Radium's 'Fiery Furnace'

THE immense power of radium is graphically shown in this photograph, taken in the light produced by a small quantity of refined radium through a thick protecting lens of glass. Dr. Luther Gable is holding the glass lens, which has 208 facets. Dr. Gable is in charge of a radium exhibit at the Chicago World's Fair. He calls the display pictured here "radium's fiery furnace."

Canine Aquaplane Star

(Acme photo.)

PERHAPS the only expert canine aquaplane rider is Rex, a Belgian police dog, pictured here. Rex performs in the water circus at the Steel pier, Atlantic City, N. J. According to his owner, Stanley Powell, Rex greatly enjoys the sport and seldom loses his footing.

How Science Vies with the Silkworm's Art

By C. Robert Moulton

THERE is the best proverbial authority for the statement that one cannot make a silken purse from a sow's ear. With this literal statement everyone used to be in agreement until a chemist by the name of Arthur D. Little decided to try to do this very thing.

Dr. Little knew that silk, which comes from the cocoons made by silkworms, was made of protein secreted by the worms in the form of a moist thread which, when spun into shape and dried by the air, became a cocoon. He also knew that a sow's ear had a lot of protein in the skin and cartilage of which it was made. Furthermore, he knew that skin and cartilage could be made to yield a soluble protein called gelatin when boiled with water.

So he proceeded to make the gelatin solution, which was forced out through a die in the form of a thread and made to harden by suitable means. The resulting artificial silk was woven into a fabric and then used to fashion a woman's white purse.

About ten years ago Dr. Little showed this purse for the first time to a group of chemists gathered in convention in an eastern city. Thus does the research chemist challenge nature.

Artificial silk is in reality much older than this silk purse made from the sow's ear. About fifty years ago Comte Hilaire de Chardonnet took out a patent for collodion, or Chardonnet silk, which had nitrocellulose in place of gelatin as its base. This French count had been working with the famous chemist and bacteriologist Pasteur while the latter was engaged in working to conquer the disease that had been destroying the natural silk industry of France. So he knew much about how the silkworm made its silk.

In place of using a protein as his starting point, however, De Chardonnet used cellulose in the form of cotton fibers. These he dissolved and changed to a nitrate of cellulose by means of nitric and sulphuric acids. The resulting nitrocellulose was largely used as collodion, as the alcohol-ether solution of the nitrocellulose is called.

About the same time J. W. Swan made the first textile material which was called artificial silk. A commercial application of the product other than as collodion was in the preparation of carbon filaments for electric light bulbs. For this purpose cotton wool was dissolved in strong solutions of zinc chloride or in Schweizer's reagent.

Other attempts at making artificial silk were based on the use of casein, gelatin, egg albumin, agar agar, carrageen, and glass. None of these products gives a silk which can compete with the natural product. Cellulose, on the other hand, does yield a good silk, and it is the basis of modern artificial silk and lacquers. The commercial development along this line dates from 1892, when Cross and Bevan of England discovered that a viscous product called viscose could be made from cotton linters or high grade sulphite wood pulp, both sources of cellulose, using sodium hydroxide solutions and carbon bisulphide to swell the dried mercerized cellulose.

