

PEOPLE / IDEAS / QUALITY PRODUCTS



Eastman Kodak's
Apparatus and
Optical Division

the photographic revolution



Picturetaking in the days before Kodak cameras.

Back in 1877 a 23-year-old bank clerk, George Eastman, took up photography as a hobby.

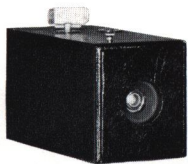
Like all pictoretakers of his time, he carried a huge camera and tripod, chemicals, a tent for a darkroom, and other equipment. He had to make a “wet plate” by coating a light-sensitive emulsion on a piece of glass immediately before he exposed it. Picturetaking at that time was hard work, but Eastman felt it could be made easier and more fun.

After many experiments in his mother’s kitchen, he found a way to mass-produce photographic dry plates, and in 1880 he started to make them commercially in a rented loft in the downtown section of Rochester, N. Y.

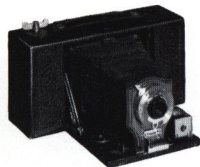
In 1884 Eastman introduced a paper-base “film,” and in 1888, the No. 1 Kodak Camera – the small box camera which simplified photography so that anyone could take pictures.

Eastman himself coined the trademark “Kodak” and the famous advertising slogan “You press the button, we do the rest.” The Kodak camera caught on quickly, and the company sold over 100,000 of them in the first eight years.

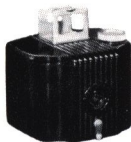
Today, some 52 million Americans take more than two billion snapshots each year. Picture-taking has become America’s number-one hobby.



The No. 1 Kodak Camera of 1888 simplified photography.



The first Folding Brownie Camera was offered in 1904.



New styling was featured in Baby Brownie Camera of 1934.



The popular Brownie Starflash Camera was introduced in 1957.



Today's Kodak cameras are easier than ever to use. Automatic features take the guesswork out of picturetaking.

a quick picture of the A&O Division

Three plants in Rochester, N. Y., compose the Apparatus and Optical Division — the Camera Works, which dates back to 1893 . . . the Hawk-Eye Works, Kodak's optical plant since 1911 . . . and the Lincoln Plant, added in the 1950's to handle defense contracts. These plants have about 2.6 million square feet, or some 60 acres, of floor space.

About 7,000 men and women work in the A&O Division. Some 1,500 of them are in research, development, and engineering activities.



The Camera Works makes cameras, projectors, and picture-taking aids—including both still and motion-picture equipment.



The Hawk-Eye Works, Kodak's optical plant, produces photographic lenses and a variety of optical-mechanical equipment.

Emphasis on Research. Over the years, an intensive program of research and development has been a vital factor in the progress of the Eastman Kodak Company.

For instance, Kodak introduced the first 16mm movie camera and projector in 1923, the first 8mm movie equipment in 1932, and the first camera with automatic exposure control in 1938.

Consumers have benefited not only from product improvements but also from advanced manu-

facturing methods which have enabled the company to keep prices moderate.

As one example, Kodak's first 8mm movie camera of 1932 sold for \$29.50. Yet, in spite of inflation, the A&O Division today makes an 8mm movie camera with a faster lens and other improved features for about the same price.

Wide Variety of Products. The A&O Division makes over 500 commercial products, nearly half of them for professional or industrial uses.

In addition to still and movie cameras, projectors, and other equipment for amateur photography, the A&O Division makes special lenses and other optical products . . . motion-picture and slide projectors for schools, television, and industry . . . photofinishing and x-ray film-processing equipment . . . electro-mechanical equipment for making prints from color film . . . Verifax and Ektalith document-copying machines . . . Recordak micro-filming equipment . . . and electronic information-handling systems.

The division also does research, development, and production work on numerous defense contracts. For example, Kodak infrared materials are being used in the "eyes" of guided missiles. And for military aircraft, the A&O Division designed and produced the first television gunsight and television bombsight.



