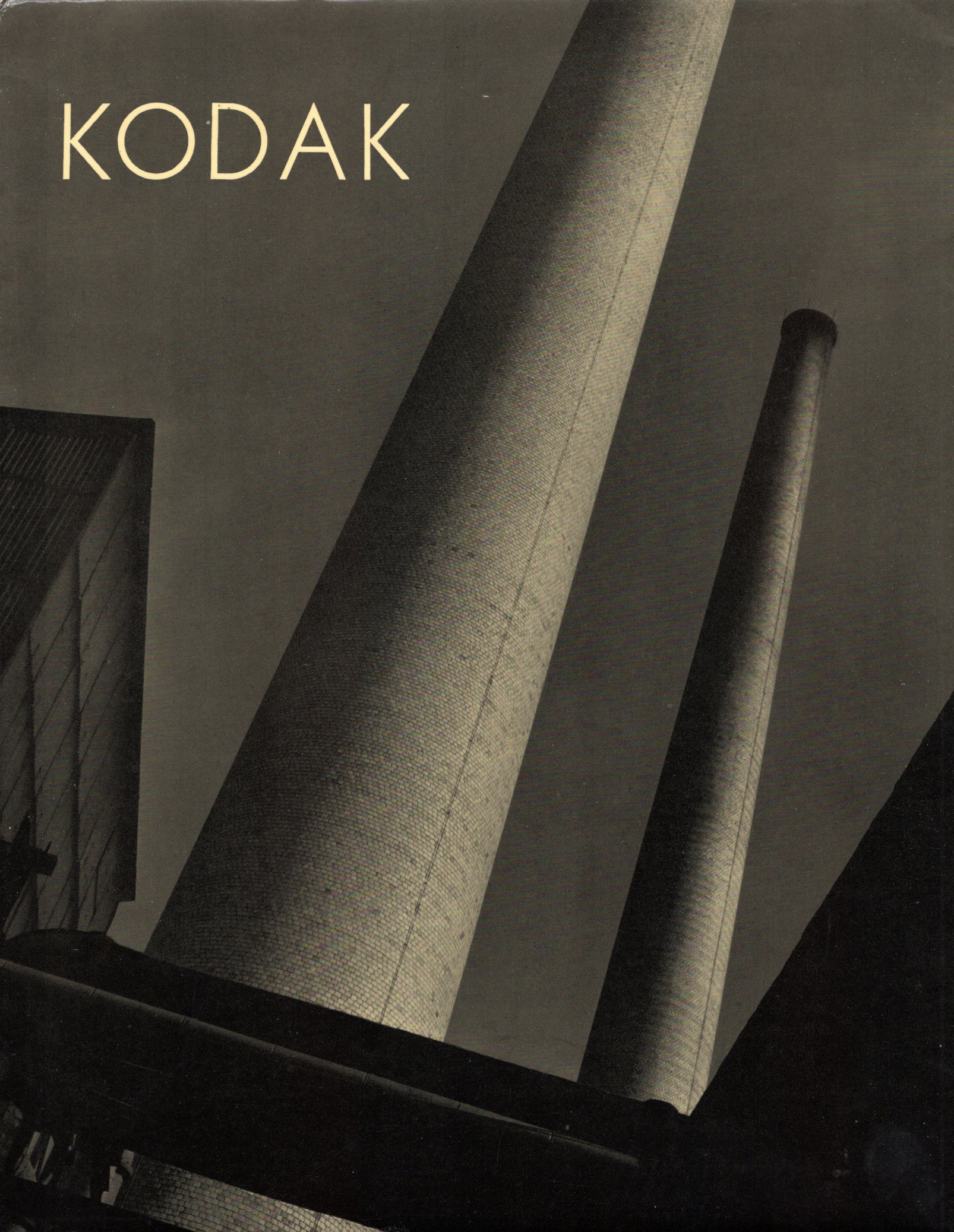

KODAK

"Long Legs," winner of the Speth Memorial Medal in the Eleventh Annual Kodak International Salon of Photography, among Kodak employees

KODAK

FACTS
ABOUT THE WORLD'S LARGEST ORGANIZATION
ENGAGED IN THE MANUFACTURE
OF PHOTOGRAPHIC
MATERIALS

EASTMAN KODAK COMPANY
ROCHESTER, N. Y.

THE MEMORIAL TO GEORGE EASTMAN

JUST inside the entrance to Kodak Park, the Eastman Kodak Company's memorial to Mr. Eastman stands in simple dignity.

"This memorial," said Dr. Rush Rhees, president emeritus of the University of Rochester, in his dedication address, "will be a lasting symbol of the abiding influence and inspiration which the memory of George Eastman will exert . . . on the thousands who in the future years may contribute by thought and labor to the future realization of the vision which Kodak's founder cherished for it and for a world increasingly worthy of man's loyalty. . . . Nothing less massive than this marble pillar can fitly remind us of the strength of his combination of technical, business, and financial ability. And all were dedicated to the constant advancement of Kodak as a service to science, art, and human pleasure."

KODAK PARK

The administration building, at the main entrance to Kodak Park

INSTEAD of the grime and noise usually associated with manufacturing, here is a calm setting of elms, shrubbery, tidy lawns, ivy-clad brick buildings. From beyond this threshold of quiet come the muffled sounds of production. . . .

What are they making inside Kodak Park, with its 83 major buildings on 400 acres of ground—the largest of the three Eastman plants in the city of Rochester, of the thirteen throughout the world?

Millions own snapshot cameras. . . . The motion-picture industry consumes something more than two hundred thousand miles of film annually. . . . An increasing number of home-movie cameras are making records of family life and travel each year—and it is now possible to do that in color. . . . Portrait and commercial photographers must be supplied with, not one type of film and paper, but hundreds, to meet the various exacting needs of their work. . . . Medical and dental radiologists diagnosing the infirmities of anatomies and teeth, x-ray technicians examining the soundness of metals, building materials, airplane parts, use a huge annual acreage of their recording medium. . . . Photo-engravers, bankers, astronomers, aviators, draftsmen, detectives, engineers, microscopists—a great variety of professions and activities have a very interesting assortment of needs for the photo-sensitive materials that Kodak Park supplies.

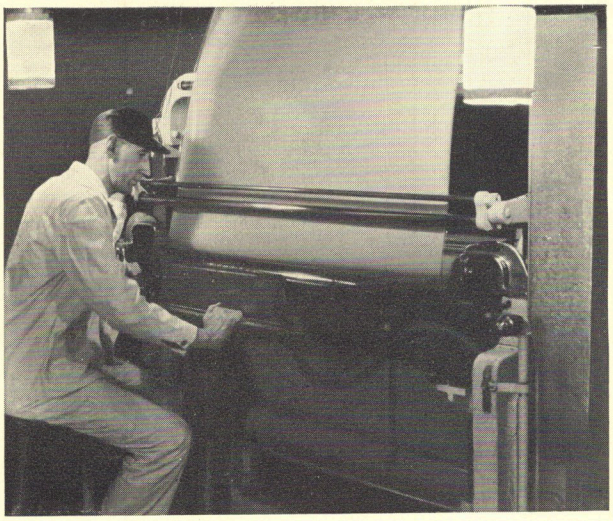
Obviously, the industry that confronts us is large in scale. But in that it is not different from other huge enterprises: from an automobile factory, say, or a locomotive plant. It is different, however, from any other industry in the fact that the scale of operations, the expense, the personnel of many thousands, all are concerned in an unrelenting fight against enemies that seem inoffensive—a speck of dirt too small to be seen, a slight variation of temperature or humidity, a dim ray of light entering where it doesn't belong.

The six miles of streets within "the Park" are paved, and are constantly sprinkled, to guard, not against dust that is unpleasant, but against dust that endangers perfect pictures. Elaborate equipment for washing and filtering air adds to the working comfort of many departments; but its real purpose is that of protecting the photographic materials from dirt.

The chimneys that carry fumes and dust 366 feet into the air, the fireless steam locomotives, the fleet of electric trucks, the constant use of scrubbing machines and floor-waxing machines, the employment of full-time cleaning crews, the white laundered suits and the girls' uniform smocks worn in any rooms where photographic materials are uncovered, are not merely interesting innovations. They are part of a program that keeps Kodak Park perhaps the cleanest industrial area on earth, and makes Kodak film and photographic paper and chemicals perfectly fit for whatever use they may be put to, simple or complex.

A mile and a half of distance intervenes between the entrance gate and the remotest building of this city within a city. Let's walk through some of the nearer streets. We pass wheeled and pedestrian traffic; but the trucks move more silently and the pedestrians walk more briskly than the traffic of a less purposeful city. Quiet organization is sensed everywhere you go.

Before George Eastman began his work of simplification, amateurs had to sensitize their own plates in portable darkrooms



Like many other Kodak Park operations, the process of coating a photo-sensitive emulsion on film base occurs under dim, colored lights. . . . The broad band of film is later cut to the required widths

At one point we see a six-story structure, a block long, which we are told is built over a reservoir that holds five million gallons of water. The reservoir is a unit in a system that supplies fifteen million gallons for use every day the Park is in full operation. Kodak Park maintains its own water plant on the shore of Lake Ontario, including a building where special purification is carried on.

Down one street we observe a solid masonry wall with no window breaking its expanse. Behind it, great, white machines with many precise moving parts are turning in dim light, or in practically none, coating the transparent, flexible film base with the "emulsion"—silver salts in gelatine—that is sensitive to light and to visual images.

At the end of a walk along an ivy-covered building, we glimpse an imposing structure that overlooks the main entrance to the Park. This, our guide explains, is the center of research for Kodak—the source of new developments that keep photography moving forward. Hence came home movies, . . . Kodachrome Film for natural-color home movies, . . . film that can record pictures from hundreds of miles away. . . . Here, too, have been discovered many hidden complexities of photographic sensitivity; and here, as well, numerous patient studies have been made to give photography and the motion-picture art a scope undreamed of when they first came into being. The Kodak Research Laboratories constitute, in truth, a research university in the important sphere of photographic science.

Photographed by only the invisible infra-red rays, here's the main building of the Kodak Research Laboratories. Extension of sensitivity far into the infra-red is an important recent achievement of Kodak research

There, on our right, is a building in which begins the conversion of silver into the materials of photography—far more precious than silver to this civilized era. Let's commence our inspection by seeing what happens to the silver. The treatment of this raw material will give us something of an introduction to this plant's manufacturing methods.

