

Outstanding Features in

This Month's Issue

Benefits of Research

Fundamental research on fiber properties and manufacturing techniques will make this country the leading textile producer of the world, according to Peter M. Strang. (See page 2.)

Fiberglas Textiles

Research to produce a better milk bottle resulted in discovery of methods of making fibrous glass suitable for use in a wide variety of textiles. (See page 11.)

Load to Remove Crimp

Investigations at Lowell Textile Institute led to development of a new method for testing cotton yarns. (See page 18.)

Evaluating Finishes

Three new instruments prove useful for determining the "hand" of woven fabrics and for evaluating finishing agents and finishing processes. (See page 24.)

Two Types of Wool

Pertinent comments on study of flannels made from two types of wool. (See page 28.)

ORGANIZATION OF RESEARCH

**Central Organization Needed
If Cotton Industry Is to**

Benefit From Research

By PETER M. STRANG

Textile research is easy to discuss, but difficult to undertake. The object of this paper is to give a better realization of the problems confronting research in the textile industry, to indicate why research has not produced extensive results for textiles in the past, and to show what research—if properly organized—can accomplish for the textile industry.

A BRIEF SURVEY of textile journals during the early 1920's discloses articles with the following titles: "Research in the Textile Industry," "Fundamental Research in the Cotton Industry," and "Starting Textile Research." If textile research has been discussed for over 20 years, there must be reasons why it has not been undertaken and why its results have not taken the industry out of the doldrums.

Some of the reasons are the following: The cotton textile industry is composed of many small units with relatively small capital. These mills make a highly competitive product. New yarns, fabrics, or designs obtain little or no patent protection and are easily copied. Each manufacturer has about the same equipment and processes. One mill does not have the money to spend to solve its problems for the benefit of the entire industry. No textile company is self sufficient enough to support a staff to design and make its own equipment. The textile

Peter M. Strang



industry is not organized to hold its best research workers.

Fundamental research is, for these reasons, too great an undertaking for most mills; and individual plant research should be considered as a combination of elementary research, production and industrial engineering, mill testing, and the development of controls for manufacture. For a cotton manufacturing company, research seems to fall into the following sub-divisions: (1) raw cotton, (2) manufacture, (3) labor, (4) new products and new uses, (5) sales and distribution.

Individual Plant Research

The potential savings from research on raw cotton requirements may be great in some instances, but probably never would amount to more than 5% of the raw cotton cost.

Research in manufacture may reduce costs somewhat by rearrangement of the processes and machinery in the plant, by increasing the package size of material in process, by rearrangement of drafts, etc., and by keeping the management informed as to what new equipment to purchase. Cooperative testing with the machine builders may lead to considerable savings in manufacture, but the

mill has no way of protecting improvements which it finds.

At present there seems to be a great need for definite knowledge concerning fatigue in workers and to learn what mathematical allowances are required in job layouts because of machine interference and spasmodic labor loads due to irregular cycles in operation.

New products and new uses for cotton goods have been studied for many years by Government and private agencies and the results at times have been very profitable. A manufacturer has a certain amount of latitude in varying such factors as yarn size, twist, and ends per inch in cloth in order to give his selling force talking points. However, he may gain but a temporary advantage over his competitors.

Many progressive mills have already entered the field of research in sales and distribution. Since the selling price of most textiles is set on the open market and the volume of production is definitely restricted by 24-hour operation, there are limits to the possibilities of this type of research.

Fundamental Research

The discussion of fundamental research to aid the industry now arises, and with it several pertinent questions appear: (1) What are the chances of the industry being superseded before research can accomplish anything? (2) Has the industry reached such a stage of development that no further progress can be expected? (3) What can research accomplish for the industry? (4) Who can accomplish this research and interpret the results?

The chances of the cotton textile industry being superseded before research can accomplish anything seem negligible. For one reason, the uses of yarns and cloths seem too closely interwoven with the customs and habits of the human race to consider their being completely discarded in anything but a long period of time even if adequate substitutes should be found.

The opening and picking operations are fundamentally the same as they were 100 years ago. The cards used,

except for sturdier construction, are practically the same as they were 50 years ago. The flyers on roving frames are almost the same as they were 100 years ago. In the last 50 years aerodynamics, electronics, electrical engineering, mathematics, statistics, physics, and chemical engineering are a few sciences which have made great progress. Application of these sciences to limitations found 100 years ago offers a fertile field for research investigation.

Elimination of any of the bottlenecks of progress will aid not only cotton textiles, but also the machinery builders, who will probably be the first to profit by textile research. If, for example, research can develop a loom which will operate at 800 picks a minute and can be manufactured and sold at a reasonable price, all existing looms will be obsolete.

Basic knowledge of fiber properties may furnish a

The opening operation has not changed fundamentally in 100 years



means for radically changing the whole process of carding through a different type of equipment which consolidates several existing processes. Knowledge of the electrical properties of the fibers may lead to greater speeds in drafting and stronger yarns. Knowledge of the effects of temperature, humidity, and ionization of air upon fibers may change manufacturing conditions.

Central Research Organization Required

If each mill in the country were to spend an amount equal to 2 per cent of its annual sales on research, as is sometimes mentioned, and the research were conducted independently in the 1,000 mills, the present status of the industry would not be changed. Each plant might benefit to some extent from its own efforts, but many of the research units would be of doubtful quality. Duplication and waste effort on minor problems would militate against attacking the major problems. In general, the returns to the industry would not be commensurate with the expenditures. Hence, the need of a central organization similar to the Shirley Institute, in England, to do textile research becomes evident. Here the ablest scientists would work with men familiar with the industry and would attempt to solve definite problems. The results of this research will put many marginal mills out of business, but for a time it will make this country the leading textile producer in the world.

