

## CHAPTER XXVII

### WOOL AND CARPET MANUFACTURES

The Wool Industry—Woollen Goods—Worsted Goods—Felt Goods—Yarns—The Carpet Industry—Carpet Weaving

#### THE WOOL INDUSTRY

**W**OOL manufacturing is second in importance among the textile industries. The divisions treated in this chapter are woollen goods, worsteds, felt goods, shoddy, carding mills, and wool scouring and pulling. Information concerning the manufacture of carpets, wool and fur hats, and hosiery and knit goods will be found in other chapters.

A general survey of the field reveals a number of features highly creditable to American manufacturers. The productions of American looms, for example, compare very favorably with imported fabrics. The importations consist chiefly of those high grade goods and novelties which require more time for their production than labor conditions in the United States will permit. In wool manufacturing machinery some of the most important inventions were made by Americans. The plants in which wool products are manufactured are superior in many ways to those abroad, containing every modern appliance for facilitating production, such as cards, combs, mules, spinning frames, looms, and other machinery, with all the latest stop motions and other automatic devices for the prevention of imperfections. The rooms in which the operations are conducted are usually large, lofty, well ventilated, lighted by electricity, and heated by steam—all of which shows that the conditions surrounding the wage-earners are far from furnishing a cause of complaint. The hours of labor do not exceed sixty hours a week in any known instance. Wages are paid in cash, either every week or fortnightly. Factory inspection laws insure the best sanitary conditions, and prevent, as far as possible, the employment of children under fourteen years of age. More than 11,500 children are employed, but it is assured that they are nearly all of an age between fourteen and sixteen.

Spinning, weaving, dyeing, finishing, in fact the entire process of converting the wool as it comes from the sheep's back, is, in this country, usually accomplished under the roof of a single mill. In England, each of these operations is done in a separate mill, this constituting the particular difference between American and English manufacture. Philadelphia, the chief

centre of wool manufacture, offers an exception to the general rule. There the mill superintendent or even the operative of to-day becomes a manufacturer on his own account to-morrow, little capital being needed to equip a small plant. These small manufacturers, "late of" such and such a great mill, having thus entered into business for themselves, carry on one process only; that is, they become either top makers, yarn makers, dyers, or finishers, making nothing but the one thing, as in England. As a vast market for their products exists within the city limits, and as they can produce at surprisingly low cost, their profits greatly exceed the amount they formerly earned in wages. In the textile world so great is the variety of goods made, and so vast the market, that a man with the skill and a moderate capital, can establish a small factory and make a specialty of one thing, with reasonable assurance of success. The cities next in rank to Philadelphia, according to value of products, are Lawrence, Massachusetts, and Providence, Rhode Island.

A factor in the woollen industry to-day is a company formed by a combination of a large number of formerly independent concerns. There is still a lively competition, however, for the combination can not be said to hold a monopoly. In its thirty plants it manufactures all kinds of woollen goods except knit goods, ladies' dress goods, and the very cheapest fabrics. Through its own travelling salesmen it sells goods direct to jobbers and manufacturing clothiers. Owing to an increase in the volume of business and to a reduction in the cost of manufacture, the number of employes in the various plants has been greatly increased since the formation of the combination. Wages, too, have been increased ten per cent, and the company is now paying higher wages than have ever been paid in the woollen goods industry in America. As in the case of combinations in other industries, it has been found a great advantage to be able to utilize in the management of all the plants the brains and energy of the best men in each of the plants.

