Washing.

The fact that soap, an agent which promotes the felting process, is employed during this process, certainly tends to further felting of the fabric. For this reason, in connection with fabrics that were not fulled to the complete exhaustion of their felting capacity, an after felting and consequent shrinkage in washing, is unavoidable. However, in this instance the shrinkage takes place only in the width of the fabric corresponding to the mechanical treatment in washing — *viz.*, by drawing it lengthwise and applying pressure, whereby the cloth is stretched in length.

The temperature of the bath used for washing is also an important factor, since some fabrics will felt during washing, provided warm water is employed, but will not shrink in connection with cold water. Again, fabrics will have a tendency to shrink considerably more when the washing (as done in some woolen mills) is carried on in the fulling mill — *i. e.*, after the fulling of the cloth in question has been finished, — than if the washing is done either in an open-width or rope washer.

There are other evils invited by washing the fabric in the fulling mill which partly consist in fixing cockles more obstinately, and an insufficient washing, both items being the consequence of the little space afforded to the goods in the channel of the fulling mill, as well as insufficient overhauling, etc. The only advantage is that the cloth is not drawn out so much in length when washed in the fulling mill. So long as the cloth runs in the soap, it will generally crimp in the channels, even though the crimping box is ungeared, and good cloth possessing a certain inclination to felt, will thereby continue to shrink in length. It is a well-known fact that nearly all the changes occurring in the texture of the cloth are directly due to washing in the fulling mill, a feature which does not happen so often in the ordinary rope washing machine.

Here it is only necessary to take into account the entrance of the cloth through the guide board, and next, its stretching produced by the drawing up from the bowl — a stretching which is caused by its own weight. Nevertheless, the cloth is invariably stretched to a certain extent in this machine also, and contracts in width, especially when the apertures of the guide board are only as small as are required for the proper entrance of the rope and the prevention of cockles and creases.

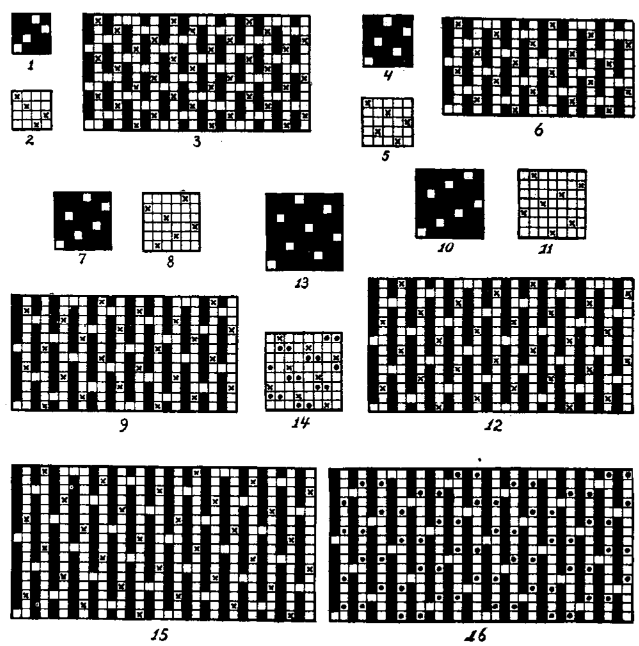
It is asserted by some mills that some makes of open-width washers stretch the cloth under operation more excessively than absolutely required, thus reducing it in width. It is evident that the cloth, when running full-width between the rollers, must be spread out to its full extent, which can only be done at a tension, or else one of the principal purposes of the machine, the smoothening of the cloth will not be attained.

Fabrics are rarely carbonized after fulling, carbonizing generally preceding the fulling; but it may be found necessary (under certain circumstances) to carbonize after fulling, in which instance this process also causes stretching and shrinking of the cloth under operation, since the latter by treatment with acid at a high temperature becomes looser in feel, and the texture is so loosened that when neutralized in the washing machine it stretches to a considerable degree, as has been ascertained by repeated trials.

Double Warp Effects.

The object aimed at by the Designer is by use of this class of weaves — combining 2 mate weaves, i. e., Warp and Filling effect of one weave to produce a two sided effect, using one color or fancy effect for one system of warp-threads in the resulting combination — using a different color or fancy effect for the other system of warp-threads; the filling being of one color.

This method of combining combination weaves for a somewhat heavier class of fabrics — using at the same time fancy effects for face and back warp — resulting in most novel effects in the fabric produced.



Weave: Fig. 1 shows the 4 harness broken twill: 3 up 1 down (single cloth).

Weave: Fig. 2 shows the 4 harness broken twill: 1 up 3 down (single cloth).

Weave: Fig. 3 shows the "proper combination" of these 2 mate-weaves, to produce a two color effect to the fabric, 1 to be the face of the fabric 2 its back side.

As will be seen from the variety of weaves — they farm a splendid foundation for constructing fancy effects for the face, as well as the back, of the fabric.

Weaves: Fig. 4 and 5 shows the combination of the 5 harness-satin — warp and filling effect — combined in weave Fig. 6.

Weaves: Fig. 7 and 8, shows the combination of the 6 harness-satin — warp and filling effect — combined in weave Fig. 9.

Weaves: Fig. 10 and 11, of the 7 harness-satin — warp and filling effect — combined in weave Fig. 12.

