For this reason the felting and fulling properties are diminished, if not wholly destroyed. The microscope also reveals a great dissimilarity in the diameter of the fibre, which is probably due to the constant wear and tear to which it is exposed. The absence of the serrations may likewise be attributed to this cause.

It may also be stated that the fibres are partially stripped of their scales and natural serrations by the mechanical operations. Yet the fibre saved from what is usually burned can be used if mixed properly with other fibre.

*Shoddy Roving Makes Shoddy Yarns.*—Great care is required in making a proper combination. The most scientific mule fixer in the world cannot set a mule so as to draw shoddy stuff into yarns smooth and good as woolen. Shoddy fibres are short, cut, broken and uncertain, and s an uncertain roving is made. Many rough and bad places in roving are reduced in size, and given a smoother appearance by drawing out, and so the aim is to draw out roving as much as possible.

The fine, lustrous, smooth and lengthy fibre of the woolen roving readily elongates one-half, and defects are easily and effectually covered up or removed. But the short-fibred, unreliable shoddy roving cannot be drawn out more than one-third, and often only a quarter, and therefore many of the defects in the roving remain and are woven into the goods.

In order to obtain a very even thread, some mills have found it very advantageous to double the roving. It is more costly and bothersome to spin yarns after this plan, also more waste is made, and so few mills adopt the method, unless exceptionally even goods are to be made from the yarns.

## THE CHLORINATION OF WOOL.

The employment of chlorine in wool-dyeing and wool-printing has of late years received an impetus in directions previously little thought of. The addition of a little chlorine to the decoction of logwood has been recommended as increasing the dyeing power of the wool. Treating the wool with chlorine has a material influence in increasing its capacity for taking dyestuffs, and, although but little attention has been paid to this circumstance by wool-dyers, yet among wool-printers it has come largely into use, and enables them to produce fuller and faster shades than would otherwise be possible.

The method involves the treatment of the wool first with an acid, then with a solution of hypochlorite. The staple becomes soft and supple, and assumes a silky character; in dyeing it shows a greater affinity for the dyes than it did previously. Although not deteriorated in strength, it almost entirely loses its felting properties. On account of this feature, the process cannot be adopted for wool which has to be fulled; but it is of service where felting of the goods is to be avoided—for worsteds, underwear, woolen and half-woolen hosiery, etc., in which the felting property that occurs on washing is rather objectionable.

By the chloring of the wool the intensity of the shade dyed is increased to such a degree that, when dyeing with acid black, naphthol black, naphthol green, nigrosine, fast blue, water blue, and some others dyed in an acid bath, but little more than half the dye used on unchlored wool is required; while with induline more even and intense shades are obtained than is otherwise possible.

The operation of chlorination can be done either in one or two baths. The choice depends upon circumstances and the judgment of the dyer. The process by the two-bath method, with subsequent dyeing in the second or in a separate bath, is (for 100 lbs. of wool) as follows: The first bath contains, for light cloths, yarn, etc., from 3 to 4 lbs. sulphuric acid, 168° Tw, and for heavier cloths and felt, where the penetration and equalization of the color is difficult, from 8 lbs. to 10 lbs. of acid. Generally speaking, a temperature of 170° to 175° F. is sufficient; although for heavy wool, and for wool with poor dyeing qualities, it is well to use the bath at the boil. The treatment lasts for half an hour, in which time the acid is almost completely absorbed.

The second bath contains a clear solution of 10 lb. bleaching powder, which solution is prepared as follows: Dry bleaching powder of the best quality is stirred in a wooden vat with 70 gallons water, the mass is allowed to stand, the clear supernatant liquor is run into the vat, and the sediment stirred up and again allowed to settle, the clear liquor being run off as before; and 35 gallons more water is run in. The clear liquors of these three treatments are then mixed together to form the chloring bath. Special care should be taken that no undissolved particles of the bleaching powder should be left in, for if these settle on the wool they result in too great a development of chlorine, which injures the wool.

The goods, after being in the acid bath, are entered in this chlorine bath at a temperature of 70° F., which is then raised to the boil. If the acid bath has been strong, or been used at the boil, it is perhaps best to rinse the goods before entering into the chlorine bath. The hypochlorous acid disappears so completely from this bath that dyeing may be performed direct in the bath—for which purpose it is only necessary to lift the goods, add the required amount of dyestuff, re-enter the goods, and work until the bath is exhausted, which generally happens when acid dyes are used. If a separate dye-bath be preferred, this is made and used as is ordinarily done.

To perform all the operations in one bath the acid bath is made with from 3 to 4 lbs. sulphuric acid, and the wool is treated therein for 30 minutes, at 170° F., until all the acid has been absorbed. Then the bath is allowed to cool down to 70° or 80° F., the clear bleaching powder solution is added, the goods are re-entered, and the bath is heated to the boil. When all the chlorine has disappeared, add the dyestuff, and dye as directed above.

In printing on wool the chlorination of the wool is a most important preliminary operation. For this purpose the cloth is passed for 15 minutes, at 170° F.,