



WOOLLEN MANUFACTURES.

THE INSPECTION OF FLEECES. — DIFFERENT KINDS OF WOOL, AND THE DIFFERENT USES TO WHICH THEY ARE PUT. — THE SORTING OF WOOL. — PROCESSES OF MANUFACTURE. — WOOL-DYEING. — WORSTED. — THE LONG-WOOL INTEREST. — AMERICAN INVENTION OF WOOL-WORKING MACHINERY. — STEADY PROGRESS OF THE ART IN THE UNITED STATES.

The fleece, when it comes into the wool merchant's hands, is subjected, first, to a general division, which determines the class of goods for which it is best adapted; then, in the hands of the manufacturer, it is very carefully examined and sorted. The three leading classes of wool are, first, felting wools. Their peculiarity consists in the serrations along the edge of the fibre. Some wools have very little of this, and felt very imperfectly. The best class of goods for gentlemen's wear — broadcloths, cassimeres, and beavers — are manufactured from felting wools.

Second, combing wools. The object in handling and working felting wools, is to pack the fibre as closely as possible. In the treatment of combing wool, the object is right the reverse — to work out the fibres in long, silk-like threads, and thus produce a fabric resembling silk goods. From combing wools are made a large class of fabrics for ladies' wear, as poplins, mohairs, and alpacas.

Third, wild and hairy wools. These come from Australia, Mexico, and South America. Wool in those warm countries, adapting itself to the climate, does not compose the fine, oily mat for the protection of the animal from cold and wet which we find on the sheep of England and Germany. It falls away from the belly and legs of the animal, whose back and sides only yield a light fleece of a coarse and hairy nature. This is used in the lower grades of blanketings, and extensively in weaving carpets. Between the felting wool and the combing wool proper is a great variety of mixed or graded fleeces, adapted to the production of

white bed-blankets, kerseys, linseys, flannels, and tweeds. Quite the majority of American mills are engaged upon the latter class of manufactures.

When a bale of felting wool is opened at the factory of a weaver of cassimeres or doeskins, the first operation is the *sorting*; and here great judgment and long experience are demanded. The loom has been brought to such perfection that the different faces that can be given to goods afford a wonderful variety of appearances, from material which is practically the same in all. Thus alternate groups of threads may be lifted so as to make ribbed goods; they may be lifted in a curious alternation, so as to give a basket or braided appearance. The part of the fleece that is thus thrown to the surface, or makes the face of the goods, is the best in the fleece. The sorter rolls out the fleece on a table, sloped a little towards him, and lays his hands first on the wool that covered the sides and shoulders of the animal. Each bale of wool, as well as the wool from the different parts of the sheep's body, affords many different degrees of fineness, softness, strength, color, cleanness, and weight; and the sorter, beginning with the best wool in the fleece, separates it into prime, choice, super, head, downrights, seconds, fine abb, coarse abb, and tags. This assortment is of great importance, and on it is based the reputation of a mill for producing high grades of goods with uniformity.

The manufacturer must have nice judgment in deciding what he can do with the various bins of assorted wool. In the winter and spring, for instance, he uses his prime and choice to compose the face of light summer goods, as fancy cassimeres. This gives him a large supply of downrights and seconds, of which he can make the body of heavy goods for cold weather. Thus it is convenient and profitable to change the make of goods from time to time in the same mill, as different sortings are the better adapted to this or that fabric.

The most thorough coloring is obtained when the material is dyed in the wool. A preparation from indigo is found to make the best basis of color. But the wool must be well cleansed before it is dyed. The old mixture was composed of strong soap-suds, with some animal acid as the uric. The quantity of soap absorbed by wool is very great. England consumes fourteen million pounds of it annually in scouring her wools.

