tive and because of the potential dangers, omitted the rinse. The babies got over the rash and have not had any more although the same diaper service is being used. The fact that the antiseptic solution is the only ingredient omitted by the laundry confirms the diagnosis that it was the cause of the trouble.

Science News Letter, June 2, 1945

OPTICS-PHOTOGRAPHY

Better Photos After Dark

New developments in optical science cut lens reflection. Will mean better photographs will be possible under poor light conditions.

➤ LENSES and glass produced by the American optical industry today by mass production methods are equal to or superior to the best hand-made items produced by German craftsmen, who were long considered leaders in the field. Many important developments that have made this record possible stem from research carried out by scientists at the Frankford Arsenal in Philadelphia, where high-school girls produce lenses and prisms for intricate gunsights, periscopes, and bombsights with speed and precision that is the envy of optical artisans.

From the cutting of the lens blank, through the rough grinding, fine grinding and polishing stages, all of the work is done by machines. With the active cooperation of industry, machines that were never meant to see the inside of an optical shop are speeding the production of lenses. Blanchard machines, used to cut, grind and polish metal, are employed to rough out lens blanks. A curve generator, with a mechanical arm that replaces the human arm, rough-grinds the lens blanks to tolerances of less than one millimeter. Over 60 different kinds of abrasives are used in the grinding of precision lenses. These range from coarse abrasives of synthetic aluminum oxide or silicon carbide in particles as large as 290 microns (one micron equals one-thousandth of a millimeter) down to fine abrasives only five microns in size. One of the fine abrasives used is made from domestic garnets. Enough rouge is used yearly on just one of several dozen lens-polishing machines to supply about 11,000 women with their cosmetic requirements for a year.

As a standard procedure, all lenses manufactured at Frankford Arsenal must be coated with a thin film of magnesium fluoride before being installed in instruments. This coating increases the transmission of light through the lens by 25%, through reducing reflection. This means increased visibility at all times, and particularly at dusk. It extends the good hunting time for our armed forces at least one-half hour at dusk. Since the magnesium fluoride coating permits more light to reach the eye, it will have many postwar uses in spectacles, microscopes and camera lenses. Glass coated with the metal is easier to keep clean, and fingermarks do not show up on it.

Lenses to be coated are mounted in a hemisphere-shaped rack which is suspended inside a large glass cylinder above a crucible cup containing finely powdered magnesium fluoride. The air is exhausted from the cylinder, leaving a nearly complete vacuum. Then a tungsten filament above the crucible cup is turned on and heated to a high temperature. The heat causes the magnesium fluoride to evaporate and condense on the lens surface, leaving a thin, almost invisible, film less than a millionth of a millimeter thick. The process takes about one hour to complete.

By depositing several magnesium fluoride films, one on top of the other, it is possible to increase reflection instead of cutting it down. This discovery may lead to new types of mirrors with the reflecting surface facing out, instead of into the glass.

For years, balsam, an oily, fragrant resin, has been used to seal parts of lenses together. However, since lenses sealed with it would not stand up in the extremely low temperatures encountered in high-altitude flying, or in the heat of a Pacific atoll, a new substitute had to be found. Men from the optical laboratory here went in search of a substitute and came up with new thermal setting cements. The one in use at Frankford Arsenal today is known as CR-39, which looks like kerosene when cool, but becomes a jelly when heated. The formula for this synthetic resin cannot be revealed at present. The other usable cement is a resin containing butyl methacrylate.

In using these cements, the lenses are pre-heated, the cement applied, and then the lenses are baked in an electric oven at about 200 degrees Fahrenheit for as long as 2½ hours. Although balsam is easier to use and dries in 15 minutes, the properties of the new thermal-setting cements make them more desirable for general use.

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A good *queen bee* lays from 2000 to 3000 eggs a day.

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