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**THE BOBBIN and BEAKER**

Official Student Publication
Clemson Textile School

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Cotton’s Increasing Competition
From Synthetic Fibers And Paper

by Robert B. Evans, Special Assistant to the Director
Southern Regional Research Laboratory *
New Orleans, Louisiana

Although the plant and animal sources from which textile materials can be derived run well over a thousand, cotton for many generations has been used both in the United States and in the world more than all other fibers combined. Its position in textiles is roughly analogous to iron’s role in metals. While the uses of other textile fibers have been more or less specialized, cotton has been the main standby for the bulk of mankind’s textile needs.

Cotton always has had plenty of competitors for consumer markets, but in the past has more than held its own. During the last few years, however, two competitors—synthetic fibers and paper—have been making particularly successful incursions upon cotton’s end-use markets. These attacks have been gaining rapidly in force, but their impact was not felt by cotton interests during World War II and the immediate postwar years, because of the huge demand for textiles of all sorts. But now that we are back again in a buyer’s market, the story may be different.

Competition from Rayon

Rayon is the oldest and by far the most important synthetic fiber. The industry that produces it ranks high among America’s best success stories. It is interesting in this connection that most of the leading rayon companies of the United States developed as offshoots of European rayon firms or via European licensing arrangements, although by now there is only one of our large rayon concerns that is not owned in this country.

Continued production of rayon, after a few unsuccessful attempts, started back in 1911, and there have been very few years since that time when the output did not show a large gain over the preceding year. The greatest advance has been during the last few years, however, with consumption increasing from the equivalent of 1.1 million bales in 1939 to the equivalent of 2.8 million bales in 1948. This record of continued growth has been based on continued improvement in properties, a downward trend in prices, and excellent merchandising.

During the last 15 years, rayon has been improved considerably in appearance, drape, softness, wrinkle resistance, color fastness, and washability, to name only some of the improved characteristics. Two specific developments, however, are directly associated with three-fourths of the huge production increase since 1939—first, rayon staple fiber; and second, high-tenacity rayon.

Until about 1936, practically all rayon was in continuous filament yarn form, similar to silk. Then rayon staple fiber, or rayon cut into short fibers, entered the picture and ever since has been increasing rapidly in importance. The lead in the development of rayon staple fiber

*One of the laboratories of the Bureau of Agricultural and Industrial Chemistry, Agricultural Research Administration, U. S. Department of Agriculture.

Figure 1. Average annual quantities of fibers made available for ultimate consumers in the United States, 1892-1948.

Although rayon’s percentage of the textile market is steadily growing, cotton still is used more than all other fibers combined.
was taken by Germany, Japan, and Italy, who, in an effort to free themselves of the necessity of using cotton, built up an output of 849 million pounds by 1939, out of a world total for that year of 1,082 million pounds. In the United States, expansion in the production of rayon staple fiber had proceeded at a more leisurely pace. But, as a result of the disruption of output in the former axis nations because of the war, the United States is now the world's largest producer of rayon staple as well as of rayon filament yarn.

The history of rayon from 1919 until about 1938 was one of continued reduction in price. The price of 150-denier viscose filament yarn per pound fell from a World War I peak of $4.77 in 1919 to 52 cents in 1938. The price of viscose rayon staple per pound dropped from 60 cents during 1928-30 to 25 cents in 1938. Despite these declines, cotton, at 10 cents a pound in 1940, had a tremendous advantage in price over rayon. But this situation changed rapidly during the next few years. Since 1945, cotton actually has been priced higher than viscose staple on a net “delivered-at-mill” basis. The price of acetate staple, always higher than that of cotton or viscose staple, was cut 6 cents per pound on March 1, following a 50-percent drop in sales during the first two months of 1949, as compared with a year earlier. Its margin of disadvantage in price compared to cotton and viscose staple is now less than ever before.

In comparing prices of cotton and rayon staple, the textile engineer must keep several facts in mind. The most commonly used cotton quotation is the 10-market average, which does not allow for freight to the mill or brokerage costs. On the other hand, quotations for rayon staple are on a delivered-at-mill basis. Rayon staple is sold on a net-weight basis, while cotton quotations are on a gross-weight basis, making necessary an allowance of approximately 4.4 percent for tare. Still another difference is that cotton mills take a loss of about 10 percent for waste, after allowing for the sale of or use value of usable waste, while the net waste in processing rayon staple is usually under 3 percent. Taking all of these factors into consideration, it was costing textile mills about 38.7 cents in March 1949 to buy as much Middling 15-16-inch cotton as they could get by purchasing viscose staple for 37 cents per pound or acetate staple for 42 cents per pound.

Still other considerations are involved in comparing rayon staple and cotton from a price viewpoint. Rayon staple sells for the same price regardless of fiber length, while the price of cotton varies greatly with length of staple. As a result of this situation, long staple cottons are at a considerable disadvantage in price competition with rayon, while the very short staples are actually slightly lower in price than rayon. Cotton prices also vary considerably with grade and character, while small premiums are charged for viscose staple if it is dull, or crippled, or is of the extra-fine, extra-strength type. It also should be mentioned that most rayon is made in yarn form and should, therefore, be compared in price with cotton yarns. Currently, coarse cotton yarns are priced slightly lower than rayon yarns, while fine cotton yarns are higher. The finer the yarn, the greater cotton's disadvantage.

