VOL. XII **TEXTILE RESEARCH** NO. 7

Outstanding Features in

This Month's Issue

Controlled Shrinkage

In less than five years after Sanford Cluett first announced the discovery of his process for preshrinking cotton fabrics, the term "Sanforized Shrunk" had become part of our daily speech. (See page 2.)

Sizing Spun Rayon

Plans have been formulated for broadening the scope of the cooperative research project. (See page 12.)

War Research Program

Program of the newly formed Textile Research Council is hailed by Government officials as a constructive step toward solution of problems due to textile-plant conversion and textile raw material shortage. (See page 15.)

Synthetic Rubber Thread

One of the most intensive research programs ever devoted to a single product resulted in development of thread derived from Ameripol. (See page 18.)

Knit Underwear

Studies reveal relative serviceability of cotton and rayon underwear. (See page 25.)

Discovery of Process for Mechanically Compressing Cotton Fabrics Resulted in

Controlled Shrinkage

During and soon after the first World War a marked change took place in men's wearing apparel. Shirts with starched and semi-soft, white, detachable collars gave way to collar-attached and matching collar-attached shirts. Mercerized English poplin and American broadcloth became the most popular shirting fabrics. Broadcloth, during dyeing and finishing, was stretched—often excessively. For this reason, shirts were cut oversize; a Size 15 collar-attached shirt was made with a collar measuring 15½ to 15¾ inches when new; sleeves marked 34 inches measured 35 inches. When the shirt was laundered, the collar shrank to 14¾ inches or less; the sleeve, to 33 inches or less. The long and short of it was that the shirt was a misfit, both when new and after laundering.

A number of finishers of shirting fabrics endeavored with more or less success to devise preshrinking treatments which would minimize this difficulty. These treatments for the most part utilized water as the shrinking medium. Although they reduced shrinkage during laundering, the results obtained were not uniform and hence were still far from satisfactory.

In Troy, N. Y., Sanford L. Cluett, vice-president in charge of research, of Cluett Peabody & Co., Inc., had given a great deal of thought to the problem of preventing shrinkage. He decided that the effect of mechanical stretching of fabrics during weaving and finishing could be corrected by mechanically causing the fibers to return to what would be a normal position of the fibers and yarns when washed. Accordingly, he set out to discover a method for accomplishing this. When still in college, Mr. Cluett had discovered a new design for chronographs; later he had discovered a new way of constructing canal locks; and still later he had discovered how to make a vertical-lift mowing machine.

Whereas it frequently takes years of research to develop a new process, it was only a few days after Mr. Cluett decided to work on a mechanical method of preshrinking that he had running a small machine which preshrunk fabrics to such an extent that they did not shrink further on being laundered. A larger model operating on the same principles was built, and for a year all fabrics going into Arrow shirts were preshrunk by this process without making it known to the general public.

Garments were sold in large quantities, cut to dimensions as marked without allowance for fabric shrinkage. Complaints because of shrinkage became nil. After some consideration as to whether or not to confine the process for use on its own products, Cluett Peabody & Co. decided to offer it to the textile industry under license;

Fig. 1. One of the early types of preshrinking machines developed by Sanford L. Cluett

the first equipment was installed by a commercial finisher in December, 1930.

In the next three years 400,000,000 yards of fabrics were Sanforized. Today there are 189 machines in operation in 87 plants in this country, which are expected to turn out at least a billion and a quarter yards in 1942. In addition, 62 Cluett patented compressive shrinkage machines have been installed in 14 foreign countries.

One of the many interesting things about the process is the fact that although its development to a commercial stage was accomplished in a relatively short period of time, there has been a vast amount of research on improvement of the process and on adapting it for use on fabrics other than those made from cotton. There are now throughout the world over 300 patents, covering the processes, products, and equipment pertaining to this mechanically controlled shrinkage.

At the start, the equipment used in the process was designed to subject the fabrics to crosswise tension and thus remove the tendency toward warp shrinkage. Preshrinkage was accomplished on a pin-chain tenter by entering the fabric through a differential feeding pad which fed the goods onto the tenter at a speed which was greater than the tenter speed by an amount equal to the desired shrinkage of the material. The fabric was then subjected to a spray of moisture, steamed, and stretched crosswise as it passed down the tenter frame. This straightened the filling yarns, caused the warp yarns to rise and fall over the filling, and thus preshrunk the fabrics to the desired length. A view of an early type of machine illustrating the corrugated form assumed by the cloth in the first stage of the process is shown in Fig. 1.

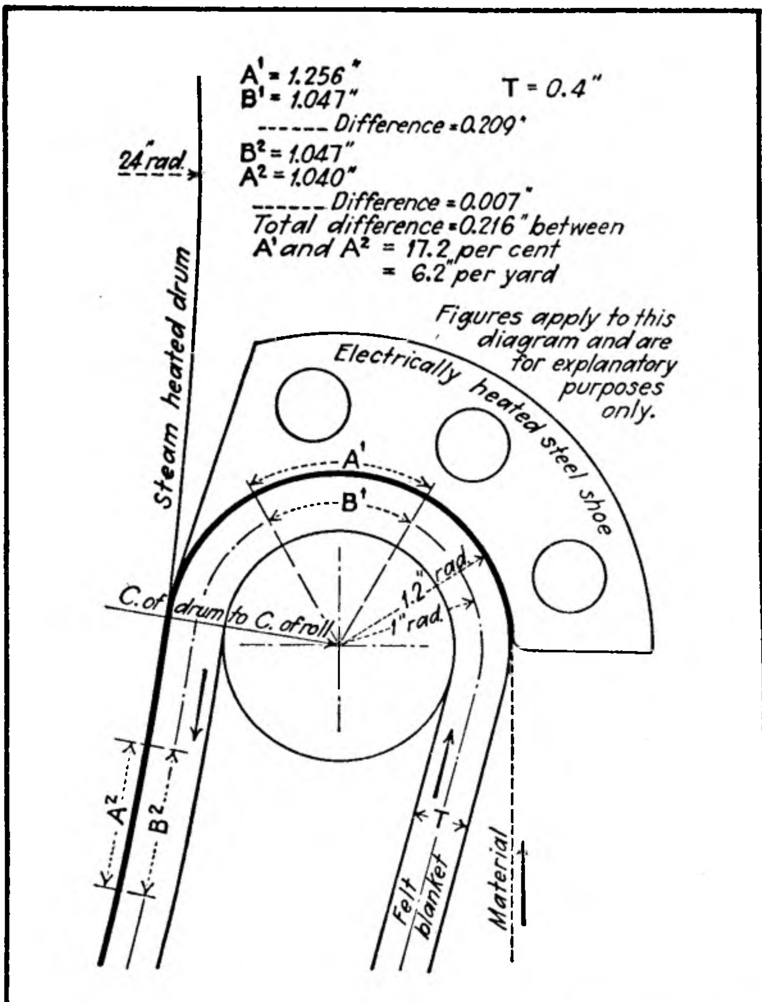
After the first type of machine had been in operation for several months, a filling-shrinkage unit was added, together with a special type of Palmer calender fitted with electrically heated shoes and designed to give a final shrinkage to the fabric and to impart a lustrous