Although cotton textile research has been discussed, research on the other fibers should parallel the work on cotton. In some cases the solution of a problem for one fiber may overlap and extend to others.

(This article is an abridgment of Mr. Strang's original paper. The complete paper—which covers in greater detail some of the points outlined above and gives a comparison between the textile industry and certain of the industries in which research has proved most effective—will be published in two parts in the March 19 and March 26 issues of *American Wool & Cotton Reporter*—EDITOR.)

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Some confusion has occurred due to the similarity in the names of Textile Research Institute, Inc., and Textile Industry Research, Inc. Textile Industry Research, Inc., is a private consulting organization, located at 11 West 42nd St., New York. For its textile mill clients and others, it carries out studies and makes recommendations bearing on improvement of working conditions and operating methods, maintenance and upkeep of equipment, etc.

U. S. Patent No. 2,268,677, covering a hosiery snag tester invented by E. Max Schenke and Howard E. Shearer, research director and associate of the National Association of Hosiery Manufacturers at the National Bureau of Standards, has been assigned to the Secretary of Commerce and his successors in office as trustee for the People of the United States of America.

Appointment by the Industrial Research Institute of a committee on economic, political, and social trends affecting research policies is announced in a recent report on "Science and Industry," by Dr. Maurice Holland. The primary purpose of the committee is to devise ways and means to preserve research organizations intact after the war. It is looking toward some method of accumulating a surplus or sinking fund for research in lean times, or some form of economic security, such as irrevocable trust funds for research workers or some form of group insurance especially designed to fit the needs of creative workers in industry. The report points out that with the appointment of Dr. Vannevar Bush as director of the Office of Scientific Research and Development,

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the entire science resources of the nation, including those of the Armed services, are now under the direction of one man. For the first time in the nation's scientific history the resources of Government, industry, and university are integrated and coordinated for the primary purpose of national defense.

Preference Rating Order-P-43, which assigns a rating of A-2 for the use of specifically approved scientific research laboratories, has been extended to Aug. 31, 1942. It was scheduled to expire on Feb. 28. Only research laboratories recommended by a committee of the National Academy of Sciences are permitted to use the rating assigned by this order, and each laboratory must have a copy of the order issued to it with a serial number.

“Optimum conditions for successful basic industrial research—inspirational atmosphere, expert guidance and consultation, adequate equipment, and freedom from dispersion of effort—are fulfilled to exceptional degree by the industrial research institute,” stated Dr. L. W. Bass, assistant director Mellon Institute, at a joint meeting of the American Section of the Society of Chemical Industry and the American Institute of Chemical Engineers. “Institutional research,” continued Dr. Bass, “because of its administrative and physical separation from industrial routine, is inherently less subject to the interruptions of trouble-shooting and short-range problems.” Other speakers at the meeting, which was held Feb. 20, in New York, were Dr. Lincoln T. Work, director of research, Metal & Thermit Corp., who discussed “What Is Research?”; Frank G. Breyer, of Singmaster & Breyer, who spoke on “Research from the

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Consultant's Viewpoint"; and Dr. George O. Curme, Jr., vice-president, Carbide & Carbon Chemicals Corp., who discussed "Research from the Industrial Viewpoint."

Woolen clothing worn by British soldiers has for the last 18 months been treated, by Government order, by a shrink-proof process developed at the Wool Industries Research Laboratory, Leeds, England.

Work on special problems relating to uses of cotton for war purposes was carried on in Washington by personnel detailed from the Southern Regional Research Laboratory, according to the report of Henry G. Knight, chief of Bureau of Agricultural Chemistry & Engineering, for the fiscal year ended June 30, 1941. The work included studies of methods for protecting cotton sandbags against deterioration by micro-organisms and investigation of the suitability for black-out purposes of black cotton fabrics of different types.

Dr. George W. Taylor, of the research department, Wharton School of Finance, University of Pennsylvania, is representing the public on the National War Labor Board.

"The fundamental objective of industrial research is insurance of the continued existence of a business and maintenance of its profits in a competitive and changing world," stated Roland P. Soule, at a recent meeting of Industrial Research Institute. "A company which invests money in properly directed research is in effect purchasing an insurance policy;

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research is no longer for only the ambitious few who desire to expand their profits. It has become a real necessity for that larger group which, content in the past with the established level of its earnings, now finds itself confronted on all sides by new threats.”

Standardization is going forward in this country at a greater rate than ever before, according to R. E. Zimmerman, president American Standards Association. Last year the association approved 69 new standards, 61 revised standards, and 4 emergency standards developed under a short-cut procedure approved by the Standards Council in January, 1941.

The vast amount of research which is being done throughout the country in an endeavor to maintain production of textiles with the use of chemicals which can be obtained, and which are not being diverted to other uses, has in many instances led to development of substitute processes that have produced better results than the original method. “This,” according to A. E. Carpenter, president, E. F. Houghton Co., “means that the development of certain new processes made from necessity will definitely replace previous methods, and the old methods will never be reinstated.”

Prof. Arthur George Green, 77, consultant to the Dyestuffs Group of Imperial Chemicals Industries, Ltd., died last fall at Walton-on-Thames, England. Widely known as an educator, research chemist, inventor, and author, Professor Green devoted much of his life to the establishment of the British dye industry on a sound foundation.

**Attempts to Make a Better
Milk Bottle Resulted in**

Fiberglas Textiles

MAKING OF GLASS is one of the oldest of arts, dating back to the first dim pages of history. Some of the oldest articles existent today in museums are made from glass. Glass is simple and inexpensive to produce. It does not rust or rot. It is fireproof. It resists the action of water and all acids except hydrofluoric and phosphoric. It is one of the best insulators against electricity.

