

## The History of Textiles in the New World.

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There are three distinct phases in the history of American textiles. In their chronological order they are as follows: The *Pre-Columbian* textile arts, the *European craft* arts, introduced by the early Colonists and the *great age of automatic machinery* and *serial production* which began in this country with the building of the first Slater Mill in Pawtucket, R. I., in 1793 and which, passing through a brilliant period of new inventions and modifications of old, the intensification and broadening of organization, has now



Aztec Mother Teaching Daughter to Spin.

come to a *new era* through the sudden development of the synthetic dye industry within the boundaries of the United States.

In this brief survey of these three principal phases, I will adhere to the historic sequence of events and endeavor, as far as the meagre information permits, to develop the theme along the lines of economic production.

Pre-Columbian America was divided into many different cultures, determined largely by the nature of the regions they inhabited, and influenced somewhat by former migrations and conquests. It is scientifically accurate to say that, according to our standards of values, no culture in the New World ever reached the level of European or Asiatic civilization. On the other hand, none ever sank to the lower levels of savagery. All of these people practised some form of the textile arts; and in certain highly favored regions achieved a skill in execution, a vigor and beauty of design, together with such technical diversity, as to place them on a level with the world's highest attainment in fabric construction.

From certain facts I will suggest in the following pages, there is reason to believe that these arts were of Asiatic origin. The same is true in reference to textile development in Europe. For if we search but deep enough in European history, we will discover that every technique, aside from the crudest, almost every design or type of ornament, and many of the principal fibres and dyes were Asiatic in their beginnings and were introduced into Europe through conquest and trade.

For example, the foot treadle loom, the principle of the spinning wheel, all silk culture and most cotton technique, were borrowed either directly or indirectly from the Far East. In a broad sense the textile history of Europe is but a record of a series of attempts of a relatively unskilled, but vigorous, beauty-loving peoples to imitate the delicate accuracy acquired through centuries of perfection in the East.

The European record of origins is historic, but the origin of the weaving arts in the New World is still shrouded in the deep mysteries of remote antiquity. And it is but just to record the fact that, whatever civilization may have come from Asia to the Americas

was in an extremely rudimentary form, and came, not from the Asia of ripened culture and intricate civilization, but from Asia at the dawn of the beginnings of her culture. The textile arts are said to be more truly indigenous in America than Europe.

There were, in all probability, two streams of migration from Asia. One we can accurately trace and measure from Northwestern Siberia over the Aleutian Islands into Alaska. The second stream is more shadowy in origin, more obscure in wanderings, and less definite in objective. The theory most readily accepted in reference to this second migration, is that of a continuous series of islands in the Southern Pacific that have since disappeared through volcanic action.

Just where the stream landed or during just what dim epoch of history the migrations were included is a matter rather for the geologists than either the ethnologists or the historians. It is certain, however, that the civilizations of the Mayan area of Costa Rica, Honduras, and Yucatan and the ancient empire of the Incas of Peru were of immense antiquity.

The moist climate in the former area has destroyed



Prehistoric Peruvian Fabrics Showing Tapestry, Double-Cloth and Brocade Weaving.

all evidence of textiles and we must seek in ceramics and statuary for the proof that these peoples were highly advanced in these arts.

However, tribes in the interior, who have been in a large measure undisturbed by white contacts, are still extremely skillful weavers and maintain arts of spinning and dyeing and fabric decoration that are beyond the skill of their Spanish conquerors to teach. To mention no other fact, it may be of interest to

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note that these people still dye with the beautiful purple of the *purpura* shellfish, the same as that used in the ancient Mediterranean to dye the famous Tyrian purple.

Peru, on the western slope of the Andes, is a continuous desert stretching over thousands of sandy miles. The myriad graves of this forgotten empire are rich indeed in textile treasures, and from these wonderful webs and the complete assortment of tools and implements, we can construct with absolute accuracy their technique, method, conception of design and their matchless color schemes.

