Photography, 1839-1937

With an introduction by Beaumont Newhall

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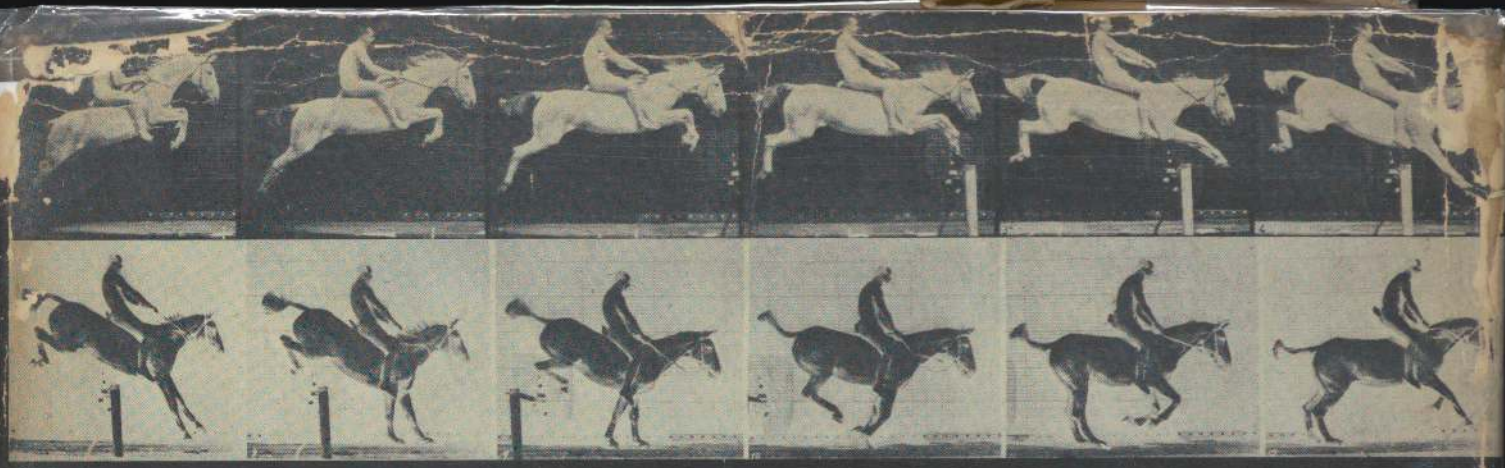

PHOTOGRAPHY

1839-1937

THE MUSEUM OF MODERN ART · NEW YORK

PHOTOGRAPHY 1839-1937

Elodie Courter

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1839 - 1937

WITH AN INTRODUCTION BY BEAUMONT NEWHALL

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An exhibition covering so broad a field must necessarily be limited. Certain omissions have been deliberate. Book illustration and the photo-mechanical reproductive processes demand an exhibition in themselves. The development of photo-montage (the assembling of sections of photographs to create a new picture) and layout, while dependent on photography, have an independent esthetic character. Certain omissions have been due to lack of material. Few collectors have turned their attention to photography for its own sake, and it is hoped that the exhibition will bring to light many photographs whose existence was unknown to the Director of the Exhibition. At the request of the photographer, the later work of Alfred Stieglitz has not been included.

In addition to those collectors and photographers whose cooperation has made this exhibition possible, the Director of the Exhibition, on behalf of the President and Trustees of the Museum, wishes to thank:

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BEAUMONT NEWHALL, *Director of the Exhibition*

Photography 1839-1937

Light entering a minute hole in the wall of a darkened room casts on the opposite wall an inverted image of whatever lies outside the hole. Aristotle noted this phenomenon in the fourth century B.C.; it was put to practical use by medieval scientists to observe eclipses of the sun. Leonardo da Vinci clearly describes the dark room, or *camera obscura* as the device came to be called, in his manuscripts. He is the first artist to mention this phenomenon; not until the Renaissance did the public demand "correct" *linear* perspective as formed by such optical projection. For example, Albrecht Dürer, the typical German artist of the transition between the Gothic and the Renaissance, in his book on proportions carefully describes and illustrates devices to aid the artist in rendering nature according to *orthographic* perspective.

Leonardo's description of the dark room lay hidden in his secret manuscripts; not until the Neapolitan Giovanni Battista della Porta independently described the camera obscura in his very popular book *Natural Magic* (1553) was the phenomenon generally known and put to practical use. Before long a lens was substituted for the minute hole, thus making the image brighter; this was proposed by an artist, Danielo Barbaro, in his *Practice of Perspective* (1568). At this period the camera obscura was quite literally a dark room, into which the draftsman entered. By tracing the outlines of the projected image, he was able to secure an accurate drawing of whatever happened to be outside the room. Draftsmen were not the only people to use the device, however. Magicians astonished the public by staging theatrical performances outside a large camera obscura while the audience, seated inside, viewed the projected image. Thus was laid the foundation for moving pictures.

Obviously this kind of camera was bulky, for it had to contain a man. Many transportable dark rooms were fitted up with handles, so that they could be carried around like sedan chairs, but all the apparatus was so clumsy that its use was limited. In the seventeenth century, however, a

truly portable camera was perfected. A small box was fitted with a lens at one end and a translucent screen at the other end. Instead of getting inside the camera and viewing the front of the image from the inside, the back of the image was observed through the screen. By deflecting the image to the top of the camera with a mirror, and shading the screen with a hood, an apparatus was made which closely resembles the modern reflex camera. The draftsman pointed the lens at the scene which he wished to draw, placed a thin piece of paper over the ground glass, and traced the outlines of the image. Cameras of this type were a regular part of artists' equipment in the eighteenth century.

Long before photography was perfected, the principle of the camera was well known, and its image had been recorded manually countless times.

Light changes the nature of many chemical substances. The chlorophyll of vegetation becomes green on exposure to light; colored stuffs fade. Among the substances radically altered by light are the salts of silver: the combining element is liberated, leaving pure metallic silver which, because unpolished, is black. The light sensitivity of these salts was first observed by Johann Heinrich Schulze in his classic experiment of 1727.

Into a glass flask Schulze poured a mixture of chalk, silver and nitric acid. After thorough shaking, the silver and acid combined to form silver nitrate. When held in the sunlight, the substance changed from white to deep purple. Exposure to the heat of a furnace produced no such change, so Schulze deduced that the reaction must have been caused by the sun's light rather than by its heat. To prove his deduction, he pasted stencils of opaque paper on the flask. After exposure to light the stencil was removed, and the figures or writing which had been cut out of the paper to form the stencil were clearly visible on the surface of the mixture within the flask, traced in the dark color of metallic silver.

Thus by 1727 the ability of light to darken certain materials and its ability to form a two-dimensional image of the world of three dimensions were both known. Yet not until the nineteenth century were experiments made toward the production of photographs, although a photograph is essentially the combination of these two phenomena. A piece of metal, paper, or glass, coated with a light-sensitive substance, is placed

inside a camera. This sensitive material is changed by the light of the camera's image in such a way that a record of that image can be obtained.

THE NEW DEMAND FOR PICTURES

The rise of the bourgeoisie at the end of the eighteenth century created a demand for more pictures. Wood engraving was revived, and lithography was invented—two methods of reproducing pictures in great quantities. Up to this time portraiture had been limited to the aristocracy; the middle classes now demanded their portraits at prices which they could afford. To answer this demand, new and cheaper ways of making portraits were devised where the artist's skill was replaced by an ingenious mechanism. The most popular, and the simplest, was the *silhouette.* The sitter was placed between a strong light and a translucent screen. A sheet of drawing paper was attached to the opposite side of the screen and the operator traced the outlines of the sitter's shadow, which was subsequently filled in with black. Such a technique, while cheap, was not entirely satisfactory, for it yielded only a contour image of the profile, and its size was approximately that of the sitter's head.

In 1786 Gilles Louis Chretin invented the *physionotrace.* The silhouette screen became a transparent glass; the sitter's features were traced with a stylus. By a system of levers resembling a pantograph, this stylus was connected with an engraving tool which recorded its every movement on a small copper plate in greatly reduced size. This plate was subsequently inked and printed exactly like an ordinary copperplate engraving (Plate 1). The physionotrace was immensely popular; six hundred portraits made with its aid were exhibited at the 1797 Salon.[1]

The development of photography was conditioned by another factor than the demand for cheap portraits: the growth of amateur artists. The accomplished gentleman or gentlewoman of the late eighteenth and early nineteenth century was expected to write poetry, play some musical instrument and sketch. Unfortunately not all aristocrats were talented, and consequently they welcomed any mechanical aid. We find the camera obscura mentioned many times, together with other devices —the *camera lucida* (which directed a virtual image onto paper) and the "Claude glass," a convex mirror of black glass named in honor of Claude

[1] Freund, Gisèle. *La Photographie en France au Dix-neuvième Siecle,* Paris, Monnier, 1936, pp. 17-23.

Lorrain. Sir John Herschel, the discoverer of "hypo" as a photographic chemical, drew a picture of the Temple of Juno, Girgenti, Sicily. This sketch, in the Science Museum, London, is signed: "J. W. Herschel del. Cam. Luc. June 24, 1824." Probably at no other period were there so many amateur artists; their ineptitude fostered the development of many kinds of reproductive devices.

Photography was definitely created to compete with manual ways of making pictures. Simultaneously and independently two distinct methods were perfected: the *daguerreotype* (on metal) in France; the *talbotype* (on paper) in England. A third method, partaking of both these techniques yet apparently quite independent, was also perfected at this time. All these processes depended, however, on the work of earlier experimenters. To these pioneers we must now turn.

"PROFILES BY THE AGENCY OF LIGHT"

Probably the first to attempt to make a photograph with the camera was Thomas Wedgwood, son of the British potter. In 1802, in collaboration with Sir Humphrey Davy, he presented a paper at the Royal Institution of Great Britain entitled: *An Account of a Method of Copying Paintings upon Glass and of Making Profiles by the Agency of Light upon Nitrate of Silver.*[1] Paper or leather was bathed in a silver nitrate solution, a painting or drawing upon glass was placed over the sensitized surface and the whole was exposed to light. Wherever the glass had not been drawn upon, light was transmitted to the sensitive paper, which turned dark. The portions beneath the drawn or painted areas were protected from the rays of the sun and consequently remained white. Exactly the same principle is used every day for the production of blueprints, except that translucent paper is used instead of glass and the sensitive material turns blue because of being treated with an iron salt instead of silver nitrate. Pictures so obtained are negative, that is the white portions of the original are reproduced as the dark tones against which the drawing appears in white.

Profiles of objects could be made by the same technique. A leaf placed on sensitive paper and exposed to light will leave its outline in

[1]Wedgwood, T. and H. Davy. "An Account of a Method of Copying Paintings upon Glass and of Making Profiles by the Agency of Light," *Journal of the Royal Institution*, 1802, vol. 1, p. 170.

white on a dark ground; semi-transparent material will transmit light in proportion to its opacity, with the consequence that middle tones can be secured.

Wedgwood and Davy were dismayed that the records so obtained were not permanent. They could find no way to render the sensitive material insensitive to further action of light when the protecting areas of the drawing, or the object, were removed. Only by taking them into a dark room could they be prevented from turning black, and they had to be examined by the weak light of a candle.

These experiments were but the logical development of Schulze's work of 1727, with this important difference: whereas Schulze was interested only in proving that the silver salts were sensitive to light, Wedgwood and Davy used this property to make pictures. They were the first to describe the "shadowgraph" or "photogram"—a silhouette picture made without a camera—which was revived as an artistic medium in 1918. Such a process however, is a distant step from the far more important problem of fixing the camera's image mechanically and chemically. Wedgwood attacked the problem, but as his material was not sensitive enough to record the weak image of the cameras then used by draftsmen, he gave the matter up as impossible. Davy, however, was successful in a very limited way.

Because their results were not permanent, no work of Wedgwood and Davy is now extant.

NIEPCE AND HELIOGRAPHY

The first photographs made by a camera must be credited to Joseph-Nicéphore Niépce of Chalon-sur-Saône. Although not a single example of these photographs remains today, his letters[1] and eye-witness accounts leave no doubt that, between 1816 and 1829 he succeeded many times in fixing the camera's image with comparative permanency. Several of these early pictures were commented on by the editor of an English periodical more than a decade after they were made.

Niépce was an enthusiastic experimenter. When lithography was in-

[1]The majority are published in Fouque, Victor: *The Truth Concerning the Invention of Photography*, trans. by Edward Epstean, New York, Tennant and Ward, 1935 (original edition, 1867). Following this authority the spelling *Niépce* is here used. The family later dropped the acute accent.

troduced in France he became very much interested in this new graphic technique and wished to simplify the process. Through these experiments he conceived the idea of fixing the image of the camera obscura. To his brother Claude, who was in Paris promoting a hot-air engine which the two had invented, he wrote on April 1, 1816: "The experiments that I have thus far made lead me to believe that my process will succeed as far as the principal effect is concerned, but I must succeed in fixing the colors; that is what occupies me at the moment, and it is most difficult." Twelve days later he describes his camera: "I used some of the time while here making a kind of artificial eye, which is nothing but a small box six inches square; the box will be equipped with a tube that can be lengthened, and will carry a lenticular glass."[1]

Niépce broke the lens of this camera. Nothing daunted, he made a miniature camera, one and one-half inches square, from a jewel case and the lens of a microscope. "I placed the apparatus in the room where I work, facing the bird house, and the open casement. I made the experiment according to the process which you know, my dear friend," he wrote to Claude on May 5, 1816, "and I saw on the white paper all that part of the bird house seen from the window and a faint image of the casement which was less illuminated than the exterior objects. . . . That which you have foreseen has happened. The background of the picture is black, and the objects white, that is, lighter than the background."[2]

This is an accurate description of a negative photograph, where the brightest lights of nature are represented in dark tones and the deepest shadows by the lightest. Niépce was troubled by this reversal: "the effect would be still more striking, as I have told you, or moreover as I need not tell you, if the order of the shadows and the lights could be reversed."[3] As we have seen, the copies which Wedgwood and Davy secured of natural objects and of paintings upon glass showed this same reversal of tones—a black leaf was drawn as a white outline on a dark ground. If Niépce had only thought of copying in this way the picture he had obtained in the camera, he could have inverted the tones again so that they corresponded to the values in nature. Moreover it would have been possible for him to secure from a master negative any number of identical copies.

[1]Fouque, *op. cit.*, p. 29. [2]Fouque, *op. cit.*, p. 30. [3]Fouque, *op. cit.*, p. 34.

But Niépce knew nothing about the Englishmen's work. Thirteen years later this negative-positive technique, which is the basis of all modern photography, was conceived by Henry Fox Talbot. Niépce wanted to secure pictures directly in the camera, by one operation; so he gave up this preliminary work and experimented with substances which, instead of darkening, bleach white on exposure to light. His experiments were fruitless until he found that a certain type of bitumen, normally soluble in lavender oil, became insoluble on exposure to light. At first, instead of trying to reproduce the infinite shades of light and dark which form the camera's image, he attempted to fix simply the black and white contrast of an engraving. Isidore, Niépce's son, recounts: "I witnessed the operations relative to the portrait of Cardinal d'Amboise. My father spread on a well polished piece of pewter, bitumen of Judea dissolved in Dippel's oil. On this varnish he placed the gravure which was to be reproduced and had been made transparent, exposing the whole to the light entering his apparatus. After a time, more or less long according to the intensity of this light, he immersed the plate in a solution which little by little made the image appear which until then remained invisible; after that he washed the plate and let it dry. After these different operations, for the purpose of etching it, he placed it in water containing more or less acid.

"My father sent this plate to Lemaître, requesting him to contribute his talent in engraving the design still deeper. Lemaître acceded very courteously to the request of my father. He pulled several proofs of this portrait of Cardinal d'Amboise."[1] The original plate which Isidore saw made is now in the collection of the Royal Photographic Society of Great Britain in London (Plate 2).

The engraving, of course, served as a negative. The printed lines held back the light; the white paper permitted it to pass through. Thus parts of the bitumen were rendered insoluble; those under the lines remained soluble and could be removed by bathing in lavender oil. The bare metal was then either etched to form a printing plate or blackened with iodine fumes, and the varnish removed.

This process, which is photo-engraving rather than photography,

[1] Fouque, *op. cit.*, p. 64.

would not detain us if Niépce had not attempted to fix the camera's image in a similar manner. Using glass instead of a metal plate, Niépce was partially successful; the layer of bitumen was dissolved in proportion to the light which had fallen upon it in the camera. The unexposed bitumen was opaque; this, when viewed against the light, represented shadows, or no light. The fully exposed bitumen was completely dissolved, leaving clear glass for the high-lights. The partially exposed bitumen was reduced to a thin layer which was more or less translucent and represented the middle tones.

In 1827 Niépce visited his brother Claude at Kew. There he met Francis Bauer, who was the secretary of the Royal Society. Bauer urged him to communicate his experiments to the Society. This institution refused to receive his communication because it was against its rules to discuss secret processes and Niépce declined to reveal his technique. He gave Bauer some samples of his work; three of them, including the Cardinal d'Amboise portrait, with Bauer's endorsements, are now owned by the Royal Photographic Society. These three are examples of photomechanical reproductions of engravings, but Bauer in a letter to the *Literary Gazette* (February 27, 1839) states that Niépce showed him in 1827 "his first successful experiments to fix the image of nature." The editor of the *Athenaeum* saw this photograph in 1839, twelve years after it had been made. Commenting on Bauer's letter in the issue of March 9 of that year, he wrote: "The specimens in the possession of Mr. Bauer, and others given at the time to Mr. Cussels of Richmond, have been obligingly submitted to our examination. They may be divided into—pictures copied from engravings and pictures copied from nature. Mr. Bauer possesses the only picture taken from nature."

In consideration of these statements, we have every reason to believe that Niépce made a negative photograph in 1816 and a direct positive before 1827.

MEETING WITH DAGUERRE

Before he left for England, Niépce received, in 1826, a letter from a person unknown to him who claimed that he had been experimenting on similar lines and had heard of Niépce's work through Chevalier, the optician who supplied each of them with lenses. Niépce, naturally wary,

sent him a vague answer. A second note led him to find out more about the writer. He added a postscript to a letter to Lemaître dated February 2, 1827: "Are you acquainted, Monsieur, with one of the inventors of the *Diorama,* Daguerre?"[1]

Lemaître answered (Feb. 7): "You ask me if I know Daguerre? It is several years since, without knowing him particularly, I attended some soirées, where I met him. Last spring, having been employed by a publisher to engrave one of his paintings in the Luxembourg Gallery, I showed him the sketch I had made from it: this is how I have made his acquaintance; I have not seen him since although I went to see one of his tableaux at the Diorama, and I must submit to him at the end of the month a proof of my engraving, which is almost finished.

"Concerning the opinion which I have of him, Daguerre, as a painter, has a fine talent for imitation, and an exquisite taste for preparing his tableaux. I believe he has a rare intelligence for the things which deal with machines and lighting effects; the amateur visitor to his establishment is easily convinced; I know he has occupied himself for a long time with perfecting the camera obscura, without nevertheless knowing the object of his work, such as you and Count Mandelot have discussed."[2]

On the basis of this letter, Niépce sent Daguerre a sample of his heliographic reproduction of an engraving. Later in the year, while en route for England, he visited Daguerre in Paris. "I have had frequent and long interviews with M. Daguerre," he wrote his son Isidore. "He came to see us yesterday. His visit lasted for three hours; we shall have to return it before we depart, and I do not know how long we shall remain with him, because this will be the last time, and the conversation on the subject which interests us is really endless.

"I must repeat to you, my dear Isidore, what I said to M. Champmartin. I have seen nothing here that impressed me more, which gave me more pleasure than the Diorama. We were conducted through it by M. Daguerre, and we had the opportunity to contemplate the magnificent tableaux which are exhibited there quite at our ease. The interior view of St. Peter's at Rome, by M. Bouton, is certainly an attempt at an admirable work and it produces the most complete illusion. But noth-

[1] Fouque, *op. cit.*, p. 66.

[2] Fouque, *op. cit.*, p. 68.

ing is superior to the two views painted by M. Daguerre; one of Edinburgh, taken by moonlight during a fire; the other of a Swiss village, looking down a wide street, facing a mountain of tremendous height, covered with eternal snow. Those representations are so real, even in their smallest detail, that one believes that he actually sees rural and primeval nature, with all the fascination with which charm of colors and the magic of light and shade endow it. The illusion is even so great that one attempts to leave his box, in order to wander out into the open and climb to the summit of the mountain. I assure you there is not the least exaggeration on my part, the objects in addition are, or seem to be, of natural grandeur."[1]

Small wonder that the creator of such illusionistic spectacles was interested in the idea of photography!

In 1829 Daguerre and Niépce formed articles of partnership to last ten years. Four years after the signing of the contract, in 1833, Niépce died at Chalon-sur-Saône.

Primitive Photography

By 1837 Daguerre had modified the technique of heliography radically and succeeded in photographing a corner of his studio (Plate 3). So greatly had he improved Niépce's process that he persuaded Isidore Niépce, who had succeeded his father as Daguerre's partner, to cede him priority in an amendment to a second contract, made in 1835. The process was to carry the name of Daguerre only, "daguerréotypie," but it was to be made public jointly with heliography "in order that the name of M. J.-Nicéphore Niépce may figure always, as it should, in this discovery." The contract continues with a plan for selling the new process by public subscription. The associates met with no success in their attempts to sell subscriptions; possibly because Daguerre refused to disclose the secret, the public was skeptical of daguerreotypy. Daguerre is said to have approached various European sovereigns in the vain hope of selling them the rights.

[1] Fouque, *op. cit.*, p. 75.

Then Arago, the famous scientist, heard of the process. Through his interest, the Academy of Sciences, on January 7, 1839, proposed that the French government should purchase the full rights after the value of the process had been proven by thorough investigation. For six months the commission of the Academy of Sciences, headed by Arago, worked with Daguerre in great secrecy. Ill luck befell Daguerre; on March 3 the Diorama burned down, destroying not only the inventor's means of income but his laboratory and much of his pioneer work. Apparently the disaster forced him to agree to a recompense offered by the state: an annuity of 4000 francs ($800) for the publication of his method of photography, and half that sum, 2000 francs ($400), for the disclosure of his invention of the Diorama. The state offered Isidore Niépce the same amount, 4000 francs, in recognition of the part his father had played in making photography possible. Both houses passed the appropriation; Arago was thereupon directed to make public all the technical details on August 19, 1839.

The public's reaction to these negotiations was extraordinary. They had seen Daguerre's finished products at the Chamber of Deputies. "In one, representing the Pont Marie, all the minutest indentations and divisions of the ground, or the building, the goods lying on the wharf, even the small stones under the water at the edge of the stream, and the different degrees of transparency given to the water, were all shown with the most incredible accuracy," wrote one eye-witness.[1] The Leipzig *Anzeiger*—for the news spread throughout Europe—went so far as to brand such a process sacrilegious.[2] Curiosity gave way to impatience: such a process was impossible, Daguerre was a hoax. An open circular letter, multiplied by lithography and signed "Philolithographe, one who remembers that Daguerre was called an idealist because he didn't succeed," and entitled *Another Dream Which May Well Become a Reality*, is dated July 30, 1839—the very day when the Academy's resolution was passed. Excitement ran high, and on the day set for formal publication all Paris was tense.

[1] Reprinted from *Mechanic's Magazine* in *Journal of the Franklin Institute*, October, 1839, vol. 24, pp. 286-7.

[2] Quoted in Freund, *op. cit.*, pp. 101 *ff.*

THE PUBLIC DEMONSTRATION

"Perhaps at no other time," wrote Gaudin five years later, "have devotees of science and natural phenomena shown more impatient curiosity than on the occasion of the astonishing discoveries of Messrs. Niépce and Daguerre which enabled all that lies before our eyes to be reproduced down to the last detail. The brilliant lectures delivered by Messrs. Arago and Gay-Lussac before the two Houses were not of a nature to chill the enthusiasm; so the palace of the Institute was stormed by a swarm of curious people at the memorable sitting [of the Academy of Science and the Academy of Fine Arts] on August 19, 1839, where the process was at long last divulged.[1] Banned from the hall like many others for having come only two hours beforehand, I, with the crowd, was on the watch for everything that happened outside. A frightened man comes out at one moment; he is surrounded, he is questioned, and he answers as if he knew it all, that bitumen of Judea and lavender oil is the secret. Questions are multiplied, but he knows nothing more, so we are reduced to talking about bitumen of Judea and lavender oil. But soon the crowd surrounds a newcomer even more startled than the first. And he tells us that it is iodide and mercury, with no further comment. Finally the sitting terminates; the secret is divulged. As for me, I run right away to buy iodine, reluctant to see the sun setting and myself obliged to put off the experiment until the next day."[2]

The privileged ones within the palace were disappointed not to see Daguerre, who excused himself as suffering from a sore throat. The demonstration was conducted by Arago. A brochure, *History and Description of the Technique of Daguerreotypy,* was published on that very day by Susse Frères. Gaudin's impatience to try the new invention was matched by others; he continues: "A few days later, opticians' shops were crowded with amateurs panting for daguerreotype apparatus, and everywhere cameras were trained on buildings. Everyone wished to copy the view from his window, and he was lucky who at the first trial got a silhouette of roof tops against the sky. He went into ecstasies over chimney tops, he counted again and again roof tiles and chimney bricks, he

[1]Arago, D. F. *Rapport sur le daguerréotype, lu à la séance de la Chambre des Députes le 30 Juillet 1839 et à l'Académie des Sciences, séance du 19 Aôut.* Paris, Bachelier, 1839.

[2]Gaudin, M. A., *Traité Pratique de Photographie,* Paris, Dubochet, 1844.

was astonished to see the very mortar between the bricks—in a word, the technique was so new and seemed so marvelous that even the poorest proof gave him an indescribable joy."

The handbook published on that momentous day was so complete that anyone could have the apparatus built by a skilled instrument maker and anticipate some sort of result if he followed the directions carefully. Joachim Bishop, a Philadelphia instrument maker, using the translation of the manual which was published in the *Journal of the Franklin Institute,* Philadelphia, November, 1839, constructed three cameras in 1839 which follow Daguerre's description in every detail; one of these cameras is now in the Franklin Institute. The spread of photography can, therefore, be partially judged by the translations and editions of Daguerre's brochure all dated 1839:[1]

Paris	5	London	3
Berlin	3	London and Edinburgh	1
Stuttgart	2	Philadelphia	1
Carlsruhe	1	Naples	1
Hamburg	1	Genoa	1
Halle	1	Stockholm	1
Quedlinburg	1	Barcelona	1
St. Gall	1	Madrid	2

Twenty-six editions within five months!

But Parisians complained that the brochure was written in too scientific a language; the process seemed excessively complicated. In answer to such criticism, Daguerre was asked to give public demonstrations every week, so that the very simplicity of the process might be made clear—for obviously the government was obliged to defend the invention which it had purchased with public funds. A daguerreotype made by Hubert, friend, pupil and assistant to Daguerre, at one of these meetings is now in the collection of the French Society of Photography.

A CONTEMPORARY ACCOUNT

At a further demonstration, on September 17 at the Grand Hotel on the Quai d'Orsay, an American reporter was present. His account, pub-

[1]Stenger, Erich. *Daguerre Schriften,* Berlin, Author, 1936.

lished in the New York *Star* for October 14, 1839, is remarkably vivid and clear. Daguerre himself conducted the demonstration:

"He took a plate of copper plated with silver, and rubbed the silver surface in a slight manner with very fine pumice powder and sweet oil, using small balls of cotton wool for this purpose. He thus completely dulled the surface, and I noticed that he rubbed first with a circular motion, and then with straight lines from top to bottom.

"He then washed the plate thus dulled in a liquid consisting of: distilled water, 16 parts; nitric acid, 1 part. He then gave a slight heat to the plate by passing it over the flame of a lamp—the copper side being next to the flame and the silver surface uppermost. He then washed it a second time in dilute nitric acid.

"The plate was now ready for a coating of iodine. The apartment was darkened, and the plate, fixed on a small board, was placed (with the silver part downwards) over an opening the size of the intended picture, in the lid of a box at the bottom of which the iodine was. Half way down in the box was a slight wooden frame on which a piece of muslin was strained, and through this muslin, as the iodine evaporated, the fumes rose, and were thus equally received upon the silvered surface, thus forming a coating of iodine of silver, having the yellow appearance of brass.

