CHEMISTRY

Nylon After the War

Window screens, shoes, sash cord, and furniture are ready for post war use, but now nylon has gone to war. Discarded stockings turned back to chemicals.

➤ AFTER THE WAR you can have window screens of nylon, shoes of cloth coated with nylon wearing better than leather, window sash cords of nylon that won't fray out, electric wires insulated by nylon, rattan porch furniture woven from gaily colored nylon, and scores of other such things.

Nylon is the synthetic stuff that ladies' stockings used to be made of — remember? (For chemists, it is the polymer of adipic acid and hexamethylenediamine.)

Since March, 1937, Du Pont has been turning out this product of their chemists' genius and sweat. Most widely known as the material for hosiery, this synthetic, basically obtainable from coal, air and water, rescued America from the silk monopoly of the Japanese.

Now nylon has gone to war, conscripted 100% for dozens of secret military purposes.

It is for that reason that the Army-Navy E flies today over the unobtrusive and unpretentious group of buildings on historic Brandywine Creek, in Wilmington's outskirts, the nylon research laboratory and pilot plant.

Because of the vital military uses for nylon, every pound of it is precious. In normal peace times no one would suggest using as raw material the discarded finery off the legs of American women. Yet in the war emergency this is being done. The wrecked nylon stockings being left at collection depots in department stores by patriotic women are used as an emergency raw material.

From 25,000,000 to 30,000,000 pounds of nylon have been produced since 1938 and if only a small portion can be collected and reclaimed it will be a great help. Great piles of stockings retired after faithful and intimate service are awaiting resurrection — thousands of pounds of them.

The process is relatively simple. The stockings are eaten up or dissolved by sulfuric acid, the solution heated to obtain a dark mass containing adipic acid and a light brown liquor containing the diamine. Purified, these give the two shining white mother chemicals of nylon, just as pure and useful as the same chemicals synthesized from the original raw materials.

To our fighting forces in the tropics there will soon be available some experimental batches of insect screening, the "wires" of which are nylon. This is less easily torn, is resistant to weather, as copper or aluminum, and lighter in weight. A hole can be punched in this screen with a pencil point and a little straightening out will restore the screen good as new. Beautiful screens of a hundred meshes to an inch are being made for use in war production. Electric motors are being made more efficient, lighter and smaller through use of magnet wire insulated by dipping in nylon.

When nylon comes back from war, it will do more than approach that ideal of hosiery perfection, an impalpable film of color. There will be a thousand new jobs for it in the free and united world we are fighting for.

Science News Letter, January 9, 1943

STOCKINGS GO TO WAR—Here is a pair of the stockings that America gave Uncle Sam for Christmas starting through a new process, developed at the Du Pont Company's Nylon Research Laboratory, which chemically "unravels" the stockings down to their original chemical ingredients — adipic acid and hexamethylene-diamine. The heated hydrolyzing agent in the flask will break the stockings up into a black powder and a reddish brown liquid — first step toward making them into needed war materials. (See also picture on page 20.)

PHYSICS

New Ration Books Will Have Special Safety Paper

➤ COUNTERFEITERS who try to make illegal ration books will be stymied by highly technical and new scientific devices, declares E. W. Spencer, assistant technical director of the U. S. Government Printing Office.

Special paper structure permits easy and positive identification. Among secret safeguarding features for the new point-rationing books, will be tiny coded markings. These enable government agents to tell where stolen material left legitimate channels and illegality started. Secret markings indicate in which mill the paper was made, what plant processed it, and whose printing plates were used.

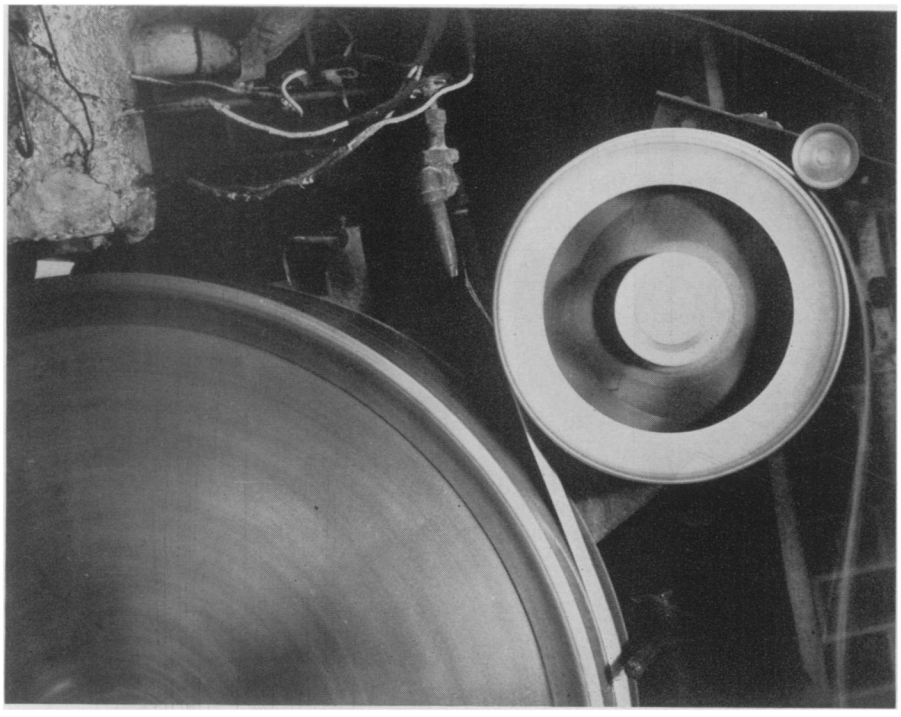
Further laboratory tests will point out the place where counterfeiting began or help trace the criminals responsible. By such methods the Government Printing Office and its laboratories are ready to protect the consumer from the counterfeiting attempts expected as a result of wider rationing and tightening restrictions, Mr. Spencer reports. The special safety paper will be just as hard to counterfeit as a twenty-dollar bill.

