CHEMISTRY

Work for New Fabrics

New Fibers of the Research Laboratories Do More Than Adorn; They Have Important Industrial Functions

By ROBERT D. POTTER

This is the second of a two-article series on those new fabrics of today and the future that are contributions of the scientific laboratory to more pleasant living. See SNL, Feb. 17 for article describing wool from milk and new cloths from rayon.

FIBERS and fabrics of the future by no means are confined to wearing apparel for usefulness. Hidden in the complex mechanisms of our modern age are fibers and fabrics which are seldom seen, but without which our splendid engineering and industrial machines could never function.

Metal fabrics stand guard in great radio stations shielding intricate parts from electrical interference with one another. Fibers of metals become electrical cables in modern automobiles and carry electrical current to millions of homes in the land.

Man's problems of cooling and heating are intermingled with glass "wool," and glass cloth is becoming a reality instead of a novelty.

Fibrous glass is the new marvel of the glass industry which already has turned out such diversified articles as giant telescope mirrors and baby's nursing bottles, not to mention heat-resisting glass frying pans.

Melted glass can be passed through tiny holes to form fine fibers that are smaller in diameter than a human hair. These glass fibers can be spun into threads and woven into cloth.

Not Yet for Clothing

Articles of clothing can be, and have been, made of glass for exhibit purposes but the day of glass clothing is for the future. However, glass fabrics are finding a multitude of uses without entering the apparel field.

Drapes and curtains of shimmering glass fabric are easy to keep clean, long wearing, moisture-proof, rot-proof, will take brilliant colors that never fade and —most important in public places—are fire-proof. The day may be coming when fabrics of glass will be used for upholstery on chairs in the public rooms of hotels, ships and theaters, as a fire-protection measure.

Because there are few common materials which have better electrical insulation properties than glass, fabrics made of this material are finding wide use in the vast electrical industry. Glass wool, too, is entering more widely into heat insulation with every advance of air conditioning. The "wool" is a fluffy material that weighs only a pound and a half to the cubic foot.

In Chemical Industry

Large sections of the chemical industry, also, could not exist without the use of glass fabrics and wool. These materials form splendid filters in chemical processes with acids which would attack paper and ordinary wool filters.

"Materials fabricated from glass yarn still do not have the softness and flexibility that we ultimately hope to obtain," reports Donald C. Simpson of the Owens-Illinois Glass Co. "At present the fibers are still too harsh for use as wearing apparel, or for purposes where they come in contact with the human body in any manner; nor are applications logical where excessive wear or flexing is necessary.

"Uses of fibrous glass cloth where there is a desire for permanence or a need for fire-proofness, acid-proofness, resistance to rot or decay are logical immediate fields for the introduction of glass textile materials, and it appears that a fundamentally new art is being developed."

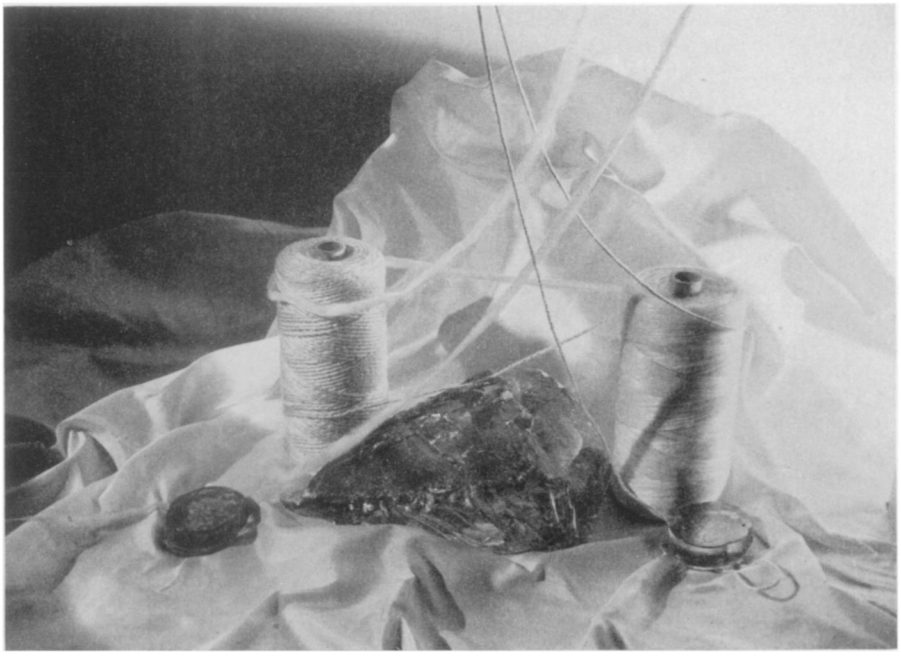
Developing along with glass as a fiber of the future are the new uses for metal fibers and fabrics. "Cloth of Gold" is, of course, almost synonymous with royalty and the emperors of ancient Rome. But, while fibers of metal have a venerable antiquity, they have increasing usefulness in the present and will have in the future.