"A camera obscura was now brought up. Its focus had previously been adjusted by trying the effect of the picture on a bit of ground glass. The plate prepared as above was placed in the camera. The view intended to be taken was the Tuileries, the Quay and the Seine in front of the window where the camera obscura was placed. It was there to remain until the action of the sun's rays on its surface was sufficient. This occupies a period of from five to forty minutes, according to the time of year and state of the weather, and as the director (for I cannot call him the operator) cannot see by the plate how the process goes on, experience alone can tell him how to judge as to the advancement which the action of the light has made. In this instance the day was dull, and the plate remained fifteen minutes in the camera obscura. When it was taken out it appeared exactly the same as when it was put in, and the people looked very blank, I do assure you, at what looked like a failure; but indeed one could scarcely tell whether or not it had been marked, for the process requires that no light should fall on it before the finishing operations.

"M. Daguerre took the plate and held it with the silver part downwards, and thus held it for half a minute, while three persons peeped upon it and said, 'Nothing has been traced upon it.'

"He fixed it then, at an angle of 45°, in a box at the bottom of which was an earthern pan holding two pounds of mercury. Under the pan was a lamp which heated the mercury to 62° Centigrade or 117° Fahrenheit, and as the mercury grew hot its globules arising, combined with the prepared surface of the metal, *brought out the picture*. In front of the box is a glass spy hole, through which the process is watched, and the moment it was completed the plate was taken out and washed with distilled water saturated with common salt or with hyposulphite of soda, heated a degree below the boiling point. This finished it, and the picture, thus literally executed by the sun, was handed about.

"I never saw anything more perfect. When examined by the naked eye every object appeared minutely engraved, but when viewed through a magnifying glass the difference of grain in the separate flags on the *trottoir* was visible, and the texture of everything, if I may use the phrase, was easily distinguishable.

"The time occupied by the whole process was 72 minutes, which is much more than I had been led to expect."[1]

The *Star* reporter was amazed that there was no trace of an image on the plate until it had been "brought out" by the mercury vapor. This *development* of the hidden, or latent, image enabled Daguerre to reduce the exposure time; it is a principle which has been followed ever since in every photographic process.

FAULTS OF THE DAGUERREOTYPE

The majority of contemporary critics praise the exceptional detail of the daguerreotype. But even so enthusiastic a daguerreotypist as Gaudin is forced to admit that "the first proofs had several major faults which, in spite of the unparalleled perfection of certain details, troubled artists. The picture was reversed, the tone was harsh *(criard)*, masses of greenery appeared only as silhouettes, and nowhere were any people to be seen; in a word color and life, the two parents of all poetry, were lacking."

Ever since the day when daguerreotypy was published, photogra-

[1] Quoted by Sachse, *American Journal of Photography*, June, 1892, pp. 247-249.

phers have struggled to meet this criticism. If we have at last succeeded in adding life, attempts to introduce color are still in the experimental stage; the satisfactory combination of the two is yet to be reached.

Daguerreotype exposures were so long that street scenes showed no people; traffic and pedestrians did not remain still long enough for the lens to record their image. It is hard for us to realize the length of exposure in these primitive days. Here is an actual exposure table from an 1840 manual.[1] The shortest time is 67,500 times greater than the snapshot taken today by the merest tyro with a box camera.

	Summer	*Winter*
Bright sunlight		
White subjects	4– 5– 6 minutes	8– 9–10 minutes
Colored subjects	8– 9–10 "	12–15–17 "
Diffused sunlight		
White subjects	12–15–18 "	25–30–40 "
Colored subjects	20–25–30 "	40–50–60 "

The daguerreotype had another disadvantage. Each picture was unique. It could be duplicated only by being rephotographed or copied by hand. Many engravings and lithographs after daguerreotypes were published in albums; of these the *Excursions Daguerriennes*[2] (1841-1842) was the most famous. The daguerreotypes were painstakingly copied by tracing, and to endow them with life, figures and traffic were added. Almost at once experiments were begun to convert the daguerreotype plate into a printing plate by etching out the shadows and electroplating the high-lights. Two of these primitive photogravures were published in the *Excursions* (Plate 4) but the process never became common practice.

Although these albums were very popular, the public was disappointed that the daguerreotype did not reach the heights anticipated by the first announcement. "It has excited some surprise," we read in the London *Athenaeum* of October, 1839, "that, after the eager and natural curiosity of the public concerning the discovery of M. Daguerre while it yet remained a secret, so little interest should now be taken in the subject."

Daguerreotypy needed radical improvements if it was to meet this

[1] [Hubert] *Le Daguerréotype Consideré sous un Point de Vue Artistique, Méchanique et Pittoresque par un Amateur,* Paris, Giroux, 1840.

[2] *Excursions Daguerriennes,* Paris, Rittner and Goupil, Lerebours, Bossange, 1842.

early criticism and play the part assigned to it by the public. Curiously enough Daguerre himself did little to perfect the process he had launched. He took up again the scenic artist's brush and palette, and in 1842 completed painting an illusionary apse for the church of Bry-sur-Marne. He died in this village in 1851.

PERFECTION OF THE DAGUERREOTYPE

The desire to have daguerreotypes enlivened by people and the demand for portraits made greater working speed imperative. There are three ways of decreasing the exposure of a photograph: 1) the subject can be more brightly illuminated, 2) the lens can be perfected to admit more light to the sensitive plate, and 3) the plate can be made more sensitive. All three were worked on by independent investigators and even today primary photographic improvements fall in the same three catagories.

The first contribution came from Vienna, in the form of a double lens, designed by Josef Petzval and constructed by Voigtländer, which admitted sixteen times more light in a given period than the simple lens by Chevalier with which the original Daguerre cameras were fitted. As soon as these new lenses were introduced to Paris, in May, 1840, they became so popular that French opticians were forced to imitate them and to market them as "German lenses."

The next advance was an increase in the speed of the plate. Many people thought of adding to the iodized surface some other more sensitive chemical, but it is clear that the first to publish a practical method was John Frederick Goddard, a lecturer on optics and natural philosophy at the Adelaide Gallery, London. The *Literary Gazette* of December 12, 1840, describes his process: after the silver plate had been fumed with iodine, the operation was repeated with bromine fumes. By combining bromide acceleration with the Petzval lens, it became entirely possible to take portraits regularly at an exposure of one minute.

Gaudin's first criticism was answered—daguerreotypes acquired life. The reversed image which troubled him was easily corrected by using a prism in front of the lens, a simple device which was impractical with the first daguerreotypes because it added to the exposure time. The harsh tones were partially alleviated with the invention of gold toning by Hippolyte-Louis Fizeau in March, 1840. After exposure the plate was

bathed in a solution containing gold chloride. This darkened the polished silver which formed the shadows and heightened the high-lights.

As soon as these improvements had been made innumerable studios were opened and all the world rushed in to be photographed.

DAGUERREOTYPE PORTRAITS

We know the names of innumerable daguerreotypists; we have their advertisements; we possess descriptions of their galleries. Yet, in spite of the large number of existing daguerreotypes, it is difficult to form an exact judgment of individual work. Few daguerreotypes bear any kind of maker's mark, and when this does appear it is invariably on the frame or within the locket; when these have disappeared, identification becomes difficult. Indeed it is impossible to determine with accuracy the place of origin or even the year of production of a daguerreotype unless we happen to possess definite documentation. Also, the very fact that the pictures are small, within convenient protective lockets and of sentimental value as family documents, has kept countless numbers in private hands.

One thing that strikes us as we examine the early French work is the type of person represented. All walks of life sat before the portraitist; thanks to the cheapness of production, financial distinctions mattered little. Distinguished ladies (Plate 5) as well as peasants and ordinary working men (Plate 8) have left us their pictures. They are remarkably straightforward and unflattering. This is partly due to the lack of retouching, which, except for slight tinting, the fragile surface of the silvered plate did not allow. The precision of detail inherent in the technique also played its part. But perhaps the penetrating simplicity of daguerreotype portraits is more largely due to the length of exposure. It was hard work to be photographed: you had to cooperate with the photographer and sit still under the brightest possible light for at least a minute. If you moved, the picture was ruined; if you could not put yourself at ease, the result was so forced that you did not keep it.

A chapter of *La Grande Ville* (1844), a literary and pictorial description of Paris, is devoted to a daguerreotypist's studio which was so popular that people waited their turn for an hour. One sitter, "who is naturally ugly, who sees herself even uglier in the melancholic atmos-

phere of the daguerreotype, is convinced that her portrait is a failure and leaves without taking it." The anonymous author continues: "After her, there comes a man with a tic, who everlastingly turns up the corner of his mouth, and in spite of it wants to be daguerreotyped; then another who blinks his eyes rapidly, then an old lady who continually shakes her head. All these people cannot understand that they will never have a portrait by this process."

Although the majority of daguerreotypes are portraits, one should not overlook such architectural views as the early Cathedral of Notre-Dame, Paris, or Saint Peter's, Rome. Architectural plates have not been as jealously guarded as portraits. They were a means to an end; after copies had been made for such albums as the *Excursions Daguerriennes,* they were destroyed or mislaid.

DAGUERREOTYPES IN AMERICA

It is interesting to observe that, of all countries, America adopted the daguerreotype with most enthusiasm, and that it lived longer here than elsewhere. American daguerreotypes were famous abroad for the excellence of their technique. New York, Boston and Philadelphia learned about the process almost simultaneously, and from these centers traveling daguerreotypists, like the hero of Hawthorne's *The House of Seven Gables,* circulated throughout the country. Commercial portraiture was first practiced here, and the bulk of American daguerreotypes are portraits.

While all Paris was waiting expectantly for daguerreotypy to be published, Samuel F. B. Morse succeeded in visiting Daguerre at his laboratory, and sent an account to the New York *Observer* which appeared in April, 1839. In a letter to Marcus A. Root, author of the earliest history of photography in this country,[1] Morse describes taking a daguerreotype in September of that year from the roof of New York University, and claims to have made portraits of his wife and daughter, who patiently sat from ten to twenty minutes in brilliant sunlight. He does not claim the honor of having taken the first portrait, however, which may have been done, he adds, by his associate J. W. Draper, with whom he opened a commercial studio in April, 1840.

[1] Root, Marcus A. *The Camera and the Pencil.* Philadelphia, Author, 1864.

In 1839 Alexander Woollcott and John Johnson invented a new type of camera, which used a concave mirror in place of a lens—a principle used today in large astronomical telescopes. With this they were able to take portraits, but the results obtained were so small, from three- to five-eighths of an inch square, that they were impractical.

In Philadelphia interest was very great. Here the Daguerre manual was first translated and cameras were made from the description contained in that brochure. Joseph Saxton took a view of the old Philadelphia mint in September, and Robert Cornelius, using an opera glass for a lens, is said to have made portraits in five minutes' time in October.

Daguerreotypy was brought directly from Paris to Boston by one Monsieur Gouraud, a pupil of Daguerre, who gave a series of lectures[1] which inspired many people to take up the new technique. One of those who learned from Gouraud was Josiah J. Hawes, who immediately set himself up in business with Edward Southworth. Their work must be considered among the finest ever produced, and posterity is indeed fortunate that they made it an invariable rule to photograph all sitters three times. Most of their clients purchased only one or two, so an unparalleled collection of daguerreotypes is still in the possession of the Hawes family. Perhaps the finest of these portraits is that of Chief Justice Shaw (Plate 12), which has been described as "the absolute power of a crag vitalized by a human spirit."[2] The great rival of Hawes and Southworth was John A. Whipple, whose splendid portrait of Longfellow is dated 1859.

Although the Langenheim brothers were not among the early Philadelphian workers, they achieved international fame. Immigrants from Germany, they took up daguerreotypy when their brother-in-law Voigtländer, who constructed the Petzval lens, sent them an all-metal camera, which looked like a fat telescope. They quickly achieved prominence, and, while specializing in portraits, also did some landscape work. In 1845 they made several panoramic views of Niagara Falls, each composed of five plates set within a frame simulating an arcade. One of these was sent to Daguerre, a second to Queen Victoria, a third to the King of Prussia, and a fourth to the King of Saxony. A fifth is now in the posses-

[1] *Description of the Daguerreotype Process or A Summary of M. Gouraud's Public Lectures, According to the Principles of M. Daguerre.* Boston, Dutton and Wentworth, 1840.

[2] *Photo-Era,* 1900, vol. 4, p. 365.

sion of William Langenheim's son, who has lent it to the exhibition.

The remarkable feature about this panorama is that the brothers were able to give so short an exposure that people and horses standing beside the waterfall are rendered in perfect detail. It was this technical excellence which prompted the German kings to offer the Langenheim brothers gold medals. The illusionistic presentation seems strange to us; we feel it hard to believe that the makers were not content to let the daguerreotypes speak for themselves. The clue lies in the title: "Panorama of the Falls of Niagara" (Plate 10). Surely the brothers had in mind that extreme illusion which so impressed visitors to Daguerre's Diorama.

The daguerreotypes of Matthew B. Brady have been eclipsed by the remarkable documentation of the Civil War which he directed. His gallery on Broadway, and later in Washington, was famous; the technical perfection of his work brought him a medal from the 1851 London Exposition. M. M. Lawrence and Meade Brothers were his great rivals. The latter achieved the unique distinction of having photographed in 1841 the camera-shy inventor of the process they exploited, Daguerre himself.

These three galleries were magnificently luxurious, to judge from contemporary pictures of them. Indeed, the success of a daguerreotypist seems to have been measured by the luxury of his quarters, and photographers outdid one another in creating an atmosphere of regal splendor. A contemporary description of the Boston studio of Luther Holman Hale is an index of the taste of the day: "The pianoforte, the music box, the singing of birds; the elegant drapery; the beautiful pictures; the expensive gallery of portraits; the struggling sunbeam peering through doors of stained glass; statuary, engravings; all, all seem to impress the visitor with the ideal of palace-like magnificence, and serve to soothe the troubled spirit, and calm the anxious brow, preparatory to the obtaining of a good picture."[1] This passage should be supplemented with the exterior view of Frederick's Photographic Temple of Art (Plate 21).

This photograph is not a daguerreotype, though made while that process was in common use. It is a print from a paper negative, produced by the process which, invented at the same time as daguerreotypy, was its great rival.

[1] *The Photographic Art Journal*, 1851, vol. 1, p. 358.

CALOTYPY

While Daguerre was experimenting in Paris with Niépce's heliography, a lone Englishman was conducting similar researches. "One of the first days of the month of October, 1833," wrote William Henry Fox Talbot,[1] "I was amusing myself on the lovely shores of the Lake of Como in Italy, taking sketches with Wollaston's Camera Lucida, or rather, I should say, attempting to take them: but with the smallest possible amount of success. . . . After various fruitless attempts I laid aside the instrument and came to the conclusion that its use required a previous knowledge of drawing which unfortunately I did not possess.

"I then thought of trying again a method which I had tried many years before. This method was, to take a Camera Obscura, and to throw the image of the objects on a piece of paper in its focus—fairy pictures, creations of a moment, and destined as rapidly to fade away.

"It was during these thoughts that the idea occurred to me—how charming it would be if it were possible to cause these natural images to imprint themselves durably, and remain fixed upon the paper!"

On his return to England Talbot began experimenting. At first he tried coating paper with a silver nitrate solution, but this was only slightly sensitive to light. Then he discovered that if paper was first coated with a solution of common salt and then, when dry, coated with the silver nitrate solution, it became much more sensitive. This was, of course, because silver nitrate added to salt (sodium chloride) forms silver chloride. He was able to repeat Wedgwood's and Davy's experiments; what is more important, he found a way of partially preserving these shadowgraphs (which he called "photogenic drawings") from further action of the light. He bathed them in a strong solution of salt, or of iodide of potassium. This method of "fixing" was not entirely reliable; when, a few years ago, his granddaughter discovered some unknown examples of his work in Lacock Abbey, where he conducted his researches, the earliest ones faded before her eyes. But the process was practical; he copied botanical specimens by its aid, and actually used these as scientific records. Some of these, sent to the Italian scientist Antonio Bertoloni, are now in the Metropolitan Museum of Art, New York.

[1] Talbot, William Henry Fox. *The Pencil of Nature*, London, Longman, Brown, Green and Longmans, 1844.

The original shadowgraph was reversed: a leaf was recorded as white on a dark ground. To invert the tones it was simply necessary to make a copy of the original shadowgraph by the same process. The original was waxed to make it transparent, and laid on top of a fresh piece of paper. Sunlight, coming through the white portion, turned the copy black, while the black background, which transmitted no light, prevented the background of the copy from turning dark. It is obvious that this copying not only reversed the tones properly, but it enabled Talbot to produce an unlimited number of copies from one prototype. Sir John Herschel proposed the name *negative* for the prototype and *positive* for the copy. On this negative-positive technique all modern photography depends. To Talbot belongs the credit of having discovered it.

IMPROVEMENTS IN CALOTYPY

By using very small cameras, having lenses of short focal length and large aperture, Talbot succeeded in making a photograph from nature as early as 1835 (Plate 13). The negative has been preserved (it is now in the Science Museum, London), but it has faded badly. Fortunately it was photographed at the time of its discovery in Lacock Abbey by Herbert Lambert, and this copy is a truer representation of Talbot's work than the original in its present state. The minute photograph—only three-quarters of an inch square—is mounted on a card, with this inscription in Talbot's own hand: "Latticed Window (with the Camera Obscura) August, 1835—When first made, the squares of glass, about 200 in number, could be counted, with the help of a lens."

In January, 1839, Talbot heard the news of Daguerre's secret process and, wishing to establish priority, read a paper at the Royal Society in London on January 31: *Some Account of the Art of Photogenic Drawing, or the Process by which Natural Objects may be made to Delineate themselves without the Aid of the Artist's Pencil.*[1] This was but an announcement; in February he gave a description of his technique in which he proved that his process was relatively permanent (as Wedgwood's and Davy's was not) and that he had secured chemical records of the camera's image.[2]

[1] *Proceedings of the Royal Society*, No. 36, 1838-39.

[2] *Ibid*, No. 37, 1839, Feb. 24, 1839.

Whatever effect the announcement might have had on the public was eclipsed by the dramatic publication of daguerreotypy.

Talbot's experiments led indirectly to a great improvement in the rival process. Sir John Herschel had discovered in 1819 that silver salts could be dissolved by sodium thiosulphate (then improperly called sodium hyposulphite, a name which has persisted in the shortened form "hypo"). He published this discovery and suggested its use to Talbot as a means of dissolving the unaltered silver salts from the photograph and thus rendering it permanent. Daguerre immediately adopted it; Talbot was reluctant, which was unfortunate, for not until he used it were his photographs permanent.

After the publication of daguerreotypy, Talbot improved his process by borrowing the principle of development. By this means he was able to cut down the exposure time to rival the improved daguerreotype. He patented his new process as *calotypy* in 1841; from that date it becomes a significant technique. Its great advantage was that an indefinite number of copies could be made from one master negative. Talbot published an album of actual prints, entitled *The Pencil of Nature,*[1] in 1844; this is the first publication illustrated with actual photographs. With each installment a slip was inserted, reading: "The plates of the present work are impressed by the agency of light alone without any aid whatsoever from the artist's pencil."

Unlike Daguerre, Talbot continued his researches and practised photography himself; the Royal Photographic Society possesses an album of eighty-two prints; a manuscript note at the head of the table of contents dates them as 1843. Original duplicates of some of these prints, in a remarkably fine state of preservation, have been lent to the exhibition by Talbot's granddaughter (Plates 13-15). Talbot unceasingly experimented; in 1852 he patented a most important method of photogravure on steel. His calotypy was most highly developed by later workers.

SPREAD OF CALOTYPY

Unlike Daguerre, Talbot attempted to control personally the patent rights to his process. This was, of course, impossible; anyone with the requisite skill could duplicate the experiments published by the Royal

[1] Talbot, *op. cit.*

Society. Yet he hindered the spread of calotypy so that it was years before it equalled daguerreotypy in popularity.

The greatest photographers to use the calotype were David Octavius Hill and Robert Adamson. Hill was a mediocre Edinburgh portrait painter. When faced with a commission to paint the convention of Scotch Protestants at Cannonmills in 1843 he turned to photography to aid him in the gigantic task of portraying some five hundred individuals on a canvas five by twelve feet. The technical side was handled by Robert Adamson, a young chemist. Hill placed the camera and posed the sitters; Adamson recorded this image; the undertaking was a joint effort, and was known in their day as such. The dependence of Hill on Adamson must have been considerable for he gave up photography for painting when the chemist died in 1848 at the premature age of 27. But the artistic value of these portraits is due to Hill, who posed his sitters out of doors, usually against architecture, lighting the shadows of their faces by a mirror. Direct and simple, these portraits and genre scenes have an inner life that is profoundly moving. The grandeur and humanity that Hill attained in five short years with the primitive calotype has seldom been equaled.

These photographs remained unknown for many years until in the nineties J. Craig Annan brought some of them to the attention of people interested in the arts. Whistler, among others, praised them.[1] A number of prints were made from the original negatives by Alvin Langdon Coburn at about the same time; through these posthumous prints, done with great care by a photographer entirely in sympathy with Hill, we have formed our high estimation of the Edinburgh photographers. Thus the Coburn prints which supplement the two original prints in the exhibition (Plate 16) have a special significance; these also were the first Hill pictures exhibited to the American public in the Buffalo exhibition of 1910.

CALOTYPES IN AMERICA

In 1847 Talbot received a United States patent. Two years later F. & W. Langenheim announced that they had "purchased of Mr. H. Fox Talbot his United States Patent for taking Photographic impressions on

[1] *Camera Work*, No. 11, 1905, p. 21.

paper," and proposed "to sell Talbot's patent, together with our own improvements, in the form of individual licenses at $30 each for the first 200, $50 for each of the following." A copy of the circular from which the announcement is quoted was discovered by Miss M. T. Talbot in Lacock Abbey, together with a number of calotypes. Inside is written in manuscript the note:

"One thousand of these circulars have been distributed all over the union, but, *horribile dictu,* up to this date, Novbr 19, *not a single* license has been sold. . . . The enclosed Specimens of Talbotypes are all of them without exception in their rude state, without being retouched at all, as we desired most particularly to show the manner in which *we take* these pictures. W. & F. Langenheim."

The specimens comprised architectural views and copies of daguerreotypes. They are all badly faded, and because of their poor condition it is hard to form a judgment about them. Their chief interest to us is that they were produced in actual rivalry with the daguerreotype. The circular states the case very plainly, and it is interesting to see the emphasis on ease of reproduction:

"As many professional Daguerreotypers and Amateurs in distant parts of the country, may not be fully acquainted with all that can and has been done by the Talbotype in combination with our improvements, we will give a brief summary of it:

"1. We can take *portraits from life on paper* with the same distinctness as Daguerreotypes, and devoid of all metallic glare.

"2. We can take *views from nature on paper* and can, in fact, obtain impressions from anything which reflects light.

"3. We can *multiply* such portraits, views, etc., to an unlimited extent with very little expense and labor, and each subsequent copy as perfect as the first.

"4. We can *copy Daguerreotypes on paper* with great accuracy, and multiply these copies with the same facility and cheapness."

Much of the Langenheim brothers' paper photography was portraiture, and they were very fond of cutting out a bust from the background by using a mask. Unlike the daguerreotype, the calotype can be retouched, and many of the negatives show radical alterations made with pencil and brush.

One of the reasons why the Langenheims had no success in selling the Talbot system is that it was already known and practised in this country by 1849. In Harvard University Library are three calotype negatives by Professor Josiah P. Cooke. Two of them, representing the Old Merchant Bank Building in State Street and the City Hall, are dated 1842. In 1844 Robert Hunt wrote: "Mr. Channing of Boston appears to have been the first to publish any method by which the calotype process could be simplified."[1]

Another reason is that paper photographs never replaced daguerreotypy. Indeed, as shall be seen later, the invention of wet collodion plates was at first more important in making the imitation daguerreotypes called *ambrotypes,* than in the development of a negative-positive process. Victor Prevost brought over from France in 1853 a slight modification of the calotype, invented by Le Gray, in which the paper was waxed before, instead of after, sensitizing. His partner, P. C. Duchochois, recollects: "Our studio was in Broadway, between Houston and Bleecker Streets, pretty far uptown then [1853], but we did not succeed in making it pay; the time for photography had not come; the beauty of Daguerreotype was reigning supreme."[2]

BLANQUART-EVRARD

At the same time that the Langenheim brothers were undertaking to market the calotype patent, Blanquart-Evrard of Lille was working upon an improvement of the process. By adding albumin in some form—either milk-whey or egg-white—to the light-sensitive silver salts he obtained a smoother surface which recorded the camera's image more faithfully. This albumin paper remained in use for positives until the last few decades, long outliving its use for negatives. He also recommended moistening the paper before use and sandwiching it between two pieces of glass in the camera.

In 1851 he perfected a way of making positive prints much more rapidly than had been done before. Talbot and those who used his system printed on the primitive paper, perfected in 1839, which was called "salted paper" because it was made with common salt. As the sun acted

[1] Hunt, Robert. *Researches on Light,* London, 1844, p. 66.

[2] Letter to W. I. Scandlin, *Photo Era,* Oct., 1901, vol. 7, pp. 130 *ff.*

on the paper, it became brown immediately; the exposure it required was a matter of minutes. Blanquart-Evrard conceived the idea of using the same paper for positive prints as for negatives and developing the image after a very much shorter exposure. He was thus able to produce from two to three hundred prints a day at his Photographic Printing Establishment at Lille. These prints, on thin India paper, were mounted and published as albums or as book illustrations.

He was by no means satisfied with the uncontroled image of the camera. He first suggested the toning of prints in shades appropriate to the subject, and, in his book, *The Intervention of Art in Photography,* he suggests a method "of limiting the marvelous but unintelligent work of the camera to the formation of a complete but slightly intense image and giving the photographer a means of continuing or modifying its action at will—in a word, of substituting his action for that of the camera by using the same chemical means."[1] He proposed strengthening shadows by removing the negative from the camera and exposing it to the light, and reducing the silver deposits on the high-lights by subjecting them to the vapor of iodine, thus forming silver idoide which could be dissolved by "hypo."

This is a significant step in the esthetic development of photography, for it is one of the first times that a purely chemical, as distinguished from manual, method of altering the camera's image was proposed.

Some of the architectural views published by Blanquart-Evrard are as fine in their way as Hill's portraits. The first publication illustrated was Maxime Du Camp's *Nubie*[2] (Plate 18); there followed a number of albums entitled *Souvenirs Photographiques, Mélanges Photographiques,* etc., with views of French landscapes and architecture in the taste indicated by the great series of lithographs published by Baron Taylor, *Voyages Pittoresques et Romantiques dans l'Ancienne France* (Daguerre, incidentally, drew some of these plates in 1824).

The remarkable *Porte Rouge* of the Cathedral of Notre-Dame, Paris (Plate 19) is entirely in this manner. The larger calotypes of cathedrals by H. Le Secq, published in photogravure, are far bolder. They are

[1]Blanquart-Evrard. *Intervention de l'Art dans la Photographie,* Lille, L. Danel, 1863.

[2]Du Camp, Maxime. *Egypte, Nubie, Palestine et Syrie; Dessins Photographiques Recueillis Pendant les Années 1849, 1850 et 1851,* Paris, Gide et J. Baudry, 1852.

impressive documents of the great cathedrals before their radical restorations. The *West Portal* of Chartres (Plate 20), showing grass in the cracks of the steps and the statues less weathered than today, is a print from an original negative, signed and dated 1852.

BAYARD AND PAPER POSITIVES

There is yet one more form of photography which, although it never reached the popularity of the daguerreotype and the calotype, should not be overlooked. Independently discovered at the same time that the other two were being published, the paper positives of Hippolyte Bayard give additional proof that photography came into being at a time when the needs and thoughts of men demanded it.

On the 24th of June, 1839, Bayard—an amateur experimenter who was a friend of many well-known artists, including Gavarni and Charlet—exhibited thirty photographs for charity at the municipal auction rooms of Paris. These badly-faded prints now form part of the rich collection of the French Society of Photography; five of them have been specially copied for the present exhibition (Plate 22).