But normally glass is brittle. And for centuries men have attempted to give it flexibility. A Roman is said to have learned how to make a malleable glass, only to have his head chopped off by the emperor so that the discovery would not spoil the value of the gold and silver in his coffers. The Venetians learned how to draw glass into hair-like strands, which they used as decoration for their glassware. Patents on the formation of strands of glass fibers were among the first to be granted by the U. S. Patent Office, but the fibers lacked sufficient flexibility.

By 1893, Edward Drummond Libbey, of Libbey Glass Co., was able to produce small quantities of coarse glass strands by drawing the fibers from a heated rod rotated by a foot pedal. He had the strands of glass woven together with silk and made into lampshades which he took to the Columbian Exposition in Chicago. Miss Georgia Cayven—a celebrated actress of the day—saw the shades, envisioned having a dress made of glass, persuaded Mr. Libbey to provide her with 12 yards of the fabric, and had a seamstress make up a dress from it. So novel was the

idea of a glass gown that Princess Eulalie of Spain couldn't rest easy until she had one. Incidentally, the princess is said to have paid \$30,000 for her spun-glass dress, although Miss Cayven paid only \$25 a yard for the fabric she obtained.

Used a Bicycle

The next step in producing larger quantities of glass fibers was to fasten one end of the heated rod to the rear wheel of a bicycle. By having an operator pedaling the bicycle, which was mounted on a stand, a roll of these fibers could be produced on the rear wheel. Then some ingenious individual conceived the idea of heating glass in a tank until it was sufficiently soft to run through a fine orifice, dropping onto a spinning disk. The centrifugal force of this spinning disk drew the glass radially from the axis of the disk, and a roll or doughnut of fine fibers was obtained around the periphery. An improved method of producing these fibers was to heat the glass in the tank, allowing it to flow through a number of orifices in the form of streams of molten material. These streams were caught and fastened to rotating wheels, forming a number of doughnuts of fibers.

All these methods produced relatively coarse fibers of glass, approximately 0.001 inch in diameter. This material was used principally in foreign countries for heat and sound insulation and found its primary commercial application in Germany during the first World War, when the supply of asbestos was cut off. The only textile use evolved at that time for the material was in the construction of novelties, such as neckties, small mats, and woven baskets. The method of forming the material into a yarn or thread was to place these long, relatively coarse fibers of glass in parallel arrangement by hand and to weave such bundles in the same way that straw or other materials are woven.

This was the state of the art up to 1931, when Owens-Illinois Glass Co. established a separate division to carry out basic research on glass, which it was hoped would lead

ultimately to methods for overcoming the brittleness of glass and thus open up new applications for glass products.

During some experiments on fusing colored glass to the sides of milk bottles, finely powdered colored glass was melted with a blow torch and simultaneously forced against the bottle. The fused glass did not adhere as was desired. Instead it was blown into fine filaments that piled up in a fluffy mass alongside the bottle. As so often happens in research, the actual result was entirely different from that which was expected. The research workers had not been thinking in terms of fibrous glass, but they recognized immediately that they had "bumped

Fiberglas yarns, developed through research, are employed in manufacture of many types of industrial and decorative fabrics





The continuous filaments pass over a rotating disk and are wound on spools

into something.” Further experimentation led to development of equipment for producing fibrous

glass on a commercial scale for use in air filters and for thermal-insulating purposes.

Research was continued, and by 1935 Owens-Illinois was able to produce extremely fine glass fibers which were pliable enough and strong enough to be woven into cloth. Concurrently, research on fibrous glass was being carried out by Corning Glass Works, and in 1936 this company erected a new building for producing glass fibers for textile use. Earlier an agreement had been reached under which the two companies were to cooperate in research and development work in connection with glass fibers, and each was to have the right to use the other’s processes and inventions. In November, 1938, the two companies announced the formation of Owens-Corning Fiberglas Corp. Since then all activities pertaining to research on and production of fibrous glass have been concentrated in the new corporation.

Fiberglas for use in fabrication of textiles is produced either in the form of continuous filaments or staple fiber. Continuous-filament Fiberglas yarn is produced

In the staple process the fibers pass through a flame onto a revolving drum



by feeding marbles of specially refined glass into an electrically heated furnace which has a trough or V-shaped bushing made of metals of a higher melting point than glass. The molten glass emerges from many tiny holes in the bottom of the bushing. The filaments, averaging 0.00022 to 0.00025 inch in diameter, are combined to make one strand measuring 0.024 inch in diameter, pass over a rotating disk traverse, and are wound at a speed of over 5,000 feet per minute on special spools. A number of strands can be plied together to produce a yarn of any size required.

In the staple process, the molten glass flows downward through holes of the same type as in the continuous process. As the fibers emerge, they are caught and are blown downward by steam under high pressure. Passing through a burst of flame to eliminate moisture, the fibers, averaging 8 to 15 inches in length, gather upon and are drawn from a revolving drum. The accumulation or "sliver" follows grooved wheels to be wound on revolving spools. The subsequent spinning operation is carried out on ordinary textile machinery.