How rayon will be priced in the future is of tremendous importance to both cotton farmers and cotton millmen. In order to secure data on this subject, the Southern Regional Research Laboratory of the Department of Agriculture made a detailed study of factors influencing the price of rayon. It was found that the rayon industry has been making substantial profits and that it is constantly finding new ways to do things more efficiently. It nevertheless has had its share of postwar inflation in its cost of doing business. The cost of building a new rayon plant is now twice as great as before the war. Wage rates in the industry have climbed from 65 cents an hour in 1938 to about $1.40 an hour at present. The cost of wood pulp and chemicals per pound of viscose rayon is now 14.7 cents per pound compared with 8.6 cents in 1940. A pound of viscose rayon staple, which cost 19 cents to make before the war and sold for 25 cents, now costs 29 cents and sells for 37 cents. From these and other data, it can be concluded that it would be difficult for the rayon industry to make reductions in the price of rayon of more than a few cents per pound.

As its quality and price position has improved, rayon has been able to expand into more and more textile markets. This expansion has been abetted by an excellent merchandising program, including advertising, quality control, technical sales help, and publicity and education. Consumption in women's clothing, always rayon's most important end use, has continued to increase; and, in addition, rayon has made considerable headway in men's suit linings, summer suits, sport shirts, and slacks. Before World War II, hardly any rayon was used for industrial purposes; but it is now used in large quantities in tire fabric. During the fourth quarter of 1948, for the first time, more rayon tire was produced than cotton tire fabric.

This invasion of rayon into tire fabric is of particular concern to the cotton industry. Before World War II nearly all tire fabric was made of cotton. Tire fabric still required 750,000 bales in 1948, a staggering $117 million worth of cotton—and about as much cotton as was grown that year in Georgia or Louisiana. But the alarming aspect of the inroads of rayon, from the viewpoint of the cotton producer, is the fact that rayon tire fabric is priced considerably lower per yard than cotton tire fabric. In addition, manufacturers say that although in passenger car tires there is little, if any, quality difference between cot-

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Robert Knight Eaton
In Memoriam

Professor Eaton, Head, Carding and Spinning Department; former acting Dean of Clemson Textile School; Head, Textile Placement Bureau; and faculty advisor to Bobbin and Beaker died recently at his home at Clemson.

Professor Eaton was a favorite of the students because of his cheerful smile, competent advice and willingness at all times to help any student in any way. He is greatly missed by all in the Textile School.

He was born July 31, 1883, in Providence, R. I., and spent his early years in Brunswick, Maine. He was a graduate of Bowdoin College in 1905 and was a member of the Delta Kappa Epsilon Fraternity there. He went on to do graduate work at Philadelphia Textile Institute, later working as a textile engineer with Whitin Machine Company at Whitinsville, Massachusetts, and with Cabot Manufacturing at Brunswick, Maine.

During World War I, he served as a First Lieutenant in the Chemical Warfare Service. In 1923 he came to Clemson as a professor of Weaving and Designing, and served as a faculty member until his retirement on February 1, 1949.
Roving Frame Stop Motion

While stop motions on drawing frames have long been standard equipment and have been considered essential to the drawing of an even sliver of correct weight, roving frames have never had satisfactory stop motions adapted to their more complicated mechanism. Roving frames are, of course, equipped with knock-off levers which automatically disengage the pulley or the motor when the bobbin is full, but it has been necessary for the attendant to keep a watchful eye on every spindle to make sure that the roving is running properly. Singlings, doublings, broken ends, plugged flyers, bad piecings and roll laps are expensive and time consuming.

A new and simple roving frame stop motion has been invented and developed by S. J. Adams of Abbeville, South Carolina, which stops the frame as soon as there is any defect in the roving being delivered to the bobbins. The device has been successfully applied in several mills and is now ready for use on any type of frame and on any fiber or mixture of fibers.

Design:

The Adams Stop Motion consists of a drop wire with an eyelet at one end through which the roving runs. The other end of the drop wire goes through a slot cut in the roll beam flange directly below each front roll. The drop wire is mounted on an insulated pivot just below its slit in the frame, and when no roving is passed through the eyelet, the wire is free to pivot until it rests against one side or another of the slit in roll beam flange. While in such a tilted position, it closes an electric circuit which shuts off the frame. When, on the other hand, the tension of the roving holds the drop wires in an upright position, the electric circuit is open and in no way influences the normal operation of the machine.

It had been thought that drop wires could not be used on roving sliver delivered from the front roll of a roving frame, for there is very little twist in the roving sliver at this point and it is so weak that the weight of the wire would stretch and eventually break it. The drop wire used in this stop motion, however, is designed to have its weight supported on the pivot, but is held on balance by the roving sliver. Since the wire does not hang down from an end, as does the drop wire on a loom stop motion, there is no tendency for the roving sliver to be stretched. In spite of this light touch, the action of the drop wire will act on the slightest defect in delivery.

The drop wires do not necessarily have to be mounted on the frame itself; they may with equal ease be mounted on a bracket positioned at any convenient spot. For each different type roving frame, the stop motion is applied differently so far as the length of the wire is concerned but the method of operation is the same.

Operation:

The action of the stop motion is fully automatic. It need not be tended in any way. If it stops the machine at any time as the result of some fault which occurs in the delivery of the roving sliver, the trouble is merely located and rectified and the ends rethreaded through the drop wire on the flyer.

Ends Down:

When an end breaks or becomes slack, the drop wire, immediately as the tension on it roving falls below a minimum, the drop wire will revolve on its pivot, make electrical contact and stop the frame, the tension is taken up immediately by the roving being pulled along by the running end, the angle will be sufficient to pull the drop wire against its contact and stop the machine.

Singling:

The action of this stop motion is adjusted so that

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Iota Chapter has been busy with work as well as fellowship. Our work has centered around our projects, which we plan to take to the Annual Convention in May. They are jacquard, knitting, dobby and dyeing projects. Our fellowship has centered around several steak suppers at the steak house in Walhalla, S. C. At present we are planning on having a big time at our annual spring banquet, which is to be held April 29th at the Hotel Greenville, Greenville, S. C.