Bayard's method is entirely individual; paper soaked in a silver nitrate solution was entirely exposed to light. When it had turned black it was plunged into potassium iodide and exposed in the camera. The light bleached the paper white, in proportion to its strength; thus Bayard was able to obtain a direct positive picture which, like the daguerreotype, was unique.

It is surprising that no one else seems to have adopted this technique. The inventor made hundreds of pictures—the French Society of Photography owns some six hundred—but the process died with him.

The three processes, daguerreotypy, calotypy and Bayard's paper positives, were all far from satisfactory. The remarkable photographs which have been singled out for exhibition succeed in spite of the clumsy technique. Indeed, this very struggle gives the work its special character, and it may quite properly be referred to as primitive photography. It was gradually replaced by the collodion process which was much more practical. But before we turn to this entirely new phase of photography it may be well to consider the esthetic significance of primitive photography as a whole, for it should not be overlooked that however different

the early processes were, they followed the same general rules, and their relations to already established forms of graphic art were, for the most part, similar.

Esthetics of Primitive Photography

Even at the risk of falling into philosophical quagmires, the question, "Is photography art?" cannot be ignored. Ever since its inception, photography has been confused with all other graphic processes. From time immemorial, pictures had been made only by human hands. Suddenly, a mechanical method of producing them was presented to an astonished world. Confusion and comparison between the two methods was natural and inevitable. To this day, for example, photographic positives on paper are called *prints,* a term manifestly absurd for pictures obtained by the action of light.

Photography was brought into being by a desire to make pictures. Without exception, those men who were instrumental in making it practical were impelled by an artistic urge. Wedgwood was the son of the great potter; Niépce had been experimenting with lithography; Daguerre painted scenery and illusionistic panoramas; Fox Talbot wished to sketch but could not.

When a practical photographic process was announced, artists looked forward to the help it would give them in observing nature. Delaroche expressed the greatest optimism in answer to Arago's request for an opinion to be cited in his report to the Chamber of Deputies on the State's purchase of the daguerreotype. Delacroix, charter member of the French Society of Photography, later wrote: "The study of daguerreotypes, if well understood, can in itself remedy the lacunae of instruction, but to use it properly, one must be experienced. The daguerreotype is more than a tracing, it is the mirror of the object. Certain details almost always overlooked in drawings from nature take on great significance, and thus introduce the artist to a complete knowledge of construction. The light and shades are presented in their true character—that is to say, with the exact degree of tightness and softness, a very delicate distinction,

without which there is no relief. Yet one must not lose sight of the fact that the daguerreotype should only be considered as a translator, initiating us into the secrets of nature."[1]

And Ruskin, in his *Modern Painters,* mentions another way in which the new tool could be useful to artists: "With the help of the daguerreotype, we ought now to be able to accomplish the reconciliation of true and aerial perspective and chiaroscuro with the splendor and dignity of elaborate detail."

Even Daguerre must have looked upon the daguerreotype simply as a means to this end, for he returned to painting. Hill, when his need for photography was over, let the death of Adamson terminate his interest, and took up again his palette and brushes.

But, just as photography had been fostered by would-be artists who lacked skill and training, so it enabled countless followers who had little training to produce pictures. The public found that it could purchase portraits and other records more cheaply than ever before. An economic crisis was precipitated; the industrial revolution had penetrated the artist's studio. Minor artists who earned their daily bread largely through the subject-matter of their art rather than through their mastery of form and color probably suffered most. A satirical lithograph by Maurisset, entitled *Daguerreotypomania* (1839) shows a gallows marked: *For Rent to Messrs. the Engravers.*

The early criticism of photography was almost entirely in terms of painting and drawing. The question "Is photography art?" really meant: "Is photography a medium capable of producing the same results as painting, drawing and the graphic arts?"

THE BASIC LAWS

But we are seeking standards of criticism generic to photography. In order that such criticism be valid, photography should be examined in terms of the optical and chemical laws which govern its production. Primitive photography enables us to isolate two fundamental factors which have always characterized photography—whatever the period. One has to do with the amount of detail which can be recorded, the

[1]Delacroix, Eugène. *Oeuvres Littéraires,* Paris, Crès, 1923, p. 16. (Reprinted from *Revue des Deux-Mondes,* Sept. 15, 1850.)

other is concerned with the rendition of values. The first is largely dependent on optical laws, the second on chemical properties.

When the lens of a camera is focused on an object, an image of the object is formed whose size is determined by the distance separating the object from the camera and by the focal length of the lens. If many objects lie at varying distances from the camera, some of them may be blurred and will not be recorded clearly on the photograph. This may be an advantage, as in portraiture, or it may be a disadvantage. To overcome it when necessary, the photographer puts in front of the lens a mask which has an adjustable opening. This is called the diaphragm or stop. The more it is reduced in size, the more objects have sharp and clean-cut images. As the stop is reduced, the exposure must be increased, because fewer rays, and consequently less light, can reach the sensitive material. The distance between the nearest and the farthest objects which are sharply reproduced is called the depth of focus. This varies according to the point focused upon, the focal length of the lens and the diameter of the stop. It may stretch from three feet beyond the camera to infinity, or it may be so narrow that only a few inches are sharp, the foreground and background being greatly blurred. The proper use of this optical property is a most important part of photography.

Moving pictures have to be taken at a very short exposure, hence small stops cannot be used; that is why the backgrounds are often out of focus or blurred. Cheap box cameras are not made to focus; they are fitted with very small masks to secure a great depth of focus and therefore can only be used in bright light.

Primitive cameras had such poor lenses that only the center could be used, the rest either being cut off in the manufacture or covered with a stationary mask; thus the depth of focus was *necessarily* great.

DETAIL: THE DAGUERREOTYPE

We can see now why those earliest daguerreotypes possessed such marvelous detail. Not only did the lens form a detailed image, but the smooth silvered plates recorded this image with such fidelity that they were examined through magnifying glasses. Practically every contemporary criticism praises this detail; it still is a source of esthetic satisfaction.

The reason for our pleasure in these detailed images, or in such modern

examples of infinite detail as Edward Weston's *Sand Dunes* (Plate 77), is probably largely physiological. When looking at nature our eyes take in details one after another. They are constantly roving, jumping from spot to spot; they cannot focus on all at once. The camera is able to focus many details simultaneously, and so to reduce them that we are able to comprehend them more readily in the photograph than in nature. Thus the photographer is capable, under certain precise circumstances, of offering the essence of the natural world.

Needless to say it is not this quality alone which makes these pictures outstanding, otherwise any detailed photograph—even if exposed by sheer accident—would create the same effect. The detail must be significant, and it is the creative photographer's problem to discriminate between subjects requiring such compressed detail and those which should be treated with other technical means.

Detailed photographs invite close inspection. It is probably for this reason, as well as for economic ones, that daguerreotypes were usually made small and enclosed in lockets which the beholder is invited to pick up and hold close to his eye. Certainly it is not a technical limitation, for Daguerre specified plates 6½ by 8½ inches in his first manual, and Hawes of Boston made daguerreotypes as large as 16 by 20 inches.

MASS: THE CALOTYPE

Calotypes, on the other hand, were usually made large. This was probably because they could not rival the detail of a daguerreotype—the texture of the paper diffused the clarity of the image—and instead depended on broader effects which are more easily taken in from a distance. The best of the first calotypes are of boldly lighted objects, designed in large simple masses. Hill seems to have sensed the character of his medium intuitively. The Langenheim brothers had no eye for broad effects. Their calotypes, made after Hill had abandoned photography, are of no significance. Indeed, the brothers mixed the processes indiscriminately, copying daguerreotypes on paper and thereby destroying the chief quality of metal-plate photography without attaining the breadth of straight calotypy.

After Blanquart-Evrard improved the calotype, the marked difference in effect between the two methods largely disappears. Nègre and Le Secq

could produce their marvelous documentation of the cathedrals with ample detail and a fine range of shimmering tones. But the schism created by the two primitive prototypes seems to run through the entire history of photography. Even today, when action and detail are possible in a single photograph, we find at one extreme the broad effects obtained by enlarging from the small negatives of cinema and miniature photography, and, at the other, the sharp textural studies of "large camera" photography.

THE COMMON FACTOR

Yet, divergent though the two main types of primitive photography are as far as the problem of recording detail is concerned, there is one common factor which underlies them and which applies to every photograph, no matter what its date. Delacroix called it "the exact degree of tightness and softness without which there is no relief." The camera records color values in tones of white, gray and black. If the design of these tones conveys the conception of the photographer, his photograph may be sharp, soft or broad, but it will be successful. If the design does not, his photograph will not tell, no matter how clear his image or how fine his detail. Equality of tone, whether light, dark or medium, means monotony. In a dark photograph the dramatic element is white; in a white photograph it is black. On a gray background, whatever is black or white arrests the eye. In color photography this is even more true. It is a common fault at present to assemble only brilliant colors. One or two brilliant colors set with dark accents on gray seem to give far more pleasure. The colors and tones of the painter are not, and can never be, those of the camera, although one foresees attempts to make them so in color photography.

But behind these surface differences, the relation between photographer and painter is basic. The desire to make pictures is inherent in both. The instinctive knowledge of how to make pictures must be acquired by both. Both must know the basic laws of composition, of chiaroscuro and color value. There photographer and painter separate: each must apply the basic laws in terms of the possibilities and limitations of his medium. The photographer must know how chiaroscuro affects the sensitive material with which he works. The extreme con-

trasts of light and dark in nature cannot be registered by the light-sensitive silver salts, and he must be ready to sacrifice, at times, details in shadow or high-light. He may even force nature's contrast for a particular purpose, deliberately falsifying the original tones. He must also know about colors, even though his final result is in black and white. If red is present he must anticipate the value by which it will be recorded. (Before 1874 red photographed as black; blue, as white.) Photography now uses compositional elements peculiar to itself; its vision is its own; its means of getting effects are so manifold that they have scarcely been explored.

Early Photography 1851–1914

Glass is obviously a better support for negatives than waxed paper; being perfectly transparent, it has no texture to mar a perfect negative. Blanquart-Evrard sandwiched moist paper between glass in his modification of the calotype process; the idea of doing away with the paper support was, therefore, a logical step. In 1847 Niepce de Saint-Victor, nephew of Nicéphore Niépce, proposed the use of egg-white or milk-whey to bind the silver salts to glass. These albumin plates, while giving a clearer record of the camera's image than paper negatives, were so much slower that their use was greatly limited, and they never replaced calotypes. The search for another binding material continued.

Gustave Le Gray, who improved the calotype by waxing the paper before sensitizing it, seems to have been the first to suggest the possibility of collodion, a solution of guncotton in ether or alcohol. Swabbed or poured over a substance, it dries to form a thin, hard film. Formerly it was widely used as a protective covering for minor wounds. If collodion is bathed in a chemical before it has completely dried and is "tacky," the chemical will adhere to it.

THE COLLODION PROCESS

Credit for perfecting the practical technique must be given to an Englishman, Frederick Scott Archer. He first described his process in

The Chemist for 1851. A year later he published *A Manual of the Collodion Process.*

This technique possessed great advantages. It combined the virtues of the two more primitive methods: its negatives were capable of great detail, and could be printed exactly like their paper predecessors. In addition, they required less exposure. Portraits, we read,[1] could be made in fifteen seconds; views in about ten. The process, however, was extremely cumbersome and difficult. In the reminiscences of two old photographers who practised it, we find an exceptionally graphic picture of its exigencies:[2]

"First, all the plain glass plates in various sizes, usually 8 x 10, had to be carefully cleaned and carried in dust-proof boxes. When ready for action, the plate was carefully coated with collodion, which carried in solution the 'excitants'—bromide and iodide of potassium, or ammonia, or cadmium. . . . After coating the plate, and letting the ether or alcohol evaporate to just the right degree of 'stickiness,' it was carefully lowered into a deep 'bath-holder' which contained a solution of nitrate of silver about 60° for quick field work. This operation created the sensitive condition of the plate and had to be done in total darkness except for a subdued yellow light.

"The plate 'flowed' with collodion was dipped *at once* in a bath of nitrate of silver, in water also iodized, remained there *in darkness* three to five minutes; still in darkness, it was taken out, drained, put in the dark-holder, exposed and developed in the dark-tent *at once*. The time between flowing the collodion and developing should not exceed eight or ten minutes."

We can imagine what a nuisance this hectic performance was even to the portraitist in his studio. With his sitter waiting, he had to vanish into his dark room, carefully prepare his plate, rush it out to the camera, expose it and rush it back into the dark room for immediate development—all within ten minutes. But the photographer in the field labored under still greater handicaps; he had to take with him a portable dark room (Plate 95). Sometimes this was a tent, which had to be pitched wherever the tripod was set up. Sometimes it was a collapsible box with

[1] Van Monckhoven, D. *Repertoire Général de Photographie*, 3e ed., Paris, Gaudin, 1859.

[2] Rockwood, George A. and Rood, F. M., quoted in *The Photographic History of the Civil War*, Review of Reviews Co., 1911, vol. 1, pp. 46, 50.

sleeves through which to thrust the arms. Sometimes a wagon was fitted up with a dark room inside (Plate 27). In addition the photographer had to beware of the weather.

"When you realize that the most sensitive of all the list of chemicals are requisite to make collodion," another wet plate photographer continues, "and that the very slightest breath might carry enough 'poison' across the plate being coated to make it produce a blank instead of some much-desired effect, you may have perhaps some faint idea of the care requisite to produce a photograph. . . . Often just as some fine result looked certain, a hot streak of air would not only spoil the plate but put the instrument out of commission by curling some part of it out of shape."[1]

Rain, high winds, heat and frost all militated against success. A speck of dust could ruin the plate. Only distilled water could be used in the solutions.

Despite these obstacles, enthusiasts used wet plates under conditions which seem to us all but impossible. The cumbersome apparatus was lugged to the top of the Alps. Camera and dark room were fitted into the basket of a balloon. The Crimean and Civil Wars were documented on the spot by photographers with dark room wagons.

AMBROTYPES

Although wet collodion was principally intended for the making of negatives, Scott Archer in his instruction book mentions another use—the production of unique direct positive pictures closely resembling the daguerreotype in appearance. After a plate had been prepared, exposed and developed in the usual manner, the silver deposits which represented the high-lights were bleached with bichloride of mercury, and the back of the plate was painted black, so that the shadows, which were clear glass, could easily be distinguished from the lights. These *ambrotypes* were placed in the same miniature frames and lockets as the daguerreotypes they soon replaced. It is not surprising that ambrotypes were very popular in America where the vogue for daguerreotypes was very great, nor that they have been claimed as an American invention (Plate 23).

[1] Spencer, J. Pitcher. *Ibid,* p. 50.

England was the home of the wet plate process. Even Le Gray admits this. "Collodion, which I suggested in my previous pamphlet," he wrote in 1851,[1] "gives very good results when used on glass, and is more rapid than albumin. The English have put this technique into practice, and succeed perfectly in its use."

One of the first photographers to use wet plates was Roger Fenton, first secretary of the Royal Photographic Society of Great Britain (then known simply as the Photographic Society). In 1855 he had the idea which has grown into press photography, newsreels and documentary films. He took camera and dark room wagon to the Crimea. To us, his records of the war are disappointing. They show little more than unpopulated battlefields and posed groups of officers and men. His architectural photographs are much finer (Plate 24), partly due to the fact that since wet collodion required less exposure it also required less illumination. Such dramatic back lighting as *Tewkesbury Abbey, West Window* is not found in the work of earlier men.

Indeed, the wet plate was peculiarly suited to recording architecture. With its infinite capacity for detail and its great scale of contrast, it could record objects in brilliant light and still penetrate deeply into the shadows. Just before Napoleon III had the great boulevards cut through old Paris, Charles Marville, formerly employed by Blanquart-Evrard and at this time photographer to the National Museums, went into the condemned quarters and set up his camera and dark room apparatus in the narrow, tortuous passageways where disease and barricade fighting had flourished. Here, brushed by passersby, jeered at by the curious, he made a series of photographs which are not only invaluable documents but true personal expressions. Through subtle lighting and the careful rendering of detail, these pictures of streets and houses, worn by human use but emptied of people, have the melancholy beauty of the condemned and vanished past (Plate 25).

BRADY: DOCUMENTATION OF THE CIVIL WAR

The fact that Fenton's Crimean photographs can not altogether convince us that actual battles were fought on the pictured fields by the

[1] Le Gray, Gustave, *Nouveau Traité Théorique et Pratique de Photographie sur Papier et sur Verre*, Paris, Lerebours et Secretan, 1851, p. 61.

pictured men, makes all the more remarkable the documentation of the Civil War by Matthew Brady and his assistants. Brady's daguerreotype gallery was already famous when he imported from England as assistant one Alexander Gardner. From Gardner, Brady learned the new wet plate process. With it he took portraits of many influential people who later became involved in the great struggle. When war broke out Brady secured permission through these acquaintances to work on the actual battlefields.

With a buggy made into a traveling dark room (Plate 27), Brady hurried to the front with his assistants. The buggy became a familiar sight in the army. The soldiers called it the "what-is-it?" wagon, and spoke of Brady as "that grand picture-maker." It must have required no little zeal and intrepidity to remain crouched for minutes on end in the darkness of that buggy, going through delicate manipulations while the terrific din of battle shook the ground. Unarmed, knowing that the buggy itself was a suspicious-looking target, the photographers were exposed to all the hazards of war. They risked their lives many times to save their plates. Brady was almost killed at Bull Run. Lost for three days, he finally turned up in Washington, haggard and hungry, still in his long linen duster, from which protruded a sword given him by a Zouave. Undaunted, he purchased new equipment, rounded up his assistants, and rushed back to the battlefields.

Indefatigably Brady and his men—and his imitators—photographed every phase of the war which their cumbersome technique could encompass: battlefields, ruins, officers, soldiers, artillery, corpses, ships, railroads. Brady gave orders that, whenever possible, two negatives of the same subject were to be made. When peace was declared, he had seven thousand.

It is obvious, considering the limitations of wet collodion, that one man alone could not have taken such a number. Brady himself was the first to admit it. In a catalog of his "National Photographic Collection of War Views" he writes: "The views were taken on the spot, during the progress of hostilities, by Mr. Brady and his assistants, and represent 'grim-visaged war' exactly as it appeared." His expenses were so great that he fell into debt and gradually lost control of his negatives. Three-quarters were purchased by the War Department at auction for non-

payment of storage. Some were seized by Anthony and Co., a photographic supply house, in default of payment; these subsequently fell into the hands of Taylor and Huntingdon, who sold copies mounted on cards for seventy-five cents apiece.

Because of the various hands through which these negatives have passed, there is much confusion about the authorship of many plates. Soon after the war, Gardner published a *Photographic Sketchbook of the War* which contained prints signed by himself (Plate 29) and a number of others—T. H. O'Sullivan, Woods and Gibson (Plate 28), Barnard. Those signed by Gardner are among the finest.

Gardner has been accused of stealing some of Brady's negatives. It seems more logical to assume that Brady turned over to his assistants the duplicate negatives which they had made as a way of working off his debt to them. Brady was the director of this extraordinary experiment in documentation; it is inevitable that, while he took many of the photographs himself, many others were taken by his assistants.

Perhaps the most poignant of these Civil War photographs are the inhumanly objective records of ruins—both of architecture and of men. We cannot expect action photographs of actual fighting—that was beyond the scope of photography in the sixties. But every one of us, looking through a collection of these pictures, cannot help sensing the horrors and pathos of war. The bleak and ravaged fields, the ruined houses, the stiff and gruesome corpses—even the homely pictures of camp life—have an appalling reality.

PHOTOGRAPHIC REALISM

It is very interesting to compare these photographs with Winslow Homer's drawings for *Harper's Weekly*. We admire Homer's sketch of a sharpshooter in a tree, but we do not necessarily believe in his existence. The sharpshooter may actually have been in the tree, or he may have been a figment of Homer's imagination, or a mixture of the two. But Gardner's dead sharpshooter, his long rifle gleaming by his side, is not imagined. This man lived; this is the spot where he fell; this is how he looked in death. Therein lies the great psychological difference between photography and other graphic arts. The camera records, within certain limits, whatever is focused on the ground glass, no matter

how chaotic the subject or how complex its texture. Unconsciously we are convinced that if we had been there, we could have seen it exactly so. We feel that we could have touched it, counted the pebbles, noted the wrinkles, and found it identical. We have been shown again and again that this is frequently pure illusion. Subjects can be misrepresented, distorted, even faked. We know it, and even delight in it occasionally, but the knowledge cannot shake our implicit faith in the truth of a photographic record. Even the editors of *Harper's Weekly* seem to have felt this, for beneath the weak wood engravings of Homer's drawings there appear the words, "Drawn from life by our special artist." A picture book called *Paris Under the Commune* is subtitled, "By a Faithful Witness, Photography." A recent collection of contemporary photographs is entitled, *Eyes on the World.*

This fundamental belief of ours in the authenticity of photographs explains why press photographs exert such an appeal, and why photographs of people no longer living and of vanished architecture are so melancholy. Neither words nor yet the most detailed painting can evoke the past so powerfully and so completely as a photograph.

PORTRAITURE: DISDERI

The wet plate technique revolutionized portraiture in that it became feasible to make unlimited copies, and the exposure was so much shorter that there were fewer complete failures. By the same token, there was a less intense relationship between photographer and sitter. Cheap, popular photography became quite general. During this period Brady's portraiture fell down in quality. One of his record books, filled with small portraits, is in the collection of Mr. Frederick H. Meserve, who acquired it from Anthony and Co. These small portraits were usually pasted on cards about two by three inches in size, a format called *carte-de-visite.*

"Up to the present," we read in *La Lumière* for October 28, 1854, "calling cards have had nothing more on them than the name, address, and sometimes the title of the person they represent. Why couldn't the name be replaced by a portrait?"

André-Adolphe-Eugène Disdéri was among the first to popularize this small and inexpensive format (Plate 30). By luck, he happened to attract the attention of Napoleon III. One day, recounts Nadar in his *When I*

Was A Photographer, the Emperor, at the head of a column of troops who were leaving for Italy, stopped at Disdéri's studio to be photographed. The whole regiment waited in front of the photographer's. This unexpected publicity was so great that all Paris, it seems, followed the Emperor's example. Disdéri's studio became "really the Temple of Photography—a place unique in its luxury and elegance. Daily he sells three to four thousand francs' worth ($600-$800) of portraits."[1]

This sum represents a considerable number of portraits, for the prices were low—twenty francs ($4) a dozen. To take care of the hundreds of sitters, Disdéri employed a corps of assistants who worked at top speed. The same background served for all comers, and the lighting was so uniform that three or four sitters could be taken on different parts of the same plate. Obviously time could not be spared for individual attention. . . . All of which sounds as if Disdéri's were a luxurious passport studio. Yet, despite this vulgarization of portraiture, one must not conclude that all portrait photography deteriorated in the fifties and sixties. During those years Nadar was making his remarkable portraits.

PORTRAITURE: NADAR

Gaspard Félix Tournachon acquired the famous pseudonym, "Nadar," when he was still a caricaturist. The photographic studio which he opened on the Boulevard des Capucines was the meeting place for artistic and literary Paris. On the street floor, there was an exhibition gallery which seems also to have been used as a café. Balzac, Sarah Bernhardt, Baudelaire, Gautier (Plate 32), Delacroix, Daumier, Wagner, Rossini—all these and many more were photographed by Nadar. The negatives are preserved by his son, Paul, who at eighty years of age still continues the work begun by his father. In his studio are dozens of huge folio albums from his own and his father's negatives. To leaf through them is an experience, for they are a pictorial index to four generations of great men. Nadar's earlier work was printed on salted (unglazed) paper, and was mounted on a large card.

Nadar pioneered in several branches of photography. His wonderful pictures of the sewers and catacombs of Paris (Plate 33) are among the first photographs taken by flashlight. They date from about 1860.

[1] Liesegang, Ed., quoted in *Die Geschichte der Firma, Ed. Liesegang,* Düsseldorf, 1929, p. 8.

Passionately interested in aeronautics, in 1863 Nadar built the largest free balloon the world has ever seen. On one occasion he journeyed as far as Hanover. When he alighted, he was arrested as a spy. After this experience, he re-opened his portrait gallery, and the prints of this second period are on albumin (glossy) paper, mounted on pasteboard about the size of a postcard—the "cabinet" size. Nadar was as famous for his aeronautical experience as for his photography. In 1858, he combined the two, and took the first aerial pictures. Daumier has caricatured him in the basket of a balloon, furiously focusing a camera on the rooftops of Paris. The caption reads: "Nadar Raising Photography to the Height of an Art."[1]

Despite Daumier's comment, Nadar does not seem to have been greatly interested in raising photography to an art. He was quite satisfied with the camera's image; except for the minor retouching which he was obliged to do to keep his clientele contented, he seldom modified his negatives. His works, therefore, have a directness which makes them valuable documents.

Adam Salomon, on the other hand, definitely tried to raise photography to an art comparable to painting. The light blue cards on which he mounted his albumin prints bear in the corner the printed legend, "Composed and photographed by the sculptor, Adam Salomon." He was among the first to use the strong side light which has ever since been known as "Rembrandt" lighting. He swathed his models in drapery which he shifted to make the composition more painterly (Plate 31). Consequently, his portraits have an atmosphere far different from the variety typified by the *cartes-de-visite*. Salomon's pictures were popular in their day. A year after Lamartine had called photography "that chance invention which will never be an art—only a plagiarism of nature by optics," he wrote "After admiring the marvelous portraits caught in a burst of sunlight by Adam Salomon, the sentimental sculptor who has given up painting, we no longer claim that photography is a trade—it is an art, it is more than an art, it is a solar phenomenon, where the artist collaborates with the sun."[2]

[1] Lithograph in *Le Boulevard*, May 25, 1862.

[2] Lamartine, A. de. *Cours Familier de Littérature, XXXVIII^e Entretien*, Paris, Léopold Robert, 1859, vol. 7, p. 43. Here translated from G. Freund, *op. cit.*, p. 113.

The most deliberate attempts to rival painting were made in England. Salomon's work was praised so highly in the English press that many English workers made special trips to Paris to see it. In 1868 the photographer himself crossed the channel, to be received with great acclaim.

COMBINATION PRINTING

England was the home of *combination printing* — the use of two or more negatives to make one print. In those days, plates were most sensitive to blue light and least sensitive to red. Photographs of landscape showed no sky because the blue rays affected the plate much more strongly than the greens, browns, reds and yellows that made up the foreground. In a short exposure, the sky would be properly rendered, clouds would be visible, but there would be no detail in the foreground. To achieve a picture showing both foreground and sky, two negatives were taken, one for the sky and one for the foreground. In the first, the foreground was painted out with opaque black; in the other, the sky was masked. Both negatives were then printed on the same piece of paper. By clever manipulation, the result appeared to be a single photograph.

The most extreme example of combination printing was created by O. G. Rejlander, a Swede working in Wolverhampton, England. *The Two Ways of Life,* which he exhibited in the Manchester Exposition of 1857, was printed from thirty negatives (Plate 36). It is hard to believe that Rejlander, who was a painter, considered this scene an example of the camera's usefulness to artists, and that he could think of no other subject which would enable him better to portray "various draped figures as well as exhibit the beautiful lines of the human form."[1]

Henry Peach Robinson's *Fading Away* (Plate 37) was made a year later by the same technique but with fewer negatives, and with more skill. Contemporaries were more troubled by the subject than the unusual technique, and felt that it was poor taste to represent so painful a scene as the death of a young girl. Though the criticism seems ridiculous to us, we should not ignore it as mere Victorian squeamishness. Far more painful subjects were painted in those days. But the very fact that this was a *photograph,* even though a posed and faked one, implied a realism which displeased the spectators.

[1] Rejlander, O. G. "On Photographic Composition with a Description of 'The Two Ways of Life'," *Photographic Journal,* April 21, 1858, vol. 4, pp. 191-197.