For the purpose of clarity, I have divided the Americas into two great textile groups: the users and non-users of cotton. It is deeply significant that this apparently arbitrary division is further emphasized by a similar distinction in the types of looms employed in each area. For there are two types of weaving in the New World that never occur in the same area, and that are divided by sharp geographical limitations, indicating or at least suggesting that the fundamental ideas were derived from two sources.

The ancient cotton area in the New World began in Southern Utah, spread over New Mexico, Arizona, Mexico, Central and South America. This area includes the use of the two barred loom, similar in appearance to the crudest Asiatic looms, such as those still used to weave rugs and identical in principle with the warp manipulation of all modern looms. All weaving outside of this area, whether on the Eastern Seaboard, the Mississippi Valley or in the Northwest, including Alaska, was performed on a single barred, warp weighted loom.

In Alaska this loom reached its highest development and this indicates that the technique was imported over the Aleutian Islands and spread only in

a modified form to the other widely scattered regions. There is in the British Museum a famous Grecian vase of crude pottery on which is a rough drawing of Penelope weaving the famous Tapestry, which she left unfinished until Ulysses returned from his wanderings. It is a warp weighted single barred loom. From warp weights of clay, discovered in the silt of the Swiss Lake Dwellings, we know that this was the type of loom employed by these ancient peoples. From the sages of Scandinavia, we gather that this type of loom was common in ancient times in northern Europe.

There is some evidence to support the contention that the loom of pre-dynastic Egypt was of the same type. It then jumps across the continent of Europe and Northern Asia and appears among the Haida tribes of Alaska. I am aiming at establishing some subtle blood relationship between archaic Greece, the Europe of the River Drift Men, and primitive Alaska. I am merely suggesting the possibilities of the transference of customs and technique through migration, trade and the influence of one people on another, even if the contacts are, for the moment, too obscure to trace accurately.

The two barred loom was distributed over all Southern Asia and over the cotton area I have indicated in the New World and nowhere else, except where we can trace historic Asiatic influence and intrusion. Everywhere it corresponds exactly with the spread of the difficult and complex technique of the spinning and weaving of cotton or of silk.

Except in Alaska, and in the cotton area, nowhere in America did the textile arts assume a major position. Fabrics were made from the shredded bark of the elm, the cedar and the wild mulberry tree. The cloth was occasionally painted or stained in designs or embroidery. Wild hemp, buffalo, dog and perhaps human hair were sometimes combined with grasses and soft feathers. Even today, among the Indians of Northern Canada, strips of a rabbit skin are interlaced in blankets without the aid of any type of loom. The bags of woven hair and fibre from the Menominee Indians, show a technique midway between tapestry and basketry figures. The weaving and spinning are both excellent. The colors, reds, black and blues, may have been obtained from traders. I have examined excellent bast fibre resembling heavy linen that was discovered in the Mounds of the Ohio Valley.

The Spanish explorers reported the use of bark cloth among the Indians at the mouth of the Mississippi and the fact that cotton blankets with woven designs were more or less regular articles of trade between these rich and powerful tribes and either ancient Mexico or the Southwest.

The ceremonial blankets used in the religious dances by the medicine men of Alaska deserve, however, more special notice. These were woven with one straight edge at the top where the warps were attached to the bar and curved and fringed at the bottom. The technique is a specie of twine and tapestry weaving, resembling in some details coptic technique. The designs are vigorous conventions of their interesting animalistic mythology. The colors—blacks, grays, olive greens and yellows and greenish blues—were dyes of vegetable and animal origin.

The finest specimen in any collection is in the Peabody Museum in Cambridge, Mass., and was brought to New England almost a century ago by a whaling

captain and discovered in use as a sleigh robe of a Vermont farmer.

In the Museum of the Smithsonian Institute at Washington is a fragment of a Salish blanket, illustrated on a preceding page. It was originally collected by the great naturalist, Audubon, and secured by him perhaps from the Lewis and Clark expedition.



First Example of Cotton Knitting from Cliff Dwellers of Utah.

The oldest woven cotton fabric within the limits of the United States proper was discovered by an explorer of the American Museum of Natural History in Grand Gulch, Utah. It was wrapped about a mummy discovered in a cave high up on the side of a cliff. The colors are red, yellows and black.