OPA expects to have 30 billion stamps ready to distribute this month. This exceeds 12 years' continuous production of United States postage stamps.

Government presses couldn't handle such a task in the 60 days allotted. A call for outside printers to do the job finally turned up 18 who had the capacity and were willing to produce the books in the volume desired.

They are located at Waltham, Mass.; Niagara Falls, Tuckahoe and New Rochelle, N. Y.; Hoboken, N. J.; Scranton, Pittsburgh, and Franklin, Pa.; Baltimore, Md.; Dayton, Norwalk, and Shelby, Ohio; Chicago (two plants); Houston, Texas; Minneapolis, Minn.; Oakland, and Los Angeles, Calif. As the books roll off the presses they are bundled and start on their trip to the 5,500 ration boards for citizens in every nook and cranny of the nation.

Science News Letter, January 9, 1943



NYLON, BUT NOT FOR STOCKINGS—This wheel is part of the original equipment made in 1937 to produce the first nylon for stockings. It is still helping to produce nylon, but now it is for war purposes. Molten nylon comes out of the slot at the upper left and is solidified on the wheel in the form of a plastic ribbon which passes over the smaller guide wheel. Later it is broken into flakes and spun into yarn. (See page 19.)

ASTRONOMY

Ten Quadrillion Stars

That is the census within range of telescopes given in new book. There are about a thousand million in our own Milky Way system.

➤ TEN QUADRILLIONS of stars: 10,000,000,000,000,000. That's the modest census of the part of the universe within photographing range of our largest existing telescopes, which Prof. Harlow Shapley, director of Harvard College Observatory and vice-president of Science Service, gives in a new book, *Science in Progress,* published by the Yale University Press.

The ten chapters in the book were edited from lectures presented by ten leading American scientists, on tour over the country under the auspices of the scientific honor society, Sigma Xi. Assembling them into book form was the work of Prof. George A. Baitsell of Yale University, secretary of Sigma Xi. They present the highlights of some recent developments in astronomical, physico-chemical and biological sciences. The volume has been made a science book-of-the-month by the Science Book Club.

Prof. Shapley bases his staggering figure on a conservative estimate of the number of stars in our own galaxy, the Milky Way system—about a thousand millions of them. In the sphere of space which present telescopes can reach there are at least ten million more like it. Ten million times a thousand million multiplies out to ten quadrillion—if that number means anything.

A typical galaxy, like our own "home" mass of stars, is a more or less disk-shaped affair, perhaps 50,000 or 100,000 light-years across, frequently showing a spiral pattern in its organization. We can tell how far away other galaxies are by spotting certain types of stars in them, giants and super-giants, novae and super-novae, and comparing their known actual brightness with the much lower brightness they present because of the dimming effect of distance.

A second chapter on an astronomical subject, the expanding universe, is contributed by Prof. Edwin Hubble of the Mount Wilson Observatory. All the galaxies we know appear to be receding from our part of space at terrific rates, from 150 miles a second for nearby ones to nearly 25,000 miles a second for those near the limit of telescopic range.

That the universe is expanding (perhaps exploding would be a better word) is the only explanation at present possible for the so-called red shift of light given off by these distant masses of stars. The reddening of their light is apparently caused by a "dragging out" of the light waves as their sources speed away. Other explanations have been attempted, but, says Prof. Hubble, they have all failed. If there is another valid explanation, it involves a principle in nature of which we are still ignorant.

What fuels the terrific energy production of the stars is the cosmic puzzle taken up by Prof. Hans A. Bethe of Cornell University. Earlier theories, as that stellar heat and light are due to the gravitational compression of their substance as they shrink together, would not keep up the fires long enough. Most satisfactory, it appears, is the concept that atomic nuclei within the stars' interiors capture atomic particles (neutrons) and in so doing are transformed into other elements and at the same time give off energy.

Pressures such as those existing in the interior of the earth, if not of the stars, are described by Prof. P. W. Bridgman of Harvard University. In exceedingly massive machines, pressures measurable only in terms of dozens of tons per square inch are applied to various solids and liquids, solidly cased in massive blocks of metal so that they cannot "squeeze away." Under such pressures familiar matter assumes unfamiliar forms: a kind of ice with a temperature far above boiling, and so dense that it would sink in water; a variety of phosphorus that is black instead of yellow, and that conducts electricity instead of resisting it.

In other chapters, Dr. V. K. Zworykin of RCA Research Laboratories tells of the formation of electron images, Prof. Lionel S. Marks of Harvard University