In visiting a woollen mill, it is not often that the dye-room is opened to inspection. Each large mill has its secrets and peculiar

processes, on which, perhaps, the fame of their cloth is based. Before the development of that wonderful and beautiful series of colors from coal-tar, known as the annaline dyes, it was held that blue was the most durable of all the colors given to broadcloth. It is supposed that less damage to the fibre and soundness of the wool is wrought by indigo rather than by any of the red and dark colors. The usual proportions for a good black dye, for every hundred pounds of wool previously indigoed, are five pounds of copperas, five pounds of nutgalls, bruised, and thirty pounds of logwood. The wool is first dipped in the solution of nutgalls, then into the logwood and copperas. Pyrolignite of iron is used to set or fix the black dye.

Now commences the long and complicated process of converting the wool into cloth. The first step is to thoroughly pick the locks apart, and separate all sand, dirt, and foreign matter. It is thrown upon an endless apron, which feeds it into a cone-shaped mill, having spikes on the inside of the cone and on the axis or shaft that revolves with much rapidity. These revolving spikes pull and pick the wool very thoroughly, and a blast of air from a fan carries away the dust. It now passes to the carding machines. These consist of large cylinders, belted with leather, which is filled with fine steel wires curved all one way. Within a fraction of an inch of one cylinder another revolves in the opposite direction, equipped with little wire teeth, which are bent in the opposite direction from those on the first cylinder. The wool is thus pulled into a fine film, and wound around the cylinder; but at the end of the machine a comb, with a rapid up-and-down motion, takes the carded wool from the cylinder, and guides draw the fibres into a delicate, rope-like bundle of very loose fibres, having hardly any tenacity. This is the penumbra, from which the even, compact thread is to be condensed by the spinning-jenny. Just before entering the carding mill the wool is sprinkled with olive oil. The slender pipe or roll of wool, as it comes from the machine, is twisted into a soft, spongy yarn, and this is twisted hard, or slack-twisted, according to the requirements of the fabric in hand.

No verbal description of a spinning-jenny and of a power loom, with its various and most complicated outfit, can be made intelligible. When two or more different sorts of threads are ready for the loom, it will be sufficient for our present purposes to say that there are contrivances in weaving that will throw the fine and hard-twisted yarns to the face of the web, and repress the coarser and

softer twists to the back of the cloth. In other looms both sides are treated impartially, and a garment made of this class of woollens, of which Melton is an instance, can be turned, and will give as good service on the under as on the upper side. In some looms all threads of a certain color can be carried at the face, while the reverse is quite different — almost the opposite in color.

But the best class of woollens are only half made when the piece is unwound from the loom-beam. Fulling or felting is the next important process; and here the need for careful sorting before the wool is handled becomes apparent. A good felting wool has about twenty-five hundred spurs or notches to the inch, when examined under a good glass, while in an inch of Leicester wool there are only eighteen hundred spurs. The process of felting consists in rubbing, moulding, and pressing these fibres, so the spurs will interlock and become fixed. Superfine cloth has four pullings, of three hours each, the layers of cloth having a thick solution of Castile soap between them. When cloth is well pulled, the fibres of the web and woof are inextricably united, and it will not unravel when cut on the line of one of the threads, but is alike in every direction, having the uniform texture and soft feel of chamois leather. When the fabric is well fulling, the fibre of the wool is pulled up by a peculiar process, called teazling. Teazles are seed-pods of a weed, called *dipsacus*, in botany. It bristles with points like a thistle-burr, but these points are curved over a little, and are very stubborn at the end. When a number of these teazles are set in a cylinder, and the cloth slowly drawn over them, the points lift the fibres of wool; but if they pick up a thread which offers considerable resistance, the point of the teazle gives way or breaks. If steel points are used, they pull the threads out, or pick holes through the cloth. The teazle leaves a rough, unsightly surface on the cloth, which is removed by shearing. Two keen steel edges on a cylinder are made to play near each other, like the limbs of a pair of shears, and under the point of contact the cloth is slowly drawn. Fine broadcloth is teazled and shorn several times, till it presents a very short and perfectly uniform nap. Then it is subjected to the action of steam, and afterwards pressed, to give it lustre and compactness. To review this process by which the best cloth is made: there are nine steps or stages in it, and at some grand exhibitions manufacturers have displayed nine parcels of wool, or specimens of work, in the production of broadcloth, as follows: —