Fig. 2. View of modified Palmer employed in compressive shrinkage process

appearance. Later a second Palmer machine was added; and still later the pin tenter was dispensed with, a short clip tenter being placed in front of the two Palmers to insure precise control of width. A modified Palmer showing the electrically heated shoes is illustrated in Fig. 2 and a diagram showing how shrinkage is obtained on the Palmer is given in Fig. 3.

Briefly, the fabric to be preshrunk is laid on the blanket of the Palmer at the point of greatest expansion and made to adhere thereto by the pressure of the electrically heated ironing shoes superimposed thereon. The shape of the shoe is such as to hold the cloth in contact with the expanded element until it contacts the setting element or drying cylinder moving down to receive it. The surface of the blanket, contracting as its curvature reverses, shrinks the web adhering to it in direct proportion. The shrink here obtained always is the same for any given thickness of blanket and exceeds the amount necessary to meet the potential wash-shrink dimension. However, the surface speed of the drying cylinder, through adjustable gear connections, is made appropriate to the definite shrink required and pulls out the fabric by warpwise tension just enough to correct this overshrink. Control of shrinkage is obtained by subjecting samples of cloth before shrinking to a standard test to determine just how much shrinkage will occur during laundering, and then setting the machine so that it will deliver the fabric accurately shrunk in both warp and filling to its potential wash-shrink.

Fig. 3. Diagram showing how shrinkage is obtained on the Palmer



At about the same time Cluett Peabody & Co., decided to license other companies to use the compressive shrinking process licenses to build equipment were granted to three manufacturers of textile machinery.

Originally employed for preshrinking shirting fabrics, the process is now utilized in finishing of ginghams, muslins, voiles, and other dress goods; gabardines, seersuckers, and linens for men's slacks and summer suitings, sail cloth and denims for play suits; damasks, crashes, and cretonnes for slip covers and draperies; flannelette for pajamas; in fact, practically all types of cotton and linen wash goods. Today several types of cotton fabrics used by the Army are shrunk to the Sanforized standard.

One of the subjects which has been studied by Cluett Peabody & Co. is that of proper yarn twist and fabric construction. As a result of this investigation, several types of cotton gray goods have been reconstructed so that the fabrics will be of the correct width and weight after being compressively shrunk to the Sanforized standard. In addition, a large amount of research has been carried out on shrinking of rayon fabrics.

It was some 40 years after John Mercer made his notable discovery that the process named after him became commercially important and the word "mercerizing" was adopted into our language. In less than five years after Sanford Cluett first announced his discovery the process bearing his name had come into widespread use and the term "Sanforized" had become part of our daily speech. The reasons for the quick success of the process are not hard to find. First, in the phraseology of the Patent Office, Mr. Cluett made a "useful and novel invention." Second, the scientific research which has led to the development and improvement of the process has been accompanied by extensive market research to determine all the potential applications of the process. Third, Cluett Peabody & Co. have merchandised the process with a vigor, and to a degree, unparalled in the history of the textile finishing industry.

RESEARCH ACTIVITIES

Julian S. Jacobs has joined the staff of Textile Research Institute, Inc. He will serve as editor of TEXTILE RESEARCH and, in addition, will devote a considerable part of his time to the Institute's textile research war program. This encompasses collaboration with all branches of the textile industry, as well as with the Government, in solving technical problems arising from the prosecution of the war. Not only will the Institute collect and correlate textile research information on technical developments and necessities, but it will actively administer or engage in applied research accelerated to the pace of extensive warfare. Mr. Jacobs was formerly vice-president and general manager of John T. Slack Corp., Springfield, Vt., and later engaged in business for himself dealing in and processing of waste materials and as a consultant and textile engineer. More recently he organized an exploratory company for the purpose of investigating natural mineral resources. Mr. Jacobs is an alumnus of the University of Vermont.

Peter M. Strang, textile research engineer, Boston, has received a commission as lieutenant in the Navy and is being assigned to special work in the ordinance division of the First Naval District.

Prosperity in the cotton industry will vanish when the war is over unless intensive research to meet the challenge of synthetic fibers is carried on now, Dr. Henry G. Knight, chief of the Bureau of Agricultural Chemistry and Engineering, U. S. Department of Agriculture, Washington, declared in an address at the opening session of the recent 103rd meeting of the American Chemical Society held in Memphis, Tenn. "With almost no exceptions," stated Dr. Knight, "the basic principles and mechanical manipulations involved in spinning, weaving and other cotton-textile processes remain the same as they were when first devised more than 150 years ago. A broad approach to the entire problem of converting cotton fibers into yarns and fabrics is urgently needed, as well as critical studies and more intensive research on existing machinery and processes with a view to modifying them in such a way as to improve the quality and lower the cost of cotton products."