A little further south, knitted garments of cotton occur, together with a rude stencil pattern—the beginnings of resist dyeing on fabric. These people were also skillful weavers of yucca grass and made solid woven fabric and strong even yarn from this now unused material. From a sacrificial well in South Mexico fabrics of cotton showing gauze, embroidery, duck and tapestry weaving have recently been recovered by the Peabody Museum in Cambridge. Here human sacrifices of young girls were burned and thrown into the well. The fabrics are the charred remains and indicate a definite proficiency in the textile arts.

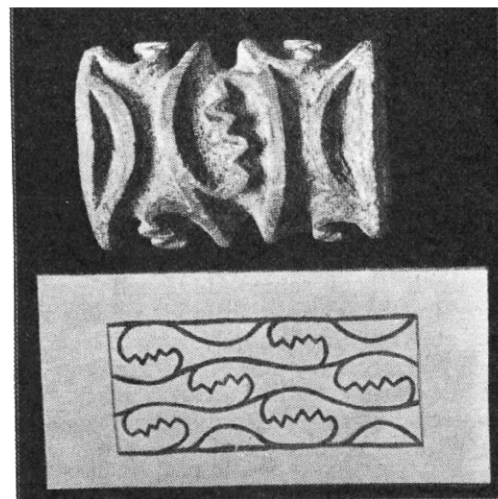
As I note above the fabrics of Central America have almost entirely disappeared unless some fortunate discoverer finds some treasure trove, similar to this mysterious well. But their pottery and stone carving show unmistakable evidences of intricately designed and delicately woven textures.

In Peru, the record is clear and straight, and based on incontestable documentary evidences. Every grave was a storehouse of textile treasures, and almost every woman's tomb contained not only fabrics marvelously preserved, bits of yarn and partially prepared fibre, but the actual tools, the loom, the

spindle and the weave patterns. Here two kinds of cotton were employed: a white fibre resembling modern Egyptian cotton in fineness, although of a bright white color; and a reddish brown evidently prized for its color. Three animal fibres—vicuna, llama and alpaca—were used, as well as human hair.

The Spaniards issued drastic laws protecting the wild vicuna, which makes its home on the upper slopes of the mountains. This wool was highly prized for its fineness and the brilliance of its lustre. Besides these fibres, the Peruvian had mastered the intricacies of the preparation of the *Agave Americana* (honnequin hemp), and from it fine, plain textures, equal to medium weight linen, were woven. They spun these yarns, especially the cottons and the vicuna, to unbelievable degrees of fineness. If we compare the length of cotton used, we have never approached them either in England or America for fineness of count, and when we come to the consideration of yarn structure, they surpass all historic spinning. This is especially true in the worsted yarns. In technique of weaving, their achievement is beyond praise.

With the exception of certain Persian and Chinese fabrics, there is no basis of comparison. The Peruvians understood, and employed, every technique known in fabric construction: tapestry, brocade, double-cloth, lace, warp and weft stripings and checks, gauze, embroidery, pile knot and painted fabrics, closely resembling printed designs. They had terra cotta blocks for stamping textile patterns, and even small cylinders of clay with designs carved in them, that must have been used for some kind of printing, although I have seen no fabric in any collection of Peruvian textiles, that I could safely declare had been printed, except a fragment of cloth made within the last century and a half, in Northern Columbia. There is no doubt, from the appearance of the little cylinders, however, that they understood roller printing, and they used wax to make patterns through resist dyeing, similar to batik in India or mastic printing today.



Terra Cotta Roller with Design used for Printing.

But little remains to say, in so brief an outline on the archaic textile history. It is, however, of interest to note that cotton was first introduced into the modern cotton states by the Spaniards, in 1536, and that silk culture was developed in Central America by the Jesuits, as early as 1530. The natives took kindly to this art, and as early as 1550 were exporting silk textures to Spain. This incurred the enmity of the

Spanish manufacturers, and drastic tax laws were applied by local governments, and in a single night the natives cut down five hundred thousand mulberry trees, rather than pay the taxes. However, a remnant of the art was preserved in inaccessible regions, and today there is a large native trade in textiles in native silk. The Indians believe that they, themselves, were the discoverers of the silk moth, and have developed an interesting group of demigods, to account for its origin.

