

CHAPTER XXV

TEXTILE INDUSTRIES AND TRADES

The Combined Textiles—Dyeing and Finishing—Textile Education—Textile Trades

AMONG primitive peoples each individual household accomplishes for itself the business of providing clothing—gathering the raw materials and working them over into the fabrics which are fashioned into wearing apparel. Later on in the social evolution, a division of labor throughout society relieves the family from these duties, and the products of the loom are purchased in the open market. In America, in the older settlements, the primitive stage did not long continue, but in the market most of the products on sale were imported from Europe. There was little of domestic manufacture which could meet the requirements of the consumer. Now, however, this state of affairs has been completely reversed. In some of our textile industries American enterprise has led us to the front rank of the world's providers. In all these fields we now hold a very high position in international commerce. A consideration of the extent to which American enterprise is devoted to the work of the loom is therefore of interest.

THE COMBINED TEXTILES

"Textiles," third in rank in the great groups of manufacturing industries, include forty-four classes of manufacture. Textile fibres of every variety—cotton, wool, silk, flax, jute, hemp, and admixtures of fibres—form the fundamental materials for this valuable class of products, which includes the manufacture of clothing, hats and fabrics, carpets, oilcloths, mats, nets and cordage. At the head stands cotton manufacture, in which the United States, judged by relative spinning capacity, holds second rank among the nations. While cotton manufacture has advanced rapidly to a perfected factory system, wool manufacture is still a more or less "scattered" industry, though there are numerous establishments of enormous productive capacity. In wool manufacture are comprised four great groups—woollen goods, worsted goods, carpets and felts. Notable achievements have been especially made in the carpet industry, and this country is to-day the greatest carpet manufacturing nation in the world. In the hosiery and knit industry, too, the United States has outstripped all other countries. More machine-knit goods, both underwear and hosiery, are

produced annually in the United States than in all the rest of the world. Again, in silk, within fifty years the United States has become the second silk manufacturing nation, the silk products only of France showing a greater value. The single textile industry in which the United States has not advanced to a front rank is that of linen manufacture, the reasons for which are set forth in another chapter.

Different conditions govern each of the three most important divisions of manufacture, namely, wool, cotton and silk. As spinning wheels and hand looms are the simplest forms of machinery, and as sheep can be raised in almost any region where warm clothing is necessary, it is natural that wool manufacture should be carried on, even among the poor people, in every State in the Union, in small mills as well as large. In the cotton industry, however, conditions are radically different. In poor communities the people can not afford to prepare the raw material and spin and weave it; first, because the labor is great, and, second, because of the very decided superiority of the products of cotton machinery over those of hand work. As a result, the cotton industry is almost entirely in the hands of capitalists. Thus while wool manufacture has spread all over the United States, cotton manufacture is concentrated either in the vicinity of the supply of raw cotton, or where power is cheap, labor abundant, or transportation rates low. In the silk industry still other conditions exist. Silk culture in the United States has never proved commercially successful. As an occupation it is difficult and uncertain, and requires constant care. It has brought disappointment and loss rather than gain to most of the Americans who have tried it. But while we have not been able to produce the raw material, the manufacturing branch has been established and has grown until it is now one of our foremost industries. But as silk is a luxury, and as poor communities, therefore, have no interest in its manufacture, the industry is characterized by even greater concentration than that of cotton.

Statistics show that the United States is the second manufacturing nation in the world in the textiles as a whole, being surpassed in the extent and value of production only by the United Kingdom. In the matter of spindles, the United Kingdom has 45,000,000, the United States 18,000,000. The number of wage-earners employed in all the textile manufactures in the United Kingdom is 1,000,000; in the United States 660,000. In respect to employés, it may be added that so great is the efficiency of machinery that only one person in each one hundred of the population is required to furnish the American people with materials for clothing. In cotton manufacture twice as many persons are employed as in wool manufacture, which in turn employs three times the number of persons engaged in silk manufacture. Other noteworthy figures furnished by the statistician concerning wage-earners show that nearly as many women as men are employed, and that the number of children under sixteen years of age working in the mills reaches a total of 70,000, more than half the number being found in the cotton mills alone.

