THE BLEACHING, DYEING AND FINISHING OF KNIT GOODS.

The preparation of knit goods (hosiery, underwear, etc.) for the market, which includes bleaching, dyeing, finishing and trimming, as well as the sorting, boxing, wrapping, etc., is really the most important operation in the entire process of their manufacture, since no matter how well they are made or how good the fabric itself is, unless the finished articles are made up in an attractive and pleasing form, they will not be salable. It is a positive fact that the appearance of knitted goods is the first consideration with the buyer, and an attractively finished article is almost always preferred to another less carefully finished, although the former may be an inferior fabric, the defective finish and untidy appearance of the better article making it seem the poorer quality of the two. Consequently, to produce goods readily salable, it is not enough to *make* them good, they must be made to *look* good, and this must always be borne in mind. Don't think that because *you* know that your knit goods are better in quality and make-up than your competitors that the public know it too, you must not only make them *actually* better than others, but you must make them *look* better, if you want to get the public's trade and money.

After all is said, the sales department of a mill is its vital part, for, unless the goods it makes are sold, there is very little use to make them; unless they sell promptly and profitably, there will be no money coming in to pay the operating expenses of the mill, let alone a profit to the owner, and the mill might just as well shut down as to make goods that people will not buy. To make knit goods that will *sell,* in these days of keen competition, is much harder than to *make* goods of the finest grade and quality, the latter is easy, given good machines and skilled operatives, but to sell these goods, they must be made to meet the public taste and must be a little more attractive than the common run. It is a very unfortunate state of affairs that the majority of people prefer articles that *look* good to articles that *are* good, but which are less attractive, but such is the case, not only with regard to clothing, underwear, etc., but even as to foods, and it is also true that the majority of people are totally unqualified to judge of the quality and excellence of textile fabrics, knit goods especially, therefore we must take these things into consideration and be guided accordingly. It is a condition, not a theory, that confronts us, and we must give the public the things they want *in the way* they want them, if we want them to buy our goods, for by the time people are educated up to buying things solely on their merits, most of us will not need money at all.

This does not mean that the knit goods manufacturer should neglect quality and turn all his efforts to making trashy stuff that will satisfy people because it looks pretty and suits their tastes, not at all, this would be a suicidal policy, to say nothing of its bad morals. It does mean, however, that to create a demand for his goods, the manufacturer must spare no time or trouble to make them what people want in regards to style, finish, etc.; let him take a lesson from the trashy stuff that sells so easily because it is made to appeal to buyers by its neatness, ornamentation, design, color, artistic appearance, etc. In addition to making his goods of the best quality, he should finish them in the latest styles of shape, color and design, give them as nearly a perfect appearance as possible, sort and pack them carefully and neatly, put them up in attractive ways so that their merits are at once shown; all this will make people believe them to be the best in the market and such goods will appeal to their taste and pocket books.

No matter how carefully the manufacturer may have selected his raw material and how skillfully it has been worked up into the knitted article, unless the latter is carefully and neatly finished and made of artistic and pleasing design, it will not sell. Bear in mind that every other manufacturer can get just as good machinery and just as good help as you, and consequently can make just as good a quality as you, therefore, to succeed, you must make your products *look* better than anybody else's, and strive to keep always a little ahead of them in newness of style, special designs, artistic trimmings, etc.

Making up Knit Goods. In making up knit goods, the designer's field for novelties is somewhat limited, the general styles, shapes and the character of knit garments having become practically standardized. Thus, the vest or shirt of a two-piece suit of underwear can be only slightly altered in shape or general finish, the same is even more the case with the drawers, while with hosiery there is still less opportunity for change. The only radical variation from the two-piece suit of underwear, the one-piece or union suit, has already been developed and standardized, and unless some new garment is invented, there is little possibility of novelty in shape. In fancy goods, such as sweaters, leggings, caps, etc., there is but little more chance for novelty in shape and general appearance, in fact, entirely new and novel garments or developments of knitted fabrics seem to be a crying need.

Under such conditions, it does not seem practicable to make any radical changes in the cut or shape of these garments, hence the designer's field is, of necessity, limited to the minor details of style, texture, color, finish, ornamentation, trimming, etc. In shape, about the only changes would be the variations of the ordinary shirt and drawers and the union suit, long or short sleeves and legs, high or low necks, etc. About the only novelties in shape, one might say, are the recently designed "athletic underwear," patterned after the garments worn by athletes, and the "coat shirt,"

which opens all the way down the front or side and is fastened by buttons or hooks.