It is with regret that we say that our Faculty Advisor Professor W. G. "Pop" Blair is ill at his home. It is the wish of the chapter that he get well soon and be able to attend the convention in Atlanta with us.

Floyd Griffin, President of Iota Chapter of Phi Psi, was recently elected a member of Blue Key, national honorary leadership fraternity.
There is a good cause for Mr. “Joe” Lindsay to be quite happy about the recent turn of events which have enhanced the Textile Chemistry Department of which he is head. Only recently it was announced that the Textile School at Clemson College was to receive a donation of $10,000 from the Burlington Foundation, a trust established by the Burlington Mills Corporation. The gift was presented to Dean Brown by J. E. Garvin, Clemson 1920, now vice president in charge of production for the Burlington chain of mills.

Early discussions of this grant were participated in by Dean Brown, Mr. Lindsay, Mr. Gage, and Mr. McKenna, Mr. J. E. Garvin, and Mr. Butler French of Burlington. The present plans are to use this donation to equip a dyeing and finishing laboratory in which actual productive processes and problems will be duplicated. It is thought that upon completion of this installation, it will be possible to take the average natural and synthetic fabrics from the “grey goods” through to the finished products. During the coming summer, bids will be received for the installing of this equipment, and construction will begin dependent on the availability of space in the textile chemistry department. When this section is put into final operation it will be classified as the “Burlington Finishing Laboratory”.

The rapid growth of textile finishing operations in the South, during the past few years, makes the establishment of such a laboratory timely. This will give the textile chemistry majors a much more accurate picture of the new machinery which is being used in the industry and better fit them for assuming their positions upon graduation.

This donation to Clemson, Burlington Foundation officials stated, is in line with the Foundation’s policy of making gifts to colleges to improve existing facilities and establish needed new ones. Primary consideration in making these donations is the need of the institution in question and the use to which the donations will be put.

Mr. Joseph Lindsay, or Mr. “Joe” as he is affectionately referred to by students in textile chemistry, has quite a varied career before coming to Clemson in 1935 to assume the position as head of the Textile Chemistry Department. During his fourteen years as class adviser to the “skein dyers”, he has sent many men into the industry who look back with thankfulness to the knowledge and friendliness that they received from Mr. “Joe”.

This gentleman's interest in textiles was not predominant at first, for he graduated from Erskine College with an A. B. degree in Chemistry in 1919 after being captain of the football team the previous fall. It need not be added that carrying the pigskin in those days was quite different from today, for the “T” and other variations had not then been introduced. Nevertheless, Mr. “Joe” was directing the plays from quarterback and leading his teammates through lines which made his weight look slight. In the (Continued on Page 14)
Nyons As A Textile Fabric

By NATHANIEL A. HOWELL

Nyons is fast making a place for itself in today's textile field. Each day new uses and applications are found for this synthetic textile fibre. Nyons was first discovered about twenty years ago by Dr. W. Carothers, who was doing research work for the Du Pont Company. Its discovery was quite accidental and it was not introduced to the public until ten years later.

All the nylon in use today is manufactured by Du Pont. While this company actually makes the nylon itself, it does not weave, knit or otherwise transform it into readiness for everyday use.

The starting point for the manufacture of nylon is the nylon salt, which is received by the plant in a water solution. This makes it easier to transport. After reaching the plant, a certain amount of the water is evaporated from the solution. When the correct concentration is attained, the solution is transferred to an autoclave where it is heated at a preset temperature and pressure. This heating under pressure is what combines the small nylon molecules into larger ones. Next, the molten nylon is cooled by a shower of water. After it hardens it is dried and chopped into flakes.

If it is to be made into a continuous filament, the flakes from several batches are mixed and blended in order to attain uniformity and is again melted. The nylon is now forced through a number of small holes in a spinneret under a very high pressure. Upon emerging from the spinneret, the molten nylon is usually passed through a jet of air so that it will cool and harden. Some of the larger filaments cannot be cooled sufficiently in this manner and must be passed through a tank of water.

After being drawn out and wound on bobbins, the nylon filament is ready to be shipped to a manufacturer to be converted for one of its many uses.

Only recently has nylon been made available on staple form. The strands are drawn out, crimped, and cut in staple lengths. In this form, it can be handled like wool or cotton.

Nyons was first used commercially as a tooth brush bristle, and during the war it was used for making parachutes and rope in which extra strength was desired.

Since the war many uses have been found for nylon. These include tirecord, nets, rugs, sweaters, socks, upholstery, women's underclothing, and other fabrics.

One very desirable trait that a nylon fabric possesses is the fact that its shape can be permanently set. Once given their desired shape, the fabric will hold it indefinitely. Therefore, sweaters, stockings, socks, or other garments will regain their original shape after being washed. Nyons is also known for its quick drying qualities.

Nyons will never take the place of cotton in the textile field, but it offers a challenge as well as an opportunity to the modern textile man to introduce it into his plant.

Nyons' usefulness is just beginning to be discovered, and its future promises to be a bright one.
Until the formation of the National Cotton Council of America, with its headquarters in Memphis, Tennessee, the United States Department of Agriculture and the Census Bureau under the United States Department of Commerce were the sole sources of data as to the fields into which cotton grown in the United States found its way. These reports were most disjointed and not particularly useful because of the manner in which the data was collected.

Since one of the major objectives of the National Cotton Council was to benefit all of the various factors in the industry, from the farmer who grows cotton right on through to the manufacturer of yarn and cloth, it was apparent that accurate information as to the uses of cotton was essential. The Council felt that by determining the uses, broken down into major categories, it could then assist in determining how to expand the use of cotton and make it a permanent and stable source of income to the farmers and other groups who make up the National Cotton Council— who are the ginneries, the warehousemen, the compressors, the cotton seed crushers, and the spinners.