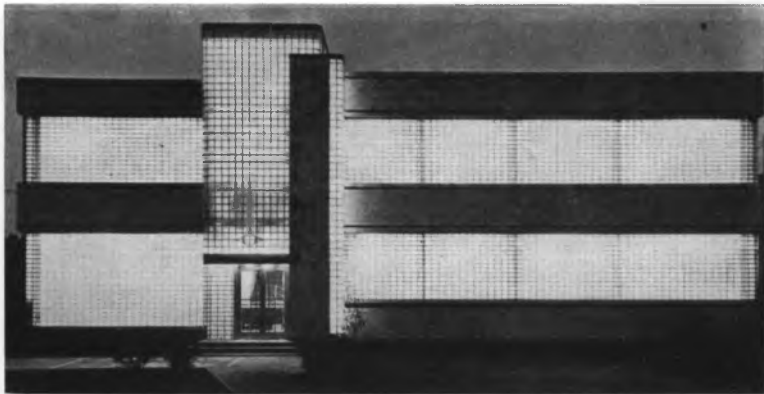
Yarns intended for electrical application are made

from a glass which has a high dielectric strength and electrical insulation resistance. Yarns intended for chemical applications are made from a glass which is more resistant to acids.

Fiberglas won quick acceptance in the electrical field, proved advantageous for several industrial applications, and then entered the broader field of decorative fabrics. In the last year or so it has been found useful for a number of military purposes. The yarns can be woven or braided, but those now available are not entirely suitable for knitting on a commercial scale.

Adjacent to the plant at Newark, Ohio, where Fiberglas is produced, Owens-Corning Fiberglas Corp. has erected a modern, well-appointed research laboratory. Here fundamental and applied research on fibrous glass continues unabated. Today much of the research is devoted to development of new products to meet war-time needs. In addition, there is a long-term research and development program directed toward permanent markets. The company's research workers and its management are confident that the experience gained in these critical times will prove to be of value in the post-war period, for the improvement of living and working conditions, manufacturing efficiency and safety.

In this ultra-modern laboratory of Owens-Corning Fiberglas Corp. research on fibrous glass continues unabated



The Immediate Task

AN EDITORIAL

▶ The importance to the textile industry of a long-range program of fundamental research cannot be over-estimated. The joining of forces by Textile Research Institute, Inc., and the Textile Foundation gives assurance that such a program will be carried out.

▶ But the immediate task of every textile industry research organization is to help win the war. All else is secondary.

▶ Today, research is needed to develop new and improved types of textiles and textile finishes required by our armed forces. Today, research is needed to find substitutes for those fibers, chemicals, and other materials which are, or may become, scarce. Today, research is needed to discover methods for speeding up those operations which are bottlenecks to production. Today, research is needed to insure an adequate supply of textiles to meet essential civilian requirements.

▶ A considerable amount of textile research directly related to the war effort is now being carried out by individual companies and by the Government. These researches must, however, be increased in number, scope, and tempo.

▶ Fundamental research should not be abandoned or curtailed. But on every program of fundamental research should be superimposed a streamlined applied-research program devoted to the solution of our immediate war-time problems.

**Investigation of Cotton Yarns
Has Revealed Information on**

Load to Remove Crimp

By PROF. HERBERT J. BALL

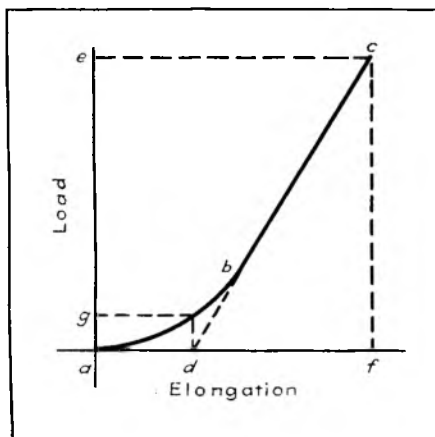
Lowell Textile Institute

IN THE TESTING OF YARNS it is customary to specify in some manner the tension to be applied in certain important length-measuring operations in which the final results will be affected by the magnitude of the applied tension. Presumably the length desired for such purposes is that of a straight but unstretched yarn, of a yarn free from the waviness, bends, and kinks characteristic of yarn unwound from a package.

As the magnitudes of tensions specified in test procedures appeared to be of an empirical origin, it was decided to determine the load necessary to straighten, but not stretch, a singles cotton yarn in the form it assumes when unwound from a bobbin; i.e., the load to remove the crimp.

It is assumed that the application of any straightening force, however small, will also stretch the yarn. Hence some method must be employed which will break up the total resulting elongation into its two components; namely, that due to the removal of crimp and that due to the stretch of the yarn. The method used, which is an adaptation of one developed by E. D. Walen, is as follows: Small, equal increments of load are applied chainometrically to the yarn, and the corresponding elongations are carefully measured by means of a linear comparator. These data are plotted, giving a load-elongation diagram

Fig. 1. Load-elongation diagram for singles cotton yarn



abc, Fig. 1. The straight portion, *cb*, is extended to cut the elongation axis at *d*, thus dividing the total elongation *af* into two parts. The portion *df* represents the stretch of the yarn and *ad* the crimp; *ag* is taken as the load to remove crimp or to straighten the yarn.

The yarns used were singles cotton yarns obtained from a variety of industrial sources. They were thoroughly conditioned before testing in an atmosphere with a relative humidity of $65\% \pm 2\%$.

Each yarn was first tested for yarn number and twist per inch, from which the corresponding twist multiplier was computed. It was then tested for load to remove crimp in the manner described above, using an initial length of specimen of 10 inches approximately. The results are given in the table on page 21 and separated into two groups: (1) yarn from warp-wound bobbins, and (2) yarn from filling-wound bobbins. The grams per denier has been calculated from corresponding values of actual yarn number and the load to straighten the yarn.