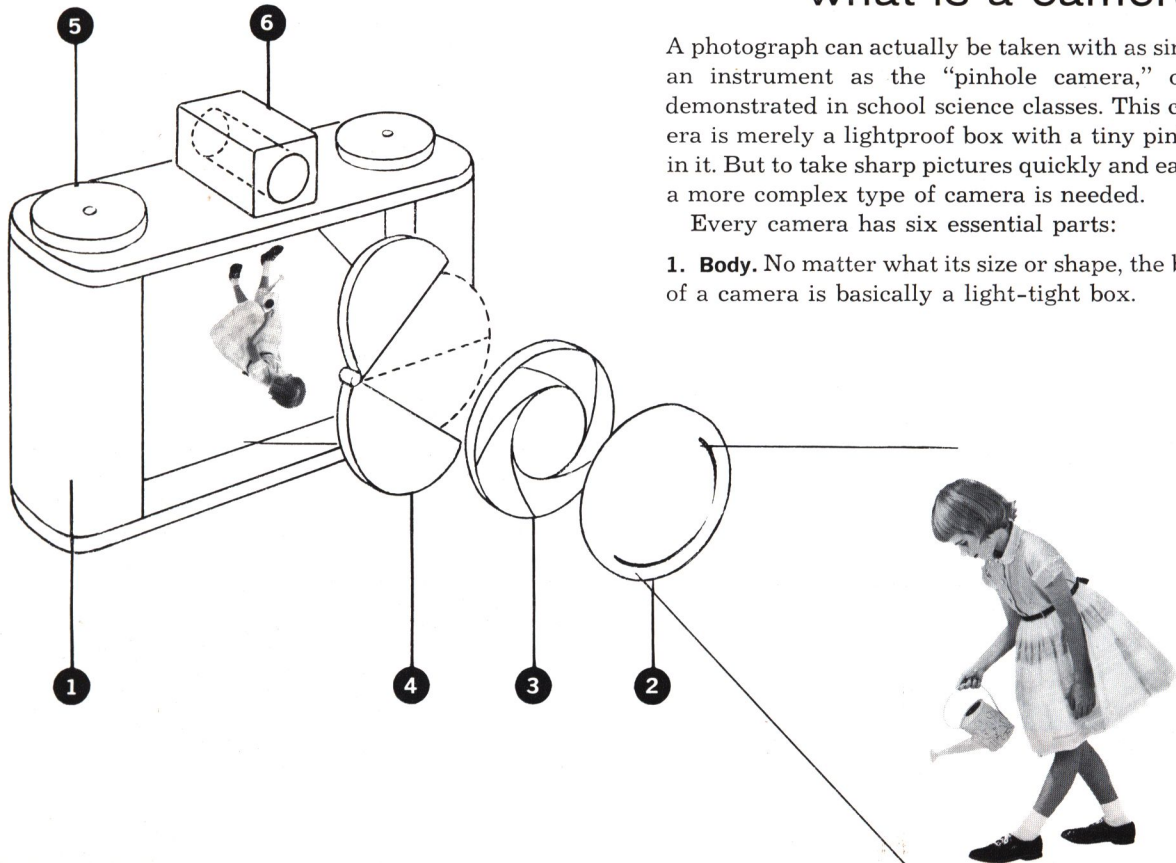
The Lincoln Plant does research, development, and production work under special defense contracts.

what is a camera?

A photograph can actually be taken with as simple an instrument as the "pinhole camera," often demonstrated in school science classes. This camera is merely a lightproof box with a tiny pinhole in it. But to take sharp pictures quickly and easily, a more complex type of camera is needed.

Every camera has six essential parts:

1. Body. No matter what its size or shape, the body of a camera is basically a light-tight box.



2. Lens. The lens forms an image on the film. A lens can be as simple as a single transparent plastic element, or as complex as a system of 10 or more elements of optical glass. Complex lenses are usually more versatile. For example, a simple lens may be fine for taking pictures in sunshine, but a more complex lens makes it easy to take pictures in the shade as well.

3. Diaphragm, or lens opening. This is the hole which controls the brightness of the image on the film. Some simple cameras have a fixed lens opening; cameras with a more versatile lens, however, have an opening that can be changed in size (in "f-number") to suit the lighting conditions. In cameras with automatic exposure control, a photoelectric cell adjusts the size of the lens opening.

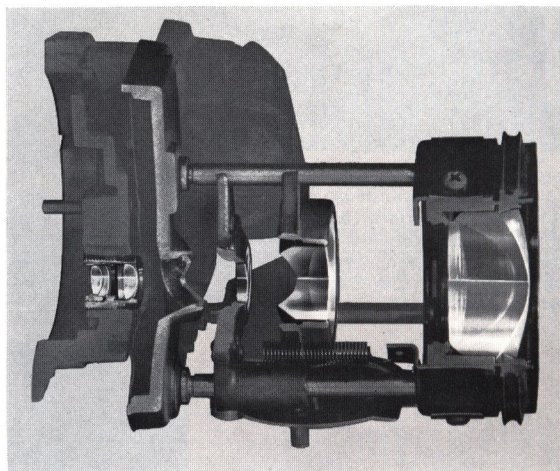
4. Shutter. The shutter controls the length of time that light reaches the film. Simple cameras have only one shutter speed — about 1/40th of a second, which is adequate for most picturetaking needs. More complex cameras offer a choice of shutter speeds and require shutters as precise as a watch.