The first year in which the analysis of uses was completed, showed that the greatest poundage of raw cotton was used by the tire manufacturers. The next largest use was for cotton bags! This came as a surprise to everyone connected with the industry, including the manufacturers of cotton bags. In round numbers, cotton bags have required the use of approximately 10% of the domestic consumption of cotton averaged over a number of years. (Bear in mind this is not the domestic production of cotton, but the domestic consumption of cotton, because this country has consistently exported a very high percentage of its production to other parts of the world.)

Ten per cent, when read quickly, does not seem like a very large amount, but when it is noted that all the cotton used in towels amounted to only about 3%, and in sheets and pillow cases to only about 5%, then the use of cotton in bags stands out as an important factor.

Of course, the uses of cotton are myriad. It was so difficult that the National Cotton Council had to stop when it got down to a fraction of 1%, and at that time had a tremendous number of classifications. Without attempting to list them, but simply to mention some of the unusual fields of the usage of cotton which do not immediately come to mind, are gloves, tapes, shoe linings, pockets, typewriter ribbons, etc.

An increase or decrease of 1% in the consumption of cotton bags is really more than some very important items which are well known—such as overalls and coveralls.

Therefore, to the entire cotton industry, the maintainances of a good market for cotton bags is of primary importance.

Of course, it is impossible always to maintain cotton goods flowing into the market in the form of bags. A brief example will indicate this—take table salt. Up until the late '20's, most of the table salt that was available in grocery stores was put up in small cotton bags. They were made of relatively light fabric, but they served the purpose and consumed altogether a very considerable volume of cotton. Because of salt's normally hygroscopic nature, and also because of its use in relatively small quantities, the producers turned to a package that would be more acceptable to the housewife. There are a number of other items that fall in this category.

Another basic economic change accounts for a large volume of cotton that formerly went into bags for 5 lbs.
10 lb., 12 lb., and 25 lb. of flour. In the very small sizes, flour is now packed almost automatically in either paper bags or cartons. In quantities of from 10 lbs. to 25 lbs., there are relatively few households that have need for so much flour at a time; the reason—growth of bakeries and delivery by bakeries of the various products made from flour. Not only does the housewife save the effort and trouble of baking, which is certainly no simple task, but she is also saved the trouble of mixing, washing pots and pans and mixing bowls, and carrying on hand many of the ingredients that the housewife felt were necessary to add for her own particular baking. Even in rural districts, better roads and the access to bakery products in communities, if not from delivery trucks, has further curtailed the use of flour in small packages. On the other hand, the use of flour in large packages—for example, 100 lb. size—has increased in proportion to the increase in the number of bakeries. Unfortunately, this flour has not been going into cotton bags, but a considerable proportion of it has been going into paper bags. It is at this point that many mills and manufacturers of cotton bags have seen the necessity for making careful analyses from the economic standpoint.

Even at the present relatively high price of cotton bags, as compared with paper, still the salvage value of the fabric used in a cotton bag makes the continued use more economical for the baker than to accept flour in paper bags.

Of all the bags made, by far the greatest yardage of cotton goods is consumed in the manufacture of bags for feedstuffs of all kinds. These include dairy feeds, chicken feeds, rabbit feeds, etc. Nearly all of these feeds are bulky and require a relatively large bag to carry the usual quantity of 100 lbs. Not only does cotton fabric lend itself to this service, but, in addition, the piece of fabric left after the feed is used out of the bag is of a desirable size. The industry—to make these fabrics even more desirable to women who like to use them for home sewing, etc.—now furnish these bags in attractive prints. Not only that, but many different constructions of fabrics are used for this purpose to further their appeal from the standpoint of style and appearance.

These print bags are an outstanding example of some of the things that can be done to maintain the flow of cotton into the bag market.

Frequently, there have been articles published and speeches made about the loss of the market for cotton bags that formerly carried cement. Rather peculiarly, this market has not disappeared altogether, though it has shrunk materially, and the shrinkage, instead of being caused by paper bags, has been caused by the shipment of cement in bulk. This, in turn, has actually cut into the use of paper bags as well.

Sound economics will generally control in all matters of this kind, with due regard to "style", which is much more of a major influence on all of us than we would like to admit. If cotton proves to be more serviceable and desirable from an economic standpoint, and also can be "styled"—then with proper promotion and intelligent planning there should be—as far into the future as we can now see—an excellent market for cotton in the form of bags.

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**COMPLIMENTS OF**

**SMITH-DRUM AND COMPANY**

"BUILDERS OF THE BEST SINCE 1888"

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**SPRING, 1949**
Cotton helped bring in the new textile machines. For thousands of years there had been few changes in the technique of making cloth. Within the space of one hundred years, spinning and weaving were to be speeded up one thousand times. Machines were to be invented that could be tended by children (to their misfortune). John Kay, with his fly shuttle, was to start a sort of tag game between the spinners and the weavers; first the spinners could not make yarn fast enough for the weavers, and then the looms were not fast enough to use up all the yarn that the spinners made.

John Kay was a weaver who wanted to make wider cloth and to make it more quickly than was possible on the primitive loom. To do this, he saw that it would be necessary to invent something that would throw the shuttle through the shed faster and for a longer distance than the weaver’s arm could throw it. After many efforts, Kay succeeded in making a springing hammer that would do this. Because the shuttle seemed to fly back and forth of its own accord he called his invention the “fly shuttle”. When Kay speeded up weaving with his fly shuttle one thing occurred that he had not expected. Weavers were able to use up yarn faster than spinners could make it. The weavers had to tramp from house to house trying to buy enough yarn for their looms. Spinners could get a high price for their work and were in no hurry. The need of the weavers for more yarn caused the invention of a number of machines for spinning.