The business of wool manufacture has shown a remarkable increase in the last half century, alike in point of capital invested, wages paid, cost of materials used and the market value of products. Within one decade (1861-70) alone, the percentage of increase in all branches of the industry rose as high as 171.3 per cent, due most largely to the unusual demand for clothing and uniforms for army equipment. Since that time the progress of the business has been steady, save for an occasional season of depression, owing entirely to extraneous conditions. In America, also, the several changes in tariff regulations, both on the raw material and on the finished product, have had an influence. Thus, the year 1900 was an unfortunate one for the trade in all parts of the world, leading to the failure of numerous important manufacturing firms and to the formation of several large combines, while most of the stronger mills were running at about half force. This remarkable condition was brought about by the fact that world commerce in wool had begun to feel the universal tendency to expansion, with

the consequence that, in attempts to meet the new demands, prices rose to nearly prohibitive figures. In London the price per pound of a certain class of raw wool rose from  $20\frac{1}{2}$  *d.*, as quoted for several years, to  $34\frac{1}{2}$  *d.* within twelve months; other classes rose at an average rate of about seventy-five per cent. These unusual advances were followed by a sudden fall, which brought the figures to a point lower even than at the start, creating widespread consternation; but, in the words of one authority, involving the "lesson that wool is wool, whether it be merino or crossbred, and that no class of raw material can long maintain a price which is out of all proportion higher than another."

The industry in the United States was largely affected by variations in the tariff duties on both raw materials and finished products during the decade immediately preceding (1881-1900). By the Law of 1894 raw wool was put upon the free list, while the duties on wool manufactures were put upon an ad valorem basis; but by the Law of 1897 substantially the old rates of duty on the raw material were restored, while wool products were again taxed on the "compound system," partly specific, partly ad valorem. During this decade the total imports of all classes of raw wool amounted to over 1,500,000,000 pounds, representing a total yearly average of over 126,000,000 pounds under the Law of 1890; of over 272,000,000, under the Law of 1894, and of not quite 118,000,000 under the Law of 1897. The yearly average for the entire decade was about 167,000,000 pounds, or more than 60,000,000 pounds less than the average under the Law of 1883.

Wool manufacturing in the United States is mostly concentrated in the States of Massachusetts, Pennsylvania, Rhode Island, New York, New Jersey, Maine, Connecticut, New Hampshire, Vermont and Tennessee; their relative importance in all branches of the industry following in the order given. In special branches however, the relative importance is somewhat different. Thus, while Massachusetts leads in the value of its woollen and worsted products, distancing its nearest competitors, Pennsylvania and Rhode Island, respectively, by over \$5,000,000 in the one article and by over \$7,000,000 in the other; Pennsylvania is the first in carpet manufacture by over \$8,000,000; New York leads Massachusetts by over \$200,000 in the production of felt goods, and exceeds Pennsylvania by over \$200,000 in the production of wool hats. During the ten years ending with 1900 there was an increase of 11.3 per cent in productive capacity throughout the country, while the cost of raw materials was increased by about 8.3 per cent and the value of finished products by about 9.8 per cent. Taking into consideration all advances in mechanical appliances and manufacturing methods, an average increase for this period in production of a given class of work was fully ten per cent.

#### WOOLLEN GOODS

The class of fabrics under the general head of "woollen goods" includes all products of card manufactures, among which are broadcloths, doeskins,

cassimeres, satinets, jeans, flannels, blankets, mixed cotton and wool dress goods, linings, and the like. They represent the varieties of fabric most common and most suitable for clothing and other needs of the consumer; also the most important numerically, both in point of the number of establishments engaged in their manufacture and of the number of persons employed. According to the showing of the last census, however, this branch of the wool industry seems to be in danger of losing its relative importance, principally on account of the increasing use of combed wool, or worsted, fabrics for men's wear and of knitted underwear and stockings. Thus, while the number of concerns engaged in the manufacture of this class of goods was 2,891 in 1870, it was 1,990 in 1880, 1,311 in 1890, and 1,035 in 1900. The number of persons actually employed was 80,053 in 1870, 86,504 in 1880, 76,915 in 1890, and 68,893 in 1900. The value of products similarly decreased from about \$160,000,000 in 1880 to about \$133,000,000 in 1890, and to less than \$119,000,000 in 1900; while within the same two decades the value of raw materials used was decreased about \$30,000,000. These figures, however, do not indicate the precise relative proportions in the matters noted, since these decades were also periods of falling values. It may be partially explained, also, by the fact that cotton and other fibres have come into more general use in the last twenty years, particularly in the manufacture of horse-blankets and carriage robes, the production of which was over 3,000,000 square yards more in 1900 than in 1890. Shoddy also shows an increased consumption of about 15,000,000 in the same period.