For the purposes of the present work, the various branches of the textile industry may be divided according to the vegetable or animal fibre which predominates in the manufacture. At the same time, it is necessary to call attention to the fact that all the branches are closely allied. In a single establishment several different processes may be combined, and two or more fibres used. Many cotton spinning factories, for example, also weave yarn, twist and finish it into sewing thread, or knit it and make underwear. Others combine cotton with linen in producing towels. In the manufacture of cloth, many woollen and worsted mills use cotton. Raw silk is often used in cotton or woollen mills. In mills where upholstery goods are manufactured, jute yarn is used. In cordage and twine mills, even wool and silk are sometimes employed, in addition to many other fibres. Because of these conditions, authorities declare that the textile industry should be treated as a unit, based upon the spindle—but this manner of treatment is manifestly impossible in the present instance.

DYEING AND FINISHING

As dyeing and finishing is carried on as one of the processes in factories in each of the three great textile branches—cotton, wool and silk—mention of this industry is properly included in this section. The important fact to be noted is that dyeing and finishing is not only included as a process in cotton, wool and silk mills, but is carried on as an industry in nearly three hundred independent establishments, employing about 30,000 wage-earners. An idea of the magnitude of this business may be conveyed by the figures giving the cost of the chemicals and dye stuffs used—nearly \$11,000,000 in the independent factories, and nearly \$15,000,000 in all other textile mills.

By the modern improvements of the dyer's art it is possible to produce many surprising effects, among which may be mentioned the feat of dyeing goods in several colors, threads or stripes, in the piece. This is, however, a simple matter, so far as the theory is concerned, consisting merely in taking advantage of the known affinity of certain dye stuffs for some fabrics and their neutrality to others; or of treating the separate threads, previous to wearing, by diverse chemical mordants. Thus, there are very few dyes that will tinge wool, cotton and silk equally, with the same preparation or in one process. If, for example, a piece of half-woollen weave, wool and cotton, be treated to a dyeing process capable of coloring the wool, the mechanical precipitate on the cotton fibres may be "stripped," without attacking the color "lake" on the wool, generally by boiling in distilled water or in a weak solution of acetate of soda. The cotton is then mordanted with tannin and antimony, or with simple antimony salt, and may be dyed with basic dyes from cold to warm. A very similar process is employed for producing the familiar "changeable effect" in piece-dyed glorias—these consist generally of a woollen warp with a silk filling—except that the peculiar effects of differing temperatures on the

separate threads is made an essential part of the operation. Thus, the wool is dyed in a boiling bath, after which the small amount of color adhering to the silk is stripped by boiling in pure water for thirty minutes, the silk being then dyed in a cold bath. By this process a rotation of colors may be produced which will show the wool red and the silk green; the wool garnet, the silk blue; the wool orange, the silk garnet, etc.

Again, precisely similar results may be achieved by taking advantage of the fact that numerous dye stuffs will produce different colors with the use of different mordants. Thus it is possible to produce three and more colors in a homogeneous piece of goods, by the simple expedient of diversely mordanting the separate threads previous to weaving. By treating one thread with chorme, a second with alum, a third with iron, we may derive bordeaux, high red and lilac, respectively, when the weave is dyed in alizarine red; the effect being a triple-colored weave. By leaving one thread unmordanted a weave of four thread colors may be obtained. In the same manner, different shades of a single color may be produced, according as the interwoven threads have been diversely treated, for example, with sumac, tannin-antimony or simple antimony, or left unmordanted.