Dr. Harold De Witt Smith, treasurer of Textile Research Institute, Inc., spoke on the launderability of spun-rayon fabrics at a convention of laundry owners held last month in Kansas City, Mo.

Lawrence H. Flett, group leader in the research and development department at the Buffalo plant of National Aniline Division, Allied Chemical & Dye Corp., has been chosen to receive the 1942 award of the Jacob F. Schoellkopf Medal, the highest honor which can be bestowed by the Western New York Section of the American Chemical Society. Mr. Flett was selected for the award because of his work in the development of detergents of the higher alkyl aryl sulphonate type, application of the high alkyl aryl sulphonate detergents, dyestuffs and dyestuff intermediates, and miscellaneous other developments, as well as his valuable contributions to the welfare of the Section.

William H. Bradshaw, member of the research staff of E. I. du Pont de Nemours & Co., was the guest *speaker at the joint annual meeting last month of the Virginia Section of the American Chemical Society and the Hampton Roads Chemists Club, held in Williamsburg. Mr. Bradshaw discussed the properties and applications of regular and high-strength viscose rayon yarns.*

George A. Sloan, former president of the Cotton-Textile Institute, has been appointed president of the Nutrition Foundation, recently formed by fifteen leading food manufacturers. Nearly $1,000,000 is understood to have been subscribed already by the manufacturers to support the Foundation, which contemplates establishment of what is described as the first cooperative scientific research laboratory ever created by the food industry. The whole science of nutrition in relation to consumers will be studied. Dr. Karl T. Compton, president of Massachusetts Institute of Technology, is president of the board of the Foundation.

Colonel Vere Painter is now in general charge of both the Promotion and Research Division and the Inspection Division of the Philadelphia Quartermaster Depot. Major Frank Steadman is in direct charge of promotion and research.

"Our research program goes right on," states American Viscose Corp., in its current trade-paper, advertisements. ". . . If you took a short-sighted view of present conditions . . . you might conclude that we should devote ourselves 100 per cent to production, and discontinue all other activities. . . . But look again at the same situation, and this time be far-sighted. You'll see how essential these research and development activities really are. You'll see that the ideas developed by these practical scientists are destined to aid America's textile industry immeasurably when conditions return to normal and problems other than supply arise to plague us."

Prof. Pauline Berry Mack, of Pennsylvania State College, has recently been elected to the board of directors of the American Standards Association. Professor Mack is well known in the textile industry through her researches on durability of textiles under actual conditions of wear and other investigations of textiles from the consumer viewpoint.

A directory of commercial testing and college research laboratories has been issued by the National Bureau of Standards. The director contains the names of 244 commercial laboratories, with 71 branch laboratories or offices, together with the addresses and a brief outline of the type of commodities or products tested. It also lists the laboratories of 199 colleges which are used not only for purposes of instruction, but also to a considerable extent for research. The directory is known as Miscellaneous Publications M171. Copies may be obtained from the Superintendent of Documents, Washington, D. C., at 15 cents per copy.

Intensive industry-wide research on the following problems involved in production of rayon hosiery is advocated in the April issue of Textile World: (1) soaking and sizing of rayon hosiery yarns; (2) counts and twists of yarn for legs, welt, and feet; (3) reinforcing yarns; (4) courses per inch and gage; (5) humidity and temperature conditions in throwing and knitting; and (6) bleaching, dyeing, and finishing operations.

Plans Formulated for Extending Research on

Sizing Spun Rayon

PLANS FOR BROADENING THE SCOPE of the research on warp sizing of spun-rayon yarns now being carried out under the auspices of Textile Research Institute, Inc., were formulated at a conference held April 8, in Washington. Approximately fifty representatives of textile mills, manufacturers of sizing materials, and machinery companies attended the conference, which was called by Edward T. Pickard, executive secretary of the Institute.

It was generally felt that the practical experiments on sizing spun-rayon warps now being conducted at North Carolina State College Textile School should be supplemented by fundamental studies on properties of sizing materials. Possibility of further extending the investigation to include blended yarns containing spun rayon in admixture with other fibers was also suggested.

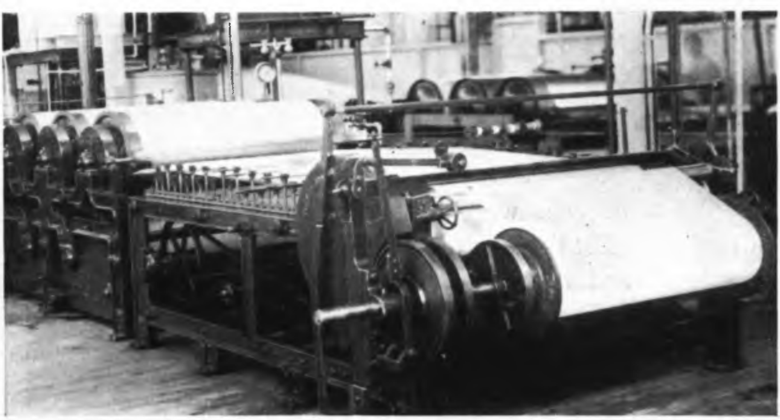
Preceding the informal discussion, Prof. William E. Shinn, who is supervising the cooperative research on warp sizing now being carried out under the auspices of the Institute at North Carolina State College, outlined the work completed to date. Tests have been carried out under diverse conditions on penetration and take up of size with a wide variety of sizing materials, and six confidential reports have been issued to subscribers. Among the phases which have been investigated are the effect in slashing of viscosity and temperature of size bath, and the effect of stretch on tensile strength and residual elongation of the yarns. To permit a study of the resistance to abrasion of sized yarns, an instrument for measuring this property has been developed.

Dean Thomas Nelson described research facilities of State College Textile School; these include a five-cylinder rayon slasher, a miniature slasher, and a wide variety of testing equipment. In addition, experimental carding, spinning, and dyeing equipment are available.