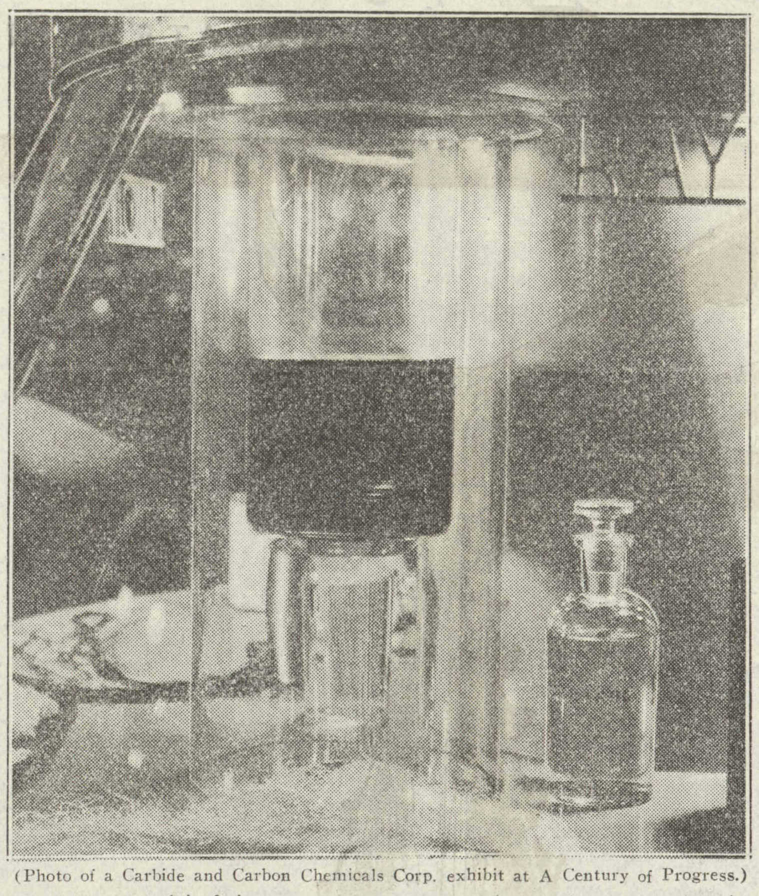
Another thing that was required before the artificial production of silk could be a success was a spinning box for the new material, which C. F. Topham invented in 1900. But the World war gave the final impetus to this industry. In 1927 235 million pounds of viscose silk was manufactured.

The nitrocellulose of Chardonnet was inflammable and explosive. Another name for it is guncotton. Celluloid is a compressed, solid solution of nitrated cellulose in camphor or a camphor substitute. It would not do for one's silk dress to explode or catch fire, as celluloid does. So the modern process removes the nitrate. Not much silk is made by this process.

Still another type of silk is the acetate silk, the process for which was patented in 1895 by Cross and Bevan. By their process cotton linters are converted into an acetate of cellulose, which is dissolved in acetone and spun. The spun thread is allowed to dry in the air—the so-called "dry" process.

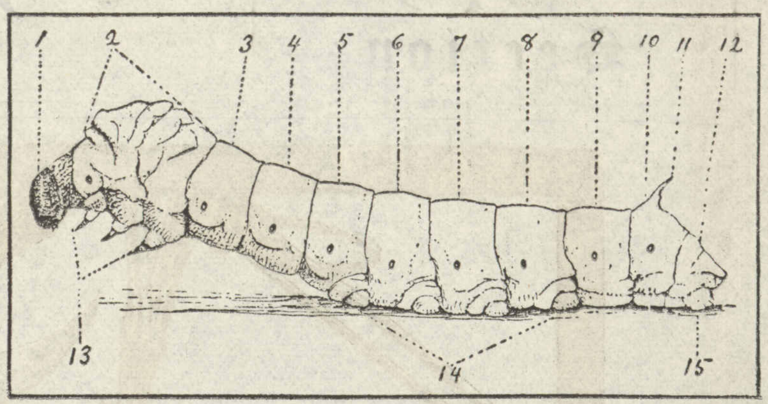
Solutions of cellulose acetate found extensive use during the World war as "dope" for aircraft, due to its low inflammability and its shrunk-finish effect on airplane wing fabric. Cellulose acetate, dissolved in a suitable solvent and mixed with pigments, is the basis of lacquers. About 29 million pounds of acetate silk cloth was made in 1927.

The ideal cross section for silk fiber is a circle with a close, minutely serrated edge much like a diminutive circular saw with extremely fine teeth. This form is most favorable for light reflection and thus for an even color effect after dyeing. In the case of the viscose silk the method of setting the spun fiber, which is done in solution by the "wet" process, affects the cross section. Artificial silk has been successfully dyed since 1920, but it is not so elastic as natural silk. Also, natural silk varies in cross section in a peculiar way which the synthetic product so far canunot imitate.