Robinson produced many of these genre pictures. Some were straightforward prints; others were combined from several negatives. He lived on into the day of dry-plate photography, which he adopted with enthusiasm. Perhaps his greatest contribution is a series of well-written books explaining this technique and expounding the laws of composition which governed academic painting. The first of these handbooks, illustrated with actual albumin prints, is appropriately enough dedicated to Adam Salomon, who visited Robinson at Tunbridge Wells.

AMATEUR PHOTOGRAPHERS

These books were intended for amateur photographers. As evidence of the extent to which photography has become a part of everyday life, the rise of the amateur is an important chapter in the history of photography. Even more significant is the fact that amateurs have been able to carry out experiments which their professional brothers could not afford to do.

Among the first amateurs whose work has survived today is Auguste Vacquerie, the French poet. He accompanied Victor Hugo on his exile to Jersey and, with Charles and François Hugo, produced a remarkable documentation of the poet's life. An eerie romanticism pervades these pictures; the details seem selected for their symbolism: the gnarled logs of the breakwater, Hugo's resting place under the flowering vines of the conservatory, Vacquerie dozing on a grassy bank. A series of hands—Hugo's and his wife's—appear, a novel idea in photography. Most characteristic of all is the picture of Hugo dramatically perched on his rock of exile (Plate 38).

In England the best amateur spirit is summed up in the dynamic portraits of Julia Margaret Cameron. This extraordinary Victorian lady was given a camera when she was fifty years old. With customary energy she threw herself into the mastering of its intricacies. A portrait signed "Annie, my first success" is dated 1864. She trained her camera on the prominent people who were her friends; by the sheer force of her personality she intimidated them into cooperation. Thrusting aside established technique, she resorted to any means in order to get desired effects. It did not matter if the subject moved—she wanted that spirit which defines a personality, not accidental details. In order to destroy these details

she purposely used badly made lenses and was the first to have them specially built to give poor definition. When printing the negatives, she would sometimes put a piece of glass between the paper and the negative to decrease even more the precision of detail so inherent in the wet plate process.

Thus by artificial means Mrs. Cameron gave her photographs that breadth and simplicity which was a technical characteristic of early calotypes. The brilliant success of her portraits cannot be due to this technique, however, but rather to her intuitive sense of lighting and character, and her remarkable ability to gain the cooperation of her sitters. When she used "soft focus" lenses on models, in attempts to rival the Pre-Raphaelite painters, her work lacks distinction. She has earned her place in the history of photography with such penetrating studies as the portraits of Carlyle, Tennyson (Plate 39) and Herschel.

Comparatively speaking, amateurs were few in the days of the wet plate. Perhaps the excellence of their work is due to the very difficulties of the technique, which must have intimidated all but the most intrepid. Photographers rebelled against these handicaps, against sensitizing their own plates on the spot, against lugging about the heavy equipment for immediate development and against the caustic silver nitrate which blackened their fingers and ate into their clothes. All kinds of substances were added to the collodion in attempts to keep it "tacky" over a period of hours, so that the plates could be prepared in advance and developed later. Beer, honey, sugar, tea—every conceivable hygroscopic substance was added without success.

At last an entirely new method of binding the silver salts to glass was invented. The new method was a great simplification and replaced the wet plate for all except special purposes. Its introduction not only enabled the photographer to take pictures under conditions previously impossible, but it increased the number of camera users. Appropriately enough, the new process was invented by an amateur.

DRY PLATES AND FILMS

In 1871 Dr. R. L. Maddox, in a letter to the editor of the *British Journal of Photography,* described experiments in binding the sensitive silver salts to the glass support with an entirely new medium: gelatine. The

gelatine was melted, and, while liquid, silver bromide was added. The mixture was poured on a glass plate and allowed to cool. Instead of adhering only to the surface as in the wet collodion process, the silver salts were imbedded in the binding medium. For this reason, as well as for some reason still mysterious, the plate was much more sensitive than any previous plates had been. So great was the difference that photographers used to the slower wet plate process regularly overexposed the new plates without realizing it, and thus condemned the new material.

A physician by profession, Maddox could not take the time to perfect his discovery. Other workers followed his description, and soon a revolutionary change in photography came about. Prepared plates sold in packages retained their sensitivity over long periods and could be developed long after exposure. The photographer was not only freed from his dark room but also from his tripod, because the exposure was so reduced that the camera could be held in the hand. This new simplicity of equipment and of operation increased the ranks of amateurs and enlarged the scope of photography enormously. Its most important result was the photography of moving objects.

PHOTOGRAPHY OF MOVING OBJECTS

One year after Maddox published his discovery, Eadweard Muybridge went from England to California to practice photography. While at Palo Alto he was asked by Governor Leland Stanford to photograph the race horse Mahomet while it was galloping. At this period dry plates had not appeared on the market so Muybridge used every means of illuminating the subject as strongly as possible. On one side of the race track he built a fence, which was painted brilliant white. Opposite this he arranged twenty-four cameras in a row, with a string attached to each shutter release. When the horse galloped in front of the cameras the strings were broken and the shutters released. Because of the insensitivity of the collodion plates, Muybridge succeeded only in getting vague silhouettes, despite the brilliant California sun and the dazzling background. But the result was epoch-making. So curious did the attitudes of the horse seem that people were incredulous. To prove that his analysis was correct, Muybridge mounted prints in the toy called the zoetrope. This consisted of a revolving drum with slits through which a series of

pictures in the interior were viewed. The horse galloped again when the zoetrope was spun. A year later Muybridge devised an apparatus for projecting this moving image. An important step was thus taken in the development of the moving picture although the photographs were so underexposed that the results are little more than silhouettes.

In 1884 Muybridge continued his experiments under the auspices of the University of Pennsylvania. Using dry plates, he was able to record details clearly. The 781 plates in his *Animal Locomotion* (Plate 40) were made by an electric shutter control and were produced for artists as study material. This accounts for the inclusion of a large number of nude models.

During this time the French physicist Etienne-Jules Marey had been conducting similar experiments. In 1882 he made a photographic rifle which took twelve exposures in a second on a revolving plate. He later devised an apparatus which recorded successive phases of motion on one plate. In order to isolate certain parts of a model he clothed them in parti-colored clothes. If, for example, a man was photographed against a black background, wearing a suit entirely black except for the right trouser leg, the motion of the leg was isolated. Marey also devised a camera which used moving film to record motion. Unlike Muybridge he took all his pictures in one position from a single camera which more closely approximated the moving picture camera. It was primarily intended for the analysis of motion, not, as in moving pictures, for the synthesis.

Almost contemporary was Ottomar Anschütz of Posen and Berlin. His photographs of animals are remarkable examples of high-speed photography. He exhibited these photographs in a primitive type of viewing apparatus in 1887. The illumination was a brilliant electric spark which vibrated and thus took the place of a shutter on a motion picture projector.

Today news photographers take sporting events with a "magic eye" camera which differs only slightly from Marey's improved photochronograph of 1890.

The series of photographs taken by these various workers can be mounted in sequence to form a dynamic suggestion of motion. The idea is not new; continuous narrative, with the same characters seen in various

stages of action, is one of the oldest forms of art, and it is not surprising that it was used in photography. In 1886 Paul Nadar, the son of Gaspard-Félix Tournachon (Nadar), visited the scientist Chevreul on his hundredth birthday. He brought with him a stenographer; having arranged his camera and adjusted his lighting, he carried on a conversation with Chevreul which the stenographer noted. At the same time M. Nadar took a number of photographs; the stenographer noted every exposure. The prints were reproduced in *Le Journal Illustré* (Plate 41), captioned with the very words which Chevreul was speaking at the time each photograph was taken. The result is a series of spontaneous and interesting portraits which have a meaning as a whole.

The importance of these photographs is that they were taken instantaneously, while the subject was engrossed in conversation and ignorant of the exact moment when the exposure was made. Three years later Nadar interviewed General Georges Boulanger; twenty-four photographs of the same type were published in *Le Figaro* for November 23, 1889. Some of these are circular; they were made with one of the first Kodak cameras, which were introduced in 1888.

THE DEVELOPMENT OF THE HAND CAMERA

This camera was only one of the many hand cameras devised in the eighties which permitted the photographer to make several exposures before reloading. A popular type was the Fallowfield "Facile" camera, which was simply a large box with a lens at one end and a simple form of shutter. A box of fresh plates was placed in the focal plane; after each exposure a button was pressed and the exposed plate fell into another box within the camera. Thus a dozen "quarter-plates" (3¼ by 4¼ inches) could be exposed, after which the camera was reloaded. Because this camera could be disguised as a small suitcase or as an innocent parcel, it was possible to take photographs without people even realizing that a camera was pointed at them; hence it was known as a "detective camera." In spite of the fact that the optical equipment was very slow and the sensitive material by no means so rapid as the ordinary film of today, under good lighting conditions workers were able to get some surprising results.

One of the most enthusiastic users of the Fallowfield "Facile" camera

was Mr. Paul Martin of London, a wood engraver, who wandered about London during lunch hour taking snapshots. Mr. Martin has lent the exhibition a selection of these "candid camera" photographs of London types, and has included some of the series of London by gas-light (1895), which are perhaps the earliest photographs of city streets taken at night. Mr. Martin's work is particularly interesting because from the outset he realized the possibilities of the new simplification of technique and recorded subjects not generally photographed before (Plate 42).

In 1888 George Eastman, who had been manufacturing dry plates in Rochester, N. Y., conceived the idea of making photography even simpler and so attracting more amateurs. He put on the market a camera which held a roll of paper coated with a gelatine film containing light-sensitive silver salts. The camera was sold already loaded with a roll of film long enough to allow one hundred exposures to be made. When the entire roll had been used, the camera was sent to Rochester, where the exposed film was replaced with a fresh one and returned to the customer. After development, the gelatine emulsion was stripped from the paper support and mounted on glass; from these negatives the Kodak Company made albumin prints. The pictures, two inches in diameter, were carefully mounted by the company on individual cards. To describe his product, Eastman coined the word "Kodak," chosen because it was odd, easy to remember and could be pronounced in any language. "Kodak," said the inventor, "sounds like the click of a shutter."

The next step in the development of the Kodak was to substitute celluloid for the original paper base of the roll films, thus eliminating the delicate operation of stripping the gelatine emulsion from its support. In 1894 Eastman bought patent rights for improved packing of roll film. By rolling the film up with black paper, it could be removed from the camera in daylight. It was no longer necessary to send the whole camera to the factory for reloading.

For the first time photography was truly within the reach of all. The effects of this popularization are felt to the present day. On the one hand the simplification of technique has resulted in a great increase in the production of photographs. On the other hand, the very simplicity of the process has led to carelessness. Because fair results are obtained by anyone who can point a camera at a brightly lighted subject, hold it steady

and press a button, it seems to many hardly worthwhile to study the principles of photography in the serious way in which one studies the playing of a musical instrument.

A great many non-professional photographers, however, are thoroughly informed about their medium and have produced remarkable work. As the number of such amateurs grew, clubs were formed all over the world and exhibitions were organized. The standards of the juries which judged these exhibitions were based almost entirely on the traditions of painting. This was equivalent to rejecting the principles and properties of photography, and denying that straightforward, unmanipulated prints were legitimate works of art.

THE HURTER AND DRIFFIELD EXPERIMENTS

One of the photographers who confused the two media was P. H. Emerson. His book, *Naturalistic Photography,* contains an art history based on the philosophy of the Impressionists. While he stood out against combination printing and waged tremendous verbal battles with H. P. Robinson, in his own book he preaches a doctrine of direct manipulation of the negative, which he felt could be altered by development and subsequent chemical intensification or reduction of the silver image.

Later Emerson learned about the experiments of Hurter and Driffield. These men were professional scientists and amateur photographers. There was too much guesswork in photography to please their trained minds. They wanted to establish photography as a science with a purely rational basis, so that anyone could make technically perfect pictures. Their first step was to devise a way of measuring the speed of a plate, that is, its degree of sensitivity. Then they calculated a method of judging more accurately the exposure necessary to record as well as possible any given subject. Their experiment is classic; it changed radically the entire method of developing photographic plates and made possible the perfect development of any negative by purely scientific means. With an apparatus made from an old sewing machine, and with a candle for a standard illumination, they exposed a plate to successively increasing amounts of light; the silver deposit (or relative darkening of the plate) they measured optically in a home-made photometer. Then they drew a curve showing the relationship between exposure time and the amount of silver de-

posited. One would expect that this relationship would be uniform; that an equal increase of exposure would create an equal increase in the silver deposit. They found, however, that this was not the case. At first the blackening is much less; soon equality is reached; then the blackening becomes greater. Underexposed negatives show no details in the shadows. Not enough light has been admitted to affect the salts equally. In order for a negative to represent the tones of nature in exactly that proportion in which they appear to the eye it must be given an exposure which lies in the middle section of the curve, where the increase is regular. This curve, which is called the "characteristic curve" or the "H. and D. curve," varies with different types of plates.

Although this discovery may seem of purely theoretical interest, it was of immediate practical value. Further experiments showed that development played no part in the true rendition of tone values, and that there was an optimum development time, depending on the subject and plate, which would produce the best results no matter what the exposure. Thus it was found possible to develop entirely by calculation; the plate or film could be enclosed in a light-tight tank and the developer poured in through a light trap. After a certain number of minutes, which depended on the temperature of the developing bath, the solution was poured off and "hypo" added to dissolve the unexposed silver salts. Moving picture film could be developed with great ease by this method as well as films which were sensitive to all colors, for there was no need to examine them during development with a colored light. Today, practically all workers follow this "time and temperature" method.

"THE DEATH OF NATURALISTIC PHOTOGRAPHY"

After learning of the Hurter and Driffield experiments, P. H. Emerson studied them carefully. As a result, he became convinced that photography could never be an art. This conclusion, perhaps the earliest admission *by a photographer* that photography was not an art (that is, not a medium capable of results comparable to painting or drawing), he published in a little pamphlet whose title, *The Death of Naturalistic Photography,* was surrounded by a heavy black border.

"The limitations of photography are so great that, though the results may and sometimes do give a certain aesthetic pleasure, the medium must

always rank the lowest of all the arts . . . for the individuality of the artist is cramped, in short, it can scarcely show itself. Control of the picture is possible to a *slight* degree, by varied focusing, by varying the exposure (but this is working in the dark), by development, I doubt (I agree with Hurter and Driffield, after three-and-a-half months careful study of the subject), and lastly, by a certain choice in printing methods.

"But the all-vital powers of selection and rejection are fatally limited, bound in by fixed and narrow barriers. No differential analysis can be made, no subduing of parts, save by dodging—no emphasis—save by dodging, and that is not pure photography, impure photography is merely a confession of limitations. . . . I thought once (Hurter and Driffield have taught me differently) that true values could be *altered at will* by *development*. They cannot; therefore, to talk of getting values in any subject whatever as you wish and of getting them true to nature, is to talk nonsense.

". . . In short, I throw my lot in with those who say that photography is a very limited art. I deeply regret that I have come to this conclusion. Photography is first of all the *hand-maiden of art and science*. It has and will register new facts of light, form and texture. Pure photography is a scientific method of drawing, and scientists should work on until a true and literal scientific transcript of nature can be made. . . ."

P. H. Emerson was the first to recognize the work of Alfred Stieglitz, an American who had learned photography in Germany. It is indeed significant that Emerson, who first coined the phrase "pure photography," should have singled out the work of a younger man who had quite intuitively realized the limitations of his medium but refused to be discouraged by them.

THE PHOTO-SECESSION

Stieglitz gathered around him a group of younger workers, who formed in 1902 the Photo-Secession, a definitely vanguard movement which reacted against the traditional photographic exhibition piece. He edited two magazines which will probably never be equaled visually by any photographic publication: *Camera Notes,* the periodical of the New York Camera Club, and, later, *Camera Work,* the official organ of the Photo-Secessionists. These magazines, printed on fine quality stock, with

magnificent photogravures painstakingly mounted on special paper, are among Stieglitz's greatest achievements. The critical essays published in them are of great interest; the phrase "pure photography" appears with great frequency.

Instead of "improving" or altering the camera's image by manual processes—in a word, by retouching—the members of the Photo-Secession believed that the camera's image was the only valid basis for an artistic photograph. Any control which the photographer had over the image was admitted, insofar as that control was "photographic," that is chemical or optical. Thus uncorrected lenses, such as Mrs. Cameron employed, were used to give a blurred image, the so-called "soft focus" effect. A certain amount of control could be exercised in the printing, and the members of the group experimented with all of the many printing processes which were then popular and which have generally been discarded today.

Yet while the Photo-Secession used purely photographic technique, their vision was guided by the example of painters and draftsmen. They were influenced—as, indeed, were most artistic circles at the time—by the art for art's sake doctrine. The photograph was cherished for its own sake. The number of prints was arbitrarily limited, in spite of the fact that an inherent characteristic of photography is its ability to yield infinite identical prints. This was a conscious application of the point of view then prevalent among print collectors. F. Holland Day told the members of the Royal Photographic Society in London in 1900 that "in America a photograph is regarded more as a portfolio piece. . . . I believe that if a photograph is taken out occasionally and looked at in the hand, in the same way that one would treat etchings or lithographs, it will be more highly appreciated."[1]

In the second decade of its existence *Camera Work* became less a photographic and more an art periodical. A special number was given over to Picasso, another to Matisse, and the pages were opened to lively discussions of modern art. "291," the gallery at that address on Fifth Avenue from which the magazine was published, was the center of the artistic vanguard. There is evident a weakening of the Photo-Secession, and it is significant that the last numbers of *Camera Work* (1917) contain

[1] *The Photographic Journal*, 1900, vol. 25, p. 79, ff.

photographs by a younger worker who was not a member of the group—Paul Strand. His work, which achieved maturity a dozen years later, is of a different stamp from the photographs of the original Photo-Secessionists.

The work of this group is here represented by a selection from the plates in *Camera Work* (Plates 46-50), and by the examples which Stieglitz chose in 1910 for the permanent collection of the Albright Art Gallery in Buffalo. These were selected from the great International Exhibition of Pictorial Photography, organized by the Photo-Secessionists, which was held in that year.

EUGENE ATGET

During this period, a lone photographer was working obscurely in Paris. Member of no school, unbothered by esthetic problems, Eugène Atget seemed possessed of a mania to photograph the immensity of the city. Day in and day out he lugged his view camera and tripod over Paris, focusing now on some remarkable piece of medieval architecture, now on a simple café—a butcher's wagon or a hearse—a tree or a flower—the merchandise piled up haphazard before a bazaar or the hovels of the rag-pickers. He took thousands of photographs of every phase of Paris life; the prints—mostly on albumin paper—he mounted by subject in crude home-made albums of wrapping paper, which sometimes bore on their cover "Eugène Atget, Photographer and Publisher." These albums he would leave with interested people, for them to choose what they wanted. He sold only a few to the museums of Paris and to the State Archives. In 1927 Berenice Abbott heard of this lone worker whom she photographed just before he died. After his death she succeeded in purchasing his entire collection of negatives (except those he had sold to the State) and thousands of prints; from this collection the prints now exhibited have been borrowed.

Considering when they were produced, Atget's work is not of technical brilliance. He was a deliberate primitive—he used a stand camera with long exposures. His architectural views remind us of Charles Marville's documentations of a doomed Paris, taken a half-century earlier. The people in his pictures were either posed or so absorbed in some street incident that they remained motionless. His are not the in-

stantaneous views of people in action which Paul Martin, a dozen years before, had taken in London. But Atget's work—and it must be looked upon as a whole—is the most remarkable photographic record of Paris ever created. Atget made his pictures without reference to any other form of graphic art; he relied purely upon photography. The very bulk of his work is staggering. Its importance lies in its straightforwardness. Its lesson is that the photographer must know his subject so well that he is able to choose that angle of vision and the precise lighting which brings out its particular characteristics. When first exhibited in this country, many young photographers were inspired to follow his example with American subjects, and Atget's influence has only recently been felt (Plates 44-45).

MECHANICAL IMPROVEMENTS

During this period numerous technical advances were made in addition to the development of the hand camera. The same emulsion which was applied to glass or film for negatives was used on paper for prints. Much more sensitive than the salted or albumin papers which had ordinarily been used before, this paper could be exposed under artificial light, and hence was called *gas-light* paper. Capable of yielding rich black tones, at first it was toned brown, because people had been so long accustomed to this color that they disliked pure black and white. Other printing processes were evolved; the salts of platinum were substituted for those of silver, giving a highly permanent picture with a great range of tones; gelatine and gum arabic which, when mixed with potassium bichromate, change their solubility according to the amount of light falling on them, were used as binding mediums for various pigments.

Lenses were greatly improved after the introduction in 1884 of new varieties of glass by the Jena Glass Works in Germany. Astigmatism (an abnormality possible in any lens, the camera's or the human eye) could be corrected. The first anastigmatic lens was made by the Zeiss firm in 1890. Following this principle, lenses not only of more precision, but also of much greater power have been made, further reducing the exposure time.

Lastly, and of great importance, were the pioneer experiments made in 1874 by H. W. Vogel of Berlin towards a more correct rendition of color values by black and white. To the eye, yellow is brighter than blue,

and red is of medium value. Silver salts, as we have seen, normally record blue as the brightest value, and red as the darkest. Vogel found that by bathing a plate in a bluish-pink dye (Erythrosine) the yellow and green rays would be concentrated and would partially offset this serious disability of ordinary sensitive material. Although he began with wet plates, it was not until dry plates were perfected that the process become practical.

Plates or film so prepared are called "orthochromatic"; they are "right-color" to all hues except red, and thus can be developed by a red light. By choosing other dyes (the Isocyanines) the plates or film can be made sensitive to all colors and hence are called panchromatic. They must be developed in total darkness, or by a very weak light; hence their use became difficult before the discovery of "time and temperature" development, and their manufacture was almost impossible until special machinery had been devised. Although they are sensitive to all colors, they do not record the colors correctly because they are over-sensitive to blue; for absolutely correct rendition a yellow filter is placed over the lens to absorb the unwanted blue rays. Not only can a correct rendition of tones be given by the use of panchromatic films, but deliberate distortions can be produced by choosing various colored filters. Thus a red filter will absorb all the blue rays, and so the sky will be rendered black. Panchromatism, however, has only been exploited in recent years. Like so many discoveries it lay dormant until a need for it was felt; the wave of experimentation in all photographic techniques which followed the Great War brought forth the application of this principle as an esthetic control.

Contemporary Photography

The period following the World War was one of general experimentation in the arts. Rebellion against academic standards all but became a convention in itself. The esthetic principles evolved in the early 1920's affected photography. Realizing how successfully the camera can record the past and enlarge our vision, certain photographers gave up their efforts to have photography recognized as a fine art and undertook to

exploit its special potentialities. They saw possibilities in the medium which had heretofore been neglected. One of these derived from the basic principle of photography: the ability of a sensitive surface to record in changes of density the brilliance of light.

SHADOWGRAPHS

Probably the first to apply Fox Talbot's primitive "photogenic drawings" to artistic ends was Christian Schad, a member of the Zurich Dada group, in 1918. The ability of sensitive paper to record the shapes of flat objects laid upon it, and to record a certain amount of the textures of these objects in proportion to their translucency, made it possible for Schad to make what are virtually Dada *collages* by the action of light rather than by using paper and paste. The medium lent itself admirably to the Dada esthetic precisely because of its mechanical, automatic and "unartistic" character.[1]

Since 1921 this technique has been used by Man Ray, working in Paris, and, since about 1923, by Moholy-Nagy, at one time a professor at the now abolished German Bauhaus. Instead of using merely flat objects, these workers laid three-dimensional objects on the sensitive material, and thus recorded not only the profiles of these objects, but the cast shadows as well. The element of chance enters into these creations to a large extent because it is difficult to foretell the effect which the direction of the light, its intensity and the length of exposure will have on the sensitive material. The results were often evocative, mysterious and ambiguous, and were greatly admired by the Dadaists and their successors the Surrealists.

Schad's shadowgraphs and some of Man Ray's closely resemble Cubist paintings and *papiers collés*. Louis Aragon, speaking of Man Ray's work, remarked that "one completely unfamiliar with the painters alluded to would not be able to appraise fully the results."[2] However, this is true

[1]The term "shadowgraph" is here used to describe photographs made by the superposition of objects directly on a sensitive surface. Fox Talbot termed these pictures "photogenic drawings." Tristan Tzara, a member of the Zurich Dada group, has coined the work "Schadograph" to describe the work done by Christian Schad. Man Ray refers to his shadowgraphs as "rayographs" or "rayogrammes." Moholy-Nagy calls his, 'photograms." "Shadowgram," "skiagraph," "skiagram," are alternatives listed in Webster's *New International Dictionary* (1931).

[2]*Transition*, no. 25, 1936, p. 97.

of only that small proportion of Man Ray's shadowgraphs in which a quasi-Cubist pattern was apparently intended.

Moholy-Nagy, in his book, *Painting, Photography, Film* (1925), wrote: "After the brilliant daguerreotype period, photography tried to imitate all the aims, manners and styles of painting. It lasted about one hundred years, until it reached the possibilities of exploiting its own means."[1] But some of his own and Man Ray's shadowgraphs seem as much in the tradition of painting as the landscape by Stieglitz which he so severely criticises.

PHOTOGRAPHIC PERSPECTIVE

Everybody knows that when a camera is not held absolutely level, buildings will seem to be falling down or about to topple over. Practically every manual warns the amateur against this apparent error. Academic perspective is based on one vanishing point situated on the horizon, which is always figured as at eye level. That this is a convention anyone can prove by glancing up the side of a tall building. The perpendicular sides of the building "recede" just as railroad tracks do. Yet the conventional perspective is so familiar that today we are unaccustomed to any other. In the Middle Ages people understood another type of perspective, and for hundreds of years the East has accepted still a third.

From the very earliest days of photography it was known that the camera's image, even when tilted, was "correct." In 1840 a book was published called *The Science of Vision . . . Containing the New Optical Laws of the Camera Obscura, or Daguerreotype.* The author, A. Parsey, complains that: "Notwithstanding all that has been said and published of the chemical discovery and the unusual outlines of the Daguerreotype drawings in converging perpendicular lines, not one of my countrymen has opened his mouth upon this point." By elaborate geometrical demonstrations the author proves that the image of a tilted camera is true, and concludes: "Art has always represented objects geometrically, or as they *cannot be seen,* in the *perpendicular,* and usually, or as they *can be seen* in the horizontal direction."

In spite of the fact that Parsey's book was popular enough to warrant a second edition, his new perspective seems to have been ignored for

[1] Moholy-Nagy, L. *Malerei, Photographie, Film,* Munich, Langen, 1925, p. 41.

seventy-five years; photographers invariably kept their cameras level. We find, however, that painters began to adopt vertical perspective just before the War in their general desire to break the academician's rules. This may have led to the purposeful distortion created by tipping the camera. In photographs, however, the principle was pushed much further.

The novelty of this new perspective causes us at first to overlook the subject of a photograph and to appreciate the composition. Moholy-Nagy pointed his camera up to make a formal pattern of the architecture of the Bauhaus (Plate 70), or pointed it down to place two children playing on the ground in relationship with architecture and shadows. Other photographers followed his example. Soon moving picture photography used the same technique and, largely through the influence of such films as *Variety,* the American still photographer often adopted this simple expedient.

Moholy-Nagy was also one of the first to show that the negative print might be more powerful than a positive print. His book, *Painting, Photography, Film,* written in 1924, maintains that photography is not primarily important as a picture-maker but as a means of extending human vision. This is actually a restatement of the criticism of Delacroix, applied to the whole bewildering scope of photography—press, scientific, astronomical, x-ray. Planned as a text-book, and based on lectures delivered at the Bauhaus and consequently somewhat abstruse, Moholy-Nagy's book was followed by more popular works. Among them, Werner Gräff's *Here Comes the New Photographer!* (1929) is an admirable summary of the new attitude towards photography. Illustration and text are one, the various possibilities of the camera are shown by actual examples: vertical perspective, the distortion of extreme close-ups of objects with deep relief, the improvements offered by ruthlessly trimming the print; these and other essentially photographic controls are presented in this remarkable book.