One method of stipulating the tension to be applied to a yarn is to specify that it shall be equal to the weight of a fixed number of yards; for example, 100. This has the effect of keeping the unit-stress identical in yarns of any size. Inasmuch as the unit-stress does not remain constant, the yardage corresponding to each straighten-

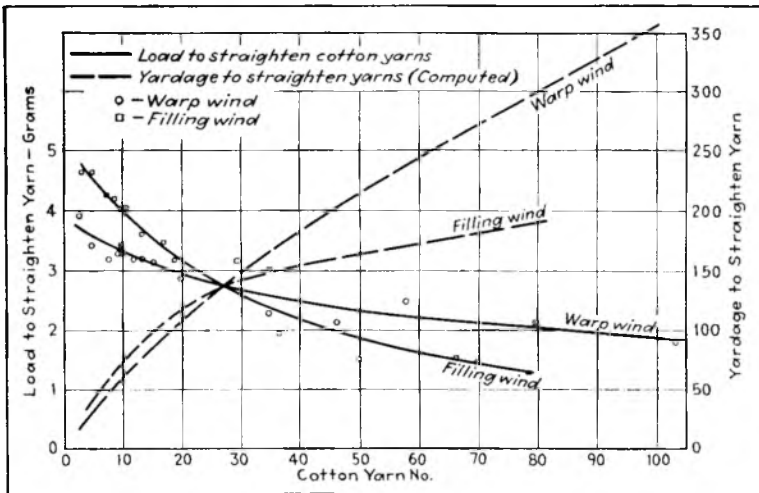


Fig. 2. Load and yardage required to straighten cotton yarns

ing force has been computed and the results are shown graphically by the dotted lines of Fig. 2. The value of the straightening force was taken from the curves shown in full lines and not from the actual test data.

It is suggested that use may be made of the results reported herein in three ways:

1. The specific straightening force in grams for any cotton yarn can be read directly from the plots (full lines) and used as such. This means a different tension for each yarn.

2. A table may be prepared from the plots specifying convenient stepped loads, each covering a range of yarn numbers; for example, the use of $4\frac{1}{4}$ grams for filling yarns from 3s to 13s.

3. The straightening forces in 1 and 2 may be expressed, if desired, in terms of yardage of yarn by direct reading from the plots (dotted lines).

(This article, which was abstracted from the November, 1941, issue of the *Bulletin of the Lowell Textile Institute*, is based on data from two theses prepared under direction of Professor Ball, by Bronislaw J. Swiatek and Jose V. Gari.—Editor.)

Load to straighten singles cotton yarns

Yarns From Warp Wound Bobbins

Actual Yarn Number	Twist Multi- plier	Number of Tests	Load in Grams	Grams per Den. ×100
2.9	3.8	50	3.91	0.21
4.9	3.9	10	3.41	0.31
7.6	4.1	10	3.18	0.46
9.2	4.0	10	3.27	0.57
9.8	4.1	10	3.42	0.63
9.9	4.9	50	3.28	0.61
11.8	3.6	50	3.17	0.70
13.3	3.9	50	3.19	0.80
15.1	4.2	10	3.12	0.89
19.8	4.9	50	2.86	1.07
29.3	4.8	50	3.15	1.74
34.6	5.9	50	2.27	1.48
46.2	4.3	50	2.11	1.84
57.8	3.4	50	2.47	2.69
79.6	4.0	50	2.11	3.16
103.3	3.9	50	1.79	3.48

Yarns From Filling Wound Bobbins

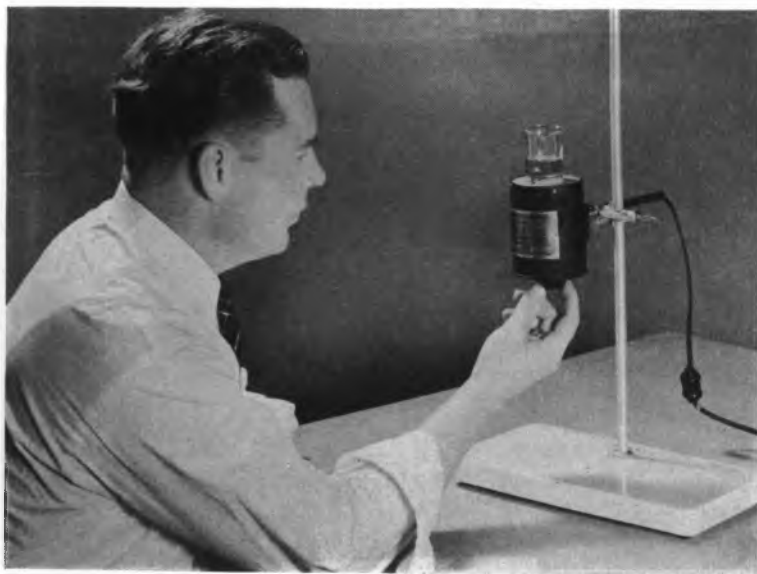
3.1	4.2	10	4.63	0.27
5.0	4.4	10	4.65	0.44
7.3	4.1	10	4.26	0.59
8.8	4.6	10	4.21	0.70
10.6	5.0	10	4.06	0.82
13.3	4.6	10	3.60	0.90
16.9	4.4	10	3.46	1.10
18.8	4.8	10	3.18	1.13
35.0	3.9	10	3.02	1.99
36.4	3.7	10	1.93	1.32
49.9	4.4	10	1.51	1.42
66.2	4.0	10	1.53	1.91
70.0	4.3	10	1.47	1.94
78.4	4.1	10	1.28	1.89

RESEARCH AIDS

Heating Appliance for Laboratories

Application of small concentrated sources of heat to laboratory objects is facilitated by use of a recently developed electric heating device. Known as the Snelling-Fisher Hotspotter, the device is recommended for such applications as low-temperature distillations; extractions with low-boiling compounds; and evaporations where a limited amount of heat, concentrated in a small space, is required. Among other uses are as a heater for melting-point and boiling-point determinations; as a microscope slide warmer; as a heater for micro-titrations and for non-protein-nitrogen determinations; and for quickly heating and boiling liquids in test tubes or small beakers without the violent action that can occur when using a gas burner. Fine control of the temperature from gentle warmth to concentrated heat with the Hotspotter is said

One use of Hotspotter is for heating contents of a beaker



to be more precise and constant than that which can be obtained by adjusting the flame of a gas burner.