Warp sizing of spun rayon as carried out today is largely an empirical procedure, according to Dr. Milton Harris, director of research of Textile Research Institute, Inc. Fundamental research on the adhesiveness, strength, flexibility, film-forming, and other properties of sizing materials should yield data which would permit the setting up of specifications for sizes which would give satisfactory results from the standpoint of both the weaver and the finisher. This fundamental research might be carried out by research workers stationed at the National Bureau of Standards to supplement the applied research now in progress.

Dr. William E. Yelland, of Corn Products Refining Co., discussed the role of starch and starch derivatives in warp sizing of spun rayon. According to Dr. Yelland, whereas raw, unmodified starch is employed extensively for warp sizing of cotton, and dextrines are used on con-

Five-cylinder slasher similar to one employed in present research



tinuous-filament rayon warps, vegetable gums derived from starch appear to be more suitable for sizing spun-rayon warps. Combinations of starch or starch derivatives with synthetic resins offer interesting possibilities, as certain resins increase the film strength and the starch gives a coating which helps to cut down resistance to abrasion.

Dr. Donald H. Powers, of Rohm & Haas Co., described the use of water-soluble and water-insoluble synthetic resins as sizing materials. Although both types find application in warp sizing, the water-soluble synthetic resins are the more important from a volume standpoint as they can be removed easily in the finishing plant. Dr. Powers suggested that these types be called synthetic thickeners to distinguish them from the water-insoluble resins. Usually the water-insoluble resins are employed as warp sizing materials when the sized yarns are to be employed in weaving of loom-finished fabrics which do not require desizing.

In the informal discussion it was emphasized by several speakers that two of the most important problems from the viewpoint of mill men are excessive shedding of the sized warps, and defects in finishing due to difficulty in removing all the size before dyeing. Consensus of those attending the conference was that the applied research should be continued, with the emphasis on solution of the more immediate problems, and that simultaneously investigations of a more fundamental nature should be undertaken for the purpose of developing basic data on the properties of sizing materials. William D. Appel, chairman of the Institute's Technical Research Committee, presided.

The conferees were luncheon guests of the Institute and of the Textile Foundation at the Shoreham Hotel. In the afternoon they visited the laboratories of the Institute and Foundation, and had an opportunity of examining their facilities and equipment and of viewing the work of the fourteen research fellows directed by Dr. Harris.

Confer with Government Agencies On Speeding-Up Tempo of

War Research Program

OBJECTIVES of the newly-formed Textile Research War Council were outlined to representatives of the various Government agencies involved in the purchase of textiles for war use, at a recent meeting in Washington held under the joint auspices of Textile Research Institute, Inc., and the Textile Foundation, sponsors of the new program. The plan had been endorsed by executives of the major textile associations at a previous meeting in New York, during which the Council was organized, representative of all those groups.

At the Washington conference, spokesmen for the Army, Navy, and War Production Board hailed the program as a constructive step toward the solution of the infinite number and variety of problems arising out of textile-plant conversion and the increasing shortage of essential textile raw materials. Plans were laid for continuing conferences on specific problems as they arise, particularly as they may affect existing specifications on military fabrics. At an early conference technical representatives of the trade will be present to discuss some of the more pressing problems on which research is needed.

Under the new program, Textile Research Institute will act as a clearing-house for such problems, and will call them to the attention of the associations directly involved, or will initiate research on problems which do not fall in any one category. With this new program, such problems will be given immediate attention. The conference was the result of a suggestion made by Franklin W. Hobbs, chairman of the Textile Foundation, at a previous meeting of the Institute's executive committee.

Representing the Quartermaster Corps at the Washington conference were: Lt. Col. Robert P. Stevens, Col. H. B. Hester, Lt. Col. L. O. Grice, Maj. A. E. Dennis, Capt. W. G. Ashmore, and Messrs. Brown, Frazee, and Buttland. Lt. C. W. Folds represented the Navy. Frank L. Walton was there from the War Production Board.

Representatives of Textile Research Institute included: Fessenden S. Blanchard, president; Edward T. Pickard, executive secretary; Dr. William D. Appel, chairman, technical research committee; Julian S. Jacobs, recently appointed editor of TEXTILE RESEARCH; Douglas G. Woolf, chairman, publications and publicity committee.

At the earlier meeting, held in New York, the following representatives of textile associations participated: Arthur Besse, president, National Association of Wool Manufacturers; Goldthwaite H. Dorr, chairman, John T. Wigington, research director, and Paul B. Halstead, secretary, Cotton-Textile Institute; Leroy A. Beers, president, Institute of Carpet Manufacturers of America; Roy A. Cheney, president, Underwear Institute; W. Ray Bell, president, Association of Cotton Textile Merchants of New York; John F. Hagen, president, American Association of Textile Technologists; J. S. McDaniel, chairman, Cordage Institute; W. P. Fickett, president, Textile Fabrics Association; Alice C. Moore, secretary, National Association of Finishers of Textile Fabrics; David Snyder, executive director, Cotton Thread Institute; C. H. LeRoy, secretary, Rayon Yarn Producers Group; Irene L. Blunt, secretary of National Federation of Textiles, Inc.; W. B. Hines, chairman of textile division, American Society of Mechanical Engineers; George F. Quimby, secretary-treasurer, and R. C. Utess, member of the executive committee, Soft Fiber Manufacturers Institute; Sidney S. Korzenik, executive secretary, National Knitted Outerwear Association.

We Must Move Fast

AN EDITORIAL

► Quickly following the organization of a Textile Research War Council, its objectives were outlined to representatives of the Army, the Navy, and the War Production Board, who hailed the program as a constructive step toward solution of the infinite number and variety of problems arising from the war.

► The time has come to take the next steps, and, in taking them, we must move fast. These steps are: first, to determine which are the most urgent problems and, second, to solve those problems in the shortest possible time.