In texture, for underwear, the variations range all the way from the closest knit fabric to a wide open-mesh work, in all sorts of fabric structure, then there are the so-called "fleece-lined" garments, which are now very popular for winter wear. Various fibres can be used, either alone or in combination, and along this line there is a chance for the development of novelties in fabric structure.

It is in the details of texture, finish, color, trimmings, ornamentation, etc., that the designer has the greatest chance for designing something novel and pleasing, here his taste and artistic abilities can have full scope. Endless variety is possible by the use of various textile fibres and of various stitches, alone or in combination, contrasts in color or trimmings, the use of various materials for trimming and various styles in trimming and finishing, etc., etc. Even in the smaller details of the stitch used for sewing on trimmings and of the kind of buttons used, there is opportunity for making garments novel and attractive in appearance, and these finer points of the art of making knit goods should be given careful attention.

If the goods are to be colored, the nature and qualities of the fibres or materials in reference to dyes and dyestuffs should be considered, since some dyeing agents and mordants are best suited to one fibre, others can be used equally as well with all fibres or mixtures thereof. The details of coloring must be suited to the quality and kind of garment; gaudy colors in underwear will make even the finest grades look cheap and trashy. It is better to finish underwear in natural color or bleached white, and to depend for color-effect on the trimmings, using simple or contrasting tapes, lace, braids, borders, etc., with or without colored, plain or fancy stitching. If colored trimmings are used, the colors should be fast to perspiration, washing, etc., otherwise, the neatest finished garment will look trashy and cheap after being worn a couple of times.

Another thing to be considered is simplicity of finish, as to fastening, buttons, buckles, straps, etc., especially in men's garments. The average man despises underwear that has a complicated system of tapes or straps or buttons and which cannot be put on or taken off with ease and quickness. Women may be satisfied with long rows of buttons or intricate lacings, but men are not, a man may be attracted by the novelty of such a garment and try it once, but ten chances to one, he will never buy another, or even wear the one he bought at first. The manufacturer who will sew the buttons on men's underwear so that they will stand a little wear and use, will gain the gratitude of mankind generally. This can be made a strong advertisement for your goods. Sew the buttons on securely, and then make a specialty of telling about it; when once your underwear becomes known as "the kind that the buttons stay on," you will have a steady demand for them that will keep your mill busy. These seem like trifles and not worth attention, but where several hundred mills are making the same thing, the man who makes his products just a trifle better than the others will sell the biggest amount.

Still another important point in connection with underwear is that they must be made and finished so as to be comfortable to the wearer. They should be of an even thickness throughout, and whatever is added in the way of trimmings, such as tapes, laces, braids, bands, etc., must not be put on so as to make the garment thick or lumpy at any point. The seams that unite the several parts of the garment must be flat, as well as strong, and without a ridged or corded or ragged appearance, and they should be located in the garment, as far as possible, so that they will not cause discomfort from chafing or pressure. Large seams should be overlapped and overstitched, to prevent ripping or ravelling, and where extra thicknesses of fabric are used for reinforcement, as in the seat of drawers, the extra piece should have its edges turned down and double-stitched, flat and evenly. Coarse seams or ridges, or a cord-like appearance at the junction of ribbed tops or cuffs, etc., with the main fabric of the garment should be avoided, and this particular part of the garment should have as much elasticity as the parts above and below it, otherwise, threads will soon be broken and the seam ripped out. The seam at the toe in hose should be made as flat and as thin as possible, with no raw edges.

Having determined the particular fibre to be used for the garment, the gauge of the fabric, its color, etc., the designer should lay a piece of the finished fabric before him and study it carefully before he begins to lay out the pattern for cutting and shaping the garment. He should consider the nature and peculiar qualities of the fabric, its elasticity, whether it will shrink or stretch after being washed or dyed, its behavior to sewing and stitching, how and where it is to be trimmed and what allowances must be made for seams, facings, shaping the garment, etc. For fine grades of underwear, the patterns should be made so as to allow liberal margins for making up the garments, so that when finished they will not look "skimpy" or as if the maker stinted the material to make more money out of it.

In the cheaper grades of underwear and hosiery, of which the price does not warrant much trimming or finishing beyond what is absolutely necessary, there cannot be much attention given to ornamentation or novel effects, but there is still an opportunity for making even the cheapest garment look attractive. The trimmings, buttons, etc., can be selected and put on so as to give them the appearance of being a much higher grade than they really are, care and attention

to the details of finishing will make them appear to be of a better quality, and all this will make them much more desired by the purchaser, with only a little money to spend, than better goods carelessly finished. Even if the manufacturer does not get a higher price for such goods, he will be able to sell them much more readily and to make a good profit on the larger volume of sales. Not the least benefit that will accrue to him will be the reputation for making first class, salable goods, which reputation will bring him orders in dull times when other mills are idle. Good goods are always in demand, when properly marketed.