The Hotspotter, which is designed for use with 110 volts a-c. or d-c. current, has an open heating coil about 1 inch in diameter mounted in a refractory unit which, in turn, is shielded by a metal case. The case also houses a rheostat and carries a hollow $\frac{1}{2}$ inch diameter supporting arm which is 7 inches long. This arm is convenient for attaching the device to stands or other supports, also as a conduit for carrying the electrical connecting cord.

The Hotspotter was designed by Fisher Scientific Co., Pittsburgh, Pa., from suggestions made by Dr. Walter O. Snelling, of Allentown, Pa., who found in his own laboratory that this type of heater is "adaptable to most of the purposes for which a small laboratory gas flame would normally be used."

Laboratory Technique

Good technique is vital in the laboratory, as well as in the mill. In "Basic Laboratory Practice,"* Professor Sprague has assembled a large amount of information on laboratory behavior and technique. Among the subjects discussed are: proper dress for the laboratory, posture and health, first aid, fire precautions, preparation of essential equipment, operations with liquids, filtration, dish-washing, drying and absorption apparatus, the balance, volumetric manipulations, and precautions to be taken with chemicals that entail special difficulties and dangers. As this manual was designed primarily for use by college students, much of the material is elementary. However, many of the suggestions given are not available in any other one place, and the book should prove valuable to experienced laboratory workers who wish further to improve their own technique or to instruct newcomers in sound, basic laboratory practice.

* BASIC LABORATORY PRACTICE; by Norman G. Sprague; *Chemical Publishing Co., Brooklyn, N. Y.*, \$3.50.

**Newly Developed Instruments
Prove Useful for**

Evaluating Finishes

By EDWIN C. DREBY

Research Associate, A.S.T.M.

THE MARKETABILITY OF TEXTILES for clothing, household, and other uses depends in no small degree upon those characteristics of the finish of the goods which are judged by the sense of touch. The importance of the "hand" or "feel" of textiles to manufacturers of finishing agents, to textile finishers, and to distributors of textiles led two years ago to the establishment, under the auspices of the Committee D-13 of the American Society for Testing Materials, of a research associateship at the National Bureau of Standards for the development of methods for evaluating textile finishes.

The problem was not a simple one, for there are at least eight physical properties of cloth which are appreciated by the sense of touch and which usually are not clearly distinguished from one another in judging hand. Three of the properties—flexibility, surface friction, and compressibility—proved to be the most important characteristics of the soft finished fabrics to which the work was largely devoted. Since the methods already available for evaluating these characteristics of the fabrics were found to be lacking in sensitivity or were tedious and time-consuming, it became necessary to develop new tests. This, in turn, called for development of three new instruments: (1) the Planoflex for measuring pliability; (2) the friction meter for evaluating the coefficient of

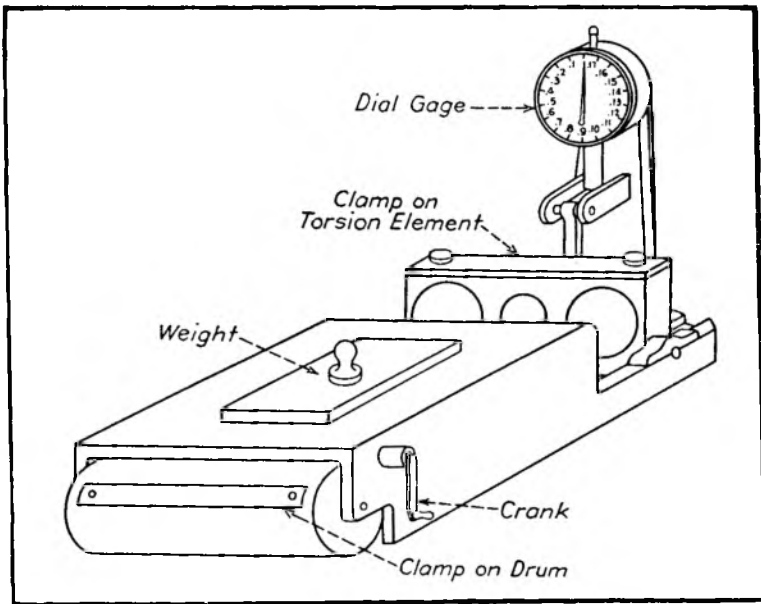
kinetic friction; and (3) the compression meter for determining compressibility.

Extensive tests showed that measurements made with these three instruments enable the quantitative specification of the "hand" of a woven fabric. It was found also that the instruments are useful for evaluating the effectiveness of finishing agents and mechanical finishing treatments, for control of finishing processes, and for determining the effect of laundering and of fiber composition on the hand of fabrics.

The Planoflex was described and illustrated in the December, 1941, issue of *TEXTILE RESEARCH*.