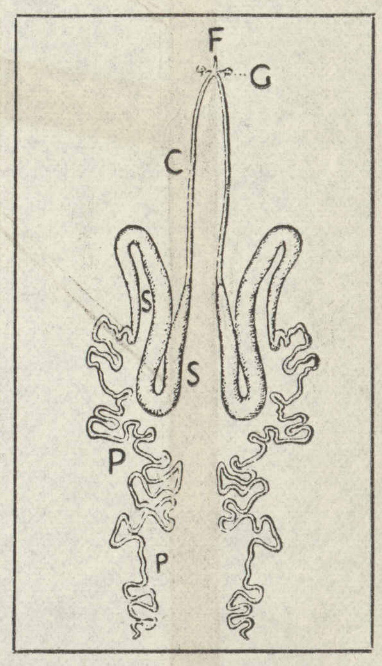


(Photo of a Carbide and Carbon Chemicals Corp. exhibit at A Century of Progress.)

A miniature model of the acetate rayon process, showing how rayon threads are obtained by chemical treatment.

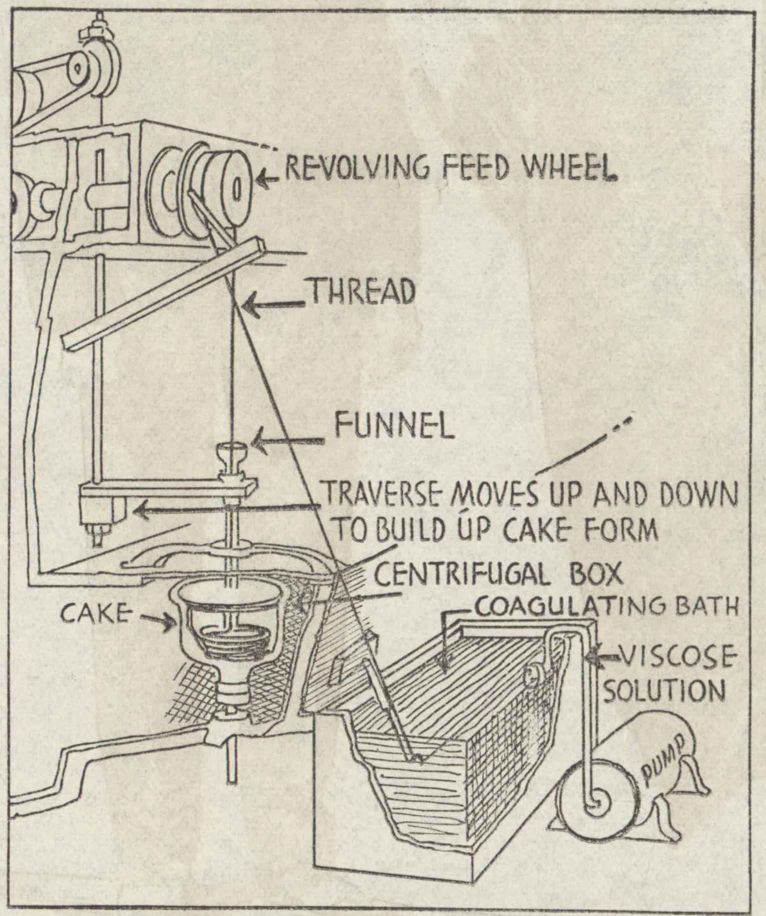


An adult silkworm, or larva, showing the head, rings, horn, pairs of articulated legs, and abdominal legs, or false legs.



Silkworm glands: F, spinneret; G, accessory glands; C, conducting canal; S, reservoir; P, secreting gland.

Mature silkworms as they appear in commercial production centers, chief of which are in Japan and China. The worms are weaving cocoons of silk.