First, a good specimen of felting wool, scoured white. Second, the same after the indigo bath, presenting a bluish tinge. Third, dyed quite black, with nutgalls, logwood, and pyrogallic acid. Fourth, carded in plaits or rolls, as it comes from the cylinders of the carding-machine. Fifth, spun and ready for the loom. Sixth, just as it comes from the loom. Seventh, after being felted or fullled. Eighth, after the nap is raised by teasing. Ninth, sheared, steamed, brushed, and ready for the tailor's shears.

These steps are much abridged in the manufacture of flannels, blankets, and tweeds. In these fabrics both sides are alike, the loom is simple in its construction, and the goods are ready for wear as soon as they come from the loom, except that in the manufacture of blankets fine-toothed cards are used to raise the nap or down.

WORSTED is a thread spun of wool that has been combed, and which in the spinning has been twisted harder than ordinarily. The word originated from Worstead, a village in Norfolk County, England, where the manufacture of this article was first introduced.

The reason why a long-stapled, strong and firm, though somewhat coarse wool, is best adapted for this class of cloths is, because they require a fine, smooth yarn, with no tendency to shrink or felt. The wool is washed and willowed, as for making pulled cloth. Then follows the combing process, the object of which is to draw the fibres out in parallel lines or threads. It was formerly done by hand; but forty-two years ago John Platt, of Salford, invented a comber, which has been improved and modified, till it does the work expected of it with great perfection. No verbal description of a machine so complicated can be made intelligible. The work on alpacas and mohairs is expended mostly on the yarns, to make them even, regular, and glossy, for weaving is the last operation on goods of this class.

The long-wool interest, as it is called, in distinction from felting wool, is comparatively new in this country, having been developed since the war; but the manufacturers in this line have made wonderful advances, and we can show lustre goods as elegant in their finish as any from the French looms.

Erastus Bigelow, of Boston, has done more than any American, as much as any one inventor that ever lived, to bring woollen manufactures to their present perfection. He has taken out more than fifty distinct patents for devices and improvements in looms and other machines for handling wool. His chief improvement is

in a loom for weaving Brussels carpeting. Previous to his invention, a boy was required to stand by the old loom, and ply the brass wire or rod, over which the threads are looped, to form the pattern peculiar to the Brussels style of tapestry. He invented an automatic loom, by which Brussels carpeting can be woven with great rapidity and perfection. His loom has been adopted in the English mills, and there are several factories in this country where the more expensive sorts of carpeting, as Brussels, Wilton, and Axminster, are made with great perfection and beauty of pattern.

Workmen and workwomen in woollen mills are well paid. The care and skill required in many stages of the process demand operatives beyond the average in steadiness and discretion. In broadcloths especially there is room for indefinite development and improvement at almost every stage of production. The sorting can be made more nice and perfect; the washing and removal of the animal oil can be more thorough; the spinning can be carefully adjusted to the nature of the wool, and the quality or grade of goods in which it is to be wrought. In the fulling, and shearing, and steaming, also, the most careful manufacturer will find that, as perfectly as he may conduct his operations, some bolt that he may see at an importer's, made in the west of England, will surpass his best efforts in the compactness of the fabric, in the shortness of the nap, in the smoothness of finish, and in that remarkable quality of the best English goods, the freshness of their appearance after months of constant wear. But year by year our mills are gaining on the west of England in the excellence of their goods, and there is not sufficient excuse for the too prevalent idea that a gentleman cannot array himself in first-class garments unless made up by a tailor that imports his materials. We have no class of men more intelligent, more enterprising, or more patient than our woollen manufacturers, and their greatest drawback is the irrational prejudice that, because we make great quantities of cheap goods for popular service, our mills cannot turn out a first-class diagonal, or cassimere, or beaver, or Melton.