The records of Colonial fabrics are meagre indeed. Spinning, weaving, the preparation of flax and wool and dyeing were such accustomed household arts as to arouse, comparatively speaking, little interest among the historians. The Colonists included among their number, craftsmen trained in the old methods of homework and in the master and apprentice system. Coming, however, into a new country, and possessing but few sheep and little flax, the textile situation apparently became acute as early as 1640, when the General Court of Massachusetts passed laws to encourage the manufacturers of wearable fabrics. Securing adequate fibre was apparently the most difficult concern. The problem of food was so pressing, that there was little surplus agricultural effort available to grow flax, and the attempt to use the Indian hemp was unsuccessful. Wool was imported, both in yarn and in fibre, from Spain and England, and cotton from the French Islands, in the Carribean Sea.

The Colonists, however, realized the vital importance of becoming self-supporting, and freeing their interior commerce from the entangling influence of European politics and European selfishness. Bounties were, therefore, offered for the weaving of cloth and the growing and carding of flax and wool, and classes were organized to teach spinning. Oliver Cromwell was a great, if unrecognized, friend of the American textile industry. In 1654, he became alarmed at the stagnation of industry in Great Britain, and passed stringent laws, prohibiting the exportation of wool in any form except the woven web. This forced the Colonists to direct their energies to the raising of sheep, and as early as 1660, the number had increased from one thousand to one hundred thousand, and in addition to this greatly augmented supply, the Colonists were buying wool from the Dutch. So powerful was this impulse to economic independence, that as early as 1675, wool was being exported to Spain and Portugal for wine, and to France for flax.

As each new group of immigrants arrived, they brought with them some additional knowledge in reference to the cultivation and raising of fibres, spinning and weaving, and dyeing. The first calico printer in this country was John Hewson, an Englishman, who came to Philadelphia at the invitation of Benjamin Franklin. During the Revolution, the English tried to capture him, because he was skilled in a branch of manufacture in which the English were trying to suppress Colonial competition. In 1789 he received from the State Treasury a loan of 200 pounds, to enable him to carry on the work of calico printing and bleaching.

A few years ago I had occasion to examine a collection of blue and white double cloth blankets, made of flax and indigo dyed wool. They had been woven by a descendant of the Dutch colonists in the Hudson Valley. All the patterns came from one weaver, a certain David Haring, who lived in Clos-

ter, N. J., and who in addition to his occupation of a weaver, was an undertaker. He had learned from his father a number of drafts for geometric patterns. These are very similar to certain oriental designs. His father had learned from his father, and so on, back into the earliest Colonial history. As early as 1831, David Haring acquired a knowledge of jacquard weaving from a French weaver who was established in Westchester County.

There is evidence to prove that even before the introduction of machinery, Colonial weaving had passed from a purely home industry, and had become the practice of local craft groups. Preparation of fibre, weaving and dyeing were conducted in little factory groups, and Washington records in his diary a visit to the Cabot Mills in Beverly, Mass., and of seeing a machine spinning cotton thread, which closely resembled the Hargreave Spinning Jenny, invented in England, in 1764.

I must now turn briefly to the great eighteenth century in England. Here the genius of a small handful of men, largely drawn from the textile crafts, determined the future scope and greatness of the British Empire, and saved it from the disastrous effects of almost a century and a half of continuous warfare. As I have indicated before, England's textile arts were Asiatic in origin. But this intensive period of invention is distinctly her own, and when its influence had finally spread through the British Isles to the outside world, the textile capital of the world changed from India to Lancashire. While other men contributed, the following names represent the roll of honor, not only of textile history, but of all modern industrialism.

In 1733 John Kay, of Bury, invented the fly-shuttle, the first labor-saving device in centuries to be applied to a loom. This invention eventually developed into the picking devices of the most intricate modern loom, and increased at once the productivity of the weaver almost four-fold.