5. Film transport mechanism. This device advances the film and holds it flat while it is exposed.

6. Viewfinder. A good viewfinder lets the photographer see clearly the picture he is taking.

Simple as they may seem, many of these camera parts must be made with great precision. For example, tolerances for the curvature of some lenses are held as close as a few millionths of an inch.

This is a cutaway view of a zoom lens, part of a Kodak 8mm movie camera. With this lens, the picturetaker can "zoom" in for a close-up, or "zoom" back for a wide-angle shot.



how a camera is made

A newly designed camera, fresh off the production line, is a major achievement. It represents the

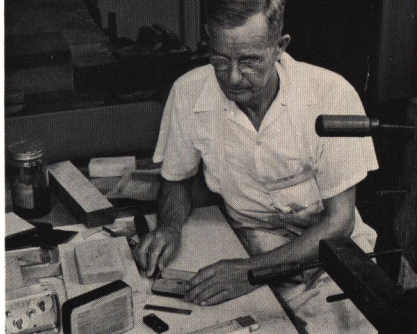
design

Design engineers must keep the customer in mind at all times. The appearance as well as the picturetaking features of a camera must appeal to customers, and so must its price tag.



work of hundreds of people over a period of a year or more. Yet, every year, the A&O Division introduces many new cameras, projectors, and other major photo-equipment products.

The next few pages show a few of the many steps in making a camera.



initial model

Exact-scale models of proposed products are made by hand. Products often go from the model stage back to the drawing board.

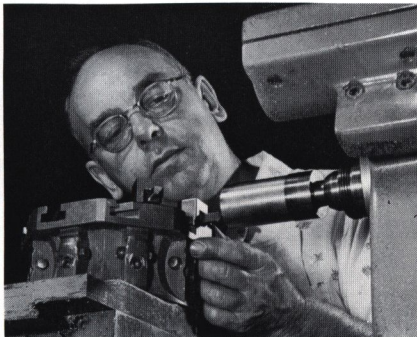


production engineering

Production engineers develop new manufacturing and testing techniques and decide how best to make a new camera in quantity.

toolmaking

Special tools to build the camera are made by skilled toolmakers. Equipment for making one line of cameras may cost \$1,000,000.



raw materials

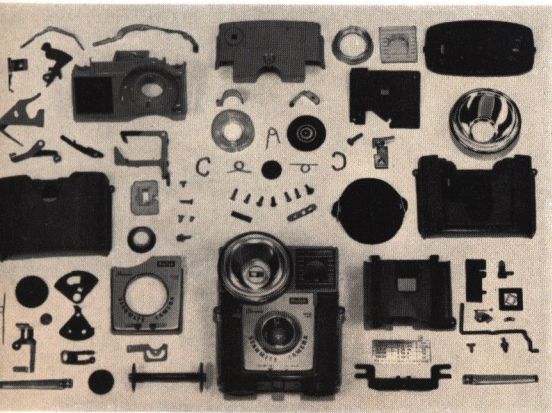
From metal stock to special lacquers, raw materials are bought from hundreds of suppliers and carefully tested before use.



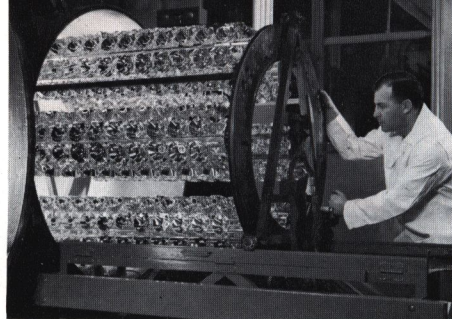
production control

Production planners see that all materials are at the right place at the right time for production. They must also see that the right quantity of each part is made.

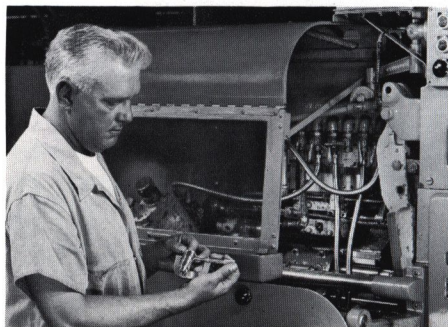
making the parts



Even a relatively simple and low-priced camera contains over 70 parts.