Preparing Goods for the Market. This is a matter to which too much care and attention can hardly be given. How often does one see the finest and best goods made practically unsalable because of careless preparation for the market, careless mixing of grades, glaring contrasts of color in the same box, careless assortment of sizes and shapes, etc. It would do the manufacturer good if he were to take a day or two off from the mill to go around through the big retail stores and look at the way goods are put up, perhaps he would learn why his own sales are slow and why his rival cannot fill his orders.

Take woolen hosiery for an example; if the overseer of the finishing department has not watched things closely, imperfect goods and bad mends will be put in the same lot as first-class goods, inferior grades will be put in with the better grades, sizes will be mixed and colors will be poorly assorted. In consequence, such lots cannot be sold for first-class goods, the presence of faulty pieces will condemn the whole package, and no matter how good the others are, unless the package is re-assorted, the whole lot must be sold as "seconds."

In examining hosiery, previously to packing them for the market, see that every piece that needs it is neatly mended, and do not allow badly-mended pieces to go in under any circumstances, sort and mate the heels and toes and the legs, and see that only one size is packed in the same box and that they are folded neatly and evenly. Have the boxes packed neatly, in dozens or in half-dozens, as the trade demands, see that the packing is done snugly so that the pieces will not be all shaken up in shipment, and send out different colored hose, for assortments, with some regard to color contrast. Carry out such points as these in the finishing department and your goods will never be turned down as "unsalable."

In preparing underwear for the market, the chief desideratum is that each garment shall appear neat and clean and attractive, and that all defective places shall be carefully mended so as not to appear as defects. If the garments are to be white or uncolored, they should be thoroughly washed, cleaned or bleached, and pressed, and should not show any stains or grease spots. Colored garments must not show irregular shading or unevenness and must not be soiled or stained. All pieces should be carefully folded according to trade requirements and then pressed, so as to present a good appearance.

The folding and packing should be done so that the garments will "show up" to the greatest advantage, *i. e.*, so that any special novelty or attraction in design or finish will at once strike the eye of the purchaser. Goods poorly packed will not show up their good points and will be passed over in favor of an inferior article that has been packed so that its best points are made prominent.

These are but a few of the many details that go to make successful business, they are mentioned more in the way of suggestions, which the manufacturer can develop, than with any idea of covering the subject.

The Washing and Bleaching of cotton knit goods is of great importance, their final appearance depending largely on the processes connected with these operations and the care with which they are performed. The knitted fabric, as it comes from the machine frame, is not very clean, and it must be well scoured and cleaned and bleached before it becomes salable, the extent to which these processes are necessary depending on the condition of the fabric as well as on the character of the finished article.

If the fabric is sold in its crude state, *i. e.*, if the manufacturer does not make it up into garments himself but sells the knitted cloth to others, it must still be cleansed from dirt, grease spots, etc., and if it is to be delivered in a pure white state, the fabric must be bleached as well as scoured. If the goods are to be dyed light colors, this preliminary scouring and bleaching are also necessary, but if they are to be dyed black or dark colors, the bleaching may be omitted.

Usually, a fabric that is to be sold in the crude state can be sufficiently cleaned by boiling it in a soap solution, to which a small percentage of alkali may be added if the goods are very dirty. If the fabric must be white, the cleansing process must be more thorough, to remove all the natural wax and fatty matters from the cotton fibres as well as dirt and grease, so that the bleaching agent can act on the yarn evenly and effectively, and the bleaching must remove all spots and traces of color or pigments, no matter of what origin. If this is not done in a systematic and thorough manner, there will be trouble in the dyeing later. Goods should be well rinsed, so as to remove all soap and alkali.

It is sometimes a question as to whether to use a raw yarn or a bleached yarn for knitting fabrics that are to be finished white. In any case, the grease and dirt received during knitting must be removed by washing the finished fabric, so it will probably be cheaper to use raw yarn and carry out all the scouring and bleaching in the finished fabric. This is

especially the case with cotton hosiery, which is mostly finished in black or dark colors, as the washing, dyeing, etc., can be performed on the completed article better and with more satisfactory results than on the yarn itself before it is knitted into hose.