Metal Fibers

Metal fibers can now be drawn to extreme fineness and for the more expensive metals, like gold and silver, there are ingenious methods to produce textile fibers at low cost. Wires of gold may be merely gold plating on silver. Or silver wires may be silver plate on copper and so on.

DRESS *SPORT*

Research has provided new kinds of stockings to beautify a lady's legs. At the left are the new Nylon stockings which look like silk but wear longer. At the right are a new kind of cotton stockings that are suitable for golf or housework, but cling snugly to the leg as cotton stockings have not done before.



SILKY

But the material is cloth of glass on which rest the various steps in production of glass fibers and fabrics. The raw glass in the center is melted and made into fine glass fibers, strong as steel. These are spun into yarn and twisted into glass cords. The yarns are woven into cloth in the ordinary fashion to make fireproof theater curtains and upholstery.

Moreover it has been found possible to cover cores of cotton and other fibers with ribbons of metals and so provide the metallic appearance. Metallic dust, too, can be made to adhere to fibers with flexible adhesives. Transparent tarnish-preventing chemical coatings complete this process.

However, the bulk of the use of metal fibers is not in the textile trade for wearing apparel, but in the industrial field.

Face powder, medicinals, and flour are only a few samples among a host of commodities which are screened through sieves made of metal cloth.

Smaller Diameter

Metal fibers can be obtained in diameters smaller than any other fiber. The finest sieves, of 400 mesh, are woven out of wire that is only nine ten-thousandths of an inch in diameter. This is comparable with the dimensions of most spider-web filaments.

For single filaments of wire, platinum fibers of one ten-thousandth of an inch in diameter are now coming into use as the cross hairs of surveying telescope sights.

The length of metal fiber in metal cloth of the finer variety is truly amazing. For 400-mesh sieves, the wire is so fine that in a square foot of cloth there is about a mile of wire.

Chemistry, long known as the wonder worker of science, has had no more outstanding achievement in the last few years than the discovery of the way to make new synthetic fibers from coal, air and water.

Rival of Silk

Out of these common and abundant ingredients has come a fiber that is potentially a real rival of glistening silk; a fiber that promises to carry its commercial fight into the last remaining large market of natural silk, the hosiery field.

Known as nylon, this new synthetic material has already been woven into experimental stockings that approach that long-time dream of inventors everywhere; the dream of making a sheer two-thread hosiery that would have the wearing qualities of three-thread service weight hose.

If the significance of this dream is confusing to the men let them ask the next girl they meet what it would mean to the nation's sex appeal and also to its stocking budget.

If America can produce a synthetic fiber that will look better, wear better and cost no more than silk, the international repercussions in international trade will truly be important for the greatest single export of Japan to the United States is silk.

Nylon is the first material, suitable for use in the fiber field, which is derived from inorganic materials. All other synthetic fibers come from organic materials; materials derived basically from living things, plants or animals.

Nylon can be drawn out into threads which are finer than those of the silkworm, look and feel like silk and possess greater strength and elasticity. Moreover it matters little in the manufacturing process whether the fibers are extruded to this extreme fineness or whether they are made thicker.

For Toothbrushes

In fact, you may be today using a toothbrush whose bristles are made from Exton which is merely the trade name of synthetic bristles derived from nylon. The wetproofness of these bristles and their springiness, that denotes great elasticity, are to be found also in the finer fibers of nylon used in hosiery.

More than any great monument or memorial, nylon is a lasting tribute to a great chemist, now dead. That man is the late Dr. Wallace H. Carothers of E. I. du Pont de Nemours and Company who, only twenty days before his death in 1937, applied for the basic patents describing nylon and the ways of making it. (*See also* SNL, Feb. 17)

In patent No. 2,130,948, which will some day become historic, Dr. Carothers described eight distinct ways of making fibers out of compound chemicals known as polyamides. In his broad basic patent with 56 separate claims the du Pont chemist founded what will some day be a great new industry; an industry which already is having an $8,000,000 plant built for it that will employ 1,000 people.