► No one textile research organization in this country has the man power or the equipment necessary to carry out all the work that is needed. But the combined facilities of all our textile associations and research organizations are equal to the task. With one organization—Textile Research Institute—acting as a clearing house, we shall insure that the various problems are referred promptly to the attention of the agencies directly involved, that research is initiated promptly, that duplication of effort is avoided, and that results are disseminated rapidly.

► One further step which will permit us to move even faster than otherwise will be possible is the inter-change of research data between this country and others of United Nations—particularly Canada and Great Britain. Methods for effecting such an exchange of information should be explored without delay.

Intensive Research Program Results in Development of

Synthetic-Rubber Thread

THE FIRST OF THIS YEAR B. F. Goodrich Co. inaugurated one of the most intensive research programs ever devoted to a single product. In April—less than four months after the project was started—the company announced the development of what is believed to be the first synthetic-rubber thread ever produced in this country. This thread —which is made from Ameripol, the synthetic rubber announced by Goodrich in June, 1940—was developed for military purposes to conserve the natural rubber thread which has been employed to date in products used by our armed forces. At present the entire supply of this new synthetic rubber thread is restricted to military uses; none is available for civilian purposes; and there is no indication as to when it will be possible to divert any of it to the manufacture of civilian products.

As now planned, the thread will be sold to textile manufacturers for military purposes in either the naked or uncovered form, or covered with yarn by the rubber manufacturer. For covering, cotton yarn is most commonly used, although rayon, Nylon, and silk are also employed. Rigorous tests on the new synthetic rubber thread show 700 per cent elongation, comparable to the rubber thread previously made from natural rubber compounds. Its comeback, or "kick" is approximately the same, and its stability under accelerated ageing tests is said to be somewhat better. The thread made from Ameripol resists the effects of dyeing or bleaching much more than the natural rubber products, resists the action of body oils carried in perspiration much better, and has a much greater resistance to chafing or cutting by the needles of the knitting machines. It is non-toxic and made only in black. As it is produced in the same gages as the natural rubber thread, the new product can be handled in textile mills, with no modifications in machinery.

Some of the potential military uses for the synthetic rubber thread are in harness for parachutes, gas masks, respirators, and other equipage. As stated above, none of the thread is available at present for civilian use. However, the producer believes that when the supplies of synthetic rubber are increased beyond the demands of the military forces, its new thread will prove applicable for many of the civilian uses for which natural rubber is now banned because of the war emergency.

Synthetic-rubber thread made from Ameripol was developed by B. F. Goodrich Co. through intensive research geared to war-time needs

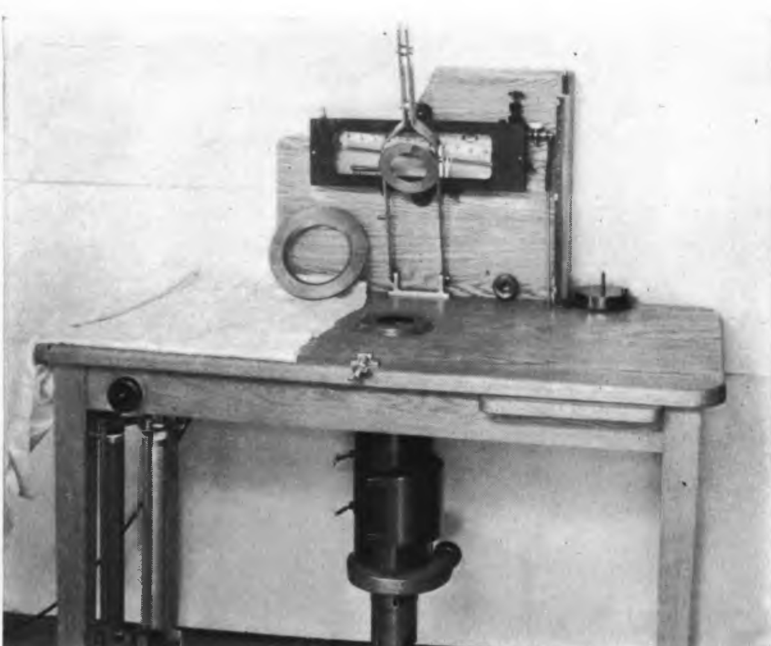
RESEARCH AIDS

Air Permeability Instrument

For measuring the air permeability of fabrics, an improved instrument has been developed at the National Bureau of Standards which permits a determination to be made of any part of a piece of cloth without cutting. The instrument is recommended for testing parachute cloth, fabrics for wind-resistant clothing, blankets, etc. Fig. 1 illustrates the instrument, and Fig. 2 shows the essential parts diagrammatically.

The orifice over which the fabric to be tested is placed is mounted in the top of a table. The area of the opening is 0.0412 square feet. A ring weighing 3 pounds and having a beveled surface with an inside diameter of 5 inches fits over a similar beveled surface of the orifice

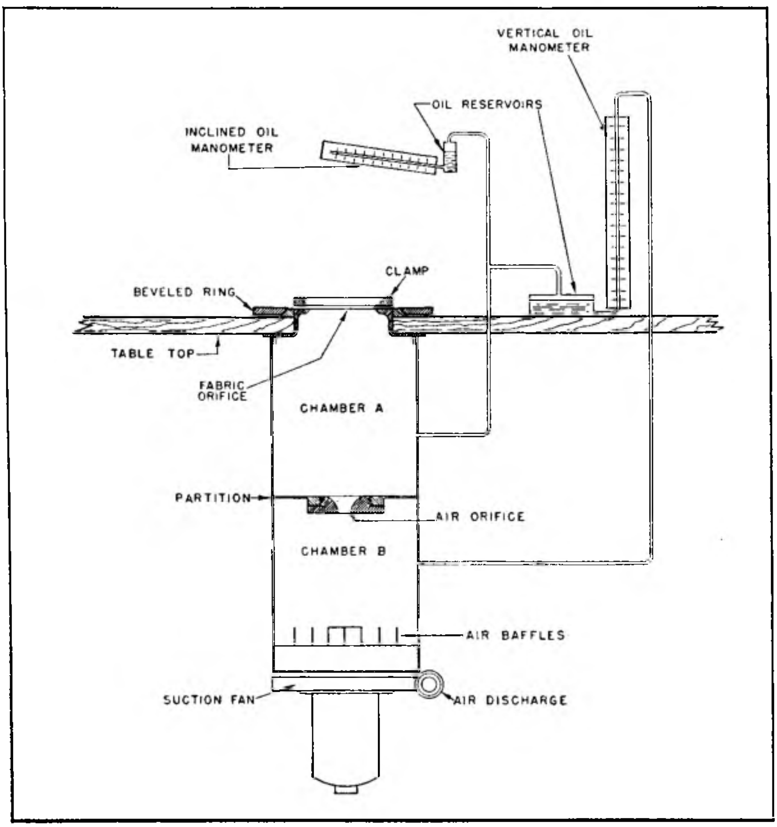
Fig. 1. New instrument for measuring air permeability of fabrics