In 1737 John Wyatt invented the roller spinning machine, where fibre passing between two moving rollers acquired both draft and twist.

In 1738 Louis Paul invented the mechanical carder, the same in principle as that used today.

These and other inventions placed a high premium on yarns, and had the effect of unbalancing production, because weaving could progress much more rapidly than spinning. Consequently, in 1761 the Society of Arts offered a prize for the best invention for spinning textile fibres by machinery. England was literally aflame with the mechanical mania, and in 1764 James Hargreave invented the Spinning Jenny.

In 1768 Arkwright, an itinerant barber, took out a patent for the water frame, an application of power to Hargreave's invention.

It is significant that as early as 1770 the first shipment of raw cotton was shipped from America to England.

In 1774 Scheele, a Swedish chemist, discovered chlorine, and laid the foundation of the modern chemical bleaching.

In 1775 Arkwright applied for the comprehensive patent for the improvement in cotton manufacturing machinery, which was the subject of litigation for over ten years, at the end of which Arkwright's patents were denied by the English Courts. During that time, however, Arkwright had so perfected his mill organization, as not only to become a wealthy

man, but to be able to defy to the end of his life any serious competition. For he was the first man to comprehend the full significance of the division of labor and the force of serial production, and deserves fame, not so much as an inventor, but as the father of the modern industrial system.

In 1779 Samuel Crompton, in the town of Bolton, England, in an ancient white-and-black house which still stands, and which has been turned into a museum through the generosity of Lord Leverhulme, invented the Spinning Mule, a device for making fine threads from cotton, which was later applied to wool, and which for the first time made it possible for England to compete on equal terms with the cotton spinners and weavers of India.

This invention, more than any other, gave to England her supremacy in the textile world, and placed an immense premium on raw fibre. Within ten years of the perfection of Crompton's invention, there were six hundred thousand spindles, spinning fine cotton yarn in England. The shipments of cotton increased very rapidly from America. In 1785 Edmond Cartwright's invention of the first crude power loom still further increased the demand for cotton fibre. It was difficult, however, to augment the supply rapidly enough, until in 1793 Eli Whitney, a native of the State of Connecticut, invented his famous Saw Tooth Cotton Gin. This was one of the two inventions that may be recorded as outside of Great Britain. The other was the Jacquard head, invented in France in 1798.

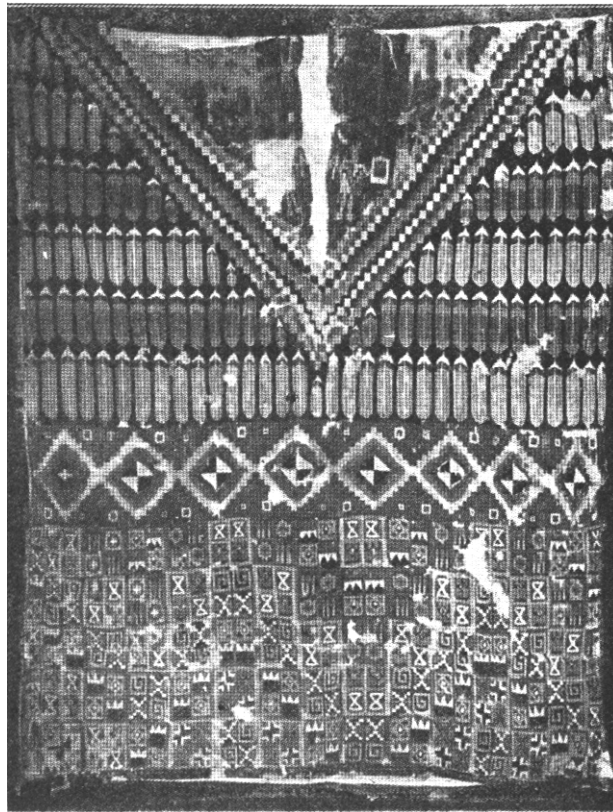
Cotton manufacturing had been conducted in the Beverly Cotton Manufacturing Company at Beverly, Mass., and by the Pennsylvania Society for the Promotion and Manufacturing of Useful Arts in Philadelphia, prior to 1789. But the real history of the American textile industry in its modern phase, begins with the establishing of the Slater Mill in Pawtucket, R. I., in 1793. For Slater not only brought with him an accurate knowledge of the new machines, but had been trained under Jedediah Strutt and Richard Arkwright in the principles of the division of labor and continuity of production. This venture was successful from the start, and resulted in the establishment of many other mills on the numerous sites where water power was available in New England.