TEXTILE EDUCATION

What opportunities has a young man for obtaining an education in textile manufacture in this country? The question is answered by a former President of the National Association of Manufacturers, thus:

The opportunity for obtaining an education in the textile trades in this country as compared with foreign countries is, in my judgment, very much less. Foreign countries have, for many years, been educating their people by means of technical schools to do technical work. We have no more emphatic instance of the working of that matter than is shown by Germany, where nearly all the hands employed in textile mills are graduates of the textile schools. Since I began manufacturing, in 1872, I have seen the advantage of trained help. I was in a position at that time where I could not avoid making a study of the case. I found that our trained help in this country had been largely imported. The trained hands, principally foreign born, and the mills that were making the best progress, were under men who had the courage to go out and bring in that kind of help. I decided that Americans ought to have the positions then held by foreigners, and that there ought to be an opportunity given our boys to educate themselves to take such positions. It was with that end in view that I started a textile school in Philadelphia. A few years ago we took examples of our work down to Boston and exhibited them to the National Association of Wool Manufacturers, and the result of that exhibition is that Massachusetts has two schools doing similar work, one of them in Lowell and another in New Bedford, and the State is supporting the work by contributions for the purpose. The South has also one school. They are agitating for another one, and so the good work is spreading.

Since 1890 the facilities for textile education in the United States have increased to such an extent that now it is possible for manufacturers to draw on a number of American schools for skilled workers, and the importation of textile workers from Europe is no longer necessary. The first school in this country devoted exclusively to textiles was the Philadelphia Textile School, connected with the Pennsylvania Museum of Fine Arts. Interest in textile education has in recent years been aroused,

especially in Massachusetts, where schools were established in Lowell and New Bedford, supported partly by the State and partly by the cities, and from private sources. The textile trades receive some attention also in the School of Design connected with the Massachusetts Institute of Technology. There are evening schools for loom fixers and weavers at Fall River and Lawrence, Massachusetts. In the South, there are at least four large textile schools, connected respectively with the South Carolina Agricultural College at Clemson, the North Carolina Agricultural and Mechanical College at Raleigh, the Georgia Institute of Technology at Atlanta, and the Mississippi Mechanical College at Starkville. Besides these, a number of correspondence schools at different places in the United States give instruction in the textile trades. These schools and results produced by the graduates are of great practical help to the textile industries. The technical training given in the higher branches of what is really a profession shows in all departments in more artistic styles, and in the economies of manufacture. The advantages of the schools, otherwise, consist mainly in the more adequate facilities which are furnished the pupil to carry all, or nearly all, the work projected by him to completion. In the Philadelphia school the student has to carry his individual design to completion, performing or assisting at every process in its progress, from the preliminary sketch to the dyed and finished fabric. Whatever this last represents of taste, of knowledge, or of skill, whatever calculations are involved, the commercial ones as well as those possessing artistic or technical significance, all must be the pupil's own. In the New Bedford school the instruction is confined to cotton mill operations.

In no trade or calling is the usefulness of the modern popular technical school more thoroughly apparent than in the field of cotton manufacture. Thousands of persons are employed in this line throughout the country, gaining great expertness in special lines of work, although at the smallest rates of wages, while the demand for thoroughly trained men, to take positions as designers, superintendents or overseers still continues greater than the supply. This is due, of course, to the lack of technical, or theoretical, training, in addition to practical experience, however broad and various; in other words, a knowledge of underlying theories and general principles. Of course, with his entire time during the day spent at some branch of cotton manufacture, the average worker has no opportunity to obtain the necessary training in ordinary schools, or to pursue a requisite course of reading unaided. It is to him, then, that the offers of a correspondence school come with remarkable force. Numerous men, now occupying responsible and highly paid positions in such factories, owe the first steps of their advancement to the assistance thus obtained.

Many of the best designers, superintendents and overseers, employed in the numerous woollen mills throughout the country, have risen from the ranks in their trade—from the loom or the "mule"—having taken advantage of the opportunities offered in some one of the textile schools to add

requisite technical training to the mechanical skill acquired in their daily work. The number of such openings awaiting persons with just this kind of training is remarkable, and the prospect of greatly advanced compensation should spur the ambition of the dullest. Furthermore, on account of the desirability that the holder of one of these responsible positions should combine actual practical experience with the necessary technical knowledge of processes and products, the presumption is in favor of the ambitious worker in the large majority of cases.