rim. The beveled ring is placed over the fabric to hold it across the orifice in a smooth condition and with a slight tension in all directions. The clamp for holding the fabric against the orifice is pivoted in its supporting frame so that it will press uniformly against the upper surface of the orifice. The frame is hinged at the back of the table and locks at the front. It can be raised to permit cloth to be drawn from a bolt across the orifice.

The speed of a motor which draws air through the fabric under test is adjusted by two rheostats—one rheostat of high resistance to obtain rapid changes in speed, and one rheostat of low resistance for fine adjustment;

Fig. 2. Diagrammatic sketch showing essential parts of new air permeability instrument



manometers filled with a special oil furnished with the instrument are used to indicate the pressure drops across the fabric under test and across the orifice for measuring the air flow. The amount of air flowing through a fabric under test is determined from the pressure drop indicated by the vertical manometer and the calibration of the orifice which is used. A set of nine orifices covers the range of air permeability from 1 to 700 cubic feet per minute per square foot of fabric. The orifices are easily inserted through a door opening into Chamber B, Fig. 2.

The air permeability is usually measured for a pressure drop across the fabric of 0.5 inch of water, but it may be measured at any pressure drop between 0.1 and 1.0 inch of water or at a series of pressure drops between these limits. The appropriate size of orifice to use for a fabric the approximate air permeability of which is not known is determined by a trial run. The pressure drop indicated by the vertical manometer should be greater than 3 inches. If it is less, a smaller orifice should be used to obtain precision in the measurement.

The instrument was developed by Herbert F. Schiefer and Paul M. Boyland of the Textile and Testing and Specifications Section of the National Bureau of Standards. It has been used for some time in testing Government purchases and is said to have proved entirely satisfactory.

Electronic Relay

Filling many laboratory needs is a recently developed electronic relay which provides means for automatically controlling various types of electrical equipment. Typical applications are for controlling the temperature of a bath or oven, counting the number of drops falling from a condenser, automatic control of fluid level, turning on and

Electronic relay as used for controlling temperature of a water bath

off lights to coincide with other factors in an experiment, etc.

The electronic relay is a compact unit which can be used anywhere that 110 volt, 60 cycle a.c. current is available. The device, which is a refinement of a vacuum-tube relay developed by Prof. A. J. Serfass, of Lehigh University, is known as the Fisher-Surfass Electronic Relay and is made by Fisher Scientific Co., Pittsburgh, Pa. Several accessories have been developed for use with the relay. These include a lamp unit, a photocell unit, and a counter. The lamp unit may be set up so that the light from it to the photocell will be interrupted when a vane attached to the moving part of the apparatus is brought between the lamp unit and the photocell unit. By proper setting of the adjuster control, the electronic relay will readily respond to this change in light upon it, and the current to some other controlling element will be controlled entirely by the presence or absence of light on the photocell. The counter is capable of following very rapid impulses from the electronic relay; the apparatus can be assembled, for instance, to count the fall of drops from the end of a condenser.

Colloids and Colloidal Chemistry

Research on textile fibers and textile processing is in large measure a study of colloids and colloidal chemistry. Essential, therefore, in every textile research library is "Advances in Colloid Science—Volume I." * This book is the first of a series intended to provide a medium in which recent discoveries and advances in colloid science can be presented in a more unified and comprehensive fashion than is possible in regular scientific and technical publications.

Authors of the various sections are men who have been closely identified with the development discussed. Among the subjects treated in this volume are: (1) the permeability method for determining specific surface of fibers and powders; (2) solubilization and other factors in detergent action; (3) recent developments in starch chemistry; (4) the study of colloids with the electron microscope; and (5) anomalies in surface tension of solutions.

* ADVANCES IN COLLOID SCIENCE—VOL I; edited by Elmer O. Kraemer in collaboration with Floyd E. Bartell and S. S. Kirstler; *Interscience Publishers, Inc., New York, $5.50.*

Relative Serviceability of Cotton and Rayon

Knit Underwear

To determine the relative serviceability of selected types of cotton and rayon knit underwear, an investigation was undertaken by the U. S. Department of Agriculture. Results of the study are reported by Ruth Elmquist Rogers, Margaret B. Hayes, and John J. Brown, in the Department's Technical Bulletin No. 803. Below is given a summary of the test procedure and the conclusions reached.

Cotton and rayon yarns of known history were knit into fabrics of comparable construction and manufactured into vests for girls and union suits for boys. These garments were placed in service in a Washington, D. C., institution. The 26 girls and 25 boys who cooperated in this study wore alternately a cotton and a rayon garment. Three garments of each type and of each fiber were removed and subjected to a laboratory analysis at regular intervals of eight periods of wear and laundering.

To reduce the variations between wearers, paired cotton and rayon garments worn by the same girl or boy were sampled at any one test period. A uniform laundering procedure was used throughout.