Whether white or natural color, the knitted fabric made from raw cotton yarns must be washed with soap and alkali before it is fit for making underwear, as the fibres of the yarn are coated with the natural wax and fatty matters of the cotton, and these must be removed, or the fabric will not absorb moisture, perspiration, etc. It is not desirable, however, to make the yarn for underwear too absorbent, as in that case it will hold the moisture from perspiration instead of allowing it to evaporate freely, making the garment feel damp and uncomfortable, therefore it is an advantage to leave some of this wax on the fibre. The ideal underwear is that which absorbs perspiration freely, yet which allows the moisture to evaporate readily from its outer surface, and which is porous enough to permit a slow circulation of air to and from the skin. Hosiery, on the other hand, should be knit closely and firmly so that it will stand the wear to which it is subjected, and it should not be so absorbent as underwear.

Scouring. Scouring, cleaning and washing are the primary operations in preparing knitted fabrics for bleaching and dyeing. Knitted fabrics made from raw cotton yarns cannot be cleaned successfully with soap alone, as it will not "cut" the wax and fatty matter coating the fibres, and an alkali must be used in connection with it. The alkali may be either caustic soda or caustic potash (soda lye and potash lye) or the carbonates of soda or potash, the soda salts being much cheaper than the corresponding potash salts. Soda lye is harsher in its action than potash lye, whereas carbonate of potash is more caustic than carbonate of soda. The strength of the solution should be proportioned to the strength of the fibre, and should also be varied according to the quality and nature of the yarn or the knitted fabric. Cotton goods can be treated with caustic alkalies without much risk of deterioration, but wool and silk would be entirely destroyed by exposure to their prolonged action. This explains why, when scouring mixed goods, *i. e.*, merino underwear, great care must be taken not to injure the wool fibres, and why caustic alkalies must not be used, carbonate of soda being employed instead. The scouring solutions must not be too strong nor hot and the goods must not be left in them any longer than necessary.

All substances used in scouring must be perfectly dissolved in the water of the scouring bath before the goods are entered, otherwise they are liable to come out spotted or unevenly washed, from coming in contact with undissolved soap or alkali. It is a good plan, and saving of both time and trouble, to dissolve soaps, alkalies, etc., in a small quantity of hot water outside the scouring tub, then to add this solution to the remainder of the water in the vat. With soap, it is advisable to melt down the hard soap with about three times its weight of water, which will make a sort of jelly or paste, easily handled and dissolved. When ready to use this, we simply take a proportionate quantity equal to the required weight of hard soap and stir it into the water in the vat, when it quickly dissolves.

In correct washing or scouring, the bath should cover the goods completely, so that no part of them is exposed to the air, and this point is especially important when handling cotton fabrics. If the fabric is exposed to the air when saturated with alkali, especially when heated, the cotton fibre becomes oxidized and loses its strength, *i. e.*, the yarn becomes "rotted" or "tendered," and the part of a garment thus exposed will soon wear out or the threads will break during the finishing, leaving defects. The fabric may also lose in weight, from the soft parts of the yarn becoming weakened and falling off during the scouring or dyeing process.

THE FIRST OPERATION is boiling the cotton goods with caustic soda, the best proportions being about one and one-half pounds of caustic soda for each one hundred pounds of goods. The boiling requires from four to five hours, and must be continuous, *i. e.*, the temperature of the bath must be kept at the boiling point, 212° to 215° F., during the entire process. After boiling, the goods are taken out, drained and squeezed, or still better, put through a hydro-extractor, after which they are well rinsed in clear water and then passed into a soap bath, four pounds of soap to one hundred pounds of fabric. This second boiling should be kept up for about two hours. After a most careful rinsing, the goods are ready for bleaching, if they are to be finished white; or if to be dyed dark colors or black, they may be at once entered into the dye bath. If the goods are to be finished in natural color, they may go to the finisher without further preparation.

Instead of using caustic soda in the first scouring, the bath may be made up by using 8 to 10 pounds of good carbonate of soda (GRAN-CARB-SODA) and 1 to 2 pounds of soap to each 100 pounds of goods. This solution is less apt to injure the fabric and is therefore suitable for the finer qualities of knit goods. It has been found that the time for boiling-off cotton goods can be much reduced if the goods be first immersed in a weak, lukewarm bath containing about 2% of sulphated oil, neutralized with a slight excess of ammonia water, or in a soap bath containing 1% to 2% strong ammonia. This treatment not only completely removes all the natural oils, etc., on the fibres but also more thoroughly *wets* the goods, *i. e.*, leaves them in a condition so that bleach or dye liquors thor-

oughly penetrates the goods. The sulphated oil may be either castor oil or olive oil, treated with strong sulphuric acid. It is best to buy it, as the process of making it requires care and skill.

Scouring Machines. Scouring nowadays is usually done in machines, which act on the same principle as the familiar washing machine of the home laundry, the goods being kept in motion through the scouring solution until cleaned. Steam is admitted into the bath through perforated pipes.