For dress goods the figures differ, according to the product, some showing a decided falling off, others a proportionate, if not greater, increase. Thus, broadcloth, once highly popular for men's suits, is now manufactured in very small quantities; also the all-wool cassimere has largely given place to worsted cassimere, increasingly popular, on account of its handsome appearance. The increasing popularity of light flannels for men's wear partially explains the fact that the production of union and cotton warp goods was not as great in 1900 as in 1890, when measured in square yards. However, the total production of all-wool goods rose from about 26,000,000 square yards in 1890 to about 35,000,000 in 1900, while the value per yard fell in the same period from about 94 cents to 66 cents, giving a total decrease of over \$2,000,000 in ten years. Union, or mixed, goods are becoming increasingly popular, the total production being nearly 31,000,000 square yards in 1900, as against a little over 21,000,000 in 1890; while cotton-warp goods, having a wool weft, including tweeds, jeans, satinets, have fallen off over 15,000,000 square yards. According to census returns, the falling off in flannels amounts to over 40,000,000 square yards in ten years, although a part of this decrease may be owing to the fact that some goods of this variety are classed as cloths. Strangely enough, the production of bed blankets shows a decrease of nearly 3,000,000 square yards, from 20,793,644 square yards in 1890 to 18,155,505

square yards in 1900. In shawl fabrics the decrease is even greater, as might be reasonably expected; the product in 1900 representing only about one-seventh the quantity and one-fourth the value of that of 1890.

#### WORSTED GOODS

The increased production of worsted goods is largely to be explained by purely mechanical considerations—the perfecting of machinery capable of combing wool of “short staple,” which was impossible with the old hand methods. The additional fact that the merino sheep has been crossed with some of the commoner varieties has been another element in the successful issue, producing a grade of wool peculiarly adapted to combing. Previous to 1870 very little was done in the line of manufacturing worsted goods for men’s wear, although several concerns made unsuccessful attempts in this direction, the first experiment having been tried in 1843. In 1860 there were but three establishments in the United States engaged in this business, and only 2,378 employés; but by 1870 the figures had increased to 102 establishments, with 12,920 employés. In 1880 there was a decrease in the number of establishments to 76, although the number of employés had risen to 18,803; in 1890 the figures were 143 and 42,978, respectively, while, in 1900, they were 186 and 57,008. During the same period (1870-1900) the total value of products has increased 120-fold, despite falling values, while the number of spindles has risen from about 200,000 to 1,371,026; of looms, from 6,128 to 26,372; and of combing machines, from 161 to 1,194. Similar figures are shown for all other matters connected with the industry. It has shown a steady growth despite the heavy tariff duties on imported wool and the unsuitable character of much of the domestic material.

In 1900 over 54,000,000 square yards of all-wool worsted coatings, suitings and overcoatings were manufactured, an increase of about two hundred per cent over the quantity produced in 1890, representing nearly twice the total value. The production of cotton-warp worsteds in the same period was maintained at about an even quantity. Although the importations of all these fabrics was heavy in 1900, the home manufacture represented more than ninety-one per cent of the total supply in worsted suitings and overcoatings. The figures for women’s dress goods are similarly hopeful. Out of a total product of over 103,000,000 square yards in 1900, the all-wool fabrics represented nearly 58,000,000 square yards, and the cotton-warp fabrics nearly 46,000,000 square yards, showing an increase of nearly 30,000,000 square yards over the product of 1890. Meantime, the manufacture of woollen dress goods, representing both all-wool and cotton-warp, had increased by nearly 30,000,000 square yards over the product of 1890, proving that the influences tending to decrease the product for men’s wear had been somewhat compensated in the domain of dress goods intended primarily for women. Further, although the average annual importation of women’s dress goods during the decade 1891-1900 was over 63,000,000

square yards, the domestic manufactures supplied at least seventy-one per cent of the total demand in 1900.