The materials as manufactured for this test were comparable in construction. For each particular size of garment, the cotton and rayon fabrics were both knit on the same machine. The cotton fabric was knit from combed yarn with an average yarn number of 35.84 and 18.3 turns per inch, and the rayon fabric from 150-denier, 40-filament viscose yarn. Since the exact yarn-number

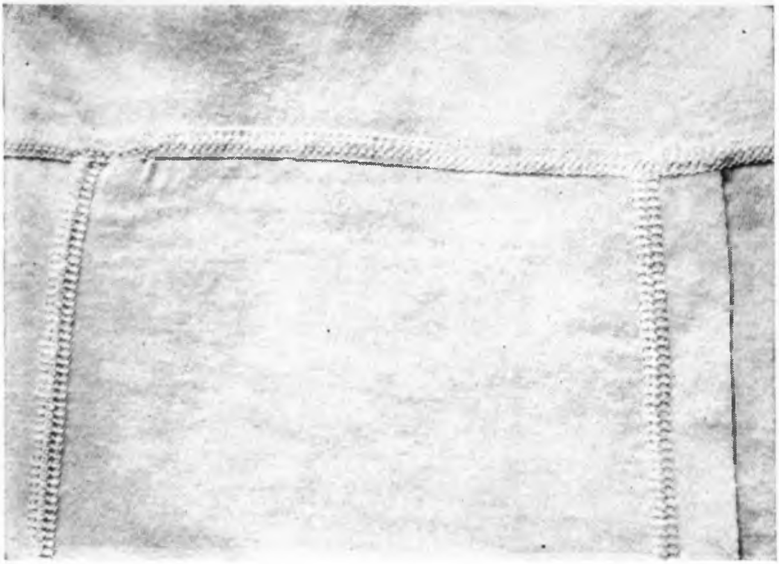


Fig. 1. Style of back reinforcement for union suits used in preliminary study.

equivalent of 150-denier rayon is 35.43, the two types of yarn are practically the same on a weight basis per unit length.

The cotton yarn was made from a 10-bale mix consisting of 7 bales classed as 1⅛ inches in staple length, 2 bales as 1³⁄₃₂ inches, and 1 bale as 1⁵⁄₃₂ inches. In grade, 6 of the bales were classed as Good Middling and 4 as Strict Middling. The viscose rayon yarn, which was obtained from one of the larger domestic producers, was reported to have been made from a mixture of approximately 50 per cent each of wood pulp and of purified cotton linters.

Samples taken of the unfinished cotton and rayon fabrics showed the weight per square yard to be 3.46 ounces for the cotton and 3.62 ounces for the rayon. The average breaking strength, by the grab test, was 33.8 pounds for the cotton and 21.2 for the rayon, and the bursting strength per square inch was 70.6 pounds for the cotton and 46.0 for the rayon.

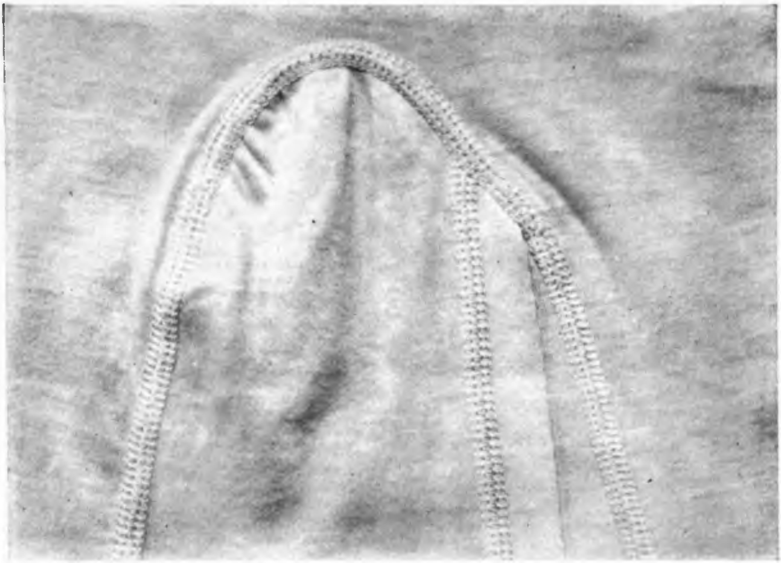


Fig. 2. Improved back reinforcement for union suits used in present study.

When new, the weight per square yard of the cotton and the rayon garments was the same. The average wale and course count of the cotton and the rayon did not differ by more than one wale or one course in an inch of fabric. The copper number and fluidity of the cotton and rayon were within the range found for commercial bleached cotton fabrics and for normal viscose rayon.

Tests made on these comparable fabrics showed that the dry breaking strength of the new cotton material was greater than that of the new rayon and the wet breaking strength much greater. The bursting strength of the cotton also was higher than that of the rayon. Both the copper number and the fluidity measurements showed that the cellulose of the cotton was much less damaged than that of the rayon.

Service produced a significant difference for grab breaking strength, fluidity, and copper number, all the tests for which the analysis of variance was made. With wear and laundering the breaking strength, bursting strength, and moisture decreased, whereas the copper number, fluidity, and ash increased. Weight per square yard and thickness had increased at the eighth wash because of shrinkage. Although, in general, the weight and thickness decreased slowly from this time on with continued service, they were greater at the end of wear than the original values.

The difference between vests and suits was found to be significant for fluidity, which is the most sensitive measure used in this study. This test showed that both cotton and rayon suits were more deteriorated chemically at 24 periods than the corresponding vests at 40. The vests lasted approximately one and one-half times as long as the suits. The cotton garments lasted in general about one and one-half times as long as the rayon. The cotton and rayon suits wore an average of 30.7 and 17.5 periods, respectively, and the vests 43.5 and 34.8 periods. It was found that no cotton suit needed to be discarded before 19 washes.