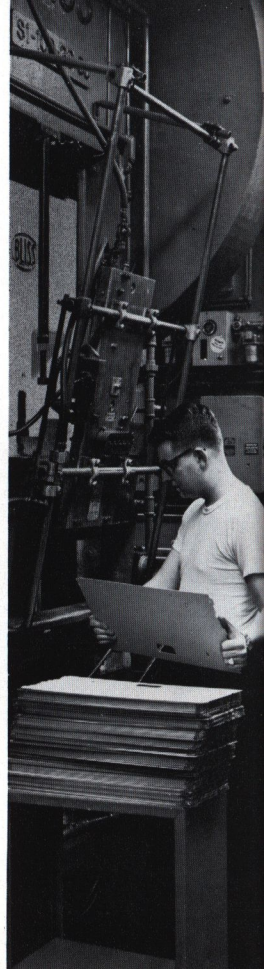


Plastic flash holders are coated with a thin layer of aluminum in a high-vacuum chamber.



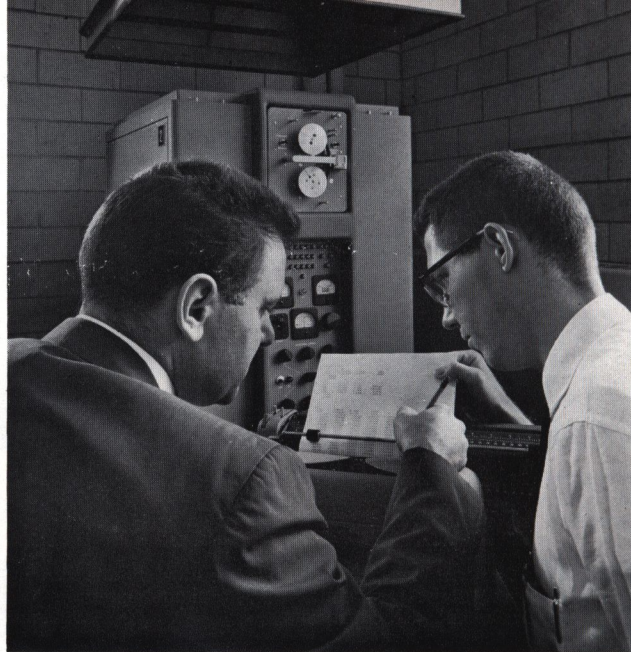
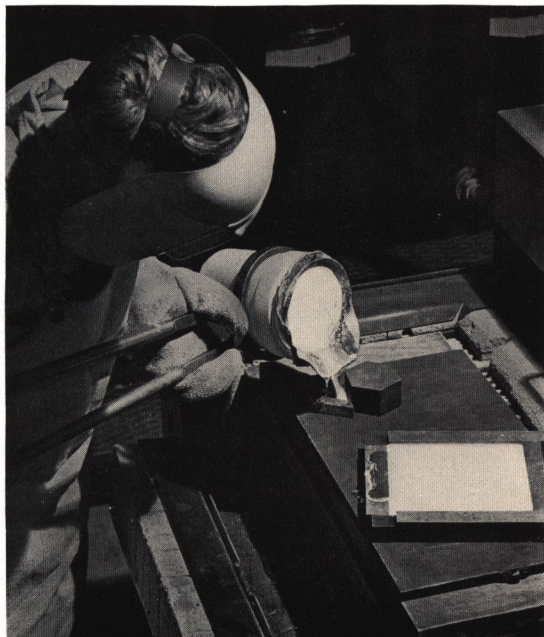
Many metal parts are mass-produced on automatic screw machines.

Other parts are stamped out of sheet metal by giant punch presses.

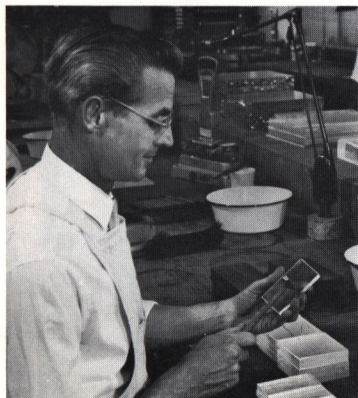


lens making

Lens design is a specialized field that involves extensive use of mathematics. Designers use modern computers to help them devise optics of very high quality. ►



◀ Some lenses are made with Kodak rare-element glass, which has unusually fine optical properties. Kodak glass is made without sand; it is a borate glass containing a variety of rare earths, such as lanthanum and zirconium. Here, red-hot liquid glass is being poured.