When Kay invented the fly shuttle loom, spinners were still making thread on spinning wheels. James Hargreaves, an English spinner, knocked his spinning wheel over one day and observed that the wheel continued to turn the spinning as it lay on its side. Hargreaves saw that with the wheel in this position it would turn a number of spindles at one time. He set to work in secret, and by 1767 had made a spinning machine that would turn a number of spindles at one time. The spinning jenny, as Hargreaves called his machine, made it possible for thread to be made much more rapidly than before. It could not, however, spin thread that was tight and strong enough to be used for the warp, the lengthwise threads mounted on the loom among which the softer filling threads are woven. Weavers still had to stop work and wait on slow hand spinners for their warp yarns.

Richard Arkwright, a young barber who traveled about the countryside buying the long hair of country girls (to be used in wigs worn by ladies and gentlemen of fashion) heard spinners complaining about the faults of the spinning jenny. As Arkwright listened to the spinners an idea began to take form in his mind. He set about making a spinning machine that would make strong thread, and make it quickly. By 1771 Arkwright had not only invented a better spinning machine than the jenny, but had become the owner of a successful spinning mill. His machines were too heavy to be worked by manpower, and were run by horse-power or by water-power.

In 1779 Samuel Crompton, a weaver, combined the good points of the spinning jenny and the horse-power frame into a spinning machine that he called a “mule” spinning frame. Crompton remembered how spinners had destroyed the machines made by Kay and Hargreaves. In trying to avoid their mistakes, Crompton sold his invention to a group of manufacturers, who made a number of the machines and never paid Crompton at all for his idea.

The “mule” was a very good spinning machine in every respect except that it took skilled workmen to tend it. Mule spinners knew they could not be replaced by untrained workers. Their demands for high wages caused the manufacturers to look about for a man who could make a spinning frame that an unskilled worker could tend. In 1830 Richard Roberts invented such a machine, called the “self-actor mule”. Even women and children could tend this machine. In 1838 another easily tended spinning machine was invented by an American worker named Jenks. This machine was called the “ring” spinning frame.

Each spinning machine could now spin twelve hundred times as much in one day as could be spun on a spinning wheel. The spinning machines called for more cotton. In 1792 Eli Whitney, a young school teacher from New England, was asked to try his hand at inventing a machine to clean the seeds out of cotton fiber. The story goes that while he was thinking about this problem, Whitney saw a cat reaching through the bars of a chicken coop, trying to pull the chicken through but only succeeding in getting its claws full of feathers. It occurred to Whitney that the way to separate the cottonseed from the fiber was to pull the fiber through an opening too small for the seed to go through. The first model of his machine was a drum set with wire hooks that turned against a grater, on the other side of which seed cotton was passed. The wire hooks caught the passing fibers and pulled them through the grate, which was too fine to allow the seeds to follow. The cotton fiber could then be brushed off the hooks.

THE BOBBIN AND BEAKER
Whitney called his invention the cotton "gin" (short for engine). It was a great success from the start, and was highly praised by such men as Thomas Jefferson and George Washington. Whitney wanted to patent his idea and manufacture the machines himself, renting them to cotton producers. But the gin was too important to be kept in one man's hands. It was immediately copied so widely that his patent was worth little to him, and it took him a long time and many lawsuits to make any profit from his extremely valuable invention.

Kay's fly shuttle loom, that had started this race for more thread and more cotton, did not have any serious rivals from the time of its invention in 1733 until after 1785, when Edmund Cartwright, a minister, invented his power loom. Everyone laughed at Cartwright for thinking that a machine could ever take the place of human fingers when it came to weaving. Edmund, who did not like to be laughed at, decided that he would make a weaving machine, just to show them he was right. In his hurry, the minister did not even stop to study the parts of a hand loom. He invented a weaving machine, took out a patent on it, and then discovered that his machine was much harder to use than was the ordinary hand loom. After six more years he had worked out an automatic machine that could be more easily handled and had set up a factory to make looms for textile factories at Manchester.

His troubles were not over. Textile workers knew that the new loom would be able to weave more cloth in a day than they could weave in a week. They tried to destroy all the machines, but, although they caused Cart-
Burlington Lends a Hand

(Continued from Page 8)

spring, "a young man's . . . . ," but to Mr. "Joe" it turned to baseball, and here again he earned a letter chasing flies in the outfield. During the fall of 1919, who was the coach at Erskine but this same man.

After leaving Erskine Mr. Lindsay sold insurance until 1923, at which time he entered the University of North Carolina and in 1924, the University of Chicago. At these two schools, additional chemistry was studied and a year's special work in textile chemistry at Philadelphia Textile school was completed in 1925. Mr. Lindsay completed his work for a masters degree at the University of Tennessee in 1945.

After leaving Philadelphia Textile School, Mr. Lindsay accepted a position as laboratory assistant for General Dyestuffs at their Charlotte office. In four years he became head of the laboratory and held this post until he came to Clemson as head of the Textile Chemistry Department in 1933. At the time of his arrival, the Textile Chemistry staff was composed of two men, whereas now it has grown to five.

While actively assisting embryo textile chemists, Mr. Lindsay has also found time for many other activities. Prior to World War II, he was a lecturer at the Ciba dyestuff school in New York every summer for five years. At present he is a member of the American Association of Textile Chemists and Colorists, the Fiber Society, Southern Textile Association, and Phi Psi fraternity.

We are proud to list the following CLEMSON MEN who are part of our organization

(Listed in order of length of service)

R. S. Pruitt
D. D. Gillespie
L. C. Chamblee
G. C. Jones
F. A. Lawton
M. S. Abrams
E. P. Abrams
T. P. Baskin, Jr.
M. B. Richardson
A. D. Sutton
C. J. Humphrey
R. P. Reagan
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case of a singling from drawing the drop wire will sag over and make contact, stopping the frame as described above.