During wear, garments were mended when necessary and returned to service. No objective test was available to determine when to discard a garment. A vest or suit was removed from service when the laboratory worker found further mending impractical. The amount of mending was closely related to the garment style. For example, the type of reinforcement shown in Fig. 1 used in a preliminary study tore at the corners after the first or second wash. The type used in this study and shown in Fig. 2 distributes the stress during wear and needs less mending. Further changes in style would no doubt further decrease the mending.

It was found that cotton was more suitable than rayon for the strenuous service to which union suits were subjected. The low wet breaking strength of rayon does not particularly impair the serviceability of vests, since this type of garment is less subjected to stress during wear than are suits. It was observed that more mending was required as the percentage of elongation decreased with increased service.

RESEARCH BRIEFS

► Microscopical, staining, and chemical tests for determining different types of deterioration in cordage fibers are described by V. Castle and W. A. S. White, in an article, "Identification of Various Types of Tendering in Manila and Sisal," in the March, 1942, issue of *The Journal of the Textile Institute.* The authors state that biological attack is the form of weakening most likely to be encountered in cordage and that oxidative attack is next in importance. The tests described are useful for distinguishing these two major types of deterioration from each other and also from other less common types of tendering which are generally brought about in a more or less accidental manner.

► Proofing and coating of fabrics are discussed from a scientific viewpoint by C. L. Wall in an article "Production of Difficultly Permeable Fabrics—VI," in the March, 1942, issue of the *Textile Manufacturer.* Ideal requirements in the cementing medium or films and the technical advantage of laminated coatings are considered.

► Theories of detergent action as they apply to scouring of wool are outlined by Dr. C. S. Whewell, of the Department of Textiles of Leeds University, in an article "The Chemistry and Practice of Finishing Wool Fabrics—Part VI," in the March, 1942, issue of *Textile Recorder.* Also included is a discussion of the properties of soaps made from various oils and fats.

► Progress in development of fire retardants, mildewproofing agents, mothproofing compounds, and water repellents is outlined by F. J. Antwerpen in an article, "Chemical Repellents," in the December, 1941, issue of *Industrial and Engineering Chemistry.*

► A simple test for determining the degree to which cotton has been damaged through formation of oxycellulose during bleaching is described by E. S. Dunlap in an article "Bleaching Cotton Knit Goods," in the April, 1942, issue of *Textile World.* The author also describes a combination chlorine and peroxide bleach and outlines the theories as to cause of damage to cotton during the peroxide bleaching process.

► Causes of skittery or heathery dyeings on wool goods are discussed by T. Barr, F. M. Rowe, and J. B. Speakman, in an article, "Wool Dyeing—The Cause of Skitteriness," in the March, 1942, issue of the *Journal of the Society of Dyers & Colourists.* Investigations made by the authors indicate that the skittery appearance is due to the fact that some fibers are lightly dyed and others heavily dyed. The differences in depth of shade are, in turn, due either to intrinsic structural differences between intact fibers or by different degrees of damage which fibers have suffered.

► Effect on strength and other properties of a wool fabric of a mordanting bath is discussed by Ruth O. Donohue and Rachel Edgar, in a research report, "Oxidation of Wool Keratin by Potassium Dichromate," in *Journal Paper No. J–918 of the Iowa Agricultural Experiment Station.*

► The percentage absorption by wool of various types of surface-active chemicals from solutions of different pH values is reported by George C. Le Compte and

Joseph W. Creely in an article, "The Absorption of Wetting Agents by Wool," in the March 2, 1942, issue of *American Dyestuff Reporter.* The authors describe the methods of testing and give results of tests with anion-active, cation-active, and non-ionizing wetting agents in acid, alkaline, and neutral solutions.

► Methods for identification of various classes of dyes on textiles are described by James F. Holmes in an article, "Dyestuff Tests on Textile Materials," in the April, 1942, issue of *Textile Colorist.*

► Finishing of woolen and worsted fabrics is discussed critically by J. Colin Schofield in a paper, "Object and Achievement in Cloth Finishing," presented before the Bradford Textile Society and abstracted in the March, 1942, issue of the *Textile Manufacturer.* The author points out the advantageous results of research at Leeds University and at Torridon on crabbing, chlorination, and other setting operations, and suggests the need for similar investigations of scouring and fulling operations.

► The structure of cotton fibers is discussed by Charles W. Hock, research associate of the Textile Foundation, in a paper "Microscopic Structure of the Cell Wall," in a monograph, "The Structure of Protoplasm," published by the Iowa State College Press. Paper is of primary interest to research workers.

► Cotton research projects now underway are outlined by John T. Wigington, director of research of the Cotton-Textile Institute, in an article in the March 31, 1942, issue of the Cotton-Textile Institute's publication, *Current Information.* Mr. Wigington lists a number of Government, college, textile school, and other laboratories engaged in research on cotton and cites briefly the projects now being carried out in these laboratories.

► Results of laboratory and field tests on spinning, weaving, and dyeing of irrigated cotton are reported by Malcolm E. Campbell, senior cotton technologist, U. S. Department of Agriculture, in a paper, "The Manufacturing Quality of Irrigated Cotton," in the April 15, 1942, issue of *Textile Bulletin.*

► Methods for producing cellulose ethers and for the etherification of cotton and rayon yarns and fabrics are described in an article, "Etherification of Cellulose Fibers," in the April 10, 1942, issue of *Canadian Textile Journal.*

► How research has brought a new concept as to the mechanism of wool dyeing is described by Dr. R. E. Rose, in a paper, "Mechanism of Dyeing," in the March 13, 1942, issue of *Canadian Textile Journal.* The author also discusses the dyeing of viscose and acetate rayon, problems in dyeing Nylon, and the opportunity for further research in the field of dye application.

► A method for measuring the water-absorbing properties of towels and toweling is described by P. Larose, of National Research Laboratories, Ottawa, Canada, in a report "The Water Absorption by Towels," in the March 2, 1942, issue of *American Dyestuff Reporter.* Apparatus, procedure, and results of tests on various types of toweling before and after laundering are given.