Polyamides are chemicals that can be prepared from black sticky coal tar, obtained from the destructive distillation of coal. It is from coal tar too that chemists have already fashioned odors never known to nature, colors never before seen and countless important medicines of which aspirin is only one example among hundreds.

Polyamides are chemicals which in certain cases have properties like proteins, the basic molecules out of which foodstuffs and the human body are made.

When I searched through the new Carothers' patent describing nylon I was astounded to see that one of the ways of making silk stocking fibers was to use a polyamide that is formed naturally in the animal body after death. This material, whose name cadaverin is a hint as to its natural origin and evil-smelling prop- (*Turn to Page 124*)

NO SPINNING

Out of raw wood chips of spruce comes a new synthetic fabric which finds use in throw-away pillow cases, aprons and curtains. Special chemical treatments turns raw cellulose into a fabric which is basically white paper but which is tough, soft and feels like cloth.

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erties, could be combined with an acid derived from castor oil. And out of this strange combination, said the famous Carothers' patent, could be made a fine, elastic and strong fiber suitable for stockings that would rival silk.

In actual practice and on a commercial scale du Pont chemists, it should be understood, will do no grave-robbing to get their basic materials. Instead they will obtain their chemicals out of the great supplies of coal and from air and from water. Whether they will use the cadaverin method, described by Dr. Carothers, or some of the other seven methods he outlined is a matter now being worked out in experimental fashion.

The price of nylon hose, which will be available to the public very soon, will be comparable with superior silk stockings. It is expected that they will gain sales by having better wearing qualities with a sheer appearance.

Still newer as a chemical fiber marvel is the plastic resin known to the trade as Vinyon, which has been developed recently by scientists of the Carbide and Carbon Chemicals Corp. Made basically from salt, coal, lime and air this material is polyvinyl acetal resin. High-molecular weight compounds are created, from the raw materials, that are water-clear and can be spun into fibers comparable to nylon in physical properties.

Besides the hosiery field, Vinyon can also be used to make waterproof clothing, bathing suits, fireproof awnings with a silk-like appearance, fish lines and fishing nets, acid and alkali-resistant clothing, electrical insulation and shower curtains.

One of Vinyon's most striking uses is in the production of felt materials which contain no hair, or fur, or wool. Felts that look, feel and wear like the ordinary kind are now being made from cotton, thanks to the remarkable binding properties of Vinyon resins.

The marvels of chemistry may now make it possible to produce rivals for silk from coal, tar and air—and for wool from cow's milk—but no one has yet managed to make a synthetic rival for cotton. Yet old King Cotton is by no means a senile old gentleman in the inventive sense.

In fact even while man-made silk from coal, air and water has been getting the headlines because it may seriously reduce Japan's silk exports to the United States, new experimental cotton stockings have been making their appearance on the women of the U. S. Department of Agriculture's Bureau of Home Economics in Washington, who are giving them their wearing tests.

These new stockings, outgrowth of scientific ingenuity, are still another competitor in the highly lucrative market of women's hose. Cotton they are, in basic material, but they have overcome the long time bugaboo of cotton stockings; the poor fit and non-snugness that leaves telltale wrinkles on the ankles of the wearer. Also the new hose—not yet on the market—have a sheerness which one would not have believed possible.

Made on the same machines that weave ordinary silk stockings the new cotton hose promise increased use of America's huge cotton surplus.

Smart salesmanship by the U.S.D.A. experts says frankly that cotton hose do not rival silk stockings in appearance but goes on to add quickly, "You wouldn't wear your silk evening dress to play golf, would you? Then why wear sheer, evening weight hose on the golf course or in the garden?"

With trick mesh weaves in attractive

● Earth Trembles

Information collected by Science Service from seismological observatories and relayed to the U. S. Coast and Geodetic Survey resulted in the location of the following preliminary epicenter:

Wednesday, Feb. 7, 12:16 p.m., EST.

Near Attu island (Aleutians). Latitude 53 degrees north, longitude 174 degrees east. Severe shock.