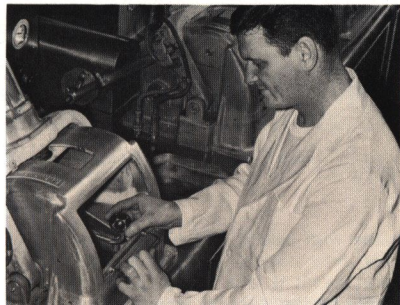


Glass is scored and broken into cubes of the right size for each individual lens element.

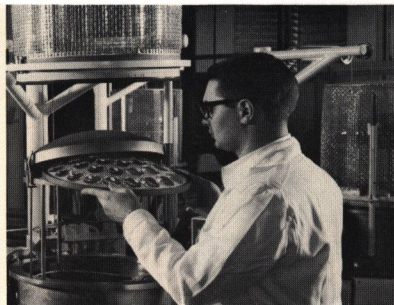


The glass cubes are heated to the softening point and molded into lens "blanks" in a special furnace.

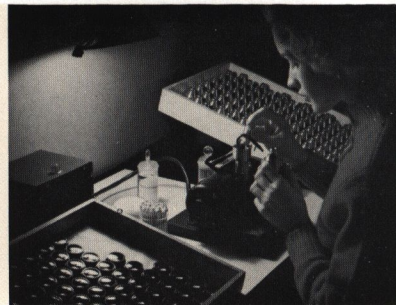
lens making (continued)



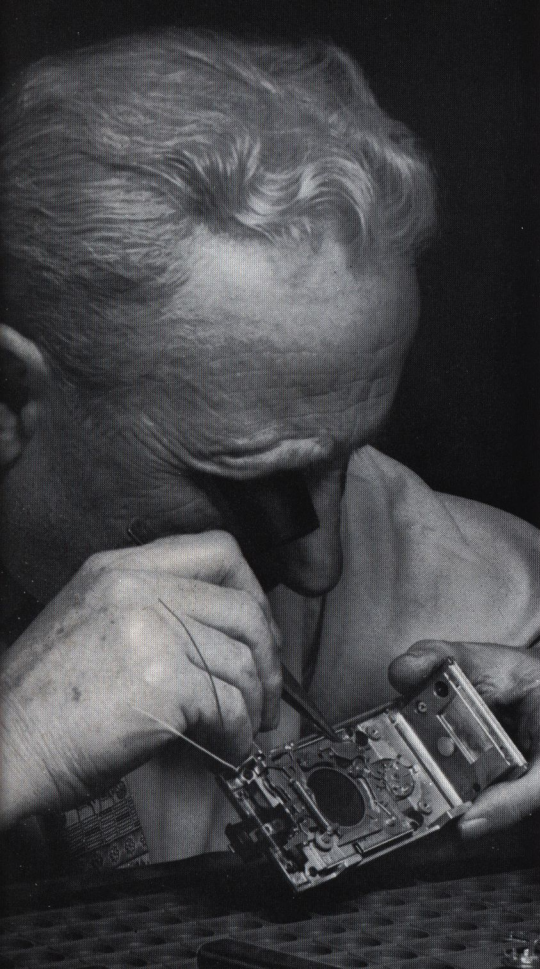
Lens "blanks" are precision-ground and polished on modern, high-speed machines designed and built by the A&O Division.



Polished lenses are coated with magnesium fluoride in a vacuum bell jar to reduce reflections, letting more light go through.



Each finished lens is assembled in a precisely made lens-mount which ensures perfect alignment of all lens elements.



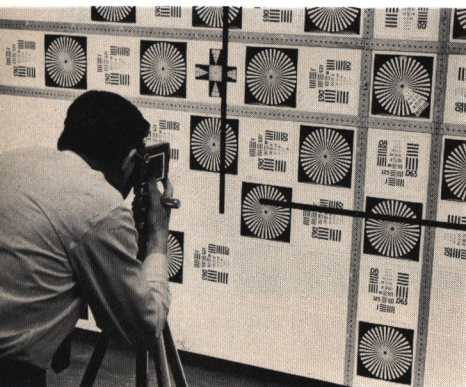
camera assembly

Assembly methods vary from the intricate handwork of putting together shutters for 35mm cameras (left) . . . to the automatic assembly and testing of some sections of Brownie cameras (above) . . . to assembly-line operations (right), which are typical of the work on most photo equipment.