Let us turn for a moment to the history of silk in the United States. An attempt as early as 1683 was made in Virginia to encourage the planters to cultivate the mulberry tree, and in 1657 the Virginia Assembly offered ten thousand pounds of tobacco to anyone who would export two hundred pounds worth of silk cocoons in a single year. This bounty was never claimed. In 1749 a filature for reeling silk was established in Savannah. However, all these attempts were largely in the nature of unsuccessful experiments, although it is recorded that the dress worn by Martha Washington at the first inauguration was made from silk, reeled, woven and decorated in America.

In the early part of the nineteenth century there was a great speculation in mulberry trees, which resulted in many disastrous failures. It was possible to grow the cocoons in this country, but we had not the skill, labor and the low costs of living of the Orient to make it possible to reel them successfully, and at prices that would permit competition with China and Japan. Several unsuccessful efforts had

been made to establish silk manufacturing in this country. The first silk mill in America was started by Rodney and Horatio Hanks in Mansfield, Conn., in 1810. In 1815, Wm. H. Horstman built a mill in Philadelphia for trimmings and ribbons, in which he attained a partial success with machines for plaiting, braiding and fringing. The Jacquard loom was imported by him in 1824.

The first successful manufacturers of silk in the United States were Cheney Bros. Their original mill was started at Mt. Nebo Silk Mills at South Manchester, Conn., in January, 1838. This mill was



Inca Poncho, Probably Woven About the Time of the Spanish Conquest in 1532.

operated by water power, and its chief function was the making of sewing silk. This organization has continued successfully, until today it is the largest silk manufacturing company in the world, employing between four and five thousand men and women, and conducting every process of silk making.

During the last generation, the industry of silk dyeing and printing has developed very rapidly in the United States. Today we use in this country between 75 per cent and 80 per cent of all of the silk shipped from the Orient, as well as a liberal percentage of the Italian filatures.

This rapid growth in the industry is due to two principal factors. First, the enterprise of the silk industry itself, and second, the fact that during the last twenty-five or thirty years the ready-to-wear garment industry has grown very rapidly in this country, and is constantly calling for finer fabrics.

A woolen mill was built in New England as early as 1643, by John Pearson, and the first worsted mill was established in 1695, by John Cornish, a comber and weaver, of Boston. He dyed with two furnaces, used two combs and wove with four looms.

Two additional inventions occur outside the early period; one, the ring spinning frame, a peculiarly

American method of spinning, perfected in 1832, which has revolutionized the manufacture of medium grade cotton; and the other invention, the Northrop loom with the automatic feeding shuttle head, perfected in 1894.

But it would be a mistake, indeed, to imagine that the end of the age of the fundamental inventions closed the period of mechanical adroitness and vision. These machines were all in the rudest form imaginable. Little had been done to outline the course events were to take, and every year saw both in this country and in England additional perfection in old machines and modifications of detail that, while small in themselves, were far-reaching in their influence on the basic mechanics of the art.

When Franklin drew lightning from the clouds, we did not build the next day delicate towers of steel and wires that flashed accurate messages through the air over thousands of miles of space. When Stephenson invented the first engine, men did not travel the day following at sixty miles an hour on the Twentieth Century Limited, to Chicago. When Fulton sailed up the Hudson on the *Clermont*, the shipyards at that time did not lay down the keel of a *Mauretania*. There has been not only a perfection of mechanical details to fit the great ideal of the inventors, but it has been necessary to build new types of factories, open fresh sources of supply in raw material, find new markets and develop old. More particularly the great problem in this country, with the rapidly fluctuating labor population, has been to adjust the human element to the machine.