In the production of worsted and woollen braids, the figures for home manufacture represent a total of seventeen establishments in 1900, as against eleven in 1890, with a corresponding increase, in the same period, from 10,750 to 15,086 employés in the mills, situated principally in Massachusetts, Rhode Island, Pennsylvania and New York. Of these figures New York claims nine mills, 9,628 hands, and manufactures nearly one-half the product of the United States, representing a total value of \$1,092,713.

#### FELT GOODS

Of all the departments of the wool industry the manufacture of felt goods is the smallest, both as regards the number of establishments engaged, and also as to the quantity and value of the product. Still there is a wide variety of uses for feltings of all kinds, and the last twenty years has seen a steady, healthy growth in the business. Feltings are used in a large variety of connections, among which may be mentioned their application for slippers and shoes, for piano keys, for upholstery and dress linings, for polishing and, as endless belts, for paper-making. In some of these uses the demand has remained about constant, while, in others, it has increased or diminished for similar reasons. Thus, during the decade 1891-1900 the manufacture of felt cloths continued at about the same rate and quantity, and felts for boot and shoe linings decreased about one-half, while the production of endless felt belts for paper-making machines increased from 216,982 to 1,114,357 square yards, and the product for trimmings and linings was nearly doubled. In 1900 there were thirty-six felt establishments in the United States, representing an advance of two in ten years and ten in twenty years. During the latter period, however, the invested capital has increased over six-fold, and the value of products has nearly doubled, in spite of the fall in values of raw materials.

#### YARNS

Although the use of cotton and of cotton yarns for hosiery and general knitted goods increased immensely in the ten years ending 1900, the estimated increase in other branches of the industry was comparatively small, representing only about 500,000 pounds for 1900, as compared with an increase of over 15,000,000 pounds in the decade ending 1890. A part of this cotton was used on cards with wool, for making merino and mixed yarns, and a part was made into cotton-warp yarns for dress goods, linings, flannels, etc. In all, the amount of raw cotton actually consumed in woollen manufactures was about 108,000,000 pounds, as compared with over 394,000,000 pounds of wool.

The total quantity of yarns purchased for the various branches of woollen manufacture in 1900, including woollen, worsted, merino, cotton, silk, linen, jute and several vegetable fibres, amounted to over 181,000,000

pounds, and represented a total value of nearly \$45,600,000. Of this supply a total of about 35,500,000 pounds was purchased by the woollen mills, another of about 35,700,000 by the worsted mills, and a third of about 109,700,000 by the carpet mills, leaving a balance of about 150,000 pounds which was used in the manufacture of felt. The figures for this year represent a total advance on those for 1890 of nearly 45,500,000 pounds.

#### THE CARPET INDUSTRY

The carpet industry forms one of the most important branches of wool manufacture in this country, its wonderful development being due principally to several American inventions—namely, the adaptation of the power loom to the weaving of ingrain carpets; a power loom for weaving Jacquard Brussels and Wilton carpets; certain machines for weaving tapestry Brussels and tapestry velvet carpets; and a power loom for weaving Axminster carpets.

By applying these inventions American manufacturers turn out annually tens of thousands of miles of carpet, including ingrains, Brussels, moquettes, tapestries, velvets, Smyrnas, Axminsters, Wiltons, and rugs—floor coverings alike for millionaire and mechanic, palace and tenement. At Yonkers, New York, is the largest moquette carpet plant in the country. In Philadelphia, the home of the largest ingrain carpet mill in the United States, more floor covering is turned out annually than is made in any other single mill in the world. American carpet mills to-day are supplying all but ten per cent of the home demand, thus reversing the conditions that prevailed years ago when the home mills supplied only ten per cent of the home demand, the remaining ninety per cent coming from foreign mills.