**Bad Piecing:**

This stop motion will stop most thick piecings from drawing when the piecings reach the drop wire. When these thick piecings hit the drop wire they will usually plug up the eye and cause the end to break. Light drawing will naturally run slack so the drop wire will pull over and make contact. In fact, when the stop motion was first tested, it cut off the machine so often that it was felt that there must have been something wrong in its operation, however, the trouble was traced back to bad piecings of ends at drawing. When the cause was located and the trouble eliminated, the sliver ran into the roving frames smoothly and the stops decreased. A much better sliver was drawn and this resulted in an improved product all down the line.

**Roll Laps:**

If the roving begins to lap around any roll, the drop wire will fall and make contact and stop the frame because there is no running through it to hold it in an upright position. Roll laps are stopped almost as soon as they begin. Without use of the stop motion, flying mandrels are not uncommon and are dangerous when they fall out of the stand and are broken by the flyer.

**Plugged Flyers:**

When a flyer becomes plugged, the tension will slacken and the frame will stop, thus eliminating the stretched roving that is ordinarily produced when the flyer is partially plugged.

**When Sliver Runs Out:**

The stop motion will stop the frame when the sliver runs out and will allow the operator to creel in a new can. On a roving frame not equipped with a stop motion, the frame will continue to run until the operator returns on his regular patrol cycle. In many instances, the frame will have run until the correct tension cannot again be obtained on the spindle and that end will have to be broken back for the rest of that doff.

**Full Production:**

When an end comes down on this stop motion, the frame will stop and cannot be restarted until the end causing the stop is put back up. An attachment is put on builder motion so the frame will not stop on the change, but will continue to run until the carriage has changed direction. This prevents the stop motion from stopping on a change which would of course cause numerous run-overs, and prevent the operation of the machine for so long a time after an end is down that production is lost. This attachment insures that proper tension will be maintained during the doff and by avoiding run-overs, full frame production is assured.

**Correct Tension:**

Correct tension is essential to the delivery of good roving. This proper tension is obtained automatically when the frame is adjusted to the minimum tension necessary to keep the drop wires in a vertical position. Unless the lay and tension are correct, the drop wires will not permit the machine to run. Often, on machines not equipped with the stop motion, frames are run with too little tension on the roving so that an inferior product results and the full bobbin does not weigh as much as it should.

It is possible for an operator to handle more frames equipped with stop motion than without. Also, the roving delivered to the spinning room is of such quality as to reduce ends down, which in turn means that one operator can handle more sides and produce better quality work to deliver to Winding, Warping, Quilling and Weaving.

Most experienced mill men know the importance of uniform sliver and roving. They also recognize the importance of a stop motion on drawing frames, warpers and looms, therefore, we are confident that when the practical mill men see the roving stop motion in operation, they will be convinced that it is just as important to have a stop motion on roving frames as on the machines mentioned above.
Cotton’s Increasing Competition
(Continued from Page 3)

ton and rayon, in truck tires rayon gives better service than present commercial cotton fabrics. With this the situation, tire manufacturers have been using all the rayon fabric they could obtain. In addition, because of the huge demand for tires they have also been finding it necessary to use record-breaking quantities of cotton tire fabric.

In the spring of 1949 the rayon industry was curtailing operations because of lack of orders for the first time since prewar. It nevertheless faced the future with a greatly expanded market compared to prewar, with improved products, and its former disadvantage in price compared to cotton wiped out. Although consumption of cotton was still nearly four times that of rayon, it was obvious to the cotton industry that it must fight to keep from losing any more markets to the rayon producing industry.

Synthetic Fibers Other Than Rayon

Until about 1935, rayon was the only manufactured fiber in commercial production. Since then, several other synthetic fibers have appeared as competitors of cotton. Combined consumption of these new synthetic fibers rose from 4.5 million pounds in 1940 to about 70 million pounds last year. Although the latter figure is the equivalent of only about 160,000 bales, it is already greatly in excess of the consumption of silk or flax in this country.

Nylon holds first place among the new synthetic fibers, accounting for more than half of the combined production. The group also includes Vinyon and Saran, both made of synthetic resins, glass fiber, and protein fibers. A protein fiber made of casein was produced from 1940 to 1948 when the plant was sold to another concern which is now producing a zein (corn protein) fiber. Not long ago, Du Pont announced construction of a new plant at Camden, South Carolina to produce Orilon (polyacrylonitrile) fiber. Several other companies have other experimental fibers which they are grooming for a place in the textile industry.

Some of the new synthetic fibers have such characteristics as high strength, elasticity, and durability, and seem assured of a bright future in textiles, while others appear to be suitable only for specialty uses. Some of them are moisture-proof, which is a major advantage for some uses, although a decided disadvantage for others. All are priced considerably higher than cotton or rayon, and it appears, from the nature of the raw materials and manufacturing operations involved, that they will continue to fall into a higher cost bracket than either of these fibers. Nevertheless, a tremendous amount of research and developmental work in the aggregate is being spent on them, and it can be expected that their quality-price position will improve. It is only reasonable to believe that they will make a stronger and stronger bid for textile markets in the years to come.

Paper as a Competitor of Cotton

Less than 10 percent of the total paper consumed in the United States is used for products that compete directly with cotton. Paper has been an aggressive competitor of cotton in recent years, however, particularly in such products as bags, towels, handkerchiefs, napkins, window shades, plastics, twine, and now draperies. Consumption of cotton in bags, cotton’s second most important end use, climbed from 548,000 bales in 1940 to an all-time peak of 920,600 bales in 1943, under the pressure of a large wartime need for bags and an acute shortage of burlap. But thereafter consumption declined to 448,000 bales in 1947, despite an increased total market for bags. In the meantime, the output of paper for shipping sacks increased from 195,600 tons in 1940 to 315,000 tons in 1943, then continued to increase to 570,000 tons in 1947 and to 667,000 tons in 1948.