Each day some three million parts are assembled into finished products at the A&O Division.



quality control



Technicians take pictures of special test patterns to be sure cameras focus a sharp image on the film.



Kodak cameras must be able to withstand both high and low temperatures as well as high humidity.

cost control



Careful cost control helps to keep prices as low as Kodak's standards of high quality will allow.

packaging

Finished cameras are placed in packages designed to appeal to customers as well as to protect cameras while they are shipped.



sales and advertising



Nationwide promotional efforts, coordinated by A&O Division and other company executives, help Kodak products reach a broad market.

from dealers to customers



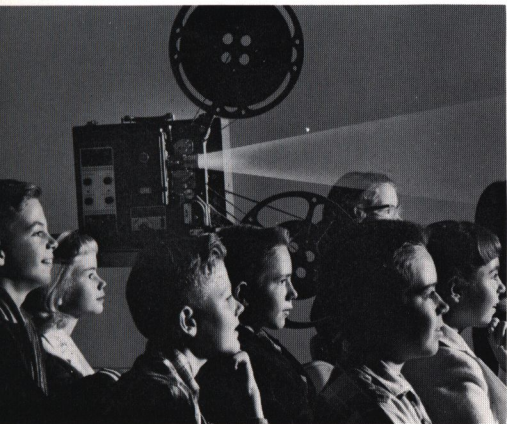
Kodak cameras are sold at nearly 100,000 outlets in the U. S., and also in most other countries.

A camera that can be relied upon must have quality built in. Thus, quality is a watchword with everyone at the A&O Division—from the people who design the camera, to those who make the tools, to those who produce and assemble the parts, to those who test and package the finished camera.

Actually, cameras are only one of a large number of A&O Division product groups. Many of the products are even more complex than cameras. The next four pages provide a glimpse of the division's broad capabilities—not only in photography and optics, but also in electronics, infrared systems, and precision mechanisms generally.

diversity of products made by A&O Division

The A&O Division produces a variety of electronic equipment. This is part of the electronic color printer that photofinishers use to make prints from color film.



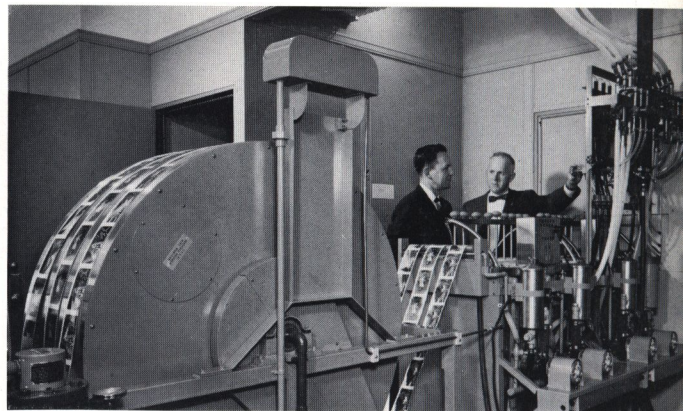
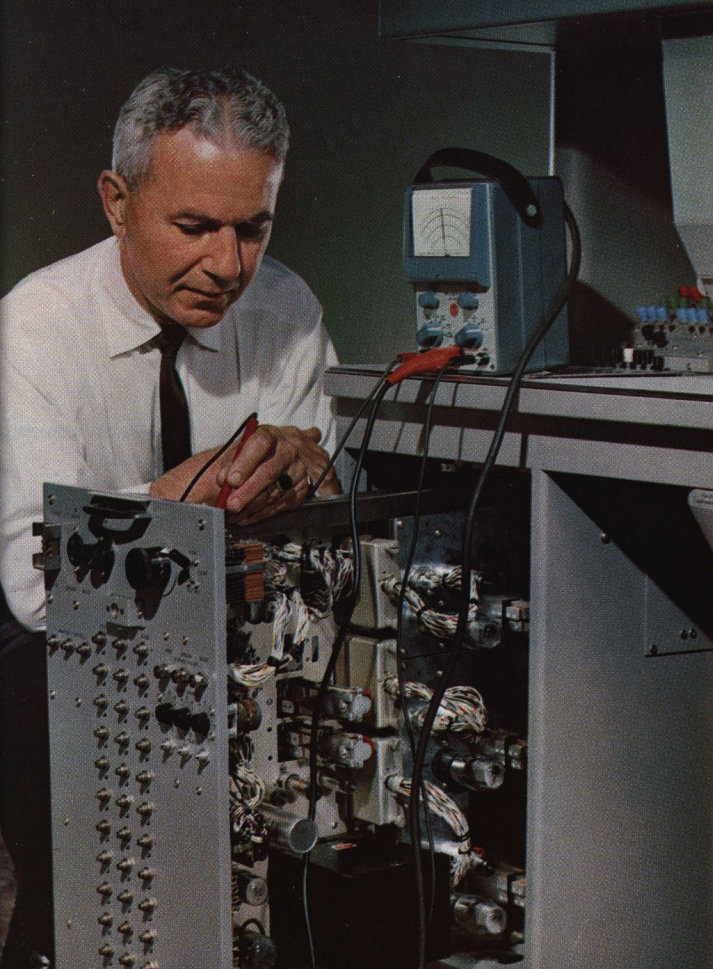
Various models of 16mm motion-picture sound projectors are produced for schools, churches, industry, and TV.