Weaves: Fig. 15 shows the combination 1—1, using the 8-harness satin warp effect — as shown in weave Fig. 13 — combined with its corresponding filling-effect.

Weave: Fig. 16 shows the combination 1 — 1, using the 8-harness satin warp-effect as shown in weave Fig. 13 with another weave; in combination, for its back.

Weave: Fig. 14 shows a figure effect for single cloth — Fancy-dress-fabric — using an 8 x 8 weave — combination for that effect to produce the figure for single cloth.

Suppose Undyed Cotton Yarn is Used.

Suppose undyed cotton yarn is used in the splicing and in the sewing or seaming operations, it is advisable to give due notice to the dyer, in order that he may modify his selection of dyestuffs, so as to produce an evenly dyed hose, or half-hose, which at the present time (on account of the scarcity of dyestuffs) is by no means a simple thing to do. The dyer then can, to the best of ability and choice of dyestuffs, add some dyestuff to the bath which will dye the cotton practically the same shade as the wool, even if it be a dyestuff that will not dye the wool at all. Moreover, he can also modify his dyeing operation by shutting off the steam towards the end of the operation so as to allow the cotton to take up the dyestuff, since cotton often dyes better at a lower temperature.

The best general method of application when using acid dyestuffs, where cotton splicing is present, is to enter the goods in a boiling bath, with or without the dyestuff, and boil them for a few minutes, so as to get the cotton thoroughly wetted out by the penetration of the boiling liquor. If the dyestuff has not previously been added, it can then be entered in a properly dissolved form along with a certain proportion of a cotton dye and the goods boiled for from one-half to three-quarters of an hour. Shut off steam and work the cooling liquor for another twenty minutes.

In order to judge whether the cotton is thoroughly dyed, it is advisable to enter a trial swatch of cotton along with the goods and afterwards take it from the bath, dry it over some adjoining steam pipe and note the density of the color. The appearance of the cotton wet and dry are two different things, since when cotton is wet the density and the tone of the color is out of all proportion in contrast with its appearance when dry. Proper penetration of seams and reinforced parts, even if composed of the same character of fibre, can only be obtained by absolute penetration of boiling water.

These methods of dyeing would seem strange in connection with the dyeing of woven goods since entering of these at the boil is considered a sure method of obtaining unlevel results. Naturally this would also occur in the dyeing of hosiery were it not for the fact that the dyer invariably uses colors which are easily levelling so that in case of too rapid absorption on different parts of the goods the excess color is afterwards removed by the boiling, the color being boiled off the denser parts and transferred to the other parts.

Hosiery dyeing, therefore, must be considered a special branch of the dyeing industry, and dyers of woven goods, when taking up this branch, should remember that the methods of dyeing woven goods can by no means be followed in entirety in the dyeing of knit goods.

The Mordanting of Wool.

Speaking generally chrome is easier to apply to wool, and gives, on the whole, better results than any other metallic mordant. It has almost entirely superseded the mordants that were commonly used up to thirty or forty years ago; so much so that we fancy very few present-day wool dyers could claim to have familiarity with the application of iron, copper, alum, or tin compounds to the processes of dyeing. Chrome not only swept the deck of these older mordants, but its position has not to our knowledge been seriously challenged by any newer ones.

We think this betokens some lack of enterprise on the part of those engaged in the trade. The older mordants did not have all the chances given to them they might have had — with some loss in certain directions. True, the general simplification of the dyer's work by the adoption of one mordant only, has great advantages. But in certain directions, a little specialization with other mordants would probably have raised the average fastness to light, and perhaps also have shown some saving in expense.

Sulphates as Mordants.

Except tin chloride, with its special use in the dyeing of cochineal, the old mordants were practically all sulphates. Of course, we are confining ourselves exclusively to wool dyeing. The only iron salt the wool dyer seems to have known was the ferrous sulphate commonly known as copperas. Similarly with copper; blue stone, the sulphate of copper, was the only copper salt that found its way to the wool dyer. Alum is a double sulphate, the other element in it usually being potassium, but sometimes ammonia alum was used.

Sulphates are not, as a rule, good mordants for wool. Even chromium in the form of its sulphate is not satisfactory. On this point a comparison of the two sulphates of iron is significant. The ferrous sulphate $FeSO_4$ contains one atom of Fe to one radicle of SO_4. The ferric sulphate $Fe_2\ (SO_4)_3$ contains two atoms Fe to three radicles SO_4. To put it rather more obviously, whilst for every two atoms Fe the ferrous sulphate (copperas) contains two radicles SO_4, the ferric sulphate contains three such radicles — and the latter is a very poor mordant for wool. So far as we know it has never been used as a mordant by the wool dyer, though it has been available, because, under the misnomer "nitrate of iron," it has been largely made and sold to the cotton dyers.

This detrimental effect of sulphuric acid on the mordanting properties of wool is curious, and we do not remember that it has hitherto been noted. But the phenomenon is significant, and we shall have occasion later to point out a case where it has to be made allowance for, under circumstances which are quite likely to come into the experience of every dyer.

Sulphates Discarded.

It is certainly significant that the first mordant, not a sulphate, which came along, in a very short space of time commended itself so well to the whole trade that the sulphates were discarded and the new mordant adopted universally. It is almost too late now to get the reasons for the discarding of the older mordants in the form of first-hand recollections, though if any old dyer could be got to give his experiences it would be a very interesting bit if history.