A much better machine, in which large quantities of goods can be handled quickly and thoroughly, is the Klauder-Weldon Machine, which is also used for dyeing knit goods, hosiery, etc. The details of the construction and operation of this machine are shown in the accompanying illustration, Fig. 1, which is a cross-sectional view through the central part.

In this illustration, 1 indicates the washing tank, made of wood and reenforced with heavy cast-iron frames at each end, to which the gearing, not shown here, is attached. The cylinder of the washing part of the machine 2, is made almost entirely of white pine and cypress staves, the end heads of the cylinder being supported by bronze castings on the driving

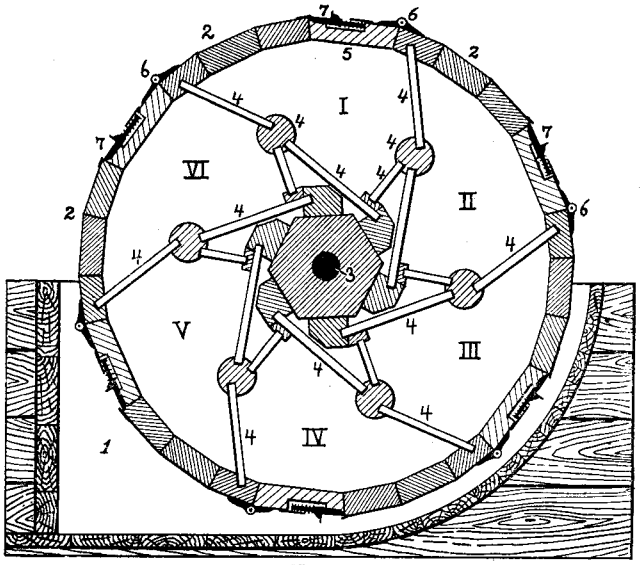

Fig. 1

shaft 3, the hubs of the castings being keyed to the shaft so that the cylinder and its contents revolve with it. This driving shaft 3 extends through the centre of the cylinder and rests in bearings supported by the iron frame of the washing tank. The driving shaft is entirely covered with wood on the inside of the cylinder and made water-tight, so that the goods being washed will not come in contact with it, this being necessary to prevent rust spots from the steel of the shaft.

The cylinder is divided, inside, into six compartments, by the partitions 4, which are so shaped as to prevent the goods from being matted together by the revolution of the cylinder and its contents during the washing process, thus enabling them to be washed evenly and thoroughly. These partitions may be either perforated boards or a series of pins, so placed that there is a perfect circulation of the washing liquor through the goods, an important point, as it insures thorough washing.

Each compartment is provided with a door 5, through which the goods are loaded and unloaded, these doors being perforated to allow the wash liquor in the tub to enter freely into the compartments. Heavy bronze hinges 6 and catches 7 are provided for fastening these doors.

The top covering of the machine (not shown here) is supported at each end by cast-iron frames and is well strengthened with rods. The openings at the back and front of the machine are covered by canvas curtains, which can be rolled up out of the way during the loading and unloading processes. This top covering and the canvas curtains are a decided advantage, as they save steam, by confining the heat, and also insure the maintenance of the required temperature. These, and the shape of the washing tank, allow the minimum of wash liquor to be used. Steam is admitted in the tank through a pipe, which enters at the bottom and extends across it. The goods, being inside the cylinder, are not exposed to the direct action of the steam and cannot thus be injured by it. The tank has an outlet valve, at one side, to discharge used liquors, water, etc., the valve being made as strong as possible.

The cylinder is rotated by a driving arrangement, either from the side or from the back of the tank. When driven from the side, a worm gear is attached to the end of the driving shaft 3, and this gear is driven from a second worm located on the same shaft as the driving pulley. When driven from the back, a bronze head is attached to the periphery of each end head of the cylinder, and this is driven from a shaft extending across the back of the tank, on which are placed two pinion gears which mesh with the teeth in the bronze rack. A worm gear is placed on the end of this back shaft, which, in turn, is driven by a worm attached to the driving pulley, the same as in the first instance. This back drive is preferable, since it does not throw the strain on the central main shaft, the latter simply supporting the cylinder and rotating with it. A hand crank is attached to the machine, so that, in case anything happens to the power during a run, the cylinder, etc., can be turned by hand and thus prevent spoiling the batch of goods.

Care must be taken not to run the machine too fast, or there will be trouble from knotting and bunching of the goods. One machine can handle several lots of goods a day, and from 150 to 400 pounds of goods can be put in at one run, according to their nature. One man can attend three or four machines while they are running.

(*To be continued*)