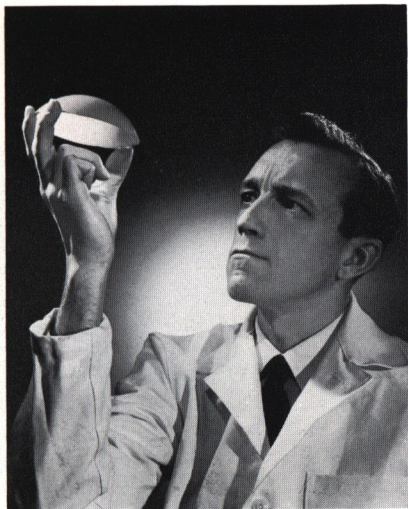
For use in the home, the A&O Division makes a number of easy-to-use movie and slide projectors.



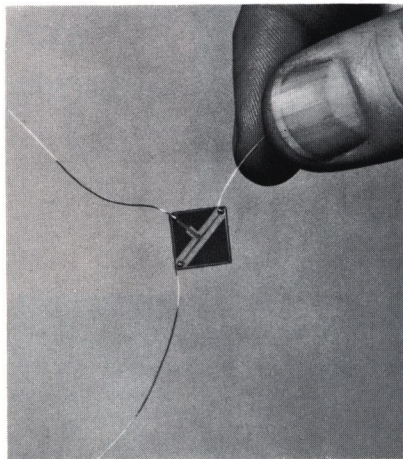
This is an Ektar lens for aerial photography. Kodak lenses are available in many different sizes and for a broad range of uses.



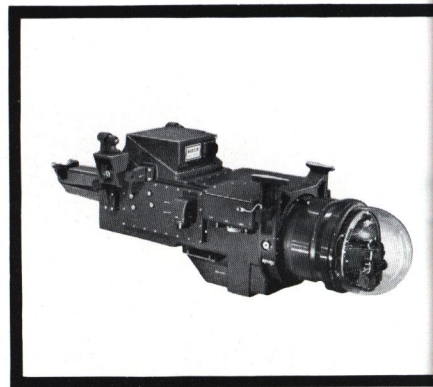
Kodak equipment for film processing is used widely by photofinishers. Hospitals and industry use Kodak X-Omat equipment for fast processing of x-ray film.



Irtran optical materials transmit infrared and microwave energy. They are used in optical windows, domes, lenses, and prisms by both industry and the military.



Ektron Detectors are tiny cells sensitive to infrared energy. They are used for military purposes—such as to detect heat-emitting targets—and also in industrial applications.



Examples of special military equipment are the TV-optical gunsight (above) for an Air Force bomber, and the TV bombsight for a Navy attack bomber.



Verifax office copiers enable secretaries to make several copies of any kind of document in less than a minute. The A&O Division also produces Ektalith document-reproduction equipment.



Recordak microfilming equipment serves banks, businesses, libraries, and government agencies. It is made by the A&O Division and sold by the Recordak Corporation.



people of the A&O Division

Toolmaker and engineer, lens grinder and secretary, camera assembler and accountant, quality control and research people . . . these are among the 7,000 men and women who do hundreds of different jobs in the Apparatus and Optical Division. They contribute the skills, knowledge, and

Skills and knowledge are passed along both in classrooms and on the job.

abilities that make possible the wide variety of precision-built Kodak equipment.

The continuing progress of the Eastman Kodak Company is due in large part to the efforts of these people and many others like them throughout the company.