The friction meter is shown in Fig. 1. It is designed to measure the coefficient of friction between two surfaces of the same fabric. To make a test, two specimens approximately $3\frac{1}{2}$ by 10 inches, with the long dimension in either the warpwise or fillingwise direction, are used. One specimen is placed face up on the table, and one end of it is fastened in a clamp on the torsion element;

Fig. 1. Friction meter



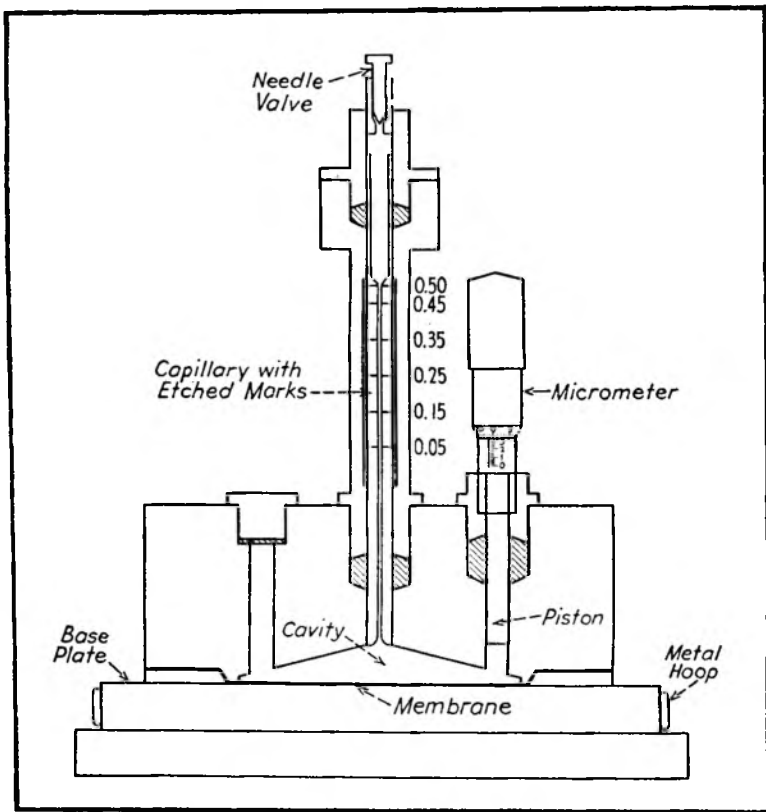


Fig. 2. Compression meter

a 1-pound weight, having an area of 10 square inches, is put on top of the two specimens. The lower specimen is drawn uniformly from under the upper specimen by turning the crank. The frictional force between the sliding surfaces of the fabric specimens causes a deflection of the torsion element, which is essentially a torsion spring with a 2-inch lever arm. The deflection is indicated on a dial gage, the scale of which is graduated to read the coefficient of kinetic friction directly. At the beginning of the motion a high value is observed, corresponding to the coefficient of static friction, which falls off to a steady value as the motion is continued. The latter value is the one recorded.

The compression meter is shown in Fig. 2. To make a test, a fabric specimen is clamped over the base plate by means of a 4-inch diameter metal hoop. Variations in the tension do not have an appreciable effect upon the measured values. The compression-meter is swung into place and clamped over the specimen. Then, with the needle valve open, the liquid level is adjusted to the 0.05-psi. pressure level by turning the micrometer. The needle valve is closed and, again by turning the micrometer, the pressure is increased on the fabric. The micrometer readings in inches at the various pressure levels are observed. The difference in the micrometer readings for a pair of pressure conditions; that is, the micrometer displacement in inches, is proportional to the change in volume of the fabric produced by the change in pressure. This value, when divided by the thickness of the fabric, is proportional to the average compressibility of the fabric for this range of pressure conditions.

In practice it is the over-all effect in the hand that determines a fabric's desirability, and although one fabric may have characteristics that make it desirable for one purpose, the same characteristics may make it undesirable for another. Measurements made with the three instruments enable the quantitative specification of the hand of a fabric. For example, eighteen percales were rated for desirability as dress fabrics, being classified as good, fair, and poor. The Planoflex, friction meter, and compression meter data were plotted to show the distribution of values and their relationship to desirability of hand. It was found that the graph could be divided into certain regions associated with different degrees of desirability. Thus, all the percales having a Planoflex value greater than 6.0, a friction-meter value greater than 0.48, and a compression-meter value greater than 0.057 had a good hand for use as a dress fabric.

(Abstract of a paper presented before Committee D13 of the American Society for Testing Materials and reported in full in the January, 1942, *ASTM Bulletin*.)

Comment on Study of Properties of Flannels Made From

Two Types of Wool

RESULTS OF EXPERIMENTS made recently at South Dakota Agricultural Experiment Station, as reported by Barbara Bailey in the Nov. 15, 1941, issue of the *Journal of Agricultural Research*, were summarized in the January issue of *TEXTILE RESEARCH* under the title "Study Reveals Properties of Flannels Made From New and Reprocessed Wool." It is believed that the following comments on the report, made by a member of the industry familiar with the provisions of the wool labeling law will be of interest both to textile manufacturers and to research workers:

"First, the summary of the report in *TEXTILE RESEARCH* states that 'reprocessed' wool from sweater clippings was blended with the new wool from Rambouillet sheep. It would appear 90% certain that under the terms of the Wool Labeling Act, the fiber blended with the Rambouillet fleece wool is not 'reprocessed wool' but 'wool.' In current parlance clips are the small fabric bits resulting from the cutting of new material in the manufacture of apparel and other products. If these be the source, and if the clips are of new fabric knit of worsted yarns, the fiber resulting from their defabrication is 'wool.' This is also true if they are knit woolen yarn, unless the fiber in the yarn has previously been spun and woven into fabric or felted and then reduced to fibrous state to be spun into the yarn of which the knit fabric is made.

"If the assumption made above is correct, the data

in the report do not relate to fabrics of different percentages of 'wool' and 'reprocessed wool,' but to four fabrics which, under the law, are 'all wool.' What has really been done is to examine fabrics made of 100%, 75%, 50% and 25% fine fleece wool and the balance, if any, half-blood wool.