Over the years, paper bags have become better and better adapted to users’ requirements as a result of an aggressive research program. In addition, paper bags benefited during the immediate postwar period, from skyrocketing prices for cotton bags. Paper bags always had a lower cost than cotton bags, but they are nearly worthless after being used once, while cotton bags frequently make several trips or eventually may be reincarnated as someone’s house dress or dish towel. The net cost of using cotton bags compared favorably with the cost of using bags through World War II, soared to much higher levels in late 1940 and 1947, but was back down again at the beginning of 1949. The National Cotton Council and the Textile Bag Manufacturers’ Association currently are conducting a successful campaign to promote the use of cotton bags, based on their value for re-use purposes.

Cotton’s Future Promising

Despite the increasing competitive strength of its rivals, there are several reasons for believing that cotton’s future is bright. The cotton industry is well into its greatest revolution since the invention of the cotton gin. Mechanized production means that cotton will be produced at a far lower cost in terms of human effort in the future than it has been in the past. In fact, it appears that cotton can be grown at a much lower cost than seems possible, at least yet, for the production of any man-made fiber. Since price is a decisive factor in many textile end-use markets, the importance of this advantage is tremendous.

A second promising factor in cotton’s battle to maintain its markets is the improvement being made in its quality. At present, not more than 4 million dollars is being spent annually for research on cotton, compared to possibly as much as 10 million dollars on rayon, which is only a fraction as important quantitatively. The cotton industry, however, is taking steps to increase its research program so that it will not lose by default the battle for quality advantage. Although cotton is an age-old crop, the developments of the last few years in improved varieties of cotton, better testing methods, shrink-proofing, wrinkle-proofing, improved dyeing, flameproofing, waterproofing, and permanent starching, to name only a few, indicate that there are still no limits for productive, paying research on cotton.

A third factor has to do with some basic trends that affect textile markets. The population of the United States has increased by more than 15 million cotton consumers since 1940, and there has been a very substantial increase in the average standard of living. At present there is a strong trend toward greater use of lighter, more open, sports-type apparel, for which cotton is particularly adapted. The movement of the population of the United States toward the South and West, and the increasing amount of leisure time is adding momentum to this trend.
Progressive Development of

(Continued from Page 13)

wrought a great deal of trouble, they were not successful.

Since the time of the Greeks it had been known that steam could be made to move things. When water has been heated until it turns to steam it needs 1700 times more space than it occupied as water, and to get this space steam will push with unbelievable force against the walls that contain it. This force was set to work in the steam engine.

James Watt was a Scottish instrument-maker to whom a mine-owner had brought a broken pumping engine in 1753. As he worked with this machine Watt saw that it was not as efficient as it might be. He set himself to the task of making a better one. His first steam engine was a fearful thing that hissed, snorted, and finally blew to bits. Watt persisted, and by 1770 he had invented a steam engine that would really work. By the time Cartwright had invented the power loom, in 1785, the steam engine was ready to furnish the power needed to run it. The day of the loom run by man-power was gone forever.

Now that the new spinning and weaving machines were making cloth in an endless stream, there were not enough cloth printers to print the cloth. Cloth printing was still a slow job by hand. A Scotchman named Thomas Bell changed this when, in 1783, he invented a printing machine that consisted of a roller upon which the pattern was engraved. As this roller turned over and over, it printed an endless design upon a bolt of cloth passed through the machine, just as an automobile tire makes an endless print in a dusty road. With Bell’s roller printer, hundreds of yards of cloth could be printed in one day.

Over in France the roller printer was adopted on a big scale by a manufacturer named Oberkomph. Cloth made in his factory at Jouy became so famous that the hard-working manufacturer grew rich and received many decorations, but he continued to open the factory doors in the morning and to oversee every bit of work that was done. Oberkomph had hundreds of designs engraved on his rollers. **Toile de Jouy** (cloth of Jouy) prints did not stop with floral designs: there were pictures of millers, reapers, hunters, sailors, American Indians, and scenes from literature and history.

Another French manufacturer, Joseph Marie Jacquard, of Lyon, invented a practical draw loom by means of which designs could be woven into cloth as it was made. Jacquard had seen sketches of the draw looms with which the Chinese wove their flowered silks, and he used much the same idea in his machine. His loom had an attachment that made it possible to lift any one warp thread at a time, by means of needles that reached down through holes in a band of paper. To make the loom produce a new design, it was only necessary to make a set of perforated cards. Jacquard looms were so successful that they are still used today, although other looms have been invented upon which designs can be woven.

Perhaps the most important thing about the Jacquard loom was that it released from the slavery of the old draw loom the children who, crouching behind it, had lifted and lowered the heddles as the weaver directed, to make the pattern on the cloth. Before he was ten years old Jacquard had been put to work at this job, and he knew how cruel it was.

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THE BOBBIN AND BEAKER. Organized in November 1939 by Iota Chapter of Phi Psi Fraternity, and published and distributed without charge twice during the school year by students of the Clemson College School of Textiles. Address: The Bobbin and Beaker, P. O. Drawer 552, Clemson, S. C. All Rights Reserved.

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Thank You

I wish to take this opportunity and space to express my appreciation to all of those who have made the 1949 Bobbin and Beaker a success.

It has been especially gratifying to be able to publish three excellent articles written by such distinguished men as T. L. W. Bailey, Jr., Norman E. Eilsa, and Robert B. Evans. To these men who are so well qualified to inform us, we extend our sincerest thanks.

I also wish to thank my most able staff who cheerfully took on the added responsibility and work that was necessary for the publication of the Bobbin and Beaker. I am especially indebted to Bob Rice, Joe Clancy, Ed Broadwell, E. G. Sparks, and George Uldrick who were ready and willing to put in hard work and long hours when things were rushed.