All Kodak people share in a broad industrial relations program. In addition to fair wages and safe working conditions, the program includes such benefits as the wage dividend (an annual cash payment related to the dividends declared on the company's common stock), liberal vacations with pay, sickness allowances, a retirement plan, and group health and life insurance plans.

Through a suggestion system, cash awards are paid for ideas which improve products, increase safety, or save time or money.

Plant recreation groups sponsor many activities, including camera clubs, athletic teams, field and stream clubs, and holiday trips for both active and retired men and women.

Over 1,000 people in the A&O Division have been with Kodak for more than 25 years.



The men and women of the A&O Division represent an amazing array of special abilities, talents, and skills. With these people rests the company's reputation for high-quality products.

other Kodak units in the U.S.

The work of the A&O Division is coordinated closely with other Kodak units, especially the Kodak Park Works in Rochester, where photographic films, papers, and chemicals are made.

Located throughout the U. S. are ten Kodak Processing Laboratories for processing Kodak color film and eight sales divisions for the distribution of photo products to dealers.

The Recordak Corporation is the company's sales and service organization for microfilming systems. Its offices are located across the nation, with headquarters in New York City.

Another unit, the Eastman Gelatine Corporation at Peabody, Mass., produces gelatin for use chiefly in photographic film and paper.

Nearly one-third of company sales comes from non-photographic products. Plastics, fibers, and chemicals are made by the Tennessee Eastman division in Kingsport, Tenn., and the Texas Eastman division in Longview, Texas. These products are sold by Eastman Chemical Products, Inc.

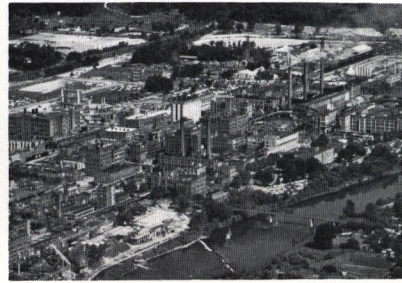
The Distillation Products Industries division in Rochester makes vitamin concentrates and other products for foods and pharmaceuticals.



The Kodak Park Works in Rochester, N. Y., the company's largest plant, produces photographic films, papers, and chemicals.



The Distillation Products Industries division in Rochester makes products for use in pharmaceuticals, foods, and animal feeds.



The Tennessee Eastman Company division in Kingsport, Tenn., produces plastics, man-made fibers, and industrial chemicals.

Kodak units in other countries

Over 10 percent of the output of Kodak plants in the U. S. is sold abroad. In addition, large quantities of Kodak photo products are made by associate companies in five other countries:

England—Kodak Limited, with plants at Harrow, Hemel Hempstead, Kirkby, and Stevenage.

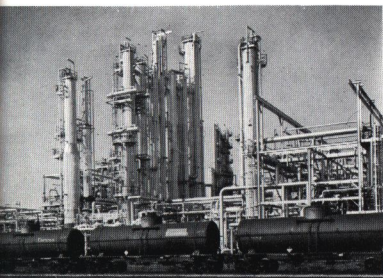
Canada—Canadian Kodak Co., Limited, at Toronto.

France—Kodak-Pathé, with plants at Vincennes, Sevrans, and Chalon-sur-Saône.

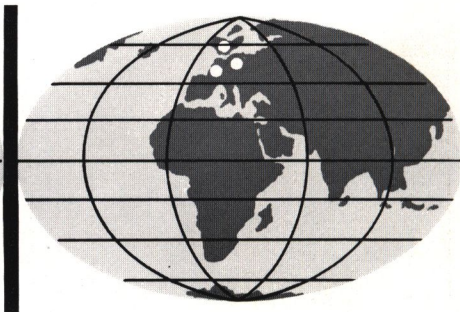
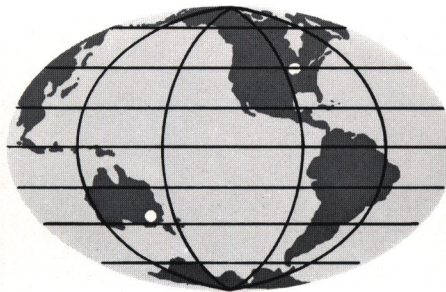
Germany—Kodak A.G. at Stuttgart.

Australia—Kodak (Australasia) Pty. Ltd., with plants at Abbotsford and Coburg.

Kodak products are sold by associate companies or independent distributors in about 110 countries and territories throughout the world.



The Texas Eastman Company division in Longview, Tex., makes industrial chemicals and polyethylene and polypropylene plastics.



EASTMAN KODAK COMPANY, Rochester 4, N. Y.