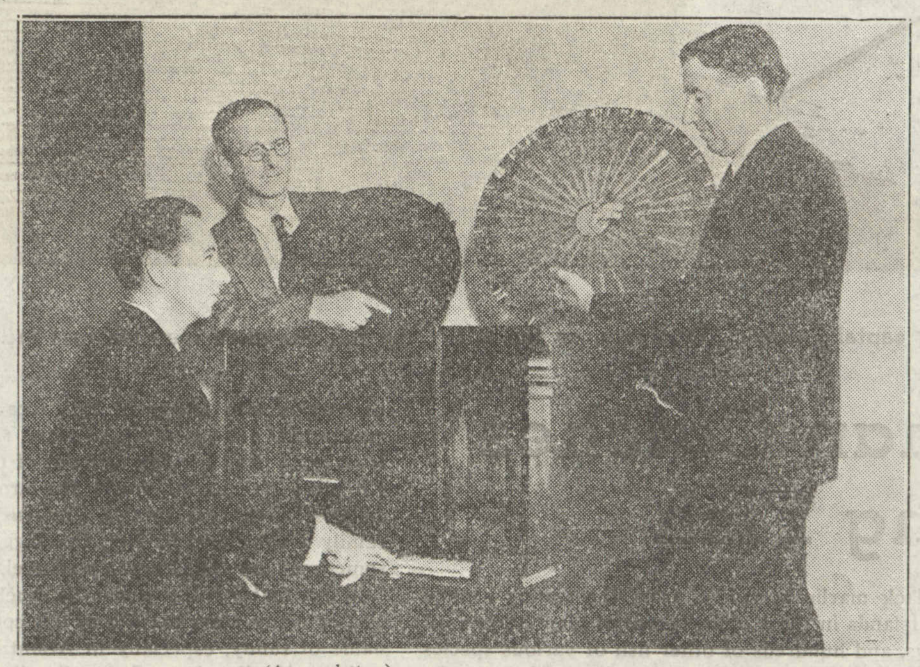
(Courtesy Viscose company.)

This diagram shows how rayon silk is spun. Viscose is forced through small holes into a coagulating bath.

(Courtesy Viscose company.)

These factory workers in a large rayon plant are sorting unfinished yarn on the racks. Imperfect yarn is removed.

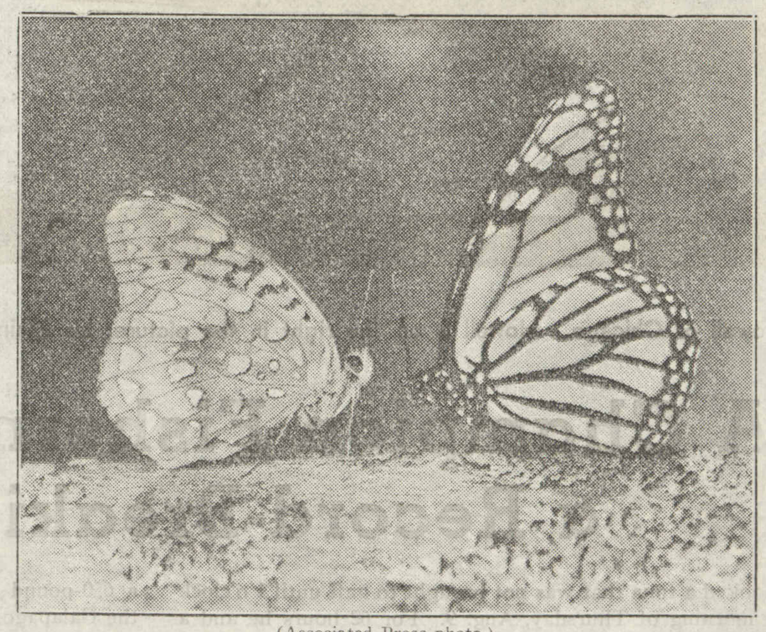
Sound Film Plays This Organ



(Acme photos.)

THE home-made organ in the right-hand picture reproduces music from a sound track film, such as the strip shown at the left, by means of beams of light and a photo-electric cell. James Nuttal and Frederick Sammis of Los Angeles constructed the instrument, which operates on the principle of moving picture sound reproducing equipment. The organ reproduces fine tonal qualities remarkably well, according to Joseph Wayne, musician, shown in the foreground, who played the instrument.

Monarch and Silver Spot



(Associated Press photo.)

THE cameraman who took this picture was searching in the woods for an unusual nature study. His patience was rewarded when he found these two exquisite specimens of the butterfly family resting on a woodland stump. The butterfly at the right is a monarch; the other is a silver spot. They represent two of the most beautifully colored insects of the butterfly species.

For $63,000,000 Bridge

(Acme photo.)

HOW some of the government's easy money is being spent is revealed in this picture of huge steel caissons which will support the piers for the new bridge which will span San Francisco bay. The bridge will cost approximately $63,000,000.