TEXTILE TRADES

The present condition of the textile trades is the resultant of many new influences and numerous modern developments. Take the department of machinery. We see here constant improvements, new time-saving devices, and the introduction of methods leading to great subdivision of labor. Then there is the varying tide of immigration, swelling the ranks of workers, who come from different countries to find a home, temporary or permanent, with us. Most desirable are those immigrants who come to stay. The nomads of a year or two, flocking down from French Canada, tend neither to raise the standard of living among workmen nor to better the general conditions of the trades. The employment of women and children must also be considered in its general effect, and its relation to trade conditions and prospects. Country competition is also a factor not to be overlooked. Referring to the introduction of improved machinery, weavers have more than doubled their capacity in the last thirty years, and, with the employment of the Northrop loom, they are able to produce five times as much as they produced forty years ago. The ring-spindle machine does twice the work of the mule spindle. It may be stated that with the increase of machinery the intensity of exertion and the alertness of the weaver have also increased. Under former conditions the machines ran much more slowly, and there were frequent breaks of the thread. There are better machines now and better cotton, and there is also greater speeding, and no cessation. A hard-working spinner in the spindle-room formerly earned \$12 to \$14. Now the woman at the ring-spinning machine earns \$6 to \$8, the work not being so hard.

The many improvements in machinery have opened a place for the extended employment of unskilled labor, which, in so many departments, has been able to take the place of skilled labor. For instance, only a week or two is needed to learn to operate the ring-spinning machine, and the operator in three or four weeks can run four looms and begin to earn something. Very naturally the immigrant has taken advantage of this widespread and ever increasing opportunity. He has seen his chance for immediate employment, with a speedy return in wages. The effect of this incessant tide of immigration is observed in a comparative study of the nationalities succeeding one another in the cotton-textile trade. Fifty years ago the Americans were the only employés. Following them came

the English, Irish and Scotch. The high wages caused by the Civil War were again reduced by the French-Canadians, who began to come in 1866, and by the declining markets. Without tracing in detail the fluctuations of wages, we may note that in 1897, for instance, the earnings which thirty years ago were \$12 to \$13 had been reduced to \$8 and \$10 a week. A slight increase since that time has again been checked, with the prospect of a reduction, by the rise of a new factor, the competition of Southern mills. In these mills the operatives work sixty-six hours a week, the employers having the advantages of low fixed charges, the latest improvements in machinery, and very cheap labor.

The influence of various classes of immigrants upon trade conditions may be observed by a glance at the characteristics of the French-Canadians who come to this country in search of work. They brought with them, at first, a remarkably low standard of living, and were willing to work for almost any wages. Their standard has gradually improved, and they live more like their fellow laborers of other nationalities, English, Irish and American. The French-Canadians are apt to look upon their American employment as more or less temporary. The families of French-Canadian farmers come to Fall River and other New England towns to earn a little money and then return, their numbers varying with the price of labor. A small percentage more of them are now inclined to remain. But the general temporary nature of their residence has tended to make them indifferent to the improvement of their standard of living, and willing to endure privation for the sake of the savings which they may take back with them to Canada. The French-Canadians were accustomed to place their children at work at a very early age. Legislation has stepped in and interfered with this objectionable practice. They also, in former days, were in the habit of working unlimited hours. In many States this sort of competition has been legally restricted. In Massachusetts, for instance, the law fixes the hours of work at fifty-eight hours per week. Thus the State of Massachusetts has come to the fore in legislative enactments for the benefit of labor, in these two regards at least, the prohibition of child labor and the reduction of the hours of employment, and a general tendency is observed toward the protection of the American standard of living.