Stations cooperating with Science Service in reporting earthquakes recorded on their seismographs are:

University of Alaska, College, Alaska; Apia Observatory, Apia, Western Samoa; University of California, Berkeley, Calif.; Dominion Observatory, Ottawa; Dominion Astrophysical Observatory, Victoria, B. C.; The Franklin Institute, Philadelphia; Harvard University Observatory, Harvard, Mass.; University of Hawaii, Honolulu; Hong Kong Observatory, Hong Kong, China; Magnetic Observatory of the Carnegie Institution of Washington, Huancayo, Peru; Massachusetts Institute of Technology, East Machias, Maine; University of Michigan, Ann Arbor, Mich.; Manila Observatory, Manila, P. I.; Montana School of Mines, Butte, Mont.; Montana State College, Bozeman, Mont.; Nebraska Wesleyan University, Lincoln, Neb.; Pennsylvania State College, State College, Pa.; Phu Lien Observatory, near Hanoi, French Indo-China; Seismological Observatory, Pasadena, Calif.; University of South Carolina, Columbia, S. C.; U. S. Weather Bureau, University of Chicago; Utah Agricultural College, Logan, Utah; Williams College, Williamstown, Mass.; University of Wisconsin, Madison, Wis.; Zikawei Observatory, near Shanghai, China; observatories of the Jesuit Seismological Association at Canisius College, Buffalo, N. Y., Fordham University, New York City, Georgetown University, Washington, D. C., St. Louis University, St. Louis, St. Xavier College, Cincinnati, and Weston College, Weston, Mass.; observatories of the U. S. Coast and Geodetic Survey at San Juan, P. R., Sitka, Alaska, Tucson, Ariz., and Ukiah, Calif.

shades the government people offer the alternative stocking for sports; a cotton stocking that will give long wear plus good looks. Women are becoming more sensible, reason the U.S.D.A. experts, and are coming to realize that dance floor hosiery styles offer all too little for the average housewife when viewed in the light of the dent put in the household budget by the item of stockings.

Most synthetic fibers and fabrics have their birthplace in chemical laboratories but one of the most recent came out of a bathtub.

This new fabric, created by two advertising men turned inventors, is called Pervel. Like rayon Pervel comes from the cellulose of trees but with this similarity the comparison stops, for Pervel contains no threads and is essentially paper. Yet it is paper so strong that it can be used wet without breaking, but so soft and flexible that it feels and looks like cloth.

Like many a man before them the two inventors, Francis DeWitt and Paul Bryant, dreamed of a cloth that could be made so cheaply it would be thrown away instead of being sent to the laundry for cleaning.

Out of months of bathtub research in their New York apartments came a hint at what was needed. With cellulose wood pulp and chemicals they concocted sticky drab materials that hung over the shower curtains to dry.

Balked finally, they took their problems to the chemists of a Maine paper company. There it was found possible to press the cellulose fibers in sheets of material that could be properly "weighted" to add body, strength and beauty to the finished product. Lime, sulfur, leaching solutions and acids are only a few of the chemicals used in the new method.

This new fabric is unique, for while it contains cellulose the cellulose fibers are not spun into threads and then woven into cloth. The cellulose is simply pressed flat. Pervel, by avoiding the spinning and weaving stages, arrives in the finished fabric form with a great economy. That explains why you can buy a pillow case, an apron or bed sheets of this new material for but little more than it costs to send cotton ones to the laundry.

On the list of Pervel products today are aprons, curtains, table and bed linen, handkerchiefs and scores of other products where a "throwaway" principle can apply.

There is one other unusual material now finding a steadily increasing use in modern clothing. It is the milky white sap of the tropical tree that man calls rubber when it is hardened and properly processed.

The dark-skinned natives of the Dutch East Indies probably never wear bathing suits but the rubber they produce now finds wide use for just this purpose through lastex fabrics.

Clothing of this material literally covers the figure with slender, tiny rubber bands which are skillfully wrapped round with coverings of silk, cotton or linen so that the resulting cloth resembles, in appearance, its covering rather than the inner rubber core.

Makers of girdles and other foundation garments for women were quick to realize the worth of this new advance. Now lastex fabrics have come out into the open and appear not only in clinging form-shaping (and revealing) bathing suits but also in many articles of clothing where snugness is desired. Just as one example, lastex riding breeches solve the problem of having snugness at the knees without binding. Claim of this elastic fiber is that for the first time since Adam killed an animal and used its skin for clothing, man has at last achieved a fabric that will hug the figure and not hang in folds.

Science News Letter, February 24, 1940

About 250,000 miles of rural roads are cleared of snow by state and county highway departments.