Our total export trade in carpets in the course of a year is represented by the output of the mills of the country for but a single day—350,000 running yards, valued at about \$175,000. American manufacturers can compete with those abroad only in the sale of surplus products; and so great is the demand at home that the surplus makes a comparatively small showing. Looking at the carpet industry as a whole, never have so many carpet and rug looms been in operation in this country as at the present time; and never has labor been so steadily employed.

One branch of the industry is threatened with destruction. The large importation of straw mattings from China and Japan is responsible for a decline of nearly forty per cent, in the last few years, in ingrain carpet manufacture. In 1893 the output of ingrain carpets was fifty million yards. In 1900 it had fallen to only thirty-three million yards. In 1892 only eight million yards of matting were imported. In 1900 more than forty million yards of matting of foreign manufacture were sold here. Lower wages abroad are the cause of this condition of affairs. The Chinese weaver of mattings is paid five cents a day, the Japanese weaver ten cents a day, the American weaver of ingrain carpets two dollars a day.

American rugs are in great demand. American carpets of all kinds

are now woven in one piece, and—despite the flood of Oriental rugs that yearly pour into the United States—are making their way into the homes all over the land. In 1900 there were nearly 9,000,000 square yards of rugs made.

#### CARPET WEAVING

There are two varieties of carpet ordinarily manufactured, pile carpets and woven ply carpets. The former have, as their distinctive feature, a surface of raised loops, cut or uncut, while the latter have a flat surface, like other knitted or woven fabrics. Among the better known varieties of pile carpets manufactured in America are Wilton, Axminster, Brussels, tapestry, moquette, and velvet. Wilton and Brussels carpets have a cotton or linen chain, a linen filling and a warp of colored worsted yarn. They are made on the same kind of loom; the worsted warp forming the pattern in each case being raised into loops, on the face of the carpet, by wire points, successively inserted and withdrawn, as the weaving progresses. The principal difference between the two varieties of carpet is that in true, or body, Brussels the loops of the pile are left uncut, while in Wilton they are severed by a sharp edge on the lifting wires. In other respects the process of making these two varieties of carpet is the same: Wilton, however, has generally about fifty per cent more wool than Brussels. The variety known as tapestry carpet, more properly tapestry Brussels, differs from body Brussels only in the materials used. It is made with a cotton chain, a linen or jute filling, a jute yarn backing and a worsted warp. The warp is lifted by wire points, as already described, and, in weaving, develops the pattern "printed" in the yarn. Velvet carpet holds the same relation to tapestry as does Wilton to Brussels—the wire points used to raise the warp into loops have a cutting edge that severs them into so many straight piles: it also contains a greater percentage of wool. Axminster and moquette carpets, although resembling the former varieties in the piled surface, differ very essentially in materials used, and also in the manufacturing processes employed. Both are made on looms of very similar description. The peculiarity of moquette carpet is that the pile surface is formed by cutting off short pieces of woollen yarn and fastening them to the warp threads as the back is woven. The back is composed of heavy jute and cotton, and the pile yarn does not appear on the "wrong side." True Axminster is an imitation of Turkish carpet, having a linen or hempen warp and a chenille filling. The surface, of course, partakes of the peculiarity of the filling, which is made by weaving together four warp threads of wool, or three warp threads upon a soft filling thread, thus producing the characteristic "fluffy" appearance, which is imparted to the finished carpet. Ingrain carpet is made in two piles, consisting of a worsted or cotton warp and a wool filling. The surface is flat, or unpiled, since the weaving is not interrupted by the use of wires, or other devices to raise the warp threads.