Today we lead the world in the production of silk. We are second only to England in the production of cotton goods and, if the ratio of the development increases, will soon surpass England in this. We are second only in woollens, and in knitting challenge the world; and, added to this, we have acquired the beginnings of a synthetic dye industry that must give us, if not full supremacy in all textile fields, the assurance that we will be able to function independently of European competitors. Nor must we forget, in this connection, the great development of artificial silk in America. We are already making two kinds of fibre silk, and a third type is about to be placed on the market.

One hundred and one years elapsed between Eli Whitney's invention of the saw tooth gin and the invention of the Northrop loom. During this time, the energy of literally thousands of technical men and executives had been devoted to the perfection of mechanical processes of production, more intricate than the world ever previously knew. We should not be surprised, therefore, if the machine received undue measure of attention, and the arts of designs and color were neglected for engineering problems.

America has reached, however, a development in civilization, where taste plays a vital part in each commercial transaction and markets are controlled by the whim of millions to possess beautiful materials, rather than by the sheer need for creature comforts, that directed the energies of our forefathers. The American costume designer, after a generation of effort, has come to be an artist recognized as equal to any in the world, and, through sympathy and knowledge, better able to determine the type of dress and ornament desired by American women than the artists of any other people. We must work for a greater harmony between the producers of fabrics

and the designers of costumes, and bring these elements into closer artistic and commercial relationship.

We possess raw material, mechanical genius, a vigorous, well-trained labor population, the greatest market for fine merchandise the world ever saw, immense possibilities of export business, a dyestuff industry producing colors as good as ever were produced before, and perhaps in the vigorous atmosphere of American science and American taste, the probability of new colors and new dyes and new methods of ornamenting fabrics.

Wherever textiles have risen to a great art, all processes of manufacture, from the raw material to the finished product, have been under unified control. This was true in Persia, it was true in China; it must be true in America. We must have everything from the fibre in its raw state to the finished, designed fabric or costume, and each process must be under the guidance of engineers and artists, who share our visions of national greatness, and who are in deep sympathy with our national ideals in art.

History will repeat itself, and the economically secure nation, where a vision of the whole problem is held in mind rather than the selfish interests of a small group, will develop its resources, to make the next phase of the history of textiles in this country even more brilliant than the past epochs have been. (*Dyestuffs.*)

**"PUT THE WORLD RIGHT," SAYS PRESIDENT HARDING "BY THE SAVING OF MONEY."**

In a recent letter to Earl R. Obern, of Chicago, President Harding goes on record as an enthusiastic advocate of the practice of saving money. He declares that saving is the only means to reestablish the world's stores of working capital, and expresses the hope that the public may take this lesson to heart. The President's letter follows:

"You ask me for an expression regarding the subject of saving money.

"I have for many years been pretty well convinced that saving money is largely a matter of habit, and people who make a good beginning at it presently discover that it is by no means impossible, and it is altogether a good thing to do. Just at this juncture in the world's and our country's affairs it is certainly one of the most useful contributions that people could possibly make to putting the world right. I do not believe there is any other way to straighten out the tangle of financial and economic concerns into which the world has been precipitated by the war, except to produce a good deal more than we consume, which means to save, and by our savings to reestablish the world's stores of working capital.

"I have no more earnest hope than that the public may take this lesson to heart and learn to save as, in view of our great national good fortune, they could be able to do."

**ACTIVITY IN THE COTTON SPINNING INDUSTRY FOR OCTOBER.**

Washington, D. C. The Department of Commerce, through the Bureau of the Census, announces that 34,221,646 cotton spindles were operated at some time during the month of October, compared with 33,898,415 for September, 1921, and 33,771,988 for October, 1920. The aggregate number of spindle hours for the month was 7,583,342,519. Based on an activity of 25½ days (allowance being made for the observance of Columbus Day in some states) for 8.6 hours per day, the average number of spindles operated for the month was 34,579,765, which compares with 34,322,831 for September.