"Second, in the report in TEXTILE RESEARCH there occur the following contradictory statements of fact or opinion: 'All lots were spun to 3½ run Z twist and an identical layout was used . . . ' and 'since fabric weight decreased progressively with increasing percentages of reprocessed wool, it must be concluded that there was more carding and spinning waste as the percentage of reprocessed wool was increased.'

"Since yarn counts are actually a length-weight ratio, every yard of 3½ run yarn, regardless of its content, should be of equal weight. On the other hand, if it is meant that the original machine settings necessary to spin a 3½ run woolen yarn, using 100% Rambouillet fleece wool, were maintained for all stock combinations without adjustment to compensate for the admixture of coarser wool of probable different average length, then, it is submitted, the yarns used were not all 3½ run. The statement in regard to increasing loss in carding and spinning would seem to confirm this.

"Third, any attempt to relate the finished ends and picks to the percentage content of 'reprocessed wool' (which really seems to be 'wool') would appear groundless if unrelated to the shrinkage in finishing. Fabrics composed of fine diameter wool would normally be expected to shrink more in like finishing operations than fabrics of coarser stock, even assuming the use of fleece wool throughout.

"It is hoped that these comments will be helpful in clearing up any misconceptions regarding either the Wool Labeling Act or the textile manufacturing technique, and that they will be of assistance in the conduct of further research on this subject."

RESEARCH BRIEFS

► PROGRESS IN DYEING AND PRINTING acetate rayon is outlined by G. Holland Ellis in a paper "Recent Years' Developments in Dyestuffs for, and in the Dyeing and Printing of, Celanese and Mixtures," in the December, 1941, issue of *The Journal of the Society of Dyers & Colourists*. The paper, which was presented originally at a meeting of the West Riding Section Society of Dyers & Colourists, is of interest from both the scientific and technical viewpoint.

► HOW STEPS TAKEN by the Government of India have led to the formation of a central organization for guiding and developing research is discussed by Sir Shanti Bhatnager, in an article "The Organization of Scientific and Industrial Research in India," in the Nov. 29, 1941, issue of *Chemistry & Industry*. Article outlines the work of the Board of Scientific and Industrial Research in India in advising the Government as to lines along which research should be conducted, in coordinating research activities of existing organizations, in commercial exploitation of research results, etc.

► THE CHEMIST'S PART in the development of the textile industry is outlined by Dr. K. Venkataraman, of the University of Bombay in an article "Chemical Research in the Textile Industry," in the "Golden Jubilee Souvenir" issued by *Indian Textile Journal* in commemoration of its 50th anniversary. Topics treated include work on determination of structure of cellulose; chemistry of wool; and development of synthetic dyes, fibers and textile chemicals. Failure of the Indian textile industry to carry out chemical research is censured, and the urgent need for or-

ganization, on a large scale and on a permanent footing, of such research is emphasized.

► RECENTLY DEVELOPED PROCESSES for producing non-felting wool are discussed by Dr. H. Phillips, of the Wool Industries Research Association, in a paper "Producing and Using Non-Felting Wool," in the January, 1942, issue of the *Textile Manufacturer*. Dr. Phillips points out that to refer to "non-felting" wool as "unshrinkable" wool may be misleading and that probably only an unstretched or relaxed fabric of non-felting wool can properly be termed "unshrinkable."

► PROOFING AND COATING of fabrics are discussed from a scientific viewpoint by C. L. Wall in an article "Production of Difficultly Permeable Fabrics—IV," in the January, 1942, issue of the *Textile Manufacturer*. Possibilities and limitations of laminated films on fabrics are considered.

► A CHARACTER IN A DETECTIVE STORY tested fibers by tasting them, by which simple test he could say what the fibers were and what part of the world they came from, according to J. M. Preston in a paper "Methods and Practice in Fiber Identification," in the July, 1942, issue of the *Textile Manufacturer*. Mr. Preston does not recommend that test, but describes a more rational procedure.

► INCIPIENT CHEMICAL DAMAGE to cotton textiles, which may subsequently lead to premature failure of the material, can be detected by means of cuprammonium fluidity tests, according to an article "The Significance and Utility of Cuprammonium Fluidity in Textile Bleaching," by F. L. Fennell, of R & H

RESEARCH BRIEFS

Chemicals Dept., E. I. du Pont de Nemours & Co., Inc., in the Sept. 15, 1941, issue of *American Dyestuff Reporter*. To the bleacher, the fluidity-test offers a new and valuable tool for determining the relative merits of various process, for determining optimum bleaching time, and for controlling each step in the process. Details of the test are given.

- ▶ COLOR REACTIONS of vat and acetate rayon dyes are given by W. Bradley, of the Dyestuffs Research Laboratory, College of Technology, Manchester, England, in an article "Alkali Color Reactions of Some Anthraquinone-Type Intermediates and Dyes," in the January, 1942, issue of the *Journal of the Society of Dyers & Colourists*.
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- ▶ THE NATURE OF WOOL DYEING SOLUTIONS is considered from a scientific viewpoint by C. L. Bird, of the Dyeing Department of Leeds University, in the second of a series of articles on "Modern Theory and Practice of Wool Dyeing," in the January, 1942, issue of *Textile Recorder*.
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- ▶ THE CONSTITUTION OF CELLULOSE according to present concepts is discussed in the first of a series of articles on "The Reactions of Cellulose," in the January, 1942, issue of *Silk and Rayon*.
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- ▶ SHRINKPROOFING OF WOOL and results obtained by a continuous method using a solution of potassium hydroxide in denatured alcohol are discussed by M. R. Freney and M. Lipson in an article "Prevention of Shrinkage in Woolen Goods," in the *Australian Journal of Science* and reprinted in the January, 1942, issue of *Textile Colorist*.