A chemical control, capable of great possibilities, has been popularized by Man Ray. If, during the development of a negative, a strong white light is turned on for a brief interval, and if development is then continued, a complete or partial reversal of the image will take place. By careful experimentation, this second exposure can be so timed that the outlines of the image are made positive, thus yielding a print with the

edges of all objects heavily outlined (Plate 72). The prototype is thus made by this "solarisation" process into a partially negative, partially positive transparency. Separate positive and negative transparencies can be superimposed so that the images are very slightly out of register. A print from the combination creates an effect of sculptural relief.

American photography changed after the War. Steichen, formerly an active member of the Photo-Secession, discovered phases of photography which he had not previously considered. In charge of aerial photography under the American Expeditionary Forces, he was faced with the problem of getting maximum detail with the poor material then at hand. After the War had ended he set out to learn photography anew, photographing the extreme contrasts of a white teacup on black velvet until he could control his medium so that it rendered detail both in the highlights and in the shadow. Stieglitz considers his mature work that which he did after 1917; this is noticeably different from his earlier work and has a precision of detail which gives a special value to this photographer's always remarkable vision.

"STRAIGHT" PHOTOGRAPHY

Just as in Germany, the functional spirit caught hold of the younger generation of American photographers. They became interested in the problem of "straight" photography—by which is meant not only the production of unretouched prints from unmanipulated negatives, but an insistence on the utmost clarity and detail of the image. Atget's work was first appreciated by this group. Edward Weston (Plate 77) and his son Brett Weston, Walker Evans (Plate 62), Berenice Abbott (Plate 51) and Ansel Adams (Plate 52), belong to this group. Their work, like Atget's, is usually limited in its field,because their desire for precise detail necessitates small stops and consequently long exposures. Arresting fast action does not predominate in their work; its chief value lies in its remarkable analysis of the face of nature and of man's work, rather than of man.

Paul Strand's photographs are of a different kind. Equally interested in "straight" technique, through his choice of lighting and understanding of his subject he brings out the lyrical quality of nature and of man. Texture and detail, while remarkably rendered, are subordinated to the whole. A brilliant technician, Strand uses every available photographic

means to obtain the results he wishes. The very color of the final print is calculated as meticulously as its precise mounting on pure white cardboard.

The most interesting experimenters in portraiture belong to this group so far as technique is concerned. There is, however, this special difference: instead of photographing the natural world, by specially designed settings and by artificial lighting these photographers create an atmosphere which heightens any aspect of the subject they may wish to emphasize. This work has mostly been produced for sophisticated fashion magazines (the same technique, with definite changes of emphasis, may be used for presenting the glamor of an evening gown as for presenting personalities), but the portraiture is of more lasting value. Lynes's *Cocteau* (Plate 68), or Beaton's *Tchelitchew* (Plate 53), are effective because of their setting. Other portraits depend mostly on lighting, the setting being reduced so that nothing distracts from the face, which alone expresses the personality (Plate 61). In both cases a straightforward technique may record these compositions: enough illumination is afforded by the special lighting to permit the use of large cameras well stopped down to give detailed images.

The exponents of pure photography, in its contemporary sense, wishing to get every possible advantage from their medium, make their prints mostly by contact—that is, sensitized paper is placed under the film or plate which bears the negative image and the whole is exposed to light. Necessarily the size of the picture is determined by the size of the plate; for large pictures a large camera must be employed. The "straight" photographer also composes his picture on the ground glass viewing screen of the camera. The final image is unaltered, once the exposure has been made; "cropping" or trimming of prints is to their minds wasteful and inappropriate.

MINIATURE CAMERAS

In contrast to this type of work, which might be called classic in that it depends on long-known fundamental principles, is the work done with small cameras, which are so popular today. There is nothing new in the principle of the miniature camera. In 1860 one Thomas Skaife was arrested in London on the charge of pointing a weapon at Queen Victoria

during one of her public appearances. When the "weapon" was examined it proved to be a camera in the form of a pistol, loaded with a wet plate two inches in diameter. Skaife called his camera the "Pistolgraph" and his instruction book describes a small light-tight bag with sleeves through which the photographer passed his hands to sensitize and, after exposure, develop the plate. The difficulty lay not in the making of the negative, but in the subsequent enlarging of it to practical dimensions.

If, instead of a glass lantern slide a negative is put into a magic lantern or stereopticon, an enlarged negative image will be thrown on a screen. If a piece of sensitized paper is placed on the screen it will, after suitable exposure, record the light and dark areas to form a positive picture. Before the discovery of gas-light paper, even when the source of light was brilliant sun, too long an exposure was necessary to make this technique practical. Skaife, for example, had to enlarge onto wet plates from which large negatives were made by contact. The problem of enlarging occupied many writers in the sixties: D. V. Monckhoven predicted that "the future of photography lies in the practical solution of photographic amplification of small images," and mentions his attempts at enlarging *carte-de-visite* negatives up to one meter (a magnification of about twelve diameters).

With the introduction of gelatino-bromide printing papers at the end of the century, enlargement became a regular practice. The results, however, were usually so inferior to contact prints that it was not a satisfactory substitute.

When the Great War broke out, Dr. Oskar Barnack, a microscope maker in the firm of E. Leitz, Weimar, Germany, made a small camera to test motion picture film. It used a small strip of standard size cinema film, and was fitted with a shutter working at the same speed as a regulation cinema camera. Seeing the possibilities of using this camera as a means of making pictures, he perfected it. In 1925 the first model was marketed. This camera was built with the precision of a microscope. A special enlarging apparatus, equally precise, was designed.

The combination extended the scope of the camera enormously. The great difficulty with the enlargements was loss of detail, because the image was magnified so greatly that the actual grains of silver in the negative are themselves enlarged. Film manufacturers studied the prob-

lem of reducing the size of the silver grains. When this was perfected enlargements from tiny negatives (1 by 1½ inches) could compete with contact prints made from much larger negatives. The little camera, and countless similar ones which soon followed, could be taken to places where its larger brother would be a serious impediment. It could be hidden and used to photograph people unawares. And, most important of all, it could take pictures in rapid succession under very poor lighting conditions with instantaneous exposures.

The reader will recollect that lenses are of various diameters and of various focal lengths. A diaphragm controls the amount of light entering the lens, a shutter the length of time that this light is allowed to act on the sensitive plate or film. The larger the diaphragm, the fewer objects are in focus. But the depth of focus depends on another factor: the focal length of the lens. The shorter the focal length, the greater the depth of focus at a given stop. A very large stop, F/2, must be used if we are to take instantaneous pictures under poor lighting conditions, such as ordinary artificial illumination in a room or normal stage lighting. With lenses of long focal length, the depth of focus will be so small at such a large stop that only a few objects will be in focus; with lenses of short focal length much more will be included under the same conditions. The user of a large camera will perhaps succeed in getting only a single face in focus; the miniature camera worker can take a group under the same conditions.

"CANDID" PHOTOGRAPHY

Thus the miniature camera has opened new, wide fields to the photographer. Because of the startlingly natural pictures that this technique permitted, the phrase "candid" photography was coined to describe them—unfortunately a misleading nickname. All camera work can or cannot be candid. Few recent pictures are more candid than those of Civil War corpses. Candid photography has been extended, so that events previously unrecorded now leave their image on the sensitive film. The miniature camera penetrates the operating room (Plate 54), the theatre, the diplomat's office, night clubs (Plate 67), factories. Its rapid action permits many photographs to be taken of one subject, and the cheapness of film encourages this practice. Thus the laws of chance

are definitely exploited and the best of the many exposures are enlarged while the rest are discarded.

Photographers in general have always taken more exposures than they intend to use. In 1906 George Bernard Shaw, himself an amateur, wrote: "Technically, good negatives are more often the result of the survival of the fittest than of special creation: the photographer is like the cod, which produces a million eggs in order that one may reach maturity."[1] Furthermore since miniature pictures must be enlarged to be of any practical value and since it is difficult to compose a picture in the minute finder with which the small cameras are fitted, it has become a general practice to revise the first composition, when making the print, by eliminating certain portions.

This type of photography differs radically in its whole point of view from "straight" photography. The photographer's work is barely begun when he snaps the shutter; the final choice of viewpoint and actual composition within the picture frame are determined in the dark room.

THE NEED FOR BOTH METHODS

Photographic esthetics are so closely combined with technique that it is almost impossible to separate the two. Both "straight" photography and miniature photography have a vital and significant place today. Both types are entirely conditioned by the very principles of photography; both are honest and straightforward, depending on no other graphic expression. The two, however, cannot be interchanged. The man with a miniature camera who tries to record the minutiae of architectural detail will never equal his companion whose 8 by 10 inch view camera is firmly fastened on a tripod. On the other hand the large camera user who tries to take pictures inconspicuously will find himself greatly handicapped, and he cannot hope to stop action in dim lighting. It is impossible to find in the same picture the extreme detail of Weston's *Sand Dunes* (Plate 77) and the arresting of rapid action under artificial lighting of Lohse's *Night Club* (Plate 67). They should not be compared. Leading photographers either specialize in one of these branches or have cameras of both types.

Naturally there are subjects which lie between these two extremes.

[1] *Camera Work*, No. 15, 1906, p. 33.

Compromises between the stand camera and the miniature are available. A type of great popularity on the Continent takes pictures 2¼ inches square, and has two matched lenses; one of which takes the picture while the other projects an image upon a ground glass. The picture can be composed on the ground glass as in a view camera, yet the camera is small enough to be handled easily, its film is cheap, and it is relatively inconspicuous. This camera is admirable for photographing scenes of daily life out of doors. Nora Dumas catches the sincerity of the French peasant with such an apparatus (Plate 60) and Féher had his camera ready when he saw the interesting pattern of the birds and telegraph wires (Plate 63). The scenes might have passed before larger cameras could have been gotten out and we should have been disappointed with the less detailed pictures which a smaller camera would have yielded.

The technical improvements which have been made in photography during the course of its existence have enlarged the camera's uses enormously. But the fundamentals remain the same; if there is a common denominator in the best photography, it lies in the photographer's knowledge of his medium. The way in which he uses the medium is usually determined by the age in which he lives.

Certain branches of photography are extremely specialized. Press photography, because of its special requirements, has grown to be almost a technique in itself. Color photography begins with black and white work but involves much more. The ways in which science has used photography as a tool are exciting revelations of nature. The moving picture, again, is a separate branch. All these types of photography are of great importance today, and while we cannot hope to examine them with the thoroughness which they deserve, at least their general characteristics should be discussed.

NEWS PHOTOGRAPHY

The photographs which Roger Fenton took of the Crimean War were reproduced by wood engravings in the *Illustrated London News;* in the same manner the photographs of Brady and his men were published in *Harper's Weekly*. These are probably the earliest "spot news" pictures obtained by photography. So far as newspaper publishing is concerned, the photographs themselves are but a means to an end, for the picture

which the public sees is always a reproduction. The news photographer must keep this in mind while he is making his photographs; the rise of news photography dates from the invention of cheap and rapid ways of mechanically reproducing pictures. Newspapers are printed on cylinder presses, the type surface is bent around a drum, which rolls over the paper. Any kind of engraving must also be bent to this form, if it is to be printed at the same time as the letterpress. Since the very purpose of the cylinder press is to increase speed of production, it is obvious that a separate printing cannot be made for the pictures alone; engraved wood blocks such as were used in the above-mentioned weeklies had to be discarded. For the same reason early direct photo-mechanical reproductions of photographs could not be used because the plates were intaglio instead of relief. The earliest relief plates were line-cuts; consequently for many years drawings after photographs were made, to be printed together with the letterpress of a newspaper. Finally methods were discovered for making relief blocks which reproduce all intermediate shades between white and black and are therefore called half-tones.

The earliest use in a daily newspaper of a half-tone reproduction made directly from a photograph seems to be the picture entitled *Shantytown* (Plate 80) which appeared in the *New York Graphic* for March 4, 1880. That day's issue was a special anniversary number, and a full page spread gave examples of all the ways in which pictures were then reproduced; for many years, however, the newspaper continued to use drawings made either from photographs or by special artists on the spot.

It was not until the turn of the century that photo-engraving was regularly used and news pictures began to appear in the daily press. By the time of the Great War special picture services had been organized to distribute photographs to the various papers, and the flood of pictures from Europe proved so popular that *The New York Times* found that the Sunday rotogravure supplement was not enough to satisfy the demand, and issued the *Mid-Week Pictorial.* To leaf through these early volumes of *Mid-Week* is to see press photography grow from simple, almost banal snapshots to pictures with a tremendous feeling and "punch." To presentations of havoc worse than that which Brady recorded were added photographs of explosions, bombardments and actual fighting, making a far more complete documentation of a war.

After the War, the "tabloid" newspaper was evolved. Smaller in format than the ordinary newspaper, it was crowded with pictures, so that the reader received a pictorial, rather than a literary, summary of the day's events. The enormous popularity of the tabloids forced other papers to include more and more photographic illustrations, so that today a newspaper without photographs is very rare.

Obviously not all the news lends itself to photographic interpretation. Diplomats seated around a table may be reshaping the world, but it is the exceptional photographer who can make the uninitiated beholder feel the drama underlying such a conference. Understanding and appreciation are instantaneous, however, in photographs of rapid action, such as accidents and sports, or of details set against the emotional background of a disaster or a crime.

COVERING THE NEWS

Although the actual technique of a news photographer in no wise differs from that of any other worker, the special demands made on his skill, daring and ingenuity in getting unusual and exclusive pictures, and the need of producing these pictures with all possible speed make his work a special branch. James C. Kinkaid, himself a news photographer, writes:

"No branch of news photography is more fascinating than high-speed processing for one who is in the game for the thrills he can get out of it, and you would be surprised how many of the working news photographers are in that select group. They are the boys who insist upon standing at the rail on the outside of a curve at a dirt-track automobile race on the chance that some reckless driver will blow a tire or lose a wheel and crash through the rail near where they are standing or where they were standing. They are the lads who climb to the top of a bridge to make a shot. The same type of youth will go into the middle of a riot to pick out his scene of action, or go into a burning building where an explosion may occur at any moment, to get real action shots. In a word, they are the photographers who will make a name for themselves in the news game where action photographs are wanted by the public.

"The pictures that these photographers make are of exceptional news value only while the story is fresh in the mind of the public. This statement can be proved by the circulation figures of any progressive daily

newspaper when it has an exceptionally newsy picture prominently displayed. Circulation on such occasions may jump thousands over normal figures.

"Because of this factor some pictures must be supplied to the editor's desk in a minimum of time. That minimum can easily be under five minutes. Such processing requires a photographer working in the dark room to be on his toes from the time he enters it until the time he has a finished picture."[1]

Almost invariably the news photographer uses a camera taking cut-films 4 x 5 inches in size, and fitted with a moderately fast lens and a high-speed shutter. Because he can seldom count on finding his subject well illuminated and because he must take the picture on the spot, these cameras are synchronized with an electric photoflash (an electric light globe filled with magnesium foil which, when a weak electric current is passed through it, instantly ignites giving brilliant illumination for a fraction of a second). All this equipment is absolutely necessary. The nature of his profession requires that the press photographer leave nothing to chance.

He must sense where news is going to happen and be there. "How did you know that tank was going to explode?" Charles Roth was asked. "Oh, there were no buildings in that part of town, and it was Sunday afternoon, so I knew the smoke meant something unusual." (Plate 81.)

MAKING THE DEADLINE

Sensing the exact instant to release the shutter is the most important factor in the making of any photograph. With press photographers, this sense becomes so acute as to seem instinctive. Charles Roth writes: "A moment after the picture was taken, the place from which I took it became a lake of burning oil," and adds that not until he developed the negative did he know whether or not he had snapped the shutter; there was no time for thinking. A fraction of a second's delay, and the remarkable picture of the shooting of Mayor Gaynor would have lost its terrific force; it seems as if William Warnecke must have released the shutter at the same moment that the assassin fired the gun (Plate 82). Yet pictures cannot be taken in rapid succession; each plate or film must be kept sep-

[1]Kinkaid, James C. *Press Photography*, Boston, American Photographic Publishing Co., 1936, p. 65.

arate, in order that no time be lost in developing more than the one picture needed by the editor. Minutes count. Mr. Kinkaid, after giving details of high-speed processing, adds: "That is fast work and it requires concentration, especially when the rasping voice of the editor bellows through the door of the dark room, 'How long do we have to wait for that print?' "

For this reason the miniature camera is not regularly used, except for special feature work where the deadline is not a matter of minutes; the tiny negatives demand careful development and cannot survive the rough treatment of high-speed processing. Another type, called the "magic eye," is often taken to sporting events. This is a power-driven miniature camera which automatically takes pictures in quick succession —an improvement on the type used by Marey but still essentially the same.

A good news photograph must first of all isolate the significant action. Press photographers advise: "Get your subject in the center—then you'll be sure you got it." It is astounding to the layman how many of these direct compositions are magnificent. Clarity and detail are desirable, but not absolutely necessary. Print quality — so highly prized by other photographers—goes overboard; it is impossible in high-speed processing, and is lost anyway in the half-tone. In reproduction the design of the values is so important that a picture in which the subject does not stand out must be retouched.

Press photography is in direct contact with the daily lives of thousands of men and women. Necessarily it records them in the most dramatic moments of their history and brings these records to the attention of millions more while the event itself is still fresh. Most of it is sensational and dies with the sensation. The names of the men who often risk their lives to make these pictures are unknown to the mass of the public, which sees only the subject they have recorded. But frequently a photograph is made which transcends the ephemeral and becomes a great document. The essence of some situation common to human experience is driven home with poignancy and truth. These pictures are worth more than a few seconds' scanning; we may no longer feel any interest in the incidents they report, but we cannot afford to waste dynamic interpretations of the living world.

COLOR PHOTOGRAPHY

When Niépce described his early photographic researches to his brother Claude, he said: "But I must succeed in fixing the colors."[1] The image of the camera obscura was, of course, colored, and any attempt to fix this image was only partially successful if these colors were not faithfully reproduced. When Niépce visited Daguerre in 1827 he was especially interested in the latter's researches into this problem. He wrote enthusiastically to his son: "M. Daguerre has arrived at the point of registering on his chemical substance some of the colored rays of the prism; he has already reunited four and he is working on combining the other three in order to have the seven primary colors. But the difficulties which he encounters grow in proportion to the modification which this same substance must undergo in order to retain several colors at the same time. . . . After what he told me, he has little hope of succeeding and his researches can hardly have any other object than that of pure curiosity. My process seemed to him much preferable and more satisfactory, because of the results which I have obtained. He felt that it would be very interesting to him to procure views with the aid of a similar simple process which would also be easy and expeditious. He desired me to make some experiments with colored glasses in order to ascertain whether the impression produced on my substance would be the same as on his. I have ordered five glasses from Chevalier, such as he has already made for M. Daguerre."[2]

Apparently Niépce had no better results than Daguerre. The immediate possibilities of black and white photography outweighed the fact that colors were not recorded. But the public soon sensed the lack; as we have seen, Gaudin and Lerebours commented on the lack of color and life in the daguerreotype image. Just as people were added in copies of daguerreotypes to endow the pictures with life, so the actual daguerreotype plates were quite often lightly tinted to make them more realistic and to imitate portrait miniatures as far as possible. In the meantime other experimenters sought for some substance which would assume whatever color was shining upon it. Although claims of success have been made no permanent results have come down to us.

[1] Fouque, *op. cit.*, p. 29.

[2] *Ibid.*, pp. 75-76.

In 1891 Gabriel Lippmann of Paris saw that direct color photographs could be made by applying the optical phenomenon called "interference." (The rainbow hues seen on oily water are caused by this phenomenon.) The results obtained by this process are remarkably true to nature. No coloring matter is added; the plate itself looks brown unless held at a certain angle, when a marvelously brilliant image is seen in true colors. "Professor Lippmann has shown me slides of still-life subjects," wrote Edward Steichen in 1908, "by projection, that were as perfect in color as in an ordinary glass-positive in the rendering of the image in monochrome. The rendering of white tones was astonishing, and a slide made by one of the Lumière brothers, at a time when they were trying to make the process commercially possible, a slide of a girl in a plaid dress on a brilliant sunlit lawn, was simply dazzling, and one would have to go to a good Renoir to find its equal in color luminosity."[1] Unfortunately this process, which is the only one which directly records the colors of nature, was never a practical technique.

ADDITIVE PROCESSES

It has been found possible, however, to recreate the coloring of nature by indirect means. This may be done in two ways, either by the addition of colored lights, or by the mixture of various pigments. Although both ways were proposed at the same time, the first process which met with any practical success was based on the theory, expounded by James Clerk Maxwell in 1861, that any color can be created by mingling red, green and blue-violet light in definite proportions. These are the three primary colors of nature. Added together in equal quantities they make white light. Red and green give yellow; red and blue-violet, magenta; green and blue-violet, blue. It is necessary to bear in mind that this theory holds true only for colored *light;* the mixture of pigments is another matter.

If three negatives are taken through screens or filters of these primary colors, and lantern slides made from them are projected through the same filters onto a screen in such a manner that their images are superimposed, it is possible to reproduce the exact colors as well as the form of nature. Because, as we have seen, colors could not be recorded in their tonal relationships before the end of the century, Clerk Maxwell's ex-

[1] *Camera Work,* No. 22, 1908, p. 14.

periment was unsuccessful. When panchromatic plates were invented, his theory was put into practice. It is inconvenient, however, to set up three magic lanterns whenever a colored photograph is looked at. In 1892 Frederick E. Ives of Philadelphia devised a portable apparatus which he called the "Krōmskōp," which optically united three transparencies so that they could be viewed in proper register by looking through a peep-hole.

Still, people could not look at the transparencies as easily as they could look at a black and white photograph. The first practical method of making a single picture which could be viewed without any apparatus was devised by John Joly of Dublin. His method was patented in 1893. Instead of taking three separate pictures through three colored filters, he took one negative through one filter minutely checkered with microscopic areas colored red, green and blue-violet. The filter was the exact size of the plate and was placed in contact with it in the camera. After the plate had been developed, a transparency was made, and the filter permanently fastened to it. The black and white areas of the picture allowed more or less light to shine through the filters; if viewed from a proper distance the colored lights blended to form the various colors of nature. In 1903 the same principle was used by the brothers Lumière of Lyons in their *autochromes,* which were put on the market in 1907. The plate was covered with minute grains of starch which had been dyed to form the filters. After development the negative was turned into a positive by chemical means, and a transparency with natural colors resulted. A recent method, called *Dufaycolor,* combines these two techniques; a film is ruled to form a multiple filter somewhat similar to the Joly screen, and the image is reversed as in the autochrome process.

All of these methods produced nothing but transparencies. These did not answer the public's demand for they did not have the convenience of paper prints.

SUBTRACTIVE PROCESSES

The second technique is based, not on the addition of colored lights, but on the mechanical mixture of pigments. A white object reflects all the light rays which fall upon it, namely the red, green and blue-violet; these recombine to form white. A black object absorbs, or subtracts, all the

rays falling on it; no light is reflected, and hence it looks black. A red object subtracts the green and blue-violet rays and reflects the red rays only. Techniques based on this theory are called subtractive processes.

Each of three negatives taken through separate filters of the primary colors (red, green and blue-violet) is printed on paper and then tinted in the color complementary to the filter through which the negative was made (respectively blue, red, yellow). The actual gelatine of each print is stripped from its original support and the three are superimposed on a fresh paper. There are many ways of doing this, but the method which is most widely used today is a modification of the carbon process, called *carbro*. The white paper, which forms the foundation of the print, reflects all the rays; in order that the proper colors may recombine it is necessary to subtract from this white light precisely the colors which are subtracted by the filters. In the additive process the illumination is not white light but light in the three primary colors.

As early as 1869, Louis Ducos du Hauron wrote a remarkable book[1] which describes with clarity most of the processes employed today, in spite of the fact that when it was written the author could not obtain satisfactory results because of the inadequately sensitive material which he was forced to use. His description of the additive process is perfectly clear, and the following summary of the problems of subtractive photography could serve as a foreword to the most modern treatise. "To obtain, by photographic techniques already known, and by the interposition of three colored media, three monochrome prints, one red, one yellow, the third blue, and then to form, by the superimposition or the mingling of these three prints, one unique print in which will be found reproduced at once the color and the form of nature."

The technique of subtractive color photography is difficult, for it involves not only the making of three separate negatives identical in their relationship to the chiaroscuro of nature, but also the very delicate operation of making the superimposed print. Relatively few photographers are capable of this work. Factories have been established to make these prints and some remarkable results have been obtained by this division of labor. But the best work has been done by those photographers who are able to work out every detail of the process themselves.

[1] *Les Couleurs en Photographie; Solution du Problème.* Paris, A. Marion, 1869.

It is evident that, while it is theoretically possible to make faithful records of nature's color by this process, in practice many conditioning factors must be considered. These may be accounted for by strengthening or weakening any one of the three component prints so that certain colors are slightly changed. It is possible by this means to create distortions which may have great esthetic value. So few experiments have been made in this direction, however, that one cannot do more than foresee its possibilities. The desire to produce realistic photographs in color is so strong that only a few have made purposeful abstractions.

The fact that he must make three negatives introduces another problem to the color photographer. Unless he has a special camera, which will expose three plates at once, action cannot be recorded. Even with a "one shot" camera, a great deal of illumination is required. For snapshot work the additive process is more flexible; from these transparencies prints can be made by rephotographing them with the subtractive process.

Recently a new subtractive technique has been worked out at the Eastman Kodak Research Laboratories which eliminates the necessity of making more than one exposure and which calls for no special camera. Three emulsions are spread on top of one another on the film, separated by layers of pigments which act as filters. By an extremely delicate process, each one of these emulsions is individually developed, and the image is chemically reversed. So far this is practical only for the production of transparencies, but more can be expected.

Color photography is not new, but it has not been practised to any great extent until the present decade. It is too early to form any esthetic opinions, for not enough experimentation has been made. Comparisons between color photography and painting seem almost inevitable. Are the distortions so noticeable in color photography inherent in the technique? Will the development of more accurate processes prove that there are "photographic colors" as there is a "photographic perspective"? Will the photographer control his medium, or will there be a school of "straight color photography"? These are questions which will be answered in the future. One ventures to prophesy that more and more attention will be paid to color. The demand for it is as old as photography itself.

SCIENTIFIC PHOTOGRAPHY

In his report to the Chamber of Deputies, Arago spoke of the possibilities of daguerreotypy as a scientific tool. He was correct in his prophecy; scientists were quick to adopt it.

As early as October, 1839, microphotographs had been taken by daguerreotypy; in 1845 some of these were published by A. Donné in an album illustrated with photogravures made by the Fizeau process. The technique has developed enormously since that date; today microscopic specimens are regularly recorded by photography. The great ultra-violet microscope, built for Dr. Francis F. Lucas of the Bell Telephone Laboratories, has reached the amazing power of 4000 diameters, and photographs can be made of these unbelievably enormous magnifications. (If this page were enlarged an equal degree, it would cover more than 179 acres.) Extraordinary discoveries have been made by the aid of these photographs. It is possible to change the focus of the enormous microscope very slightly, and to take a series of photographs of a single cell at levels separated by a quarter of a micron (about one hundred millionth part of an inch). From the photographs thus obtained, a model of the cell could easily be constructed. Low power magnifications, which are routine affairs to the scientist, offer the layman a dramatic picture of the architecture of nature (Plate 86).

The first photograph of the moon was made in 1840 by Draper of New York. This was too small to be of practical value, and not until 1865 was a detailed photograph made which could be studied. Today most telescopes are really cameras. Fitted with special clockwork machinery they follow a star for hours, and over this long period the photographic plate stores up enough light to yield an image showing more than the eye can see. Changes in the heavenly bodies are checked by constant reference to these plates. In spite of the fact that astronomical photographs are taken solely as scientific records, some of them have an awe-inspiring beauty, especially those of spiral nebulae.