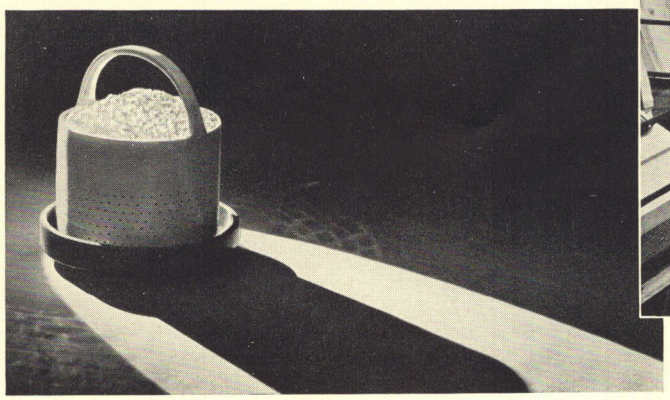
Five tons a week is the Kodak Park consumption. It comes in forty-pound bars, which are carefully tested. Impurities are rarely found in Kodak Park's silver; yet inspection continues year after year. If a trace of copper or iron were permitted, unchecked, to go into the manufacturing stream, endangering photographic effectiveness, later tests would discover the defective product before it was ready for sale; but time and other materials would have been wasted meanwhile. Production schedules would have been interrupted. Therefore, Kodak Park tests every ingredient, as well as finished products and products in process of manufacture. Of the thousands of employees at the plant, hundreds devote their whole time to the careful testing of materials at every stage of evolution into finished photographic goods.

Observing the first step in converting bar silver into photo-sensitive materials, we shall instinctively feel

The solution of silver nitrate is evaporated, which leaves this chemical in the form of crystals. The crystals are then redissolved, and the operation repeats until a high degree of purity has been achieved

Silver is photography's most vital raw material, for silver salts make film and paper sensitive to light. These forty-pound bars form only part of a week's supply. The consumption of silver by Kodak Park now approximates five tons every week

Silver nitrate—purified to the quality characteristic of Eastman chemicals—is sprayed with distilled water, then drained. After drying and blending, it is ready to be used for making emulsions

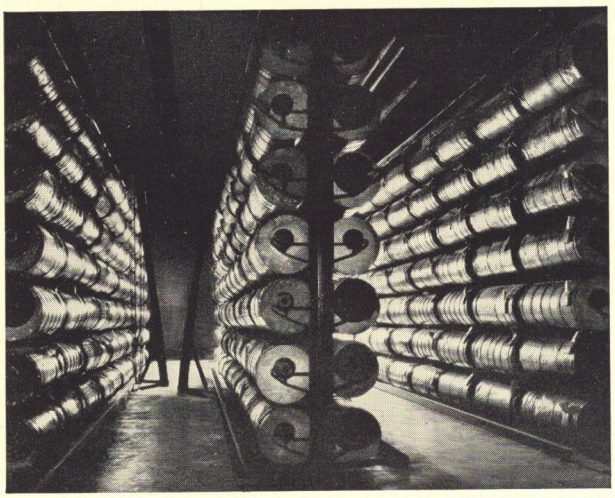


Converting fluid "dope" into endless sheets of the familiar transparent film base, . . . which is very nearly invisible as it passes over the polished rollers

shock at seeing the metal dissolved in nitric acid until all is fluid and nothing solid remains. But relentlessly on goes the process. The silver-nitrate solution is siphoned from its porcelain bowls into troughs, whence it runs through glass tubing to an evaporating room on the floor below—where men wearing rubber aprons and rubber gloves guide the flow into other bowls, which are set on heated tables. The heat drives off water; and, when the concentrated solution cools, the silver nitrate crystallizes.

Silver nitrate in this form would be more than pure enough for most uses—but photographic manufacture is an exacting master. Consequently, the crystals are again dissolved in distilled water and again crystallized. This operation is repeated until traces of impurities are all removed.

That silver nitrate is sensitive to light—a fact ascertained by Arab alchemists seven centuries before Columbus discovered America—is the basic chemical fact making the practice of photography possible.



This view shows rolls of film base in storage, before the broad bands are given their coating of the sensitive emulsion that takes the picture

The discovery of the transparent, flexible base of photographic film constitutes the Eastman organization's greatest contribution to photography and motion pictures. In connection with the base, a humbler material now enters the process of film-making.

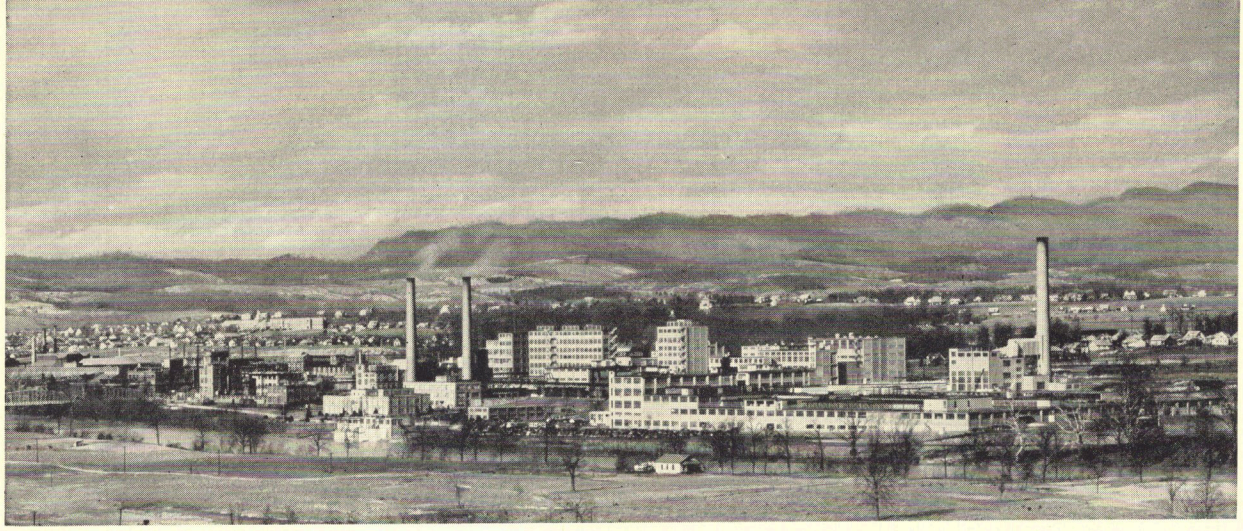
The support, or base, is composed of cotton that has been treated with a mixture of nitric and sulphuric acids. The resulting nitrocotton is dissolved, after special treatment to remove acids, in a mixture of solvents, the chief of which is methanol (wood alcohol). The "dope" thus obtained—a material with the consistency of honey—is spread on the polished surfaces of great wheels that run continuously, night and day, month after month. Heat around the giant wheels drives the solvents from the dope and permits the thick fluid to assume the form of a thin, transparent layer on the surface of the wheels. After various convolutions within one of these machines, a wide strip of finished transparent film base emerges and is wound up in a roll like newsprint paper.

Consider the steps that must be taken, collateral with the manufacturing process briefly outlined, to insure the quality that is so vital in the resulting film support. . . .

Let it be remembered that a microscopic speck of dust embedded in the material might be the nucleus of a spot causing a freckle on the nose of an immaculate cinema actress, a sharp crackle in the midst of a sound-film love scene, an extra star in some astronomer's Pleiades—or might spoil a snapshot of a child in some particularly entrancing pose.

Unusual climatic conditions might bring deterioration of valuable films if such exigencies were not protected against in manufacture. Film a hair too wide might jam in a camera or might produce on the movie screen unsteady effects.

Purity and precision are imperative at Kodak Park in every operation and in every handling of materials.



The Tennessee Eastman Corporation, at Kingsport, manufactures cellulose acetate for "safety film," as well as acetate yarn for fabrics, cellulose acetate for safety glass, and an acetate molding composition

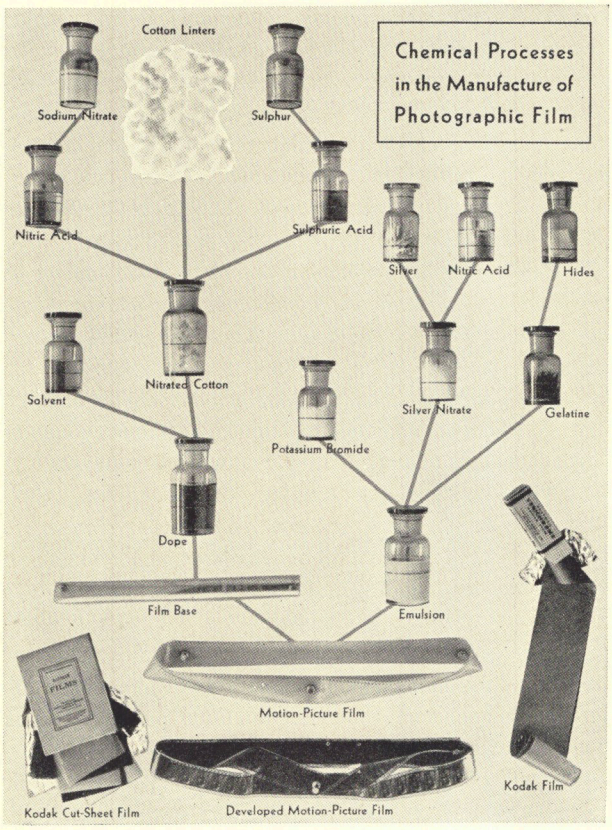
Samples of all cotton coming into the plant are tested before use. Before being dumped into the nitrating machines, the cotton is accurately weighed. Weight, temperature, and quality, of the nitrating acid, are controlled. Nitrated cotton, immersed in water, flows only through tile pipe lines, to avoid contact with metal. The substance inelegantly called dope at Kodak Park, after the nitrocotton has been thoroughly dissolved by its solvents, actually is the direct culmination in chemical purity of the work of hundreds of chemists and skilled workmen; and the outcome of study and improvement by two generations of engineers and research scientists.

The physical condition of the material, as distinguished from the chemical, becomes evident when one sees the film base winding through the great machines, so flawless and so transparent as to be invisible, except upon close examination.

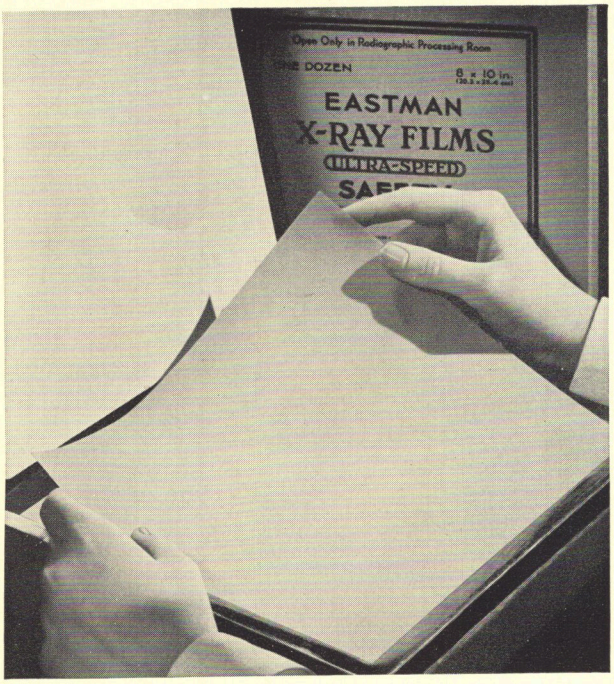
Cellulose acetate for the "safety film" of home movies and radiography results from similarly controlled manufacturing processes in the Tennessee Eastman Corporation's plant at Kingsport, Tennessee, close to the source of supply for raw materials. In the manufacture of safety film, acetic acid and acetic anhydride are substituted for nitric and sulphuric acids to treat the cotton. Subsequent conversion of cellulose acetate into film base is carried on at Kodak Park, just as in the case of film made from nitrocotton.

While we are close to the subject of cellulose acetate produced by Tennessee Eastman for Kodak Park, let's indulge in a conjecture. It is quite possible that the neckties—or the dresses—of persons reading these words are of that very substance. Not only film, but also Eastman Acetate Yarn, is made from cellulose acetate produced in the large plant set among the hills of eastern Tennessee. The yarn mill there, . . . the supplying of acetate for safety glass, . . . the manufacture of Tenite, an acetate molding composition for making combs, automobile fittings, and a large variety of other products—all that is another story.

Gelatine is used in large aggregate quantities to suspend the emulsion's silver salts evenly on the film base—but gelatine for photography must be chemically purer than that used for food. Gelatine for Eastman film and photographic paper is produced



This chart shows how the various raw materials combine to make photographic film. In manufacture of the emulsion, silver nitrate reacts chemically with potassium bromide to form silver bromide



X-ray films are an important Kodak product, not only for medical and dental uses, but also for detecting hidden flaws that may occur in articles fabricated of metal, such as castings and welds

principally at Kodak Park and by the Eastman Gelatine Corporation at Peabody, Massachusetts. Patient processes of chemical treatment in hundreds of covered concrete tanks prepare the selected starting materials for cooking. The gelatine, after washings, boilings, filtrations, solidification, blending, and removal of any chance metal content, joins the silver nitrate in the departments where emulsions are made.

It may be interesting to pause and catalog the most important raw materials of film: cotton from sunny Southern fields; saltpeter produced synthetically from the air in the United States; sulphur from Texas; camphor from Formosa; wood alcohol distilled from the Tennessee Eastman Corporation's sawmill waste; hides from cattle that once grazed in Texas or the Argentine; silver from Mexico; and potassium bromide from the Great Lakes brine deposits.

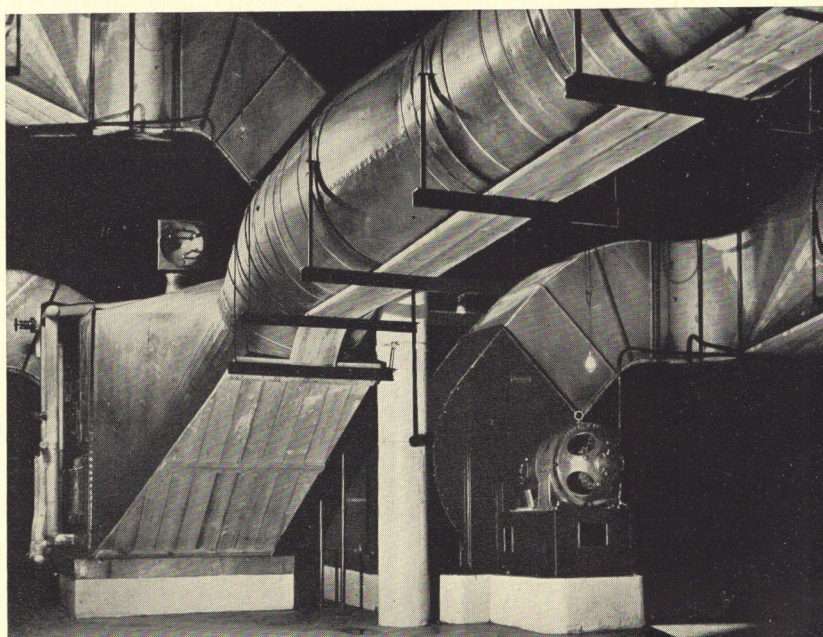
The making of light-sensitive emulsions—the layer of film that actually takes the picture—is a highly diversified and extremely delicate process. The Eastman organization, in fifty years of experience, has turned an art depending on chance and mood into an exact science. The genius of pioneering emulsion-makers, combined with the manufacturing talent of picked chemical technologists, has now established methods which insure uniformity to Kodak photosensitive materials. In his daily work the press photographer may be called upon to snap sharp pictures of racing planes in a thousandth of a second; the studio photographer makes softly modeled portraits with exquisite care. Both require types of film that may be counted on to respond faithfully to their skill, every time, year after year.

The chemical and physical control of silver-salt crystals, together with the addition of other materials, makes emulsions "fast" or "slow," "contrasty" or "long scale," sensitive to light from various parts of the spectrum, or photographically responsive in still other useful ways. Combinations of these properties result in the production by Kodak Park of more than a hundred types of film. Most types of x-ray film, and the popular Verichrome Film for use in Kodaks, are double-coated, with two separate emulsions. Kodachrome Film has three emulsions, with two separating layers of gelatine.

In the years following the first production of transparent, flexible film base, that material was made and sensitized on glass-surfaced tables two hundred feet long. Now this work is done on the great continuous machines previously mentioned.

For atmospheric control and other purposes, Kodak Park maintains the largest refrigerating plant in the world. A great network of air-conditioning equipment spreads over the plant. Humidity and temperature are accurately regulated by a large number of instruments, installed in all necessary places. These provisions remind one that the manufacturing processes, despite their huge scale, are carried on under the very strictest of laboratory conditions: "test-tube operations in trainload lots."

Of photographic paper there are even more types than of film: two hundred and fifty varieties, distinguished by purpose, weight, color, degree of contrast, texture, and action under development, produced under conditions similar to those prevailing in the departments where film is manufactured.



These ducts supply washed, conditioned air to the department that coats sensitive emulsions on film base. . . . Though such ducts carry nothing but purified air, they are frequently flushed and polished

Everybody who has taken a snapshot is familiar with the red-and-black paper sheathing film spools. The career of those strips is useful but inglorious—for they are thrown away as soon as the film is developed. Yet the quality of the protecting paper of film cartridges is higher than that of the stationery of discriminating business houses!

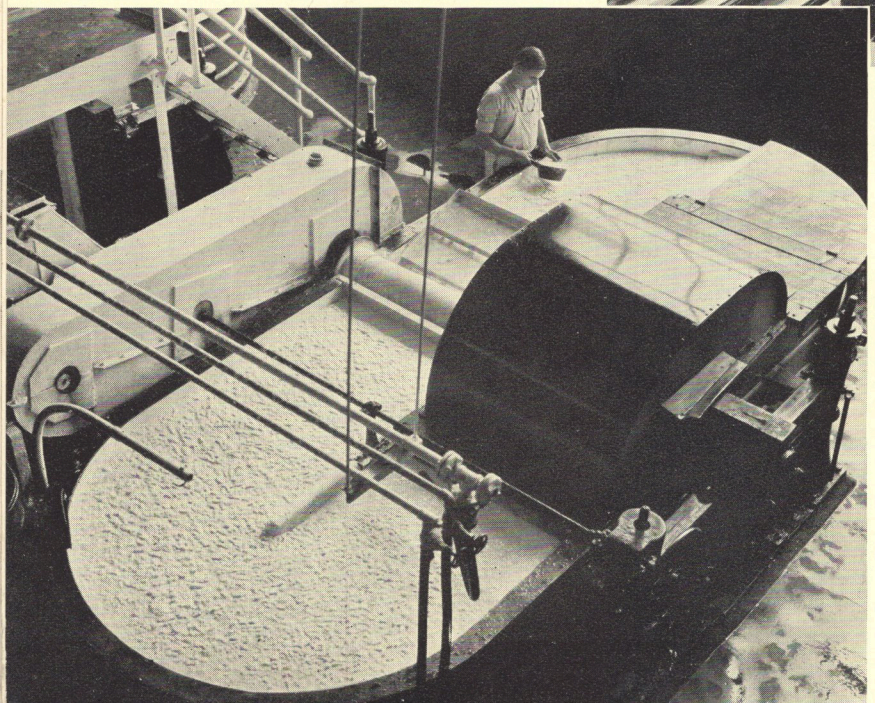
If the mere light-proof covering of sensitized material must be of such a high grade, imagine the care that goes into making photographic paper, on which pictures are to be printed. Any imagining could hardly go too far. The paper mill at Kodak Park stands alone on this continent in the manufacture of chemically pure paper for photographic use.

Only the best cellulose fibers available—of a type purified to an extraordinary degree of chemical inertness after years of research—are suitable as material to make photographic paper. The stages of manufacture at the paper mill follow closely those of other high-grade paper mills, but with these distinctions indicative of other less noticeable differences: the successive "beaters" in which the fibers are disintegrated, the vats in which pulp is stored, and the conduits through which it passes, are tile lined; beater blades are adjusted with extreme fineness, lest traces of metal appear in the paper; the pulp undergoes more cleaning processes; and—for this is Kodak Park—testing, testing, testing. From pulp to the final packing of sensitized paper, samples go to the several testing laboratories for examination. A system of record-keeping preserves, for every package of paper sold, test results at every stage of manufacture, and the name of the person who made each test. A similar continuity of identification is observed in the manufacture of film.

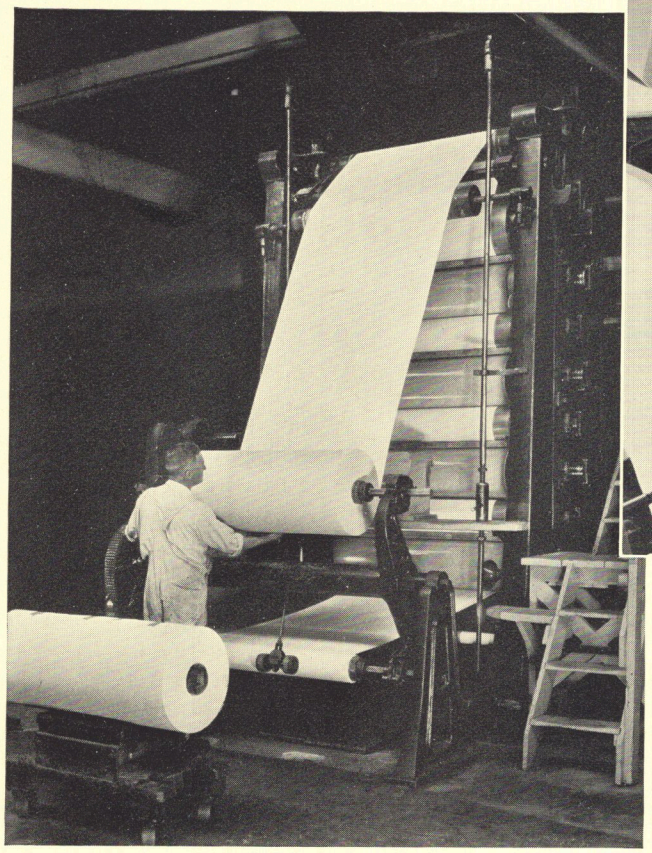
Paper is not ready to receive the emulsion simply after manufacture and after a period of seasoning. Baryta coating intervenes: application of a chalky white substance in layers that give the necessary gloss to glossy papers and control the degree of gloss on matte-surface papers. Both these processes—making paper, and coating it with baryta—have been worked out over the years to give the greatest possible permanency to the product—for the public counts on its pictures to last until grandchildren are grandparents.

The measures taken to set the baryta layers evenly, to dry them uniformly with cleaned air in great festoons along tunnels each containing thirty-six hundred feet of paper slowly progressing toward the winding machines, to control moisture content so that the paper may not crack when it is pressed by

Before photographic paper receives a light-sensitive emulsion, it is coated with baryta, a chalky white substance applied to control the degree of gloss. This operation is repeated several times, depending on the surface desired. Notice the festoons entering the drying tunnels, each of which contains thirty-six hundred feet of paper



The base of Eastman photographic papers is made from purified cellulose fibers, seen in this picture as they go through a "beater," preparatory to fabrication on great paper-making machines. These fibers are so pure, and the sizing material used is so perfectly adapted, that paper from Kodak Park is as permanent as its silver image



At the other end of the drying tunnels, the baryta-coated paper is rewound. As at every stage in the manufacture of Eastman photographic goods, samples are here taken for a variety of tests

A "supercalender," the great pressure of which smooths and improves the surface of paper after it has been coated with baryta—another step in getting it ready for its emulsion

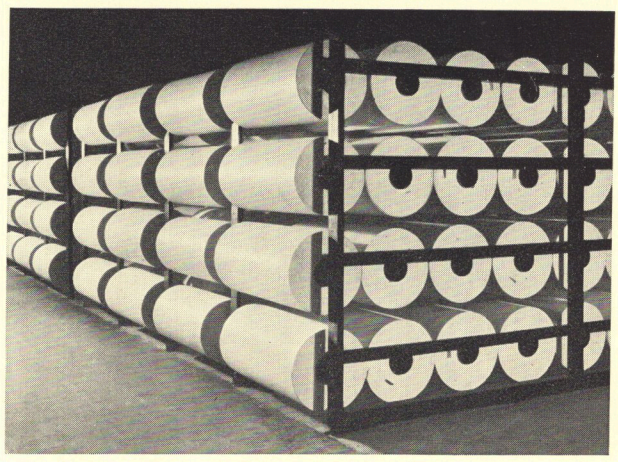
"supercalenders," and—once again—to test it (microscopic analysis, artificial aging, tests for strength, flawlessness, degree of gloss, expansion when wet, ability to stand stretching and tearing, and a number of others, including a keen lookout for the presence of those constant enemies, dirt and metal)—these measures are on a par with the manufacturing of film base. One of the most important tests at Kodak Park, to the traveler, occurs in an incubator that simulates equatorial temperatures and humidity, from the cool of morning to the steaming heat of noon and back again, and through many repetitions of this cycle of the Tropics-in-Rochester.

Visitors are inevitably impressed by the eerie glow of subdued orange and red and green lights in many of the buildings. They quickly lose all sense of direction and location. But employees, accustomed to it, work with efficiency and health unimpaired by these surprising conditions. The air throughout the Kodak Park darkrooms is as fresh as outdoors, constantly comfortable in temperature, and clean—for it is artificially conditioned to an exact temperature and humidity, regardless of the weather outside.

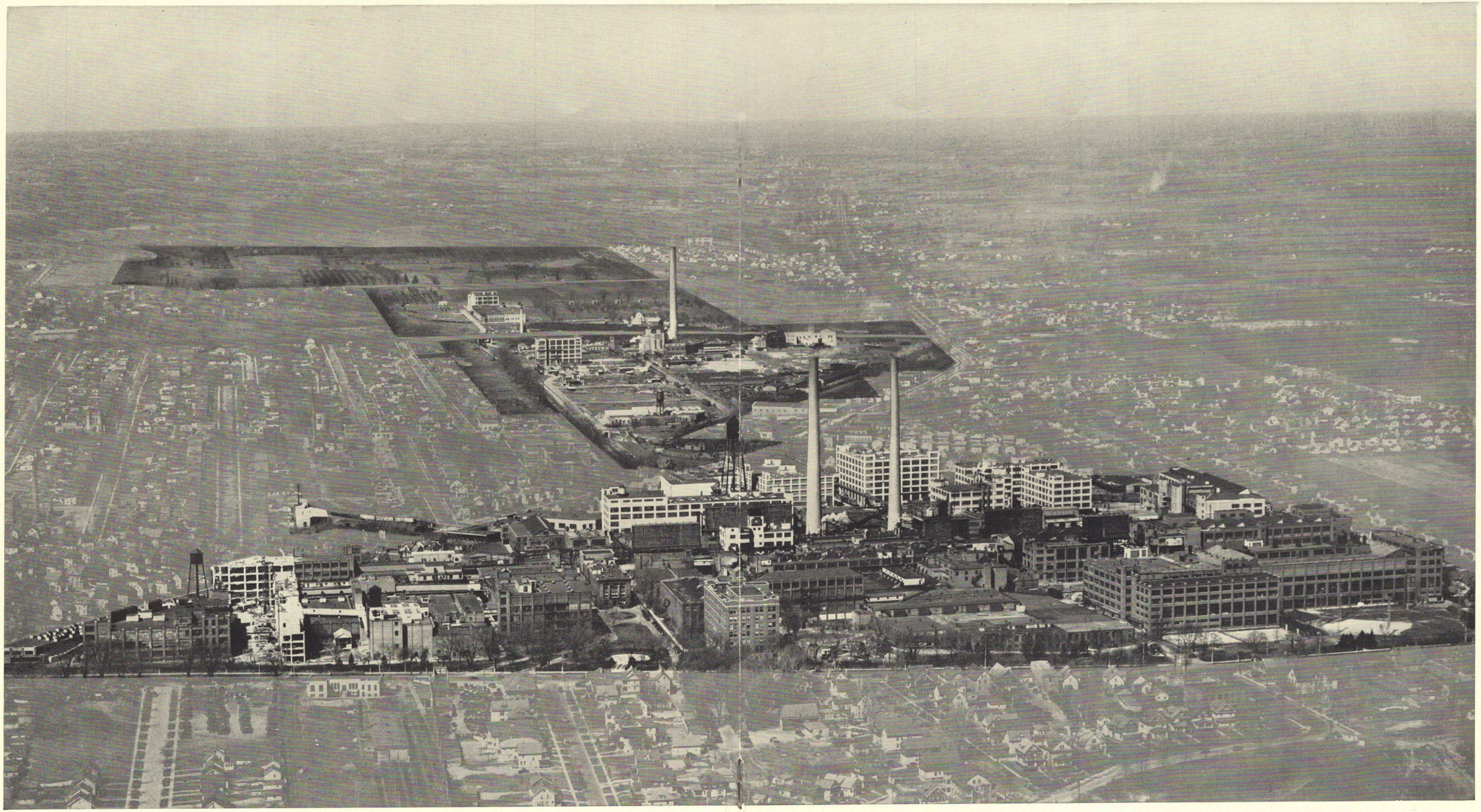
The large vaults for storage of the sensitized paper prior to cutting and packing remind one of the catacombs—dim and cool—with ghostly white rolls of paper lining many aisles. In another room, a battery of great, white cutting machines, nearly invisible in the dusk, is dividing large sheets of paper, with micrometric accuracy, into the various sizes that are required for photographic prints.

A military metaphor suggests itself for Kodak Park. An army is helpless without its services of supply. The production forces of this city of light and darkness need constant support from numerous and elaborately regimented auxiliary "troops."

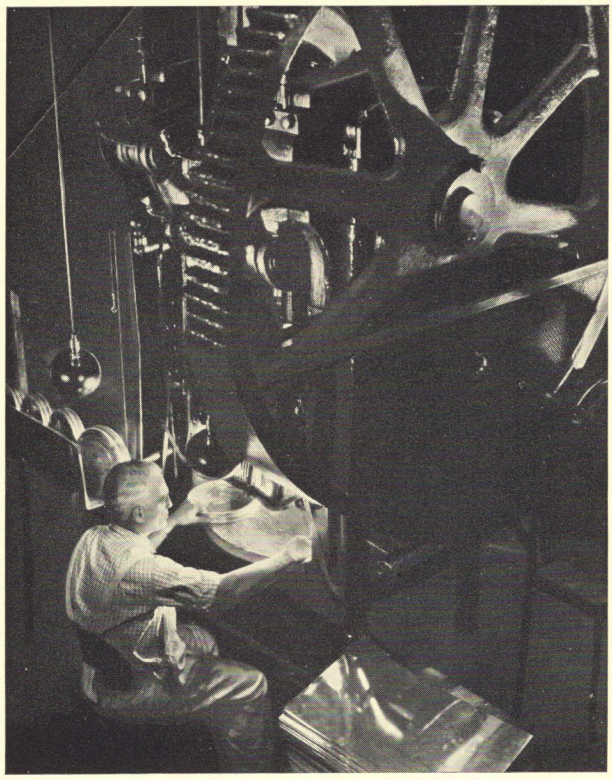
Cores and reels are needed to wind film on. A metal- and wood-working plant makes them. . . . Cartons and containers are necessary. A large printing shop and a paper-box factory are complete within the Park.



Photographic paper goes through seasoning periods on racks in air-conditioned rooms, at various stages in the painstaking process



Kodak Park from the air. . . . It covers 400 acres, contains more than 80 buildings, employs more than 10,000 people, consumes 80 tons of cotton a week and 5 tons of silver, produces photographic film, plates, paper, and chemicals. In front, at the center, is the Kodak Research Laboratories' principal building. Photographic paper is made in buildings in and near the right corner. Film-making occupies much of the rest of the front area. Kodak Park West and Kodak Park Far West extend beyond



Stamping out metal containers for movie film is only one of many auxiliary operations. Another example: Kodak Park makes the special machines necessary for carrying on many of the Kodak Park processes

Think of the machinery-repair work to be done, of the seventy-five hundred electric motors to be serviced, of the fifty thousand electric lamps to be replaced as necessary, of the plumbing and steam fitting and carpentry involved in maintaining a plant of 83 buildings, of the special machinery to be constructed for Kodak Park's unique manufacturing necessities. A large corps of men skilled in these functions is on the job constantly, and the various mechanical shops are a story in themselves.

Vast quantities of supplies, from coal to platinum, must be bought and tested. One department buys supplies, another tests the purchases.

The shipping departments are important, for the Park's great production must be kept on the move. Trucking, maintenance of roads and grounds and fifteen miles of railroad trackage, even janitor service, these constitute major projects.

In further ramification of this plant's activity, numerous materials must be provided in addition to film and paper to satisfy the photographic needs of a hemisphere—chemicals for developing, fixing, toning, bleaching, intensifying, and other mysterious manipulations of photographers, amateur and professional. One photographic chemical, known as pyro, is made of gallnuts brought from China. These "nuts," shipped across the Pacific in large quantities, are really excrescences resulting when wasps lay eggs in oak trees.

More than three thousand organic chemicals are stocked by the Kodak Research Laboratories. Although this aspect of the Kodak Company's activity is not widely known in non-scientific circles, the chemicals provided are used in hundreds of universities and research laboratories where the future progress of science and industry is steadily being worked out.

Sheeting similar to film base, and solutions similar to the dope from which it is made, are sold to many customers manufacturing a diversity of products, ranging from cakes and airplanes to poultry supplies and electrical equipment. A transparent wrapping material called Kodapak is a supplementary product with unique advantages.

Among the Eastman Kodak Company's employees, nearly half of the principal occupations listed by the census are represented, in addition to many jobs peculiar to the photographic industry. That statement of interesting fact is scarcely needed to send us out from Kodak Park conscious that we have felt the pulse of a complex industrial organism. Henceforth, also, we may find new meaning in a historic slogan, which has been a byword for longer than most of us can remember:—

"You press the button, we do the rest."

A Kodak advertisement in 1890, . . . two years after the sale of the first Kodak and a year after the Eastman discovery of film. In its first year, the Kodak made pictures on paper, from which, after development, the emulsion was stripped and mounted on glass

CAMERA WORKS

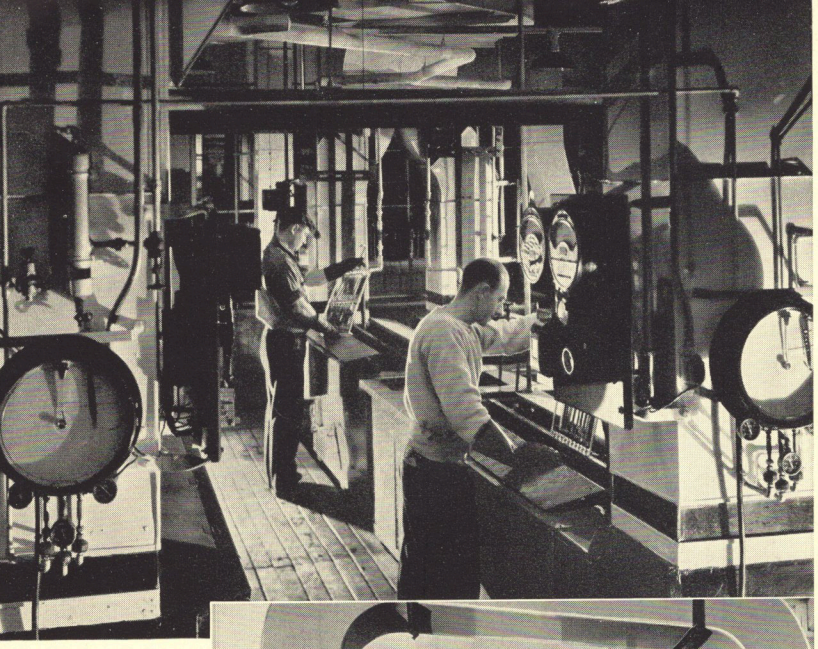
KODAK PARK is three miles north of the center of Rochester, occupying what was open farm land back in 1890 when the first film-manufacturing building was constructed there. Now the city of Rochester surrounds Kodak Park and extends several miles beyond it to the shore of Lake Ontario.

The Camera Works of the Eastman Kodak Company, on the other hand, stands just across "Kodak Street" from the site of the original Eastman factory, close to the business center of Rochester. From this solid block of six- and seven-story buildings comes forth a stream of Kodaks, Brownies, Bantams, Ciné-Kodaks, Kodascopes, Kodascope Screens, Recordaks, Microdaks, tripods, enlargers, printers, print-trimmers, and a variety of other equipment for photography and home movies. Production of accessories, alone, as distinguished from actual photographic and motion-picture apparatus, amounts to three hundred items.

Assembling automatic shutters for Kodaks: a job for watchmakers, requiring, as it does, the delicate handling of many very small parts

For persons unfamiliar with all the names in the foregoing paragraph, an introduction is in order. Kodaks, Brownies, and Bantams are amateur cameras for "still" pictures. Ciné-Kodaks are amateur motion-picture cameras, and Kodascopes are their projectors. Recordaks are used by banks and other business houses to make an automatic photographic record of checks, statements, and business papers, and of newspapers and other documents. Microdaks are cameras that fit ordinary laboratory microscopes and produce photographic reproductions of microscopic subjects for doctors, students, and biologists.

More than two thousand highly skilled workers are employed in the Camera Works. About 240 power presses stamp out various metal parts. More than two hundred automatic screw machines convert long metal rods into screws, rivets, spindles, and bushings, many of them no larger than a pencil point. The normal weekly output of the screw machines alone is two and a half million parts. Hundreds of hand screw machines, lathes, punches, drills, and perforating machines also contribute their share to the products.

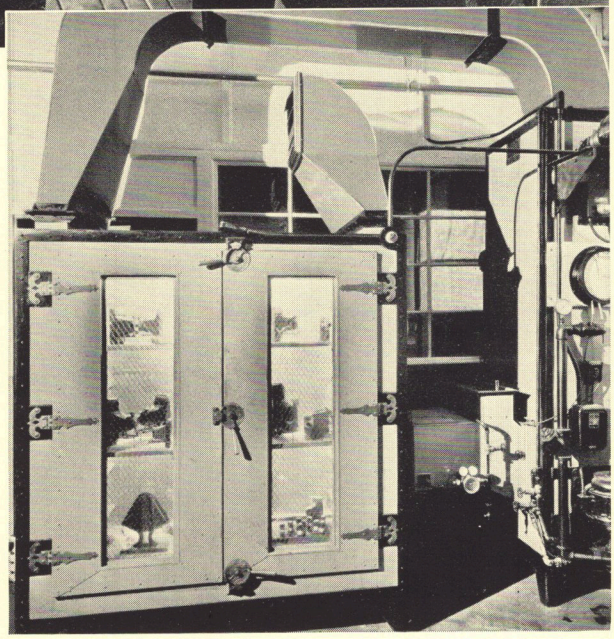


Parts to be chromium plated at the Camera Works are given thirty minutes in an electrolytic chrome-acid bath like this one, a practice comparing favorably with three minutes' plating time for the average commercial article. Cleanliness and control characterize the process

Bellows-making—with emphasis on the necessity that wear shall not cause light leaks in the folds—is an ingenious operation. Stages in sub-assembling and assembling the numerous types of apparatus are in such relationship to the various specialized production departments as to make the Camera Works a model of straight-line production. Experienced workmen do the work, operating within close limits and aided by expensive tools and fixtures. Visitors find themselves fascinated by the precision workmanship that is quite evident throughout the factory.

Yet the most compelling group of facts about this plant relates not to manufacture but to the measures taken to insure the quality of manufacture. After a visit to Kodak Park, discussion of quality-insurance may sound like repetition. Nevertheless, it is true that Camera Works inspection routines are as stringent in regard to precision, workmanship, and standards of mechanical excellence as those at Kodak Park are in assuring the performance of photo-sensitive materials. They make possible the perfect functioning of Eastman instruments after years of constant use.

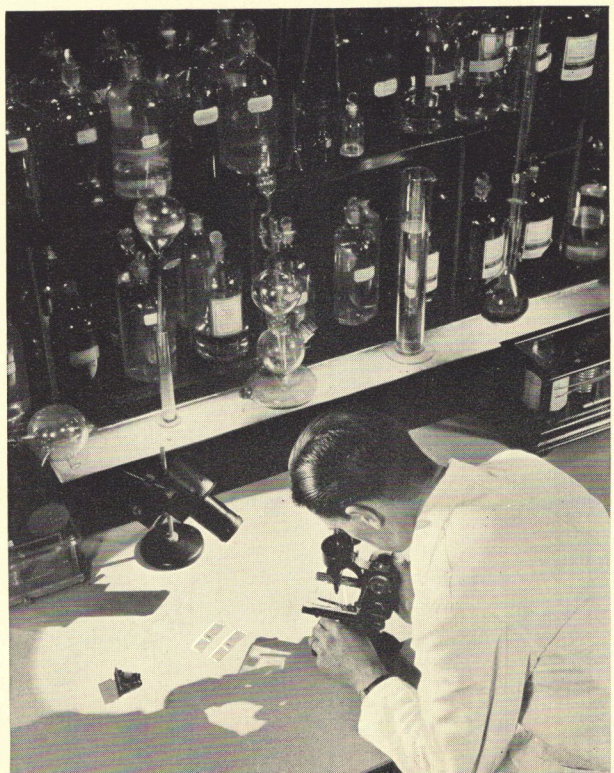
Since its inception, the Kodak Company has refused to tolerate defective production. As that principle works out today in the Camera Works, months of intensive experimentation go into models, with the merits of an instrument's design established thoroughly before any production is begun; the efficiency and reliability of a new camera or projector thus proved, extremely accurate machine tools and dies for use in production are fashioned by a corps of expert toolmakers; all materials are tested before use; workers



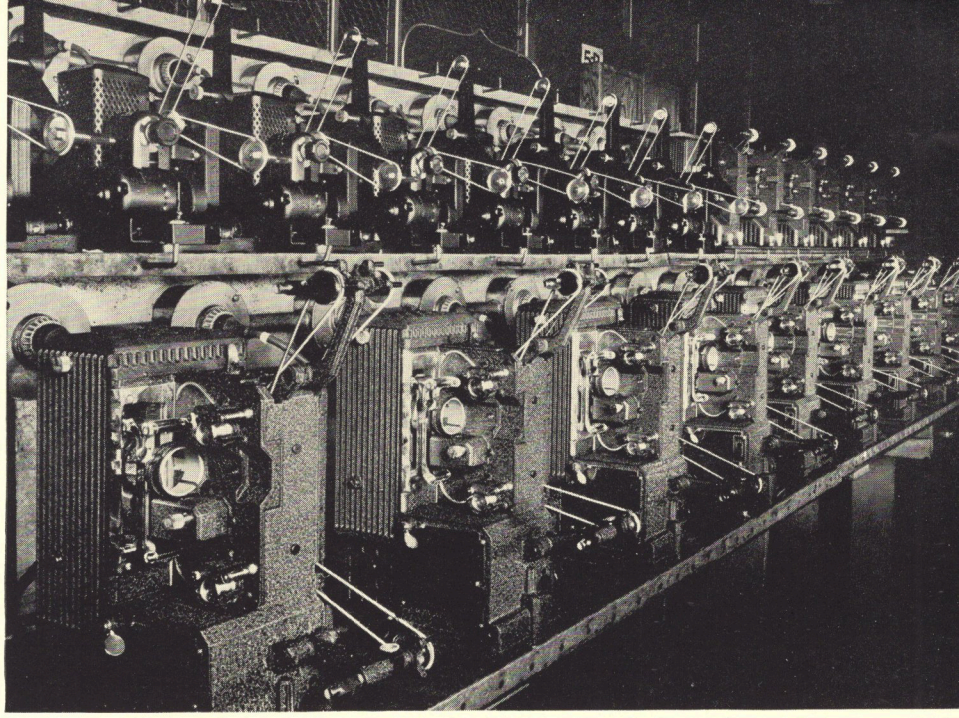
The humidor, in which materials, and occasional finished cameras, are subjected to an atmosphere more humid than the South Seas

Metal-plating operations on a large scale add to the smart finish of cameras, and play an important part, as well, in keeping rust away.

The finishing of metal camera parts not exposed to the eye is still more important in the job of making instruments impervious to the most severe climatic changes of heat, cold, and humidity. Wherever the completed cameras may go—to the Tropics or to the Far North—such treatment of the parts makes them proof against failure. Japan or lacquer is applied in several coats, after chemical cleaning operations. Giant electric ovens bake the finish of japanned surfaces. Even metal surfaces later to be covered with leather or artificial leather undergo japanning first.



Leather, glue, metals, rubber—all materials entering the manufacture of cameras—are tested by a laboratory within the Camera Works



Like expensive automobiles, Kodascopes and Ciné-Kodaks are "run in" to assure that their motors shall operate smoothly and uniformly when these home-movie projectors and cameras are put to use

are trained to reject defective parts, are made "quality conscious"; the finished product, before leaving its production department, is examined thoroughly under conditions of proper lighting that permit the exercise of employees' faculties at maximum alertness—and the cameras are then turned over by the manufacturing forces to other departments, which have as their sole duty the function of inspecting the output.

It is well worthy of note that the traditions of a pioneer industry and the loyalty called forth by sympathetic management policies have built into the Camera Works employee group, as in the other Eastman factories, a fine spirit and a remarkable cohesion. That is a positive factor in the manufacture of high-grade photographic instruments.

Let us observe some of the requirements that must be met by Eastman photographic apparatus before it is considered worthy of sale.

To prove the accurate focus of the lens in a camera, inspectors examine with a magnifying glass the image of a fine-link chain 25 feet away as it appears on a ground glass held against the open back of the camera.

This salt-spray box provides test conditions much saltier than Atlantic City. Sample cameras and parts are exposed, as well, for lengthy periods, to climate colder than Spitzbergen, much hotter than Death Valley

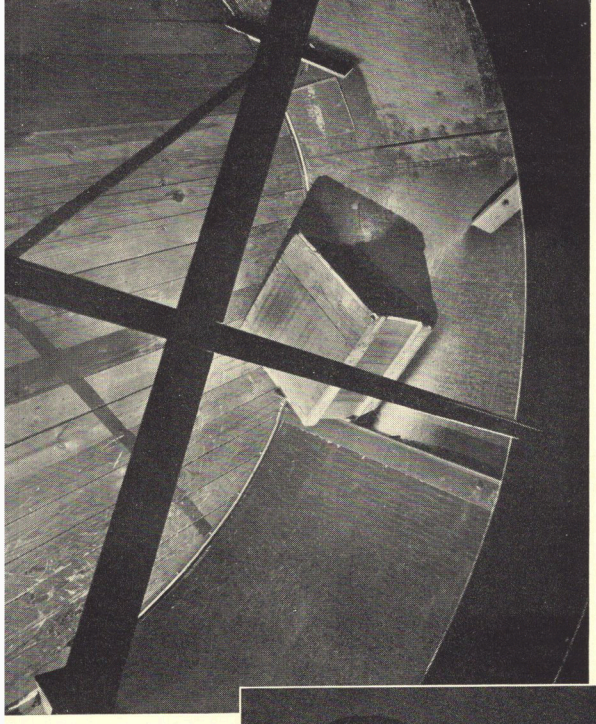
Even before this, prior to assembling into cameras, shutters and lenses have been inspected.

Light-leak tests are carried on in darkened booths where even the tiniest needle prick or a threatening dent in a metal light-lock would be betrayed by the strong detecting illumination that is used. . . . Finder-inspection makes certain, by a mathematically infallible test, that the finder shall reveal no more than the camera will photograph. . . . During the period of establishing the quality of any new camera, an automatic check-up on shutter speed determines the dependability of exposure in terms of hundredths of a second. . . . Survival by Kodaks of a period in a "jigging" machine insures that no screws nor rivets can jar loose in a generation of hard use.

A crew of half a dozen men spends its full time taking pictures out of doors with a percentage of the Kodaks produced, selected at random from the manufacturing stream. The results give a double check, by actual use, against remotely possible manufacturing defects that might have escaped the manufacturing-department inspections and the inspection department.

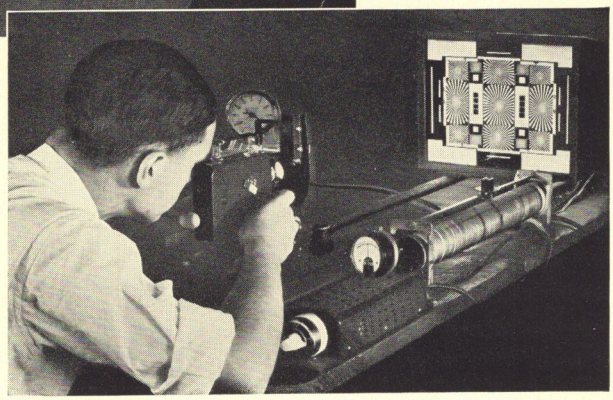
Ciné-Kodak and Kodascope inspection requires additional stages because the element of motion occurs in those machines.

Through every Ciné-Kodak a roll of unexposed film is run to test the uniformity of speed, the freedom of the film passage, the operation of the footage meter, the steadiness of operation, the pulling power of the motor, the silence of the machine. Then an exposed roll of film is put through; and that is followed by a



Kodaks reaching Nome or Manila or Shanghai must be perfectly fit. A revolving wheel gives to occasional packing cases a test battering equivalent to such trips. Then the cameras are removed and inspected

As part of its testing, every Ciné-Kodak makes pictures of "pie charts." The film is developed, and then inspected with a magnifying glass, to make entirely sure that the camera is in sharp focus at all distances



roll that has been highly humidified, to simulate conditions to be met if the camera under test should happen to go to the moist atmosphere of the Tropics.

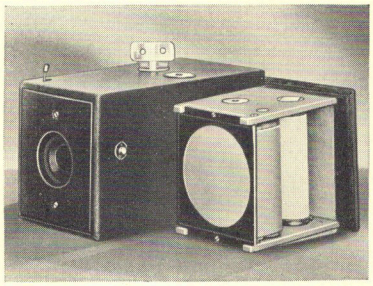
A small percentage of all Ciné-Kodaks made are given a "breakdown test"—that is, they are run until they fail. Time records are kept and subsequent inspection reveals the cause of failure. The Ciné-Kodaks thus treated are a loss, for they can not be used again; but the loss is gain from the viewpoint of providing manufacturing information to make Ciné-Kodaks proof against failure in operation.

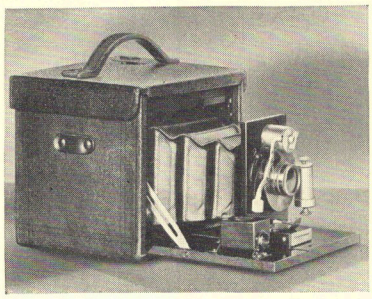
Actually, in the "breakdown test," the cameras do not fail until they have run very much longer than the average movie-maker would use them in a lifetime. From this margin of mechanical reserve strength that is built into Ciné-Kodaks some idea may be had of the Camera Works' integrity of workmanship.

Kodascopes, which are likely to be called on for more arduous service, can not actually be broken down without running continuously for months. Therefore, a fixed percentage of the production of Kodascopes are run for a definite period of several hundred hours and then are taken down and inspected for wear of the various parts.

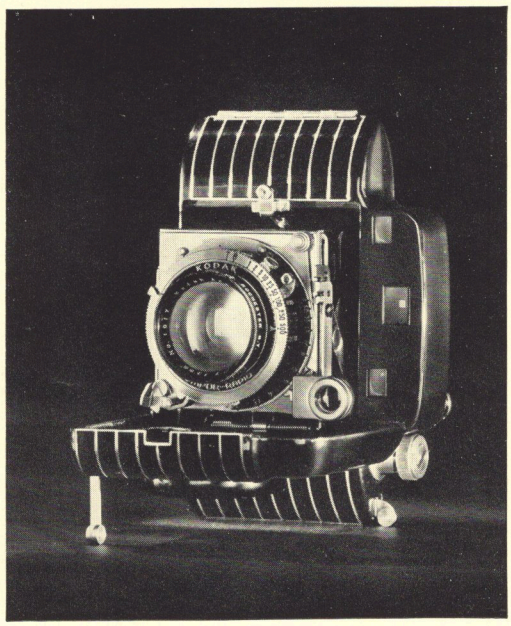
Every Ciné-Kodak, at one stage of its inspection, is loaded with fresh film and "shot" at strongly lighted "pie charts." The film from the Ciné-Kodaks is developed, and then inspected with a magnifying glass to insure that focus, at all distances, is perfectly sharp, as indicated by the reproduction of the figures on the film. For every Ciné-Kodak sold, the factory retains on file several feet of film showing that the camera passed its photographic tests.

Kodascopes undergo focusing tests similar to those described for Ciné-Kodaks, except that the process is reversed. Master test films, made in perfect focus, are projected by Kodascopes in darkened tunnels for optical check-up of the machines. The bizarre assortment of diagrams used for these tests confuses the eye, but Ciné-Kodaks and Kodascopes must reproduce them with perfect sharpness and perfect clarity.





The first Kodak was more than a camera. It introduced the world to the idea that anybody could take pictures, and thus was a landmark in cultural history. In 1890, two years after the first Kodak, came the first folding Kodak. Beside these two is the Kodak Bantam Special, a splendid miniature camera. A fine example of a high-precision instrument, it is assembled by highly skilled workers in dust-proof air-conditioned rooms

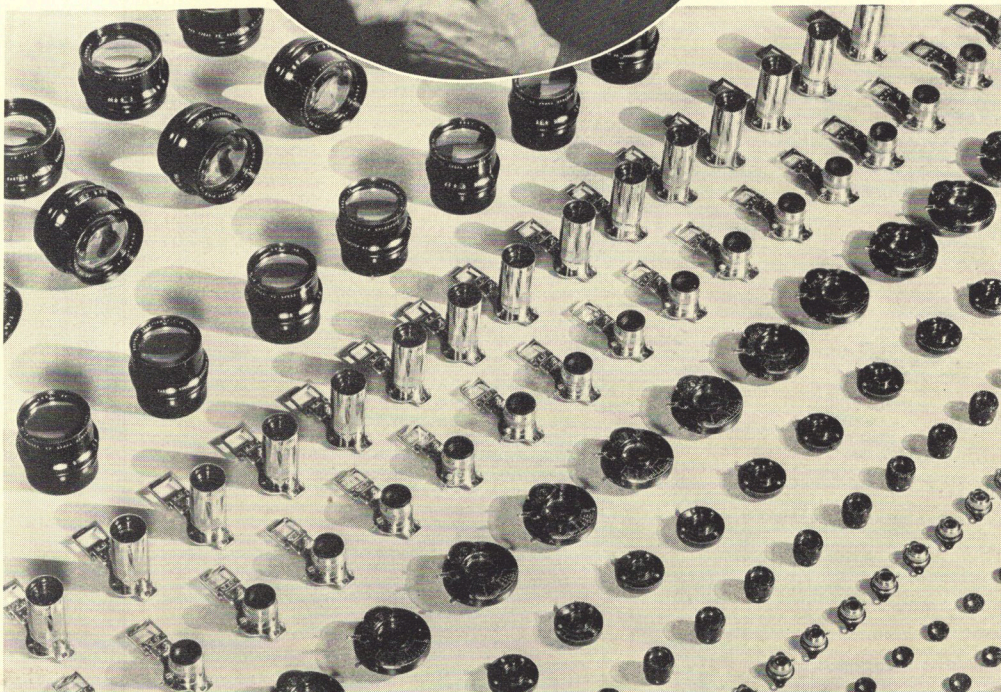


HAWK-EYE WORKS

NAMED after the brand of camera formerly made there, the Hawk-Eye Works stands on the brink of the Genesee River's deep gorge. This third plant of the Eastman Kodak Company in Rochester supplies lenses in their mounts for the Camera Works to build into cameras. To the Hawk-Eye Works credit must go, in large measure, for the relative inexpensiveness of modern Kodaks and Ciné-Kodaks equipped with "fast" anastigmat lenses (most notable of which is the new Ektar lens)—cameras not balked by weather or time of day. When every lens was hand ground by artisan labor, the counterpart of a Kodak that now costs $18 cost $50.

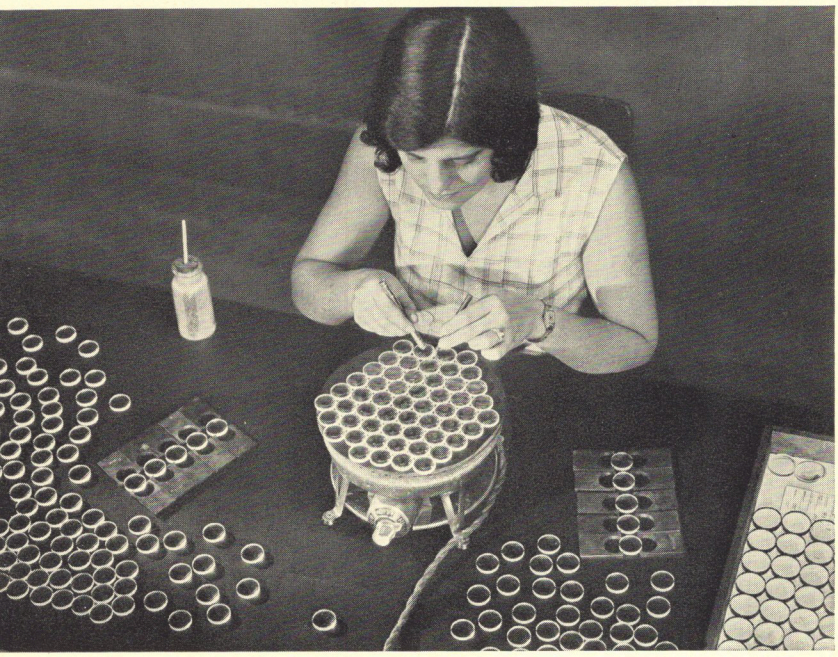
Except for types of lenses not made in quantity, where hand grinding still obtains, lens-manufacture is accomplished at "Hawk-Eye" by mechanical means, with an efficient division of labor. The skill and judgment of lens-makers have now been transferred largely to the function of inspection. Exacting specifications have to be met by lenses throughout the process of manufacture, from the moment the raw optical glass enters the factory until the last stage of mounting for installation in a camera. Each Kodak Anastigmat must emerge successfully from ten rigid tests, performed in ten different departments. In two final tests, which are identical, the judgment of one set of inspectors is pitted against that of another.

Despite the size of the inspection force thus employed, not to mention the mechanical operators, the greatly increased number of lenses now produced per worker—equivalent in quality to handmade lenses—has, over the years, permitted the price reductions.

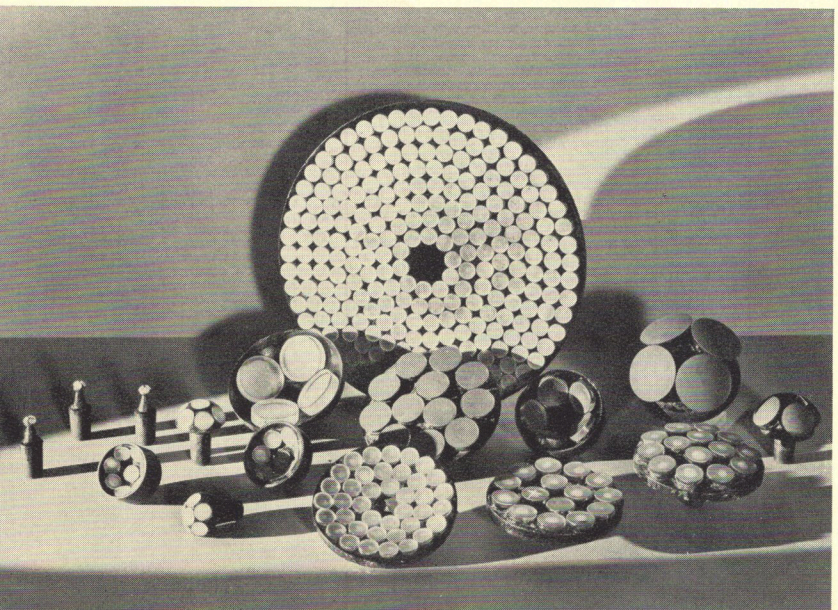


Some products of the Hawk-Eye Works; above, examination of the correctness of lens curvature

Rotating "shells" rub abrasives over lens discs—which are mounted upon "blocks" like those at the bottom of the page—to grind them



Use of two glasses in one lens element corrects certain optical aberrations; so "crown" and "flint" types are cemented together



After lens discs have been molded from red-hot optical glass, an electric annealing oven removes any strain that may be present in the discs by subjecting them to heat rising automatically to a temperature of 1000 degrees and then cooling down gradually over a period of four or five days.

Large rooms in the Hawk-Eye Works are occupied by long rows of machines grinding or polishing lenses, machines swaying monotonously as matched convex or concave parts rub abrasives over the surface of glass discs mounted with pitch on "blocks," forming thousands of lenses at a time into proper contours. The sight of these rooms is impressive evidence of the advance of the machine age in the realm of optics.

During polishing, the perfection of the lens surfaces is checked from time to time by application of a test glass, which is really a lens with an equal but opposite curvature. If the two curves differ by 1/100,000 of an inch, circles of color —"Newton's Rings"— will appear in the test glass.

It is noteworthy that distinguished optical research, as well as the manufacture of lenses, is carried on at the Hawk-Eye plant. Not only does the continued refinement of lenses for Eastman cameras result from the patient formula-calculations of the staff of lens-designers, but also Hawk-Eye may claim prestige for the production of a number of lenses that have served the cause of science in the aerial-photography branch of the United States Army, as well as in the photographic experimentation of other organizations. Light-filters and special optical instruments for other interesting purposes are also Hawk-Eye products.

The first step: optical glass is softened in a furnace with 1600 degrees of temperature, and then it is molded into lens discs

KODAK OFFICE

THE sturdy tower of the Kodak Office rises high above downtown Rochester, a landmark for travelers entering the city. Its height, indeed, is exactly that of the twin chimneys at Kodak Park.

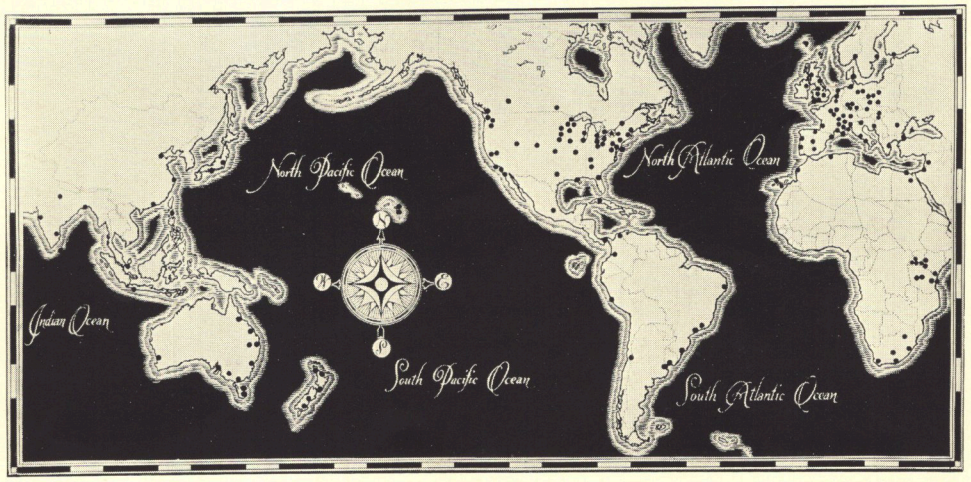
Here the separate activities of the world-wide group of Kodak units come into focus. Under the leadership of the Kodak Office, the functioning of the affiliated Kodak companies, which manufacture and distribute Eastman photographic goods in the United States and in various foreign countries, is co-ordinated. All of these individual companies keep in touch with advances in photographic processes and technique and with improvements in photographic materials and equipment through the Kodak Office, which towers above the site of the first, obscure Eastman factory of fifty-odd years ago.

A summation of the salient characteristics of this organization comprisingcompanies that employ 35,000 persons would list the extreme measures to insure chemical purity and mechanical precision, the effective photographic research, and—by no means less significant—the comprehensive industrial-relations policies, which have proven workable and satisfactory.

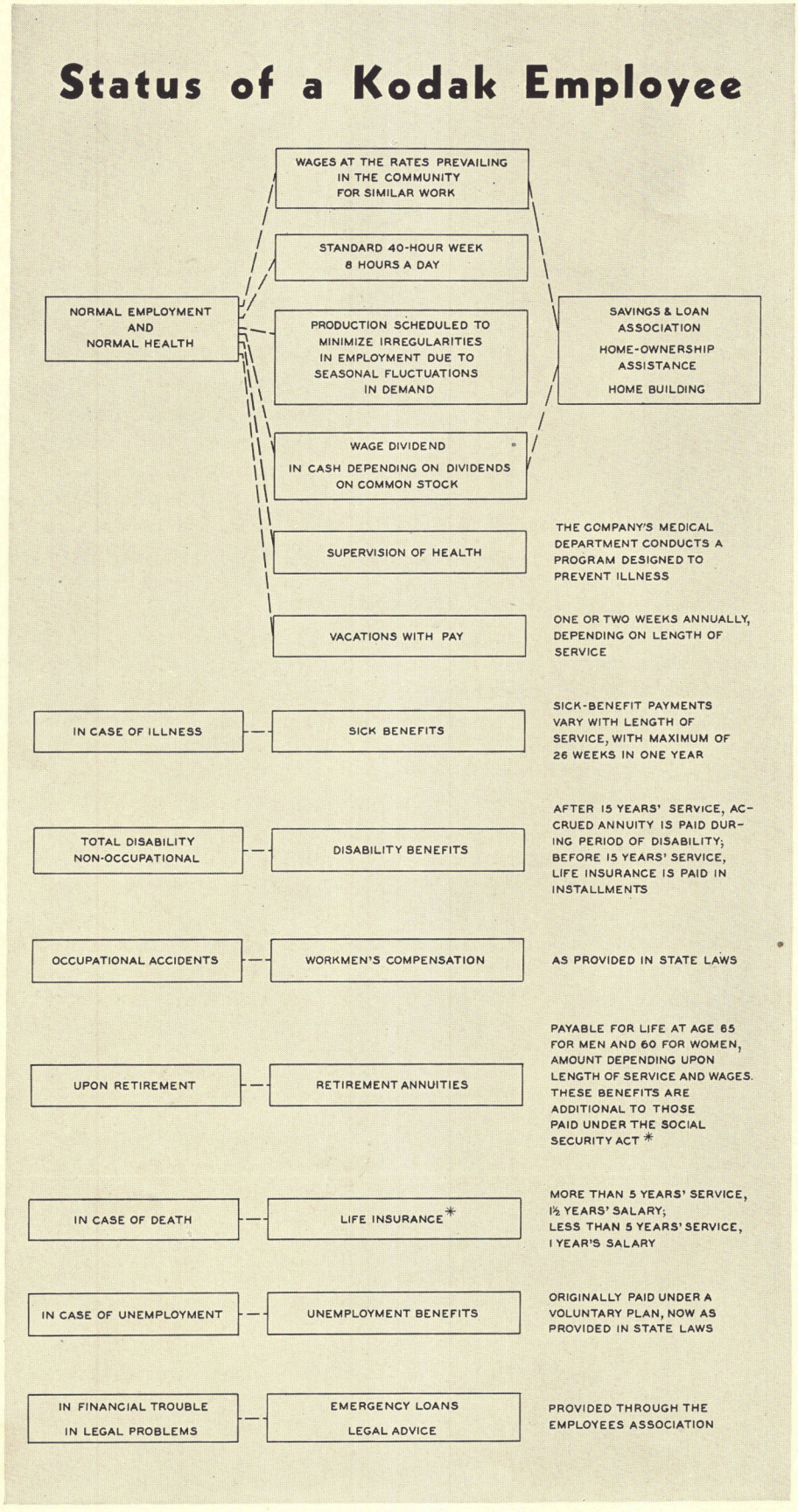
Many years ago the late George Eastman, then president of the Company, came to the realization that it was appropriate to recognize the value of trained, steady workers to the Eastman Kodak Company. In 1912, consequently, the Company paid to the employees a wage dividend, representing a share in the profits of the Company. The wage dividend has been paid annually, since then, with the exception of one year. Payments since the inauguration of the plan have exceeded $41,000,000 in total sum, and they have been entirely over and above wages.

The Eastman Savings and Loan Association, formed to help employees save money systematically and to provide mortgages for the purchase of homes, has grown into an institution of extraordinary financial strength. Group building projects have been an additional means of making home-ownership easily possible for employees of the Company.

In 1928, the Kodak Company accorded extensive benefits to its employees in the form of life insurance, disability insurance, and retirement annuities. These benefits, provided under a group policy written by a large insurance company, have continued in force since enactment of the Social Security Law,



Proverbially, travelers find Kodak signs wherever they go. On the map, all the dots represent places where Eastman goods are made (thirteen factories), or distributed, or serviced



with the retirement plan modified to the extent of the reduction of future annuities by approximately the amount the employees will receive from the Federal Government.

Thorough attention has been given to working conditions. A large medical department, with dispensaries in all the plants, watches over the health of employees and provides any emergency medical attention necessary.

Kodak has had in general operation since 1922, and in partial operation since many years before then, a production-control program designed to stabilize employment. The stabilization methods have resulted in the reduction of seasonal unemployment to a minimum, in spite of the highly seasonal nature of the demand for some of the most important Eastman products. A co-ordinate advantage of this program has been lower production costs.

The five-day, forty-hour week, and vacations with pay for all regular employees, are among the more recent Kodak arrangements.

Such provisions, as much as its plants and processes, explain the Kodak Company; for it is people —a "company" in the original meaning—that give a business its character.

*All of the employee benefits shown on the lower part of this chart are financed entirely by the Company, with the exception of life insurance available on a basis whereby employees contribute part of the cost, and of course with the exception of Social Security benefits, toward which the employees contribute the percentage of wages fixed by law

This snapshot, taken on Kodak "SS" Pan Film, won the grand prize of $1500 in a recent contest for amateur photographers

THE COVER OF THIS BOOKLET IS LAMINATED WITH KODAPAK, THE THIN TRANSPARENT SHEETING MADE BY THE EASTMAN KODAK COMPANY FROM CELLULOSE ACETATE PRODUCED BY THE TENNESSEE EASTMAN CORPORATION

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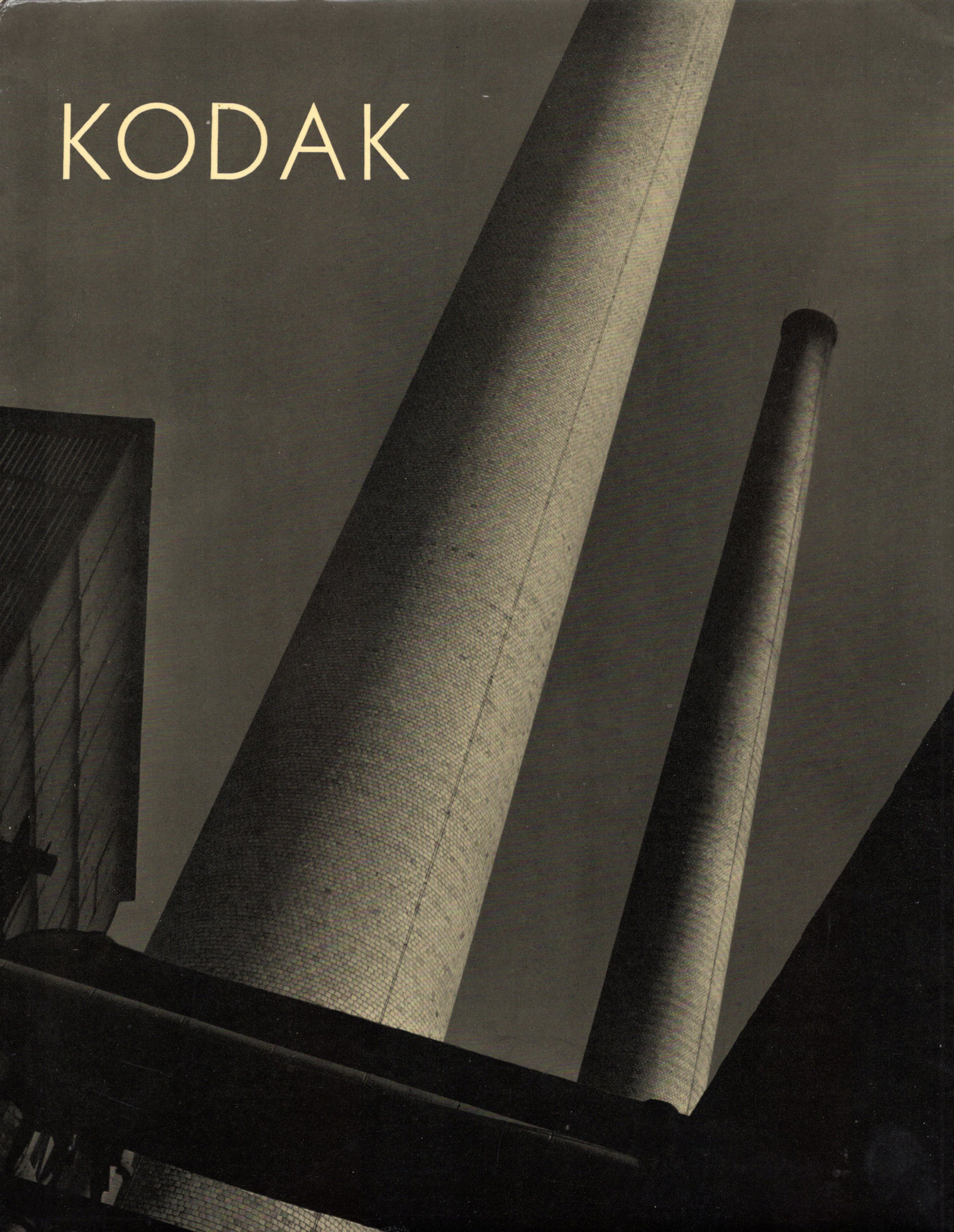
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