To our advertisers, who make this publication possible, we send our humble appreciation and the hope that the Bobbin and Beaker has served you well.

We would also like to express appreciation to the personnel of Altman Printing Company of Anderson, S. C., for their patience, welcome advice, and valuable service that transformed each issue from a jumbled mass of printed matter into the finished product.

Editor

Joins Texize Chemicals

Texize Chemicals, Inc., announces the appointment of Carl M. Chalmers as a representative in the Textile Division. Mr. Chalmers will service Textile Mills in the Southeast. Before entering the armed services, Mr. Chalmers was associated with the Draper Corporation. On his return, he studied Textile Manufacturing at Clemson College. Mr. Chalmers’ appointment is effective immediately. W. N Kline, Jr. is Sales Manager of the Textile Division and W. J. Greer is President of the firm.

EIGHTEEN

Here Comes Dixie

The South, long thought of as a backward and unimportant section of this country is finally coming into its own. Many factors contribute to this rise in prominence, but dominating them all is the South’s powerful and growing Textile Industry.

The textile industry in the Southern States is growing steadily. The South now holds greater promise for the future than at any other time in its history. Development has occurred in every phase of the industry. From the field to the distributor efficiency measures cotton manufacturing have been introduced through modernization of plants and machinery. Also special adaptation of cotton machinery has proven suitable for production of worsted and synthetic yarns. Surplus earnings have been put back into mill and machinery improvements and in the coming years when highly efficient production in a competitive market is the byword, the South will not be lacking.

Long considered America’s economic “problem child”, the South has now matured into a well balanced adult that might soon be pushing the “old folks” into the background. Perhaps it can’t be considered a “Utopia” as yet, but it does offer fertile soil, abundance of raw materials, tremendous industry both diversified and growing, and a climate that tends to simplify the domestic problems of all. The South which has a territory which amounts to thirty-one percent of the nation’s total area is populated with thirty-one percent of the country’s people. The people of the South buy almost twenty-five percent of the country’s garments through apparel retailers. Well over a billion dollars of wearing apparel was sold in the South last year.

The South, only a secondary textile producing center in 1900, has climbed in less than 50 years to a position of considerable importance, for Southern mills now produce more material than all the rest of the nation together. The movement of many of the wool, cotton, and rayon manufacturing concerns from New England to the Southern states account for much of the industrial growth, and unless there is a complete reversal of this trend, the South will soon produce all but a fraction of the nation’s textiles. When production of the new rayon fiber begins, its producers observed that Southern mills prospered because of natural advantages and decided that their best location was in the South close to large sources of wood pulp and cotton linters. The South now produces almost ninety percent of the rayon fiber made in the United States. It is booming in its production of the other manufactured fibers. More than half of all the yardage of all synthetic fibers is woven in the Southeastern States. The South is well entrenched in the fine and fancy goods market. While originally known for coarse constructions, the South is now showing the world that she can weave as fine goods as can be made elsewhere.

The South has proven that it is well into a period of social and industrial development which will astound the nation. The United States will now be forced to recognize the influence of the South on the well being of the entire country.
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(Continued from Page 17)

Now that the machine made cheap cloth, people could afford to buy more clothes than ever before. The only trouble was that sewing was still hard, slow hand work. It began to occur to a few tailors that there was nothing about pushing a needle in and out of a seam that a machine could not be made to do. But when, in 1830, a Frenchman named Thimonier showed a group of garment workers a machine for sewing, the workers were so angry that they broke his machine and threatened to do the same to the inventor if he made another one.

Over in America a young man named Elias Howe, who worked in a spinning factory, also invented a sewing machine. He invited five expert Boston tailors to a sewing match. When Howe with his sewing machine sewed five strips together before the tailors had finished half of their first strips, they were so far from pleased that Howe wisely decided to leave town at once. He tried to sell his idea in England, but, like almost every one of the inventors of the early textile machines, Howe found that his invention was copied, and it was many years before he received his due reward for it.

Once the idea was accepted that machines for spinning and weaving could be successful, there was no stopping the advance of the machines. Machines were invented that would knit, others that would make lace, embroider cloth, cut out patterns, and make cloth into garments. Spinning machines, looms, and cloth-printing machines were improved until at the present time there is little left for the human worker to do except to feed the raw fibers into one end of a row of machines and to remove finished cloth from the other end.

Textron Scholarship Announced

The School of Textiles of Clemson A & M College has been granted a Textron Scholarship to assist in covering school expenses, during the Senior year, of an outstanding Junior student of the School of Textiles. Dean Hugh M. Brown of Clemson has announced. The award of $500 for the 1949-'50 term will be made on Honors Day this year.

The Textron Scholarship is part of a plan conceived by Royal S. Little, President of Textron, Incorporated, to further the efforts of deserving Textile students. The winner is to be selected by the College on the basis of both high academic achievement and outstanding leadership qualifications for future application to the textile field.

Mr. Little believes that industry should assist talented young people, in order to help develop the tremendous human resources in this country for progress in all fields. In line with this objective the recipient of the Textron Scholarship will be perfectly free to choose his field of endeavor after graduation and is not obligated to the Textron Corporation in any way.

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SPRING, 1949
TEXTILE CHEMISTRY AWARD

A recent announcement from the headquarters of the American Association of Textile Chemists and Colorists has designated Mr. Joseph Lindsay, head of the Textile Chemistry Department at the Clemson School of Textiles, as Chairman of the Student Award Committee. This committee, which was set up originally at the suggestion of Mr. Lindsay, gives an award to the outstanding Textile Chemistry student at each Textile School that has a student chapter on the campus. The award this year will consist of paid Junior membership and a technical book which will be of immense aid to whoever reaches the goal as the outstanding Textile Chemistry student.

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