INFRA-RED RAYS AND X-RAYS

The salts of silver are sensitive to rays other than those which produce light. They are greatly affected by the ultra-violet waves at one end of the spectrum, and by the infra-red rays at the other end. Fox Talbot

had already noticed this when he wrote *The Pencil of Nature* in 1844. He imagined a spectrum so cast by a prism that only the invisible rays could penetrate into a room entirely dark. Although no visible rays were present yet it would be possible, he imagined, to take photographs of the occupants. "Alas! that this speculation is somewhat too refined to be introduced with effect into a modern novel or romance," he wrote, "for what a dénouement we should have, if we could suppose the secrets of the darkened chamber to be revealed by the testimony of the imprinted paper." Talbot's prophecy has come true; photographs can be taken in the dark, providing that there are infra-red rays present and that a specially sensitized film is used. The infra-red rays penetrate haze, and consequently one can photograph great distances by their aid. Thus Captain Stevens was able to photograph 105 square miles of land from a height of more than thirteen miles during the National Geographic Society—U. S. Army Air Corps stratosphere flight of 1935. These rays also penetrate the surface of the human skin, disclosing the veins. This new technique is being used as a regular clinical procedure.

When Röntgen, in 1895, discovered the x-rays which penetrate certain matter, he found that photographic emulsion was sensitive to them. A year later Eder was able to take delicate x-ray photographs, or radiographs, of the internal structure of fish (Plate 88). The use of the x-ray has become a vitally important phase of modern diagnosis; not only are the bones of the body clearly outlined, but also the state of various tissues and hidden organs (Plate 89). Radiographs are also taken of inanimate material. They are used, for example, to test steel for hidden cracks and impurities.

AERIAL AND HIGH-SPEED PHOTOGRAPHY

Although Nadar took photographs in 1858 from a balloon, it was not until the Great War that the full possibilities of aerial photography were demonstrated. The accuracy of artillery fire was checked by aerial photographs of the target; progressive pictures were taken of bombardments (Plate 84) in order that headquarters might know when the bombarded area had been destroyed to the point where troops might rush in and take over the territory. The photographs were marked with lines indicating landmarks or the movement of troops, and mounted together with

an untouched print. These pictures had to be of the utmost sharpness; a new standard was set in aerial photography. After the war the same principles were applied in many other ways. Inaccessible areas have been mapped; the routes of proposed pipe-lines or railroads calculated; the structure of the earth analyzed from air-views. Pictures of the same spot, taken a slightly distance apart, when viewed with special apparatus show a strongly stereoscopic effect, which makes it easier to identify landmarks and "read" the view.

In 1851 Henry Fox Talbot fastened a copy of the London *Times* to a swiftly revolving wheel on which he had trained his camera. A plate was placed in the camera, the room darkened, the camera opened and a brilliant high-voltage electric spark was set off. By this means he secured a photograph which stopped the motion of the wheel and was clear enough to show the type of the newspaper. This is the principle of *stroboscopic* or high-speed photography. An apparatus emits brilliant flashes of light at rapid intervals; a special camera with constantly moving film records the subject during the periods of illumination. The flashes are of such short duration (about 1/100,000 second) that the most fleeting action can be arrested and recorded without blurring on the film, whose motion during this time is negligible. These photographs are of great value in the study of machinery operating at so great a speed that the eye cannot see moving parts—as, for example, textile machinery. Such photographs are of spectacular interest also. No eye has ever seen the form of a drop of milk splashing into a pan of milk (Plate 87), or the indentation made in a football by the toe of the kicker's boot.

Thus the scientist, using the camera as another tool, has shown that photography has many possibilities which were ignored or overlooked by those who used the camera merely as a way of making pictures.

MOVING PICTURES

Moving pictures depend on photography for their existence. While it is true that the individual images which form the moving picture are made in a manner similar to that used for any other photograph, cinematography is so entirely different in its whole technique and point of view that it forms a special field in itself. We can no more than indicate here the barest outlines of a complex and powerful medium.

The problem of the cinematographer is almost the exact opposite of that which faces the still photographer. The latter makes a single critical exposure; the former must take a whole series of exposures. The effect of motion is obtained by projecting photographs of various phases of action upon a screen in rapid succession. Sequences not in themselves of special importance are combined with other sequences to form a dramatic and dynamic whole. Whereas the still photographer attempts to tell his story within the confines of a single picture, the moving picture photographer can tell it from a great many points of view, showing now a general view (long shot) now a detail (close-up). Because he can get these details separately, he does not need to attempt them in a distant view.

The moving picture is one of the purest forms of photography. It is almost impossible to retouch the images because there are thousands. Control of the composition by enlargement and cropping is out of the question. The cinematographer must compose all his pictures directly within a frame of unchanging size. To help him, a series of interchangeable lenses of varying focal length are usually mounted on the camera, so that from one view point long shots, medium shots, and close-ups can be made.

To examine individual stills is to see only parts of a whole, the words of a sentence, the notes of a bar of music. Enlargements from actual cinema film often have remarkable force; this may be due to the fact that from so vast a choice of pictures, the most effective arrangement can be chosen. The laws of chance, which are so successfully exploited by the miniature camera technique, seem to apply here in an extreme degree. At present, enlargements from an actual strip are technically unsatisfactory, because of the loss of detail, but it is quite possible that within a few years great improvement will be made. Already some of the most striking news photographs are enlargements from a news film.

The influence of cinematography on still photography is deeply felt. The present popularity of the miniature camera is due to the moving pictures. Another striking example of their influence is the emphasis placed on layout in thousands of publications. Photographs are arranged in sequence to give an impression of action by continuity of space, or the effect of one picture is heightened by the close juxtaposition of another. Photographs of portions of objects (close-ups) were most uncom-

mon before the moving picture. The modern use of panchromatic material giving dark skies was fostered by Hollywood.

Esthetically, the moving picture and the still photograph are so independent that they cannot be compared. A fascinating and powerful ideology underlies the moving picture; this ideology is based on the fact that the moving picture has precisely that dimension which the still cannot have—time. The moving picture creates its own time; the still photograph stops time, and holds it for us.

Herein lies, perhaps, the greatest power of the camera. What has been recorded is gone forever. Whenever a moving picture is projected, past time moves again. The actors, the statesmen, the working-men may be dead, yet their living semblance moves before us on the screen. Though the stones of Chartres cathedral are still with us, no photograph taken today can ever show the crispness of detail which eighty years of weather have dulled. The faces that look out from daguerreotypes and calotypes have vanished. Our ways of looking change; the photograph not only documents a subject but records the vision of a person and a period.

BEAUMONT NEWHALL

A Few Books on Photography

As a guide for further study, the following titles are suggested. Comprehensive bibliographies are to be found in Neblette, Eder and Potonniée; the Columbia University Library will shortly publish a catalog of the important collection of photographic literature which has recently been presented by Edward and Clarence Epstean. The student is advised to consult original sources whenever possible. Periodicals, of which a large number have been and are being published (the majority are conveniently listed in a catalog of the periodicals in the Library of the Royal Photographic Society, *Photographic Journal,* August, 1935, vol. 75, pp. 465-474) and annual albums, such as *Photographie* (published by *Arts et Métiers Graphiques,* Paris) and *U. S. Camera* (New York, Morrow) are indispensable.

THE PRINCIPLES OF PHOTOGRAPHY

Clerc, Louis Philippe. *Photography, Theory and Practice.* Ed. by George E. Brown. London, Pitman, 1930.

Standard work, translated from the French.

Mees, C. E. Kenneth. *Photography.* London, Bell, 1936.

"This book . . . is intended to provide a general review of the whole subject of photography written in a simple and popular style." (Preface.) An amplification of the author's *Fundamentals of Photography.* (Rochester, Eastman Kodak Company, 1935.)

Neblette, C. B. *Photography, Its Principles and Practice.* 2d ed. New York, Van Nostrand, 1930.

Spencer, D. A. *Photography To-Day.* London, Oxford University Press, 1936.

A brilliantly clear explanation of the principles of photography, written for the layman in terms he can understand.

Bossert, Helmuth Th. & Heinrich Guttmann. *Aus der Frühzeit der Photographie, 1840-70.* [*From the Early Days of Photography, 1840-70.*] Frankfort-on-Main, Societäts-Verlag, 1930.

A picturebook with 200 illustrations, titled in German, English and French. Short introductions by the authors in German. Despite certain serious omissions, an excellent pictorial survey of calotypy, daguerreotypy and collodion photography.

Eder, Josef Maria. *Geschichte der Photographie.* [*History of Photography.*] 4th ed. Halle, Knapp, 1932. 2 vols.

The standard technical history of photography and the only book which covers the field completely. Unfortunately chauvinistic and exceptionally full of typographical errors.

Fouque, Victor. *The Truth Concerning the Invention of Photography; Nicéphore Niépce, His Life, Letters and Works.* Translated by Edward Epstean. New York, Tennant and Ward, 1935.

Originally published in 1867, this book is the standard source of information on Niépce and his work. Unillustrated.

Freund, Gisèle. *La Photographie en France au Dix-Neuvième Siècle; Essai de Sociologie et d'Esthétique.* [*Photography in France in the Nineteenth Century; Sociological and Esthetic History.*] Paris, Monnier, 1936.

An admirable attempt to relate portrait photography to the bourgeois public and to artists.

Potonniée, Georges. *The History of the Discovery of Photography.* Translated by Edward Epstean. New York, Tennant and Ward, 1936.

The standard account of the discovery and publication of daguerreotypy, with an extensive history of Niépce's researches, based on Fouque. Entirely inadequate treatment of Talbot's work, and meagre information on the spread and social uses of daguerreotypy. A second volume is promised, covering the history of photography after 1851. The translation is not illustrated.

Recht, Camille. *Die Alte Photographie.* [*Old Photography.*] Paris and Leipzig, Jonquières, 1931.

A picturebook, to 1870. Also published under the title *La Vieille Photographie depuis Daguerre jusqu'à 1870.* (Paris, Helleu, 1935.)

Root, Marcus A. *The Camera and the Pencil; or, The Heliographic Art . . . together with Its History in the United States and in Europe.* Philadelphia, Author, 1864.

The only history of photography in this country. Professor Robert Taft of the University of Kansas announces the future publication of an exhaustive history of American photography. Certain chapters which will be included in Professor Taft's book have been published in *American Photography* during the past few years.

CONTEMPORARY TECHNIQUE

Adams, Ansel. *Making a Photograph; an Introduction to Photography.* London and New York, The Studio, 1935.

An excellent technical guide to "straight" photography.

Heering, Walther. *The Rolleiflex Book.* Translated by J. L. Baring. New York, B. Brooks, 1934.

A well-written manual for the amateur, with special instructions in the use of miniature reflex camera with matched lenses.

Morgan, Willard D., Lester, Henry M., and other contributors. *The Leica Manual.* 2d ed. New York, Morgan & Lester, 1937.

Articles by various authorities covering all phases of miniature camera work. While specifically written to serve as an instruction-book for users of the Leica camera, the information is sufficiently inclusive so that it applies to other miniature cameras as well.

ESTHETICS

Gräff, Werner. *Es Kommt der Neue Fotograf!* [*Here Comes the New Photographer!*] Berlin, Reckendorf, 1929.

A successful attempt, in words and pictures, to demonstrate how the camera can be used in a purely photographic manner as a medium for powerful and varied artistic expression.

Grashoff, Ehler W. *Kamera und Kunst; Formgestaltung in Photographie.* [*Camera and Art; the Principles of Form in Photography and Painting.*] Frankfort-on-Main, Klosterman, undated.

An experimental comparison between thirteen photographs and twenty-one paintings.

Moholy-Nagy, L. *Malerei, Photographie, Film.* [*Painting, Photography, Film.*] Munich, Langen, 1925.

Based on a series of lectures delivered at the Bauhaus School, Germany. No. 8 of the *Bauhausbücher.* 105 illustrations, including news, scientific and experimental photographs.

Robinson, Henry Peach. *Pictorial Effect in Photography; Being Hints on Composition and Chiaroscuro for Photographers.* London, Piper and Carter, 1869.

The classical handbook for the creation of photographs in the tradition of paintings. Illustrated with many wood-engravings and three original prints by the author. Subsequently published in many editions.

PRESS PHOTOGRAPHY

Kinkaid, J. C. *Press Photography.* Boston, American Photographic Publishing Company, 1936.

A straightforward guide, covering all branches of press photography, from choice of equipment to the laws of libel. The illustrations, although interesting, are not entirely typical.

Ross, Kip. *Candid Photography with the Miniature Camera.* Canton, Ohio, Fomo Publishing Co., 1934.

An aid to the effective use of the miniature camera in covering indoor news assignments.

COLOR PHOTOGRAPHY

Wall, Edward John. *The History of Three-Color Photography.* Boston, American Photographic Publishing Company, 1925.

MONOGRAPHS ON INDIVIDUAL PHOTOGRAPHERS

ATGET, EUGENE.

Atget, Photographe de Paris. Preface by Pierre Mac-Orlan. New York, Weyhe, undated.

CAMERON, JULIA MARGARET.

Victorian Photographs of Famous Men and Fair Women. With Introductions by Virginia Woolf and Roger Fry. London, Woolf, 1926.

HILL, DAVID OCTAVIUS.

Schwarz, Heinrich. *David Octavius Hill, Master of Photography.* New York, Viking Press, 1931.

Excellent introductory essay on the sociological reasons for, and technical development of, primitive photography.

RAY, MAN.

Photographs by Man Ray; Paris, 1920-1934. Hartford, Conn., Soby, 1934.

STEICHEN, EDWARD.

Sandburg, Carl. *Steichen the Photographer.* New York, Harcourt, Brace, 1929.

For the early work of Steichen, see also photogravures in *Camera Work,* especially Steichen Supplement, 1906.

STIEGLITZ, ALFRED.

America and Alfred Stieglitz. New York, Doubleday, Doran, 1934.

31 Stieglitz photographs reproduced in dimensions too small for study or appreciation. Excellent biography which should be supplemented by the excellent reproductions in *Camera Work,* especially no. 35-36, 1911.

WESTON, EDWARD.

Edward Weston. New York, Weyhe, 1932.

Forewords by the photographer, Merle Armitage, Jean Charlot, Arthur Millier, Charles Sheeler and Lincoln Steffens. 39 plates.

Catalog of the Exhibition

BEFORE PHOTOGRAPHY

1 An artist drawing a seated man on a pane of glass through a sight vane. Photograph of a woodcut in Albrecht Dürer's *Underweysung der Messung,* Nuremberg, 1525

2 Athanasius Kircher's camera obscura, 1671. Reproduced from an engraving in Athanasius Kircher's *Ars Magna Lucis et Umbrae,* Amsterdam, 1671, p. 709

*3 Camera obscura, late 18th century. Simple lens; image reflected to ground glass on top of camera, covered with an adjustable hood. 6⅜" high, 8¼" wide, 14½" deep. Lent by A. Gilles, Paris

4 Reproduction of a landscape drawn with the camera obscura, by Karl Friedrich Schinkel (1781-1841). Lent by Henry-Russell Hitchcock, Jr., Middletown, Connecticut

5 Photographs of camerae lucidae, late 18th to early 19th centuries. Originals in The Science Museum, London

6 Claude glass, 18th century. A black concave mirror named after Claude Lorrain. The reduced and darkened image was used as an aid to landscape painters. Lent by Mrs. Henry R. Hitchcock, Plymouth, Massachusetts

QUENEDY, Edmé. 1756-1830. Paris

*7 a-g Portrait engravings made with the physionotrace. Lent by Julien Levy Gallery, New York

NIEPCE, Joseph-Nicéphore. Born Chalon-sur-Saône (Saône-et-Loire), France, 1765. First photographic experiments, 1816. Cardinal d'Amboise heliograph, 1826. Met Daguerre, 1827. Contract with Daguerre, 1829. Died Chalon-sur-Saône, 1833.

*8 Reproduction of engraving of Cardinal d'Amboise, 1826 (photograph from original heliograph plate)

9 Reproduction of engraving of Christ carrying the cross, *c.* 1826 (photograph from original heliograph plate)

Originals of nos. 8-9 collection The Royal Photographic Society of Great Britain, London; photographs courtesy The Science Museum, London

DAGUERREOTYPES

ARNAUDE, J. Bordeaux, France

10 Portrait of a Man, *c.* 1850. Lent by A. Gilles, Paris

BABBITT. Niagara Falls, New York

11 View of Niagara Falls, *c.* 1850. Lent by A. Gilles, Paris

BRADY, Matthew B. New York and Washington, D. C. *For biography see nos. 149-169.*

12 Family Group, *c.* 1850. Lent by Georges Sirot, Paris

DAGUERRE, Louis-Jacques-Mandé. Born Cormeilles-en-Parisis (Seine-et-

Oise), France, 1787. Opened Diorama, Paris, 1822. Heard of Niépce's researches, 1826. Contract with Niépce, 1829. First existing daguerreotype, 1837. Published daguerreotypy, 1839. Died Bry-sur-Marne, 1851.

*13 Still Life, 1837 (photograph of original in collection of Société Française de Photographie, Paris). The earliest daguerreotype in existence

DEMANGE. Metz, France

14 Portrait of a Man, *c.* 1850. Lent by A. Gilles, Paris

DERUSSY. Paris

15 Peasant Woman, *c.* 1845. Lent by A. Gilles, Paris

DESMONTS. Marseilles, France

16 Honoré Daumier, *c.* 1845. Lent by A. Gilles, Paris

HAWES, Josiah Johnson. (Firm name: Southworth & Hawes.) Born Wayland, Massachusetts, 1808. Worked in Boston with Southworth. Died Boston, 1901.

17 Albert S. Southworth, *c.* 1847

18 Self Portrait, *c.* 1848

19 Mrs. J. J. Hawes, 1848

*20 Chief Justice Lemuel Shaw, *c.* 1850

21 Donald Mackay, *c.* 1850

22 Lola Montez, *c.* 1850

23 Triplets, *c.* 1850

24 Daniel Webster, 1851

25 Portrait of a Woman. Series of poses on same plate

Nos. 17-25 lent by Edward Southworth Hawes, Boston

HUBERT. Paris. Assistant to Daguerre

26 Still Life, 1839 (photograph of original in collection of Société Française de Photographie, Paris). Made at a public demonstration of the daguerreotype process

LANGENHEIM, W. & F. Brothers, William and Frederick. Born Brunswick, Germany, 1807 and 1802. Worked together in Philadelphia. Died Philadelphia, 1874 and 1879.

*27 "Panorama of the Falls of Niagara. Daguerreotype taken from the Clifton House, Canada side, July, 1845." Five plates in a frame

28 Portrait of a Daguerreotype Operator, *c.* 1850

29 William Langenheim, *c.* 1850

30 Frederick Langenheim, *c.* 1850

31 F. D. Langenheim, *c.* 1850

Nos. 27-31 lent by F. D. Langenheim, Philadelphia

LEREBOURS, N. P. Paris

*32 Hôtel de Ville, Paris. Photo-mechanical reproduction made directly from daguerreotype plate by Fizeau process

33 Bas-relief, Notre-Dame, Paris. Unretouched print from daguerreotype etched by Fizeau process

Nos. 32-33 published in *Excursions Daguerriennes,* Paris, Rittner & Goupil, Lerebours, Bossange, 1842. Lent by Victor Barthélemy, Paris

LORY. Rheims, France

34 Portrait of a Man, *c.* 1848. Lent by A. Gilles, Paris

MEADE BROTHERS. New York

*35 Portrait of a Woman, *c.* 1850. Lent by A. Gilles, Paris

VANERSON, J. Washington, D. C.

36 John Howard Payne, 1850. Lent anonymously

WHIPPLE, John A. Boston, Massachusetts

37 Henry Wadsworth Longfellow, 1859. Lent anonymously

UNKNOWN PHOTOGRAPHERS, American

38 Abraham Lincoln, *c.* 1860

39 Henry Clay

Nos. 38-39 lent anonymously

UNKNOWN PHOTOGRAPHERS

40 Notre-Dame, Paris, *c.* 1840

41 Portrait of a Man, *c.* 1842

Nos. 40-41 lent by Victor Barthélemy, Paris

42 Portrait of a Man, *c.* 1842

43 Man Seated beside a Table, *c.* 1843

44 Portrait of a Woman, *c.* 1843

45 Portrait of a Woman, *c.* 1845

46 Family Group, c. 1845

47 Italian Church, *c.* 1845

48 Church, *c.* 1845

49 Château, *c.* 1845

50 Fountain of the Innocents, Paris, *c.* 1845

51 Child, *c.* 1848 (hand-tinted)

52 Billsticker, *c.* 1848

53 1848 Revolutionist (hand-tinted). Lent by Georges Sirot, Paris

54 Mining Village in Western United States, *c.* 1849

55 Portrait of a Man, *c.* 1850

56 Old Lady, *c.* 1850 (hand-tinted)

*57 Portrait of a Woman against Painted Background, *c.* 1850

58 Mother and Child, *c.* 1850 (hand-tinted)

59 Child, *c.* 1850 (hand-tinted)

60 Sisters, *c.* 1850

*61 Surveyor, *c.* 1850

62 The Vatican, Rome, *c.* 1850

63 The Trevi Fountain, Rome, *c.* 1850

64 Dog in Chair, *c.* 1850

65 Celine Déhay, 1851

*66 The Photographer Fixion, *c.* 1855

*67 Man and Woman, *c.* 1855

68 Children Looking at a Book, *c.* 1855

68a Woman Looking Down from a Balcony. *c.* 1855. Paired with no. 68

69 Officer of the Second Empire, *c.* 1860

70 Portrait of a Man, *c.* 1860

71 Portrait of a Man, *c.* 1860

72 Portrait of a Woman, *c.* 1860 (hand-tinted)

Nos. 40-52, 54-72 lent by A. Gilles, Paris

UNKNOWN PHOTOGRAPHER, Spanish

73 Card players, *c.* 1845. Lent by Victor Barthélemy, Paris

APPARATUS AND RELATED MATERIAL

74 Meade Brothers' Daguerreotype Gallery, Broadway, New York. Wood engraving

75 Brady's Gallery of Daguerreotype Portrait and Family Groups, Nos. 205 and 207 Broadway [New York]. Wood engraving from Doggett's New York City Directory, 1848-49

76 Lawrence's Gallery, 381 Broadway, corner of White Street, New York. Wood engraving

Nos. 74-76 lent by the Museum of the City of New York

*77 Portable daguerreotype outfit, *c.* 1843

a. Camera with telescoping body and ground glass back. Fitted with double Chevalier lens, dated 1843

b, c. Two plate holders for plates $3\frac{3}{16}$ x $4\frac{3}{16}$ inches

d. Box for carrying plates

e. Iodizing box

f, g. Holders for exposed plates

h. Developing box, with alcohol lamp

78 Daguerreotype case with composition cover, probably American, *c.* 1850

Nos. 77-78 lent by A. Gilles, Paris

CALOTYPES

BALDUS, E. Paris (?)

79 Cathedral of Amiens, *c.* 1850. Lent by Victor Barthélemy, Paris

DU CAMP, Maxime. Paris (?)

*80 Colossus of Abu-Simbel, 1849-1851. Print by Blanquart-Evrard (1802-1872), Lille, 1852. From Maxime Du Camp, *Egypte, Nubie, Palestine et Syrie; Dessins Photographiques Recueillis Pendant les Années 1849, 1850 et 1851,* Paris, Gide et J. Baudry, 1852. Lent by The Royal Photographic Society of Great Britain, London

HILL and ADAMSON

David Octavius Hill: born Perth, Scotland, 1802. To Edinburgh, 1822, to study painting. A founder of Scottish Academy of Painting, Sculpture and Architecture. Took up photography, 1843; worked with Adamson in Edinburgh, 1843-1848, when most of his photographic work was done. Died, 1870. Robert Adamson: born Burnside, Scotland, 1821. Died St. Andrews, 1848.

*81 D. O. Hill, 1843 (original print)

82 Mrs. Bertram (original print)

Nos. 81-82 lent by The Royal Photographic Society of Great Britain, London

83 Mrs. Bertram

84 Lady with Paisley Shawl

85 John Ruskin (?)

86 In the Greyfriars Churchyard, Edinburgh

87 Portrait of a Woman

88 Portrait of a Woman

89 Portrait of a Man

90 Master Hope Finlay

Nos. 83-90 are posthumous prints made by A. L. Coburn for the International Exhibition of Pictorial Photography, Albright Art Gallery, Buffalo, 1910. Lent by the Albright Art Gallery, Buffalo, New York

91 James Fillans with His Daughters

92 Two Sisters

Nos. 91-92 are photogravures made from original negatives by J. Craig Annan, published in *Camera Work,* No. 28, 1909. Lent by the Albright Art Gallery, Buffalo, New York

*93 Colonel James Glencairn Burns, son of Robert Burns. Posthumous print by Francis C. Inglis, Edinburgh, 1936. Lent anonymously.

LANGENHEIM, W. & F. *For biography see nos. 27-31*

94-95 Calotype photographs of daguerreotypes, 1849

96 Philadelphia Exchange, August 16, 1849

97 *Circular. To all Professional Daguerreotypers and Amateurs of the Photographic Art throughout the United States,* 1849 (describing calotypy)

Nos. 94-97 were sent in 1849 by Langenheim brothers to Fox Talbot, whose American patent rights they had secured. Lent by Miss M. T. Talbot, Lacock Abbey, Wiltshire, England

98 Portrait (negative with original mask)

98a Modern print of no. 98

99 "Eight Foot Drive Locomotive," 1850 (print, *c.* 1890)

Nos. 98-99 lent by The Franklin Institute, Philadelphia

LE SECQ, H. Paris (?)

100 The Notre-Dame Pumping Station, Paris, 1852 (original print). Signed and dated

101 Wooden Stair Tower, Town of Chartres, *c.* 1852 (negative). Signed

101a Modern print of no. 101, 1937, courtesy Edward J. Steichen

102 Sundial, Cathedral of Chartres, *c.* 1852 (negative)

102a Modern print of no. 102, 1937, courtesy Edward J. Steichen

103 West Portal, Chartres, 1852 (negative). Signed and dated

*103a Modern print of no. 103, 1937, courtesy Edward J. Steichen

104 South Portal, Chartres, 1852 (photogravure, *c.* 1860). Signed and dated

105 North Porch, Chartres, 1852 (photogravure, *c.* 1860). Signed and dated

106 West Portal, Chartres, 1852 (photogravure, *c.* 1860). Signed and dated

107 Detail of West Portal, Chartres, 1852 (photogravure, *c.* 1860). Signed and dated

108 Façade, Left Portal, Rheims, *c.* 1852 (photogravure, *c.* 1860). Signed

109 Tympanum of North Porch, Rheims, *c.* 1852 (photogravure, *c.* 1860). Signed

Nos. 100-109 lent by Victor Barthélemy, Paris

MEHEDIN, L., and MARTENS

110 Artillery Park, the Crimean War. Lent by Victor Barthélemy, Paris

NEGRE, Charles. Born Grasse (Alpes-Maritimes), France, 1820. Worked in Paris and Grasse. Perfected photogravure, 1853. Died Grasse, 1880.

111 Detail of Sculpture, Cathedral of Chartres, *c.* 1856 (original photogravure)

112 North Porch, Chartres, *c.* 1859

113 South Porch, Chartres, *c.* 1859

Nos. 111-113 lent by Charles Nègre, Grasse, France

PREVOST, Victor. 1820-1881. Paris and New York

114 Broadway, New York, 1855 (negative). Lent by Chandler Chemical Museum, Columbia University, New York

TALBOT, William Henry Fox. Born Lacock Abbey, Wiltshire, England, 1800. Began photographic experiments, 1834. Published "photogenic drawings," 1839. Perfected improved calotype process, 1840. Experimented with high-speed photography, 1851. Patented photoglyphic engraving, 1852. Died Lacock Abbey, 1877.

*115 Latticed Window, Lacock Abbey, 1835 (photograph of the original negative now in collection of The Science Museum, London)

116 Landscape, *c.* 1843

117 Cambridge University, *c.* 1843

118 Building, *c.* 1843

119 Gateway, *c.* 1843

*120 Cloisters of Lacock Abbey, *c.* 1843

121 Colosseum, Rome, *c.* 1843

122 Ruined Temple, *c.* 1843

123 Reproduction of a printed page, *c.* 1843

*124 Shadowgraph of lace, *c.* 1843

125 Picnic, *c.* 1843

Nos. 115-125 lent by Miss M. T. Talbot, Lacock Abbey, Wiltshire, England

126 *The Pencil of Nature,* first installment. Book illustrated with calotypes. London, Longman, Brown, Green and Longmans, 1844. Lent by the Smithsonian Institution, United States National Museum, Washington, D. C.

VILLENEUVE, J. V. de. Paris

127 Portrait of Régnier, Comédie Française, *c.* 1850

128 Samson, Rachel's teacher

129 Portrait of Provost, Comédie Française

Nos. 127-129 lent by Georges Sirot, Paris

130 Rachel, Comédie Française. Lent by Victor Barthélemy, Paris

UNKNOWN PHOTOGRAPHER, American

*131 Frederick's Photographic Temple of Art, New York, *c.* 1850. Lent by A. Gilles, Paris

UNKNOWN PHOTOGRAPHERS, French

132 Church of St.-Gervais, Paris, *c.* 1850

*133 Porte Rouge, Notre-Dame, Paris. Print by Blanquart-Evrard (1802-1872), Lille. From *Mélanges Photographiques,* pl. 46

134 New Sacristy, Notre-Dame, Paris, *c.* 1850. Print by Blanquart-Evrard (1802-1872), Lille. From *Mélanges Photographiques,* pl. 47

135 Ruins of the Château de Falaise, Normandy, *c.* 1850. Print by Blanquart-Evrard (1802-1872), Lille

136 View taken at Evreux, *c.* 1850. Print by Blanquart - Evrard (1802 - 1872), Lille. From *Souvenirs Photographiques,* pl. 15

Nos. 132-136 lent by Victor Barthélemy, Paris

137 Portrait of a Man with a Beard. Lent by Georges Sirot, Paris

APPARATUS

138 Calotype camera used by W. H. Fox Talbot. Box form with paper holder opening like a book. 7″ high, 5¼″ wide, 6¼″ deep. Lent by The Royal Photographic Society of Great Britain

BAYARD'S PAPER POSITIVES

BAYARD, Hippolyte. Born Breteuil-sur-Noye (Oise), France, 1801. Clerk in Ministry of Finance. Knew Grevedon, Gavarni, Charlet in Paris. Exhibited 30 paper positives, June 24, 1839. Improved process deposited at Academy, Nov. 11, 1839. Died Nemours, 1887.

139. Statue, 1839 (photograph of original)

*140 Statues, 1839 (photograph of original)

141 Architectural View, 1839 (photograph of original)

142 Architectural View, 1839 (photograph of original)

143 Portrait, 1839 (photograph of original)

Nos. 139-143 are photographs of original direct paper positives, exhibited at municipal auction rooms, Paris, June 24, 1839, now in collection of Société Française de Photographie, Paris

144 Portrait of Bayard, 1840 (photograph of original in collection of Société Française de Photographie, Paris)

145 Mills of Montmartre, *c.* 1845 (later print). Lent by Victor Barthélemy, Paris

THE COLLODION (WET PLATE) PROCESS

BALDUS, E. Paris (?)

146 The Chamber of Deputies, Paris, *c.* 1860

147 Pavillion Sully, The Louvre, Paris, *c.* 1860

Nos. 146-147 lent by Victor Barthélemy, Paris

BISSON FRERES

148 Bisson the Younger, *c.* 1860. Lent by Victor Barthélemy, Paris

BRADY, Matthew B. Born Warren County, New York, 1823. To New York, 1839, with Page, a pupil of S. F. B. Morse. Began photography, 1844. Opened branch studio in Washington, D. C., 1847. Alexander Gardner, the Englishman who taught Brady the collodion process, put in charge of Washington studio, 1858. First Civil War photographs, 1862. U. S. War Department

purchased 6,000 negatives for $27,840, 1875. Died New York, 1896.

149 Album of *carte-de-visite* photographs of various dates, some reproductions of daguerreotypes

150 Benjamin Franklin Wade, probably 1852

151 General Leslie Coombs, probably 1852

152 Senator Bigler, probably 1852

*153 Richard Montgomery Young, Associate Justice of the Supreme Court, probably 1852

154 John Jordan Crittenden, probably 1852

155 Colonel E. E. Ellsworth, *c.* 1860 (negative)

155a Modern print of no. 155, 1937

156 Carl Schurz, *c.* 1860 (negative)

156a Modern print of no. 156, 1937

157 Henry T. Tuckerman, *c.* 1860 (negative)

157a Modern print of no. 157, 1937

158 Self Portrait, *c.* 1860 (modern print)

159 S. P. Chase, *c.* 1860 (negative)

159a Modern print of no. 159, 1937

160 Brady Surveying the Battlefield, 1862-1865 (modern print)

*161 Brady's Photographic Buggy, 1862-1865 (later print)

162 Removing Wounded from the Battlefield, 1862-1865

163 General McClellan with His Wife, *c.* 1865 (negative)

163a Modern print of no. 163, 1937

Nos. 149-163 lent by Frederick H. Meserve, New York

164 Battery D at Fredericksburg, Virginia

165 Ruins

166 Battery at Fair Oaks, Virginia

167 Railroad Bridge

168 Ruins of Richmond, Virginia

169 Richmond, Virginia, after Bombardment

Nos. 164-169 lent by the L. C. Handy Studios, Washington, D. C. Courtesy of Walker Evans

BRAUN, Adolphe. 1810-1870. Dornach, Switzerland

170 Flowers, *c.* 1860. Lent by Victor Barthélemy, Paris

BREBISSON, A. de. 1798-1872. Paris

171 Charlatan, 1853. Lent by Georges Sirot, Paris

CAMERON, Julia Margaret. 1814-1879. London

172 Annie, My First Success, 1864

173 Sir John F. W. Herschel, 1867

174 Thomas Carlyle, 1867

*175 Alfred, Lord Tennyson, *c.* 1868

Nos. 172-175 lent by The Royal Photographic Society of Great Britain, London

CARJAT, Etienne. 1828-1906. Paris

*176 Honoré Daumier, 1861. Signed and dated. Dedicated by Daumier: *To my old friend Lavoignat.* Lent by the Fogg Art Museum, Cambridge, Paul J. Sachs Collection

177 Self Portrait. Lent by Victor Barthélemy, Paris

CREMIERE, L. Paris

178 The Falconer

179 The Actor Lafont

Nos. 178-179 lent by Victor Barthélemy, Paris

DELMAET & DURANDELLE. Paris

180 Construction of the New Opera, 1862-1875. Lent by Victor Barthélemy, Paris

DISDERI, André - Adolphe - Eugène. Paris. Born 1819. Court photographer to Napoleon III.

*181 Self Portrait

182 The Fireman

183 Boulevard Montmartre, 1854

184 Eight poses of an actress on same plate, to be cut apart and mounted as *cartes-de-visite*

Nos. 181-184 lent by Victor Barthélemy, Paris

DUPONT

185 Coachman. Lent by Victor Barthélemy, Paris

FAURE, E. Sarralbe (Moselle), France.

186 Conductor. Lent by Victor Barthélemy, Paris

FENTON, Roger. London.

187 York Minister from Lendall, 1854

187a Photogravure of no. 187, 1856

188 Sedilia in Choir, Furness Abbey, *c.* 1854

189 Still Life, *c.* 1854

*190 Façade, Lichfield Cathedral, *c.* 1854

191 South Transept, Lichfield Cathedral, *c.* 1854

192 Tewkesbury Abbey, West Window, *c.* 1854

Nos. 187-192 lent by The Royal Photographic Society of Great Britain, London

193 Balaklava, Crimean War, 1856. Lent by Victor Barthélemy, Paris

GARDNER, Alexander. English, 1821-1882. In charge of Brady's Washington studio, 1858.

194 President Lincoln on the Battlefield of Antietam, 1862

195 Scouts and Guides to the Army of the Potomac, 1862

*196 Home of a Rebel Sharpshooter, Gettysburg, 1863

197 Ruins of Arsenal, Richmond, Virginia, 1863

198 View on Canal near Crenshaw's Mill, Richmond, Virginia, 1864

Nos. 194-195 lent anonymously; nos. 196-198 lent by Frederick H. Meserve, New York. From *Gardner's Photographic Sketch Book of the War*, Washington, Philip & Solomon, n. d., pls. 23, 28, 41, 91 and 92 respectively.

GIRARD

199 Fisherman. Lent by Victor Barthélemy, Paris

GUEUVIN

200 Sewer Worker. Lent by Victor Barthélemy, Paris

HUGO, Charles-Victor. 1826-1871. Isle of Jersey

*201 Victor Hugo on His Rock of Exile, 1853. Lent by Victor Barthélemy, Paris

LEGE & BERGERON. Successors to Etienne Carjat.

202 Ventriloquist. Lent by Victor Barthélemy, Paris

MARVILLE, Charles. Paris. Photographer to the National Museums.

203 Self Portrait, *c.* 1860

204 Corner of Rue des Marmousets and Rue St.-Landry, Paris, 1864

205 Corner of Rue St.-Christophe and Rue de la Cité, Paris, 1865

*206 Rue Glatigny, Paris. 1865

207 Rue du Haut-Moulin, Paris, 1865

208 The Old Markets, Paris, 1866

Nos. 203-208 lent by Victor Barthélemy, Paris

MAYALL, J. E. London

209 Prince Arthur. Lent by Victor Barthélemy, Paris

MAYER & PIERSON. (Louis Pierson, 1818-1913)

210 Napoleon III. Lent by Victor Barthélemy, Paris

MOFFAT, John. Edinburgh

211 William Henry Fox Talbot, *c.* 1860. Lent by Miss M. T. Talbot, Lacock Abbey, Wiltshire, England

NADAR (pseudonym of Gaspard-Félix Tournachon). Paris. Born 1820. Began as caricaturist, 1842. Opened photographic studio, 1852. Aerial photographs, 1858. Commander of balloon corps, seige of Paris, 1870. Died 1910.

212 Eugène Delacroix, 1859. Lent by Paul Nadar, Paris

213 Honoré Daumier, 1859. Lent by Georges Sirot, Paris

*214 Théophile Gautier, Paris, *c.* 1860. Lent by Georges Sirot, Paris

*215 The Catacombs, Paris, *c.* 1860. Lent by Victor Barthélemy, Paris

216 The Catacombs, Paris, *c.* 1860 (modern print by Paul Nadar). Lent by Paul Nadar, Paris

217 A View of the Sewers, Paris, (modern print by Paul Nadar). Lent by Paul Nadar, Paris

Nos. 215-217 are among the earliest photographs taken by flashlight (magnesium flare)

NEGRE, Charles. *For biography see nos. 111-113*

218 Street Musicians. Proof of heliogravure by the photographer, *c.* 1856. Lent by Charles Nègre, Grasse, France

O'SULLIVAN, T. H. American

219 Field where General Reynolds Fell, Gettysburg, 1863. Print by Alexander Gardner. From *Gardner's Photographic Sketch Book of the War,* Washington, Philip & Solomon, n. d., pl. 37. Lent anonymously

220 "Ancient ruins in the Cañon de Chelle, New Mexico, in a niche fifty feet above the present cañon bed," 1873. From *Photographs . . . Geographical Explorations and Surveys West of the 100th Meridian,* War Department, Corps of Engineers, U. S. Army, 1871-1873. Lent by Ansel Adams, San Francisco

PETIT, Pierre. Paris. Born 1832

*221 Eugène Delacroix, *c.* 1857

222 Portrait of a Woman, *c.* 1860

223 Railroad Worker, *c.* 1860

Nos. 221-223 lent by Victor Barthélemy, Paris

REJLANDER, O. G. Wolverhampton, England

*224 The Two Ways of Life, 1857 (contemporary reduced copy)

225 Portrait of Himself as Garibaldi, *c.* 1860

Nos. 224-225 lent by The Royal Photographic Society of Great Britain, London

RICHEBOURG. Paris

226 Stairway of the Foundlings Home, Paris, *c.* 1870. Lent by Victor Barthélemy, Paris

ROBINSON, Henry Peach. 1830-1901. Keamington, England

*227 Fading Away, 1858. Lent by The Royal Photographic Society of Great Britain, London

228 Fisherman, *c.* 1865

229 Portrait Study, 1866

Nos. 228-229 lent by the Smithsonian Institution, United States National Museum, Washington, D. C.

SALOMON, Adam. Paris

230 Portrait of Emilio Poncani, *c.* 1865

*231 Portrait, *c.* 1865

Nos. 230-231 lent by Victor Barthélemy, Paris

232 Portrait. Lent by the Julien Levy Gallery, New York

SELLIER. Paris

233 Self Portrait (?), *c.* 1865. Lent by Victor Barthélemy, Paris

SOULIER, Charles. Paris

234 Panorama of Paris from the Tuileries, *c.* 1860. Lent by Victor Barthélemy, Paris

TOURLAQUE & CALOIR. Paris (?)

235 Sapper of the National Guard of Montmartre, *c.* 1860. Lent by Victor Barthélemy, Paris

WOOD & GIBSON. American. Probably worked for Matthew Brady.

*236 Inspection of Troops at Cumberlanding, Pamunkey, Virginia, 1862. Print by Alexander Gardner. From *Gardner's Photographic Sketch Book of the War,* Washington, Philip & Solomon, n. d., pl. 16. Lent anonymously

UNKNOWN PHOTOGRAPHER

237 Russian Battery at Malakoff, Crimean War, 1854-1856. Lent by Victor Barthélemy, Paris

UNKNOWN PHOTOGRAPHERS, French

238 Railroad at Seaux, *c.* 1855

239 Canteen Girl, *c.* 1860

240 Portrait of Charles Nègre, *c.* 1860

241-242 Water Wagons, Paris, *c.* 1865

243 Studio of Gueuvin, *c.* 1870

244 Filling the Water Wagon, *c.* 1870

245 A Group of Tinkers

Nos. 238-245 lent by Victor Barthélemy, Paris

246 Panorama of Paris, ~~*c.* 1875~~. Lent by A. Gilles, Paris

MODIFICATIONS OF THE COLLODION PROCESS: POSITIVES ON CLOTH

BUDOR. Paris

247 Portrait, *c.* 1852. Lent by Victor Barthélemy, Paris

UNKNOWN PHOTOGRAPHERS

248 Portrait of a Man, *c.* 1852. French. Lent by A. Gilles, Paris

249 Wheelwright, *c.* 1855. French. Lent by Victor Barthélemy, Paris

MODIFICATIONS OF THE COLLODION PROCESS: AMBROTYPES (POSITIVES ON GLASS)

BRADY, Matthew B. *See nos. 149-169*

250 Portrait, *c.* 1855. Lent by Frederick H. Meserve, New York

UNKNOWN PHOTOGRAPHERS

251 Abraham Lincoln, *c.* 1860. American. Lent anonymously

252 Niagara Falls, 1857. American

*253 Portrait of a Woman, *c.* 1860. Probably American

Nos. 252-253 lent by A. Gilles, Paris

APPARATUS

254 Dark tent for sensitizing and developing collodion plates in the field, *c.* 1860. Lent by The Franklin Institute, Philadelphia

*255 Photograph of a dark tent for sensitizing plates, *c.* 1865. Original in collection of The Royal Photographic Society of Great Britain, London; photograph courtesy The Science Museum, London

256 Camera, *c.* 1855. Box type fitted with Ross lens; plate holder for plates 9 x 6⅞"; kit to hold plates 6 x 4¼"; one plate holder fitted with a ground glass back for focusing. 9⅝" high, 11¾" wide, 11½" deep. Lent by A. Gilles, Paris

257 Miniature camera with drop shutter and three holders for plates 1 x 1", *c.* 1860

258 Sensitizing bath for making collodion plates, *c.* 1860.

Nos. 257 and 258 lent by The Franklin Institute, Philadelphia

DRY PLATE PHOTOGRAPHY: 1871—1914

ANNAN, J. Craig. Glasgow

259 Janet Burnet, 1893. Photogravure from *Camera Work*, No. 19, 1907, pl. IV

260 Lombardy Ploughing Team. Exhibited, International Exhibition of Pictorial Photography, Buffalo, 1910. Lent by Albright Art Gallery, Buffalo, New York

ANSCHÜTZ, Ottomar. Born Lissa (Posen), Germany, 1846. First experiments with instantaneous photography, 1882. Died Berlin, 1907.

261 Leaping horse, 1887. Series of 26 exposures mounted in a strip for viewing in a tachyscope (early form of animated-picture machine in which timed photographs are mounted inside a rotating wheel). Photographs of originals in Will Day Collection, The Science Museum, London

ATGET, Eugène. Born Bordeaux, France, *c.* 1856. Went to Paris with theatrical troupe. Took up photography, probably in 1890s. Died Paris, 1927.

262 Stairway, Grand Trianon, Versailles

263 Quay, Bassin de la Villette, Seine

264 Tree

265 Shop Window, Avenue des Gobelins, Paris

266 Montmartre Restaurant

267 The Markets, Paris

268 36 rue du Petit Domat

269 Mexican Agava

270 Avenue des Gobelins

271 Versailles

*272 Marché du Temple

273 Clematis

274 Cabriolet

275 Street Scene

276 Versailles

*277 Ragpicker

278 Baker

279 The Tuileries

280 Interior

281-283 Scrapbooks from Atget's files

284 Album made by Atget

Nos. 262-284 lent by Miss Berenice Abbott, New York

COBURN, Alvin Langdon. Boston. Member of the Photo-Secession. Now lives in Wales.

285 The Rudder. Photo-engraving from *Camera Work*, No. 21, 1908, pl. X

286 Cadiz. Exhibited, International Exhibition of Pictorial Photography, Buffalo, 1910. Lent by Albright Art Gallery, Buffalo, New York

DEMACHY, Robert. Paris

287 Behind the Scenes. Photogravure of a gum print, from *Camera Work*, No. 16, 1906, pl. VIII

DE MEYER, Baron A. London

288 The Dresden China Fan. Exhibited, International Exhibition of Pictorial Photography, Buffalo, 1910. Lent by Albright Art Gallery, Buffalo, New York

ECKERT, C. M.

289 Eucharist Chapel, Heidelberg Castle, *c.* 1900. Lent by Victor Barthélemy, Paris

EMERSON, P. H. Born Cuba, 1856. Worked in Southwold, England. Died 1936.

290 In the Haysel (Norfolk). Photogravure from P. H. Emerson's *Pictures of East Anglian Life*, London, Sampson Low, Marston, Searle & Rivington, 1888, frontispiece

*291 Getting Ready for Fishing. Photogravure from P. H. Emerson's *Wild Life on a Tidal Water*, London, Sampson Low, Marston, Searle and Rivington, 1890, pl. 21

Nos. 290-291 lent by The Royal Photographic Society of Great Britain, London

EUGENE, Frank (Frank Eugene Smith). New York and Munich. Member of the Photo-Secession.

292 Dr. Emanuel Lasker and Brother, 1908. Photogravure from *Camera Work*, No. 31, 1910, pl. VII

293 Arthur and Guinevere. Exhibited, International Exhibition of Pictorial Photography, Buffalo, 1910. Lent by Albright Art Gallery, Buffalo, New York

HENNEBERG, Hugo. Vienna

294 Villa Falconieri. Photogravure of a gum print, from *Camera Work*, No. 13, 1906, pl. I

KÄSEBIER, Gertrude, 1852-1934. New York. Member of the Photo-Secession.

*295 The Manger, *c.* 1898. Exhibited, International Exhibition of Pictorial Photography, Buffalo, 1910. Lent by Albright Art Gallery, Buffalo, New York

KEILEY, Joseph T. 1869-1914. New York. Member of the Photo-Secession.

296 Garden of Dreams, 1900. Exhibited, International Exhibition of Pictorial Photography, Buffalo, 1910. Lent by Albright Art Gallery, Buffalo, New York

297 Portrait: Miss De C. Photogravure from *Camera Work*, No. 17, 1907, pl. III

KUEHN, Heinrich. Vienna

298 Still Life (gum print). Exhibited, International Exhibition of Pictorial Photography, Buffalo, 1910. Lent by Albright Art Gallery, Buffalo, New York

MARTIN, Paul. Born 1864. Lives in London.

299 Porter Carrying a Basket of Shrimps, Billingsgate, 1893-1896 (enlargement, 1936)

*300 The Magazine Seller, Ludgate Circus, London, 1893-1896 (enlargement, 1936)

301 Fishmonger's Wife, the New Cut Market, London, 1893-1896 (enlargement, 1936)

302 Cab Accident, High Holborn, London, 1893-1896 (enlargement, 1936)

303 Ice-cream Barrow, London, 1893-1896 (enlargement, 1936)

304 Market Porters Carrying Boxes of Oranges, London, 1894 (enlargement, 1936)

305 Cleopatra's Needle and the Thames Embankment by Gas-light, 1895 (enlargement, 1936)

306 Trafalgar Square, London, on a Wet Night, 1895 (enlargement, 1936)

307 The Alhambra, London, by Night, 1895 (enlargement, 1936)

308 The Flower Woman at Ludgate Hill Station, London, 1895 (enlargement, 1936)

309 The Great Frost of 1895-1896, London (enlargement, 1936)

310 State Opening of Parliament by King Edward VII, 1902 (enlargement, 1936)

Nos. 299-310 lent by the photographer

MUYBRIDGE, Eadweard. Born Kingston-on-Thames, England, 1830. To California, 1872, where he made first experiments with photography of motion. Published *The Horse in Motion,* 1878. Further experiments for University of Pennsylvania, Philadelphia. To Europe, 1881, where he exhibited series of photographs with early motion picture projector, the Zoopraxiscope. Published *Animal Locomotion,* London, 1887. Died 1904.

311 Mahomet cantering, June 18, 1878. Lent by the Chandler Chemical Museum, Columbia University, New York

*312 Jumping horse (photogravure). Lent by The Museum of Modern Art Film Library, New York

313 Woman jumping over chair (photogravure)

314 Deer running (photogravure)

315 Horse trotting (photogravure)

316 Hands palming a coin; hands picking up a pencil (photogravure)

317 Horse cantering (photogravure)

Nos. 312-317 are series of instantaneous exposures, from Eadweard Muybridge, *Animal Locomotion,* London, 1887, pls. 643, 156, 695, 609, 536, 534 respectively. Nos. 312-316 gift of The Philadelphia Commercial Museum

318 Woman dancing, *c.* 1887. Duplicate negative printed from a series of small glass negatives. Gift of The Philadelphia Commercial Museum

NADAR, Paul. Son of Nadar (Gaspard-Félix Tournachon). Born 1856. Took over direction of Nadar studio from his father, 1886. Founded review *Paris-Photographe.* Lives in Paris.

319 Victor Hugo on his Deathbed, 1885

*320 "The Art of Living a Hundred Years: three interviews with Monsieur Chevreul, photographed on the eve of his 101st year." Layout of 13 photographs in *Le Journal Illustré,* Sept. 5, 1886

321 Photographic interview with General Georges Boulanger. Layout of 24 photographs in *Le Figaro,* Nov. 23, 1889, literary supplement

322 Scenes from the play, *Madame Sans-Gêne.* Photogravure by Dujardin, from *Paris-Photographe,* May 30, 1894

323 George Eastman

324 Sarah Bernhardt (modern print)

Nos. 319-324 lent by the photographer

PUYO, C.

325 The Straw Hat. Photogravure of a gum print, from *Camera Work,* No. 16, 1906, pl. II

SEELEY, George

326 The Painter. Exhibited, International Exhibition of Pictorial Photography, Buffalo, 1910. Lent by Albright Art Gallery, Buffalo, New York

STEICHEN, Edward J. New York. Member of the Photo-Secession.

327 J. Pierpont Morgan, Esq., 1903

328 *La Cigale*

329 William M. Chase

*330 Rodin—The Thinker

Nos. 327-330 are photogravures from *Camera Work,* Steichen supplement, 1906, pls. II, VI, V, X

331 Moonlight, Orangerie, Paris (gum print). Exhibited, International Exhibition of Pictorial Photography, Buffalo, 1910. Lent by Albright Art Gallery, Buffalo, New York

STIEGLITZ, Alfred. Born Hoboken, New Jersey, 1864. Lives in New York. Editor, *American Amateur Photographer,* 1891-1896. Founder and editor, *Camera Notes,* 1897-1902. Founded the Photo-Secession, 1902; founder and editor, *Camera Work,* 1902-1917. Director, gallery "291," 1905 to 1917, and, since 1930, *An American Place,* New York.

*332 The Terminal, 1892 (photogravure)

333 Spring Showers, New York, 1900 (photogravure)

334 The Hand of Man, 1902 (photogravure)

Nos. 332-334 from *Camera Work,* Nos. 35-36, 1911, pls. XV, XVI, XIII

335 The Street—Fifth Avenue, 1903. Exhibited, International Exhibition of Pictorial Photography, Buffalo, 1910. Lent by the Albright Art Gallery, Buffalo, New York

*336 The Steerage, 1907. Photogravure from *291,* Nos. 7-8, 1915

337 The Ferry Boat, 1910 (photogravure)

338 The Aeroplane, 1910 (photogravure)

339 Excavating, New York, 1911 (photogravure)

Nos. 337-339 from *Camera Work,* Nos. 35-36, 1911, pls. III, VIII, X

WATZEK, Hans. Vienna

340 A Village Corner. Photogravure of a gum print, from *Camera Work,* No. 13, 1906, pl. X

WHITE, Clarence H. New York. Member of the Photo-Secession.

*341 Lady in Black with Statuette. Photogravure from *Camera Work,* No. 23, 1908, pl. IV

342 The Chiffonier. Exhibited, International Exhibition of Pictorial Photography, Buffalo, 1910. Lent by Albright Art Gallery, Buffalo, New York

UNKNOWN PHOTOGRAPHERS, French

343 Panorama of Paris, showing at right ruins of Hôtel de Ville, destroyed in 1871 and rebuilt soon after. Lent by A. Gilles, Paris

344 Ferdinand de Lesseps and his Grandchildren, before 1894.

345 *Clochards, c.* 1900

Nos. 344-345 lent by Victor Barthélemy, Paris

APPARATUS

346 The first model Kodak camera, 1888. 100 circular pictures 2″ in diameter were taken on roll of sensitized paper.

347 The first folding Kodak, 1890

Nos. 346-347 lent by Eastman Kodak Research Laboratories, Rochester

CONTEMPORARY PHOTOGRAPHY

The photographs in the following section have been lent by the photographers except in those cases where the name of another lender is given. The majority of the undated photographs were taken in 1936.

ABBOTT, Berenice. Born Springfield, Ohio, 1898. Lives in New York

*348 Rockefeller Center
349 Harness Shop
350 Black and White House
351 Christopher Street
352 News Stand
353 Portrait of Atget

ADAM, Pierre. Born 1894. Lives in Paris

354 Athlete of Martinique
355 Cup of Fruit

ADAMS, Ansel. Born San Francisco, 1902. Lives in San Francisco.

356 The Golden Gate, San Francisco, 1933
*357 Pine Cone and Eucalyptus Leaves, 1933
358 Boards and Thistles, 1934

Nos. 356-358 lent by Mrs. Charles J. Liebman, New York

359 Family Portrait, 1935
360 Mexican Women, 1936
361 Miners: the Evening Shift, 1936

Nos. 359-361 lent by An American Place, New York

ALBIN-GUILLOT, Laure. Director of Archives Photographiques, Paris.

362 The Hands of Mariette Lydis
363 Violinist

BEATON, Cecil. Born London, 1906. Works in London and New York.

364 Princess Paley, 1935
365 Mrs. Harrison Williams, 1936
*366 Pavel Tchelitchew, 1936
367 M. and Mme. Salvador Dali, 1936

BECK, Maurice. London

368 Fulham Engineering Depot, Shell Mex and B. P. Ltd. Courtesy Shell Mex and B. P. Ltd.
369 Crankshafts at London Transport. Courtesy London Passenger Transport

BELLON, Denise. Paris

370 Berber Harvester, 1936

BETZ, Pierre. Colmar (Haut-Rhin), France

371 Window
372 Bollard

BING, Ilse. Born Frankfort-on-Main, Germany. Lives in Paris.

373 Nun Sewing
*374 Nun Sterilizing Surgical Instruments, Hospital at Angers, 1935
375 Circus, 1936
376 Hendrik W. van Loon, 1936

BISHOP, Edward. Born London, 1902. Lives in London.

377 Peasant Woman

BLUMENFELD, Erwin. Born Berlin, 1897. Lives in Paris.

378 Portrait of Mme. Bernard, 1936 (negative print)
379 Portrait of Mme. Bernard, 1936 (pseudo-relief)
380 Sainte-Chapelle, Paris, 1936 (pseudo-relief)

BOUCHARD, Thomas. New York

381 Martha Graham in *Frontier*
382 Hanya Holm in *Cry Rises in the Land*
*383 Charles Weidman in *New Dance*
384 Doris Humphrey in *New Dance*
385 Esther Junger in *Berceuse*
386 Tamiris in *Momentum*

BOUCHER, Pierre. Paris

387 Snow Scene, 1936
388 Cedar Tree, 1936
389 Interior at Fez, 1936

BOURKE - WHITE, Margaret. Born New York, 1904. Studied with Clarence White. Lives in New York.

*390 Chrysler Factory
391 Iron Puddler, U.S.S.R.
392 Construction on Wind Tunnel, Fort Peck, Montana
393 "Woman Who Wept for Joy," Textile Factory, U.S.S.R.
394 "The Flood Leaves Its Victims on the Bread Line," 1937

BRASSAÏ (pseudonym). Born Brasso, Rumania, 1899. Lives in Paris.

395 Automobile Accident, 1931
396 Orchestra, 1932
397 Bal Musette, 1933
398 Canal St.-Martin, 1934
399 Meat Porter, 1935
*400 Bosson Glacier, 1936

BRIGGS, W. G. London

401 Morning Dew
402 Water Butt
403 Nature's Pattern
404 Thirsty Weather

BRUEHL, Anton. New York

*405 Mexican Child, 1932
406 Ventilators, 1936

407 Portrait, 1936
408 Lighthouse, 1936
409 Tom-tom, 1936
410 Shipyard, 1936

BRUEHL, Martin. New York

411 Nude

BRUGUIERE, Francis. American. Lives in London.

412-414 Abstractions. Lent by Julien Levy Gallery, New York

CAILLAUD, Louis. Born Bordeaux, 1894. Lives in Paris.

415 Spire of Cathedral of Notre-Dame, Paris

CARTIER-BRESSON, Henri. Paris

416 Demolished Interior
417 Café Tables
418 Stairs

Nos. 416-418 lent by Julien Levy Gallery, New York

CUNNINGHAM, Imogene. Born Portland, Oregon. Lives in Oakland, California.

419 Two Callas, before 1929
420 ~~Amaryllis, 1932~~ Hen + Chickens, before 1929
421 Portrait of Helene Mayer, 1935

DAHL-WOLFE, Louise. Born San Francisco, 1900. Lives in New York.

422 Smoky Mountaineer, 1933. Courtesy Condé Nast Publications, New York
*423 Bijou Theatre, 1933
424 Comedian, 1934
425 Ophelia, 1934

DUMAS, Nora. Born Budapest, 1895. Lives in Paris.

426 Man Eating
427 Luncheon
428 Landscape with Cows
*429 Butcher and Peasant

DUMAS-SATIGNY, A. Born Geneva, 1890. Lives in Paris.

430 Steps of Montmartre
431 Flowers
432 Fishes

DURAND, André. Paris

433 Quai Bourbon

DUVAL, Rémy. Born Rouen, 1907. Lives in Paris.

434 St. Michael's Church, Bréhat, 1933
435 Bréhat, 1933

ERFURTH, Hugo. Born Halle, Germany, 1874. Lives in Cologne.

37.690 *436 Portrait of Käthe Kollwitz, 1924
37.691 437 Portrait of Otto Dix, 1934

EVANS, Walker. Born St. Louis, Missouri, 1903. Lives in New York.

438 Moving Truck and Bureau Mirror, 1929
439 Roadside Billboard, Cape Cod, 1931
37.835 *440 Photographer's Window, Savannah, 1936 Courtesy Roy E. Stryker Resettlement Admin., Washington D.C.
441 French Opera Barber Shop New Orleans 1935
37.484 442 Bethlehem, Pennsylvania, 1936 37.786
443 False Front 1936
— Nos. 441-443 lent anonymously

FEHER, E. Paris

37.341 444 Child on Beach, 1936
37.343 *445 Spring Symposium, 1936

FEININGER, Lux. Son of Lionel Feininger. Studied at the Bauhaus, Dessau.

37. 446 From the Roof of the Bauhaus, *c.* 1929
447 Ladder, *c.* 1929
448 Carts, *c.* 1929
449 Bauhaus, *c.* 1929
Nos. 446-449 collection The Museum of Modern Art, gift of Philip Johnson

FULD, Gertrude. Born Mayence, Germany, 1895. Lives in Paris.

450 The Actor Bassermann, 1933 37.240
451 Scene from the Play *October 18*
*452 Low Tide, 1936 37.239

GRIGGS, Noel. London

453 Factory Chimney, 1934
454 Water Tower, 1935

HAVINDEN, John. Born Kent, England, 1908. Lives in London.

455 Piles of Sand

HEGE, Walter. Weimar, Germany

456 Acropolis
457 Parthenon Freize
458 Capital, Parthenon
459 Detail of Caryatide, Erechtheum
Lent by Julian Levy Gallery

HENLE, Fritz. Born Dortmund, Germany, 1909. At present in America.

460 Japanese Kite Maker, 1936
461 Gatekeeper, Lama Temple, Peking, 1936
462 Great Wall, China, 1936
463 Goddess in Rock Temple of Sravanabelagola

Consent given by Black Star, Apr. 9 '37
37.687

HENRI, Florence. Born New York, 1902. Lives in Paris.

464 Portrait of Hans Arp 37.245
465 Portrait of Robert Delaunay 37.246
466 Beside the Sea

JAHAN, Pierre. Born 1909. Lives in Paris.

467-468 The Ocean 37.250

JUNG. Theodore. Washington, D. C.

469 Screen Door
470 Street Scene 37.761

Consent given Apr 7/37

KERTESZ, André. Born Budapest, 1894. Works in Paris and New York.

471-472 Studies in Mirror Distortion, 1933

473 The Vert-Galant, Paris, under Snow, 1935

474 Road Mender, 1936

475 Fashion Plate, 1937

KOLLAR, François. Paris

*476 Return from the Fields

477 Cathedral of Dijon

KOWALISKI, Paul. Born Warsaw, 1908. Lives in Paris.

478 Reflection, 1933

479 Restaurant Dupont, Paris, 1936

KRUTCH, Charles. Born Knoxville, 1887. Chief photographer of Tennessee Valley Authority.

*480 Hydraulic Generator Scroll Case, 1936

481 Wheeler Dam Roadway, 1936

482 Great Smoky Mountains, 1936

483 Early Spring, 1936

LACHEROY, Henri. Paris

484 Testing Metal at Etablissements J. J. Carnaud, France

485 Pouring Metal. Courtesy Office Technique d'Utilisation d'Acier

LANDAU, Ergy. Born Budapest. Lives in Paris.

486 Railroad Tracks at the St.-Lazare Station, Paris

LEMERE, Bedford. Born London, 1865. Lives in London.

487 St. Paul's Cathedral

488 Royal Masonic Hospital

LENDVAI-DIRCKSEN, Erna. Born Düsseldorf. Lives in Berlin.

489 Fisher

490 Profile, Old Man

491 Boy

492 Woman with Knitting Needles

Nos. 489-492 lent by Black Star Publishing Company, New York

LINCOLN, F. S. New York

493 Triborough Bridge

494 Exhaust Pipes

495 Wagon Wheel

LOHSE, Remie. Born Ponce, Puerto Rico, 1892. Lives in New York.

*496 Night Club (Hip-shaker), 1933

497 Boxer after a Workout, 1934

498 Two Puerto Rican Boys on Horseback, 1934

499 Children in New York Soup Kitchen, 1935

LYNES, George Platt. Born East Orange, New Jersey, 1907. Lives in New York.

*500 Jean Cocteau

501 Daphne Vane and Lew Christensen in *Orpheus and Eurydice*. Courtesy American Ballet

502 Rosalind Russell. Courtesy *Harper's Bazaar*

503 Mrs. Allan A. Ryan, Jr. Courtesy *Harper's Bazaar*

MARTIN, Ira. Born Michigan, 1886. Lives in New York.

504 Abandoned Railroad Station, 1933

505 Ship's Figurehead, 1933

506 Graveyard, 1933

507 Once the Family Pride, 1933

508 Montauk Light, 1934

509 Treetop, 1935

MATTER, Herbert. Born Engelberg, Switzerland, 1907. Designer and photographer. Worked in Paris and Switzerland. Lives in New York.

510 Gipsy Girl, 1930
511 Doll Eyes, 1936
512 Archer, 1936
513 Portrait of Alexander Calder, 1937

MOHOLY-NAGY, Laszlo. Born Borsod, Hungary, 1895. Lives in London.

514-*517 Photograms, 1923
518 Photogram, 1925
519 Sewer Pipes, 1925
*520 The Bauhaus, Dessau, 1926
521 Ascona, 1926
522 Berlin from Wireless Tower, 1928
523 Nude, 1929
524 Nude, 1929 (negative print)
525 Scene from H. G. Wells' movie *Things to Come*, 1935
526 Constructing sets for *Things to Come*, 1935

MOUNIER, Georges. Lives at Parc St.-Maur, near Paris.

527 Fish Nets, La Rochelle
528 Shipyard, La Rochelle

MUNKACSI, Martin. Born Kolozsvar, Hungary, 1896. Lives in New York.

529 Dinah Grace
530 Kindergarten

NATORI, Yonosuke. Born Tokio, 1909.

531 Series of photographs of a Japanese story-teller. Lent by Black Star Publishing Company, New York

NELSON, Lusha. New York

532 Jesse Owens
533 Sikorsky

534 Mayor La Guardia
535 Cecil Beaton

Nos. 532-535 courtesy Condé Nast Publications, New York

PARRY, Roger. Paris

536 Portrait (double exposure)
537 Clouds at Moorèa, Tahiti
538 Lepers at Orofara, Tahiti

RAY, Man. Born Philadelphia, 1890. Lives in Paris.

*539 Rayograph, 1922. From *Champs Délicieux*, Paris, 1922. Collection The Museum of Modern Art, New York, given anonymously
540 Rayograph, 1923. Lent anonymously
541 *Electricity:* album of 10 rayogrammes, Paris, Compagnie Parisienne de Distribution d'Electricité, 1931. Lent by Julien Levy Gallery, New York
*542 Sleeping Woman
543 Portrait of Sinclair Lewis
544 Torso
545 Woman with African Mask

Nos. 542-545 lent by James Thrall Soby, Farmington, Connecticut

RITTASE, William. Born Baltimore, 1892. Started photographing in the Artillery during World War. Lives in Philadelphia.

546 Blast Furnace, 1934
547 Gold Mining, 1934
548 The Boatsman, 1936
549 Modern Farmer, 1936

ROGI-ANDRE, Mme. Born Budapest. Lives in Paris.

550 Charles Despiau, 1936
551 Fernand Léger, 1936
552 Pierre Roy, 1936
553 Max Jacob, 1936

SCHAD, Christian. German or Swiss. Probably first to use technique later called "rayograph" (Man Ray) or "photogram" (Moholy-Nagy).

554a-e "Schadographs," 1918. Lent by Tristan Tzara, Paris

SCHALL, Raymond and Roger. Paris

555 Blind Accordionist

556 Bridge at St.-Cyr-sur-Loire, 1936

557 Sailor of Banyuls, 1936

SEKAER, P. Ingemann. Born Copenhagen, 1901. Lives in New York.

558 Miner

559 Engineer

560 Portrait

SHEELER, Charles. Born Philadelphia, 1883. Lives in Ridgefield, Connecticut.

*561 Chartres, 1929

562 Portrait of Aldous Huxley. Courtesy Condé Nast Publications, New York

563 Blue Ridge Mountains, 1936

564 Maryland Cottage, 1936

SOUGEZ, Emmanuel. Born Bordeaux, 1889. In charge of photography for *L'Illustration*, Paris.

565 Portal of Notre-Dame, Paris

566 Smelts

567 Interior

STEICHEN, Edward J. New York.

568 Wheelbarrow and Flowerpots

*569 Carl Sandburg

570 Homeless: poster for Travelers' Aid Society

571 George Washington Bridge

572 Torso

573 Paul Robeson

STEINER, Ralph. Born 1899. Studied with Clarence White. Lives in New York.

*574 Suburban House

575 Signboard

576 Tree

577 Fence Post

STORM, Stephen. Born Holland, 1916. Lives in Paris.

578 Composition, 1935

579 Front Wheel and Mechanism of a Renault Automobile, 1936

STRAND, Paul. Born New York, 1890. Lives in New York.

580 Woods and White Lichen, Maine, 1928

581 Driftwood, Gaspé, Quebec, 1929

582 Boat and Sea, Gaspé, Quebec, 1929

583 Fishing Village, Gaspé, Quebec, 1929

584 Deserted Mining Shack, Red River, New Mexico, 1931

585 Ghost Town Shack, Red River, New Mexico, 1931

586 Sand Hills, Abiquiu, New Mexico, 1931

587 Village and Black Mountain, Cerro, New Mexico, 1931

588 Near Saltillo, Mexico, 1932

589 Cristo, Huexotla, Mexico, 1933

590 Woman of Patzcuaro, Mexico, 1933

591 Man of Tenancingo, Mexico, 1933

*592 Gateway, Hidalgo, Mexico, 1933

TABARD, Maurice. Born Lyons, 1897. Lives in Paris.

593 Guitars

594 Gothic Virgin

595 The Devil

596 Enlargement of an experimental moving picture film for Paris Exposition, 1937

VALENTE, Alfredo. New York

597 Walter Huston as Othello, 1936

598 Hindu Dancer's Feet

599-600 Performance photographs of the operetta *Frederika*, 1937

Nos. 597-600 courtesy of the magazine *Stage*

VERGER, Pierre. Paris

601 Bambara Mask

602 Bobo Dance, French Sudan

WESTON, Brett. Born Los Angeles, 1911. Lives in San Francisco.

603 Cactus, 1935

604 Clouds, 1936

605 Four Stalks, 1936

606 Wet Emery Powder on Glass, 1936

WESTON, Edward. Born Highland Park, Illinois, 1886. Lives in Santa Monica, California.

*607-612 Sand Dunes, Oceano, California, 1936.

WOLFF, Paul. Born Strassburg, 1895. Lives in Frankfort-on-Main.

613 Nordseebad Juist

614 Boy Drummers

*615 Protective Net of Aluminum Worker

616 Jewelers

Nos. 613-616 lent by Black Star Publishing Company, New York

YLLA (pseudonym). Paris

617 Swans and Cygnets, 1936

*618 Hippopotamus, 1936

619 Giraffes, 1936

APPARATUS

620 Eastman 8 x 10" view camera and stand

621 Kodak camera, model 620, 1937

Nos. 620-621 lent by Eastman Kodak Research Laboratories, Rochester, New York

622 Leica camera, model A. Used by Admiral Byrd

623 Leica camera, model G

Nos. 622-623 lent by E. Leitz, Inc., New York

624 Rolleiflex camera. Lent by Burleigh Brooks, Inc., New York

PRESS PHOTOGRAPHY

625 Arrival of Empress Eugénie at Eaux-Bonnes, *c.* 1860 (photographer unknown)

625a Wood engraving based on no. 625

Nos. 625-625a lent by Victor Barthélemy, Paris

626 Photostat of a page of *The New York Daily Graphic*, Jan. 8, 1880, showing news pictures reproduced by line cuts made from drawings

*627 A Scene in Shantytown, 1880. From *The New York Daily Graphic*, March 4, 1880. The earliest half-tone reproduction of a photograph to appear in the daily press.

ANDRE, Sam

628 An Upsidedown Touchdown

629 In the Home Stretch

Nos. 628-629 courtesy *The New York American*

BECKER, Murray L. Born New York, 1906.

630 Up Ship (Hindenburg, Lakehurst). Courtesy The Associated Press

BRODERICK, Hugh

631 Incompleted

632 Form (diver). Awarded first prize for sports at News Photographers' Association exhibition, 1936

Nos. 631-632 courtesy International News Photos

CANDIDO, Pat

633 Scram. Courtesy *The Daily News,* New York

GREENE, William C. Born Brooklyn, New York, 1900.

634 Speed, 1936. Courtesy *The New York World-Telegram*

JURKOSKI, Frank

635 Over! Courtesy International News Photos

LEVINESS, Osmund

636 "A casket . . . a rain-soaked grave . . . the end of killer Coll," 1932. Courtesy *The Daily News,* New York

LINDSAY, John. Born New York, 1903.

637 Knockout (Max Schmeling vs. Joe Louis). Courtesy The Associated Press

LOPEZ, Vincent

638 Pitcher winding up (triple exposure). Courtesy *The New York Sun*

MERTA, Frank J. Born New York, 1899.

639 Fiery Fiorello. Courtesy Acme Newspictures, Inc.

OLEN, Henry

*640 "Powerful K. O. punch sends victor and vanquished flying out of ring."

641 "Giants vs. Dodgers at Polo Grounds. Joe Stripp safe at plate as Shanty Hogan fails to tag him"

642 "In pro game at Polo Grounds, Jim Leonard is thrown over tackler's head across goal line, scoring a flying touchdown. Giants vs. Philly Eagles"

Nos. 641-642 courtesy *The Daily News,* New York

ROTH, Charles A. Born Mt. Vernon, New York, 1889.

*643 A Land Tanker Explodes, 1936. Courtesy *The Bergen Evening Record,* Hackensack, New Jersey

SANDE, Tom. Born Brooklyn, New York, 1904.

644 Wind-up (Lefty Gomez). Courtesy The Associated Press

WARNECKE, William

*645 Shooting of Mayor Gaynor. Awarded first prize, spot news division of Second Annual Exhibition of the Press Photographers Association of New York. Courtesy *The New York World-Telegram*

UNKNOWN PHOTOGRAPHERS

646 J. P. Morgan at the Senate Investigation

647 The Relief of the Alcazar. Enlargement from a Paramount News Reel

Nos. 646-647 lent by The Associated Press

648 U.S.S.R. news photographs. Lent by Sovfoto, New York. Courtesy Jay Leyda

649 Newspaper clippings showing news pictures

650 Reduced copy of newspaper, *Le Soir,* Nov. 7, 1870, to be read with magnifying glass. Sent to subscribers from besieged Paris by carrier pigeon. Lent by A. Gilles, Paris

APPARATUS

651 Speed Graphic 4 x 5" Press camera. Lent by Eastman Kodak Research Laboratories, Rochester, New York, courtesy Folmer Graflex Corporation

COLOR PHOTOGRAPHY

HAND-COLORED

652 Girl with Bird, *c.* 1850. Stereoscopic daguerreotype, tinted. Lent by Victor Barthélemy, Paris

DIRECT COLOR

LIPPMANN, Gabriel. Born Hallerick, near Luxembourg, 1845. Professor of Physics, Sorbonne, Paris, 1878. Published his direct color process, 1891. Nobel Prize, 1908. Died at sea, 1924.

653 Garden scene, 1900. Lippmann interference plate

LUMIERE, Auguste (born 1862) and Louis Lumière (born 1864). Directors of Société Lumière, Lyons, France, founded by their father, 1882. Patented *cinématographe*, 1895. Autochrome process, 1903.

654 Reproduction of the spectrum, 1892. Lippmann interference plate

Nos. 653-654 lent by the Eastman Kodak Research Laboratories, Rochester, New York

ADDITIVE THREE-COLOR PROCESSES

HEDDENHAUSEN, Elsbeth. Berlin

655 Two Ladies in a Café, 1936. Agfacolor transparency. Lent by Black Star Publishing Company, New York

IVES, Frederick E. Born Litchfield, Connecticut, 1856. For 18 years photographer to Cornell University. Extensive photo-mechanical researches. Lives in Philadelphia.

656 Cherries, *c.* 1892

657 Lilies, *c.* 1892

Nos. 656-657 are Krōmograms (triple stereoscopic transparencies) to be viewed in the Krōmskōp

658 Krōmskōp

Nos. 656-658 lent by James Stokley, Philadelphia

MOHOLY-NAGY, Laszlo. *For biography see nos. 514-526*

659 Abstraction, 1936. Dufaycolor transparency

660 Abstraction, 1936. Dufaycolor transparency

661 Four-color photo-engraving of no. 660

Nos. 659-661 lent by the photographer

STEICHEN, Edward J. New York.

662 George Bernard Shaw, 1908

663 On the House Boat "The Log Cabin," 1908

Nos. 662-663 are four-color photo-engravings of Lumière Autochromes, from *Camera Work*, No. 22, 1908, pls. I and II

SUBTRACTIVE THREE-COLOR PROCESSES

664 Progressive print showing the method by which a three-color carbro print is built up (Vivex process). Lent by Colour Photographs (British and Foreign) Ltd., London

BIRD, Walter. London

665 My Mother, 1936

666 Marie, Princess Paul Troubetzkoy

Nos. 665-666 are carbro prints (Vivex process. Lent by the photographer

BRUEHL, Anton, and Fernand BOURGES. New York

667 Sun Bather, 1936

667a Fashion plate, 1936

Nos. 667-667a are engraved directly from three-color separation negatives

Lent by Anton Bruehl

EASTMAN KODAK RESEARCH LABORATORIES. Rochester, New York

668-674 Examples of work done by the Kodachrome process. Lent by Eastman Kodak Research Laboratories

KÖNIG, Ernst. Born 1869. Chemist in firm Meister, Lucius und Brüning, Höchst-am-Main. Died 1924.

675-676 Pinatype prints, 1905

677 Print made by L. Didier's Pinatype process, 1914

Nos. 675-677 lent by Eastman Kodak Research Laboratories

MOFFAT, Curtis. London

678 Still Life with Glass of Water and Shell, 1936

679 Still Life: Books, Flowers and Shells, 1936

Nos. 678-679 are carbro prints (Vivex process). Lent by the photographer

MURAY, Nickolas. Born Hungary, 1892. Now working in New York.

680 Opera Box. Courtesy Packard Motor Co.; Agency: Young & Rubicam, Inc.

681 Vienna Sausage. Courtesy Libby McNeil Libby; Agency: J. Walter Thompson Company, Chicago

Nos. 680-681 are carbro prints lent by the photographer

OUTERBRIDGE, Paul. New York

682 Cheese and Crackers

683 Avocado Pears

684 Semi-abstraction

685 Snow Scene

686 Wall Paper. Courtesy *House Beautiful*

Nos. 682-686 are carbro prints. Lent by the photographer

STEICHEN, Edward J. New York.

687 Portrait of Rachmaninoff, 1936. Carbro print. Lent by the photographer

YEVONDE, Madame. Born London, 1893. Lives in London.

688 Queen Mary in Dock, 1936

689 First Class Bar, Queen Mary, 1936

690 Portrait of Sir Rayner Goddard (Mr. Justice Goddard), 1936

Nos. 688-690 are carbro prints (Vivex process). Lent by the photographer

STEREOSCOPIC PHOTOGRAPHY

DAGUERREOTYPES

GOÜIN, A. Paris

*691 Portrait of the Sculptor, James Pradier (1792-1862) (hand-tinted)

692 Portrait of Madame Pradier (hand-tinted)

693 Portrait of a man, *c.* 1860 (hand-tinted)

Nos. 691-693 lent by A. Gilles, Paris

MILLET. Paris

694 Portrait of a Woman, *c.* 1860 (hand-tinted)

695 Portrait of a Woman, *c.* 1860 (hand-tinted)

Nos. 694-695 lent by A. Gilles, Paris

UNKNOWN PHOTOGRAPHERS

696 Portrait of a man, *c.* 1850. In folding case with viewing lenses

697 Statuette by James Pradier, *c.* 1850

698 Chinaman, *c.* 1850

Nos. 696-698 lent by A. Gilles, Paris

PAPER PRINTS

JOUVIN, H. Paris

699 Album of instantaneous stereoscopic views of Paris. Book bound on August 10, 1865. Lent by Georges Sirot, Paris

REILLY, J. J. New York

700 Covered Bridge, *c.* 1850. Lent by Victor Barthélemy, Paris

UNKNOWN PHOTOGRAPHERS

701 Photographer and Equipment, *c.* 1870

702 Basket Weaver, *c.* 1880 (hand-colored)

Nos. 701-702 lent by Victor Barthélemy, Paris

UNKNOWN PHOTOGRAPHER, American

703 Locomotive on the Road near Port Jervis. Lent by Victor Barthélemy, Paris

UNKNOWN PHOTOGRAPHERS, French

704 Series of miniature stereoscopic photographs of Paris, *c.* 1870, to be cut apart and mounted in pairs

705 Mounted miniature stereoscopic view of the Hôtel de Ville, Paris, before 1871

706 Locomotive, *c.* 1875

707 Group, *c.* 1875

708 Arc de Triomphe du Carrousel, *c.* 1875

709 Children Playing with Hoop Skirts, *c.* 1870

Nos. 706-709 are albumin prints tinted on the back and with the highlights pricked with a pin. When viewed by transmitted light they appear in color.

Nos. 704-709 lent by Victor Barthélemy, Paris

TRANSPARENCIES

UNKNOWN PHOTOGRAPHERS, American

710 New York Ferry Boat, *c.* 1880

711 Niagara Falls in Winter, *c.* 1880

712 Niagara, Terrapin Tower and Horseshoe Falls

Nos. 710-712 lent by A. Gilles, Paris

APPARATUS

713 Stereoscope for viewing dagerreotypes, *c.* 1850. Lent by A. Gilles, Paris

714 Stereoscope viewing cabinet, with endless belt for holding a large number of stereoscopic card views, *c.* 1850. Lent by Henry-Russell Hitchcock, Jr., Middletown, Connecticut

715 Stereoscope with stand. Lent by H. L. Ripperger, New York.

SCIENTIFIC PHOTOGRAPHY

PHOTOMICROGRAPHY

ALBIN-GUILLOT, Laure. Paris

*716 Diatom. Photogravure from Albin-Guillot, *Micrographie Décorative,* Paris, Draeger Frères, 1931, pl. XVIII. Lent by the photographer

EASTMAN KODAK RESEARCH LABORATORIES. Rochester, New York

717 Cross section of human skin

718 Wheat flower

719 Cross section of stem of a fern

720 Thin section of rock, by polarized light

721-724 Crystallized melt of organic substances, by polarized light

Nos. 717-724 Kodachrome transparencies

725 Cross section of a leaf, by ultra-violet light

726 Cross section of a leaf, by ordinary light

727 Grains of photographic emulsion (fast, medium, and slow)

728 Opalized wood, by ordinary light

729 Opalized wood, by polarized light (through Pola-screen)

730 Mold on leather, by ordinary light

731 Mold on leather, by polarized light (through Pola-screen)

732 Knitted cellulose acetate fabric, by ordinary light

733 Knitted cellulose acetate fabric, by polarized light (through Pola-screen)

Nos. 725-733 lent by Eastman Kodak Research Laboratories

LUCAS, Dr. Francis F., Bell Telephone Laboratories, New York

734 Optical sections of fixed but unstained mouse tumor specimens, photographed at a magnification of 1800 X on planes spaced one-quarter micron apart (a micron is one-millionth of a millimeter)

735 Group of cells photographed with wave length *lambda* 2750 before and after a very short period of irradiation with wave length *lambda* 2265. Magnification 500 X. Disintegration of living cells by rays

736 Structure of chrome-iron quenched in oil from 1750° F. and drawn for two hours at 1450° F. Magnification 1000 X

737 Same specimen, magnification 4000 X, with apochromatic objective of numerical aperture 1.40

738 Same specimen, magnification 4000 X, with mono-brom-naphthaline objective of numerical aperture 1.60

Nos. 734-738 lent by the photographer

SMITH, A. E. Born London, 1856. Lives in London.

739 Head of saw fly

740 Foot of bee

741 Two wood ants fighting

742 Cutters of saw fly

743 House fly on sugar

Nos. 739-743 lent by the photographer

ASTRONOMICAL PHOTOGRAPHY

DUNCAN, John C.

744 Dark nebulosity in Cygnus. Photographed with 100 inch telescope at Mt. Wilson Observatory, California

MT. WILSON OBSERVATORY. Near Pasadena, California

745 Head of Halley's comet, June 5, 1910. Photographed with 60 inch telescope

PETTIT, Edisan

746 Eruptive prominences on the sun, 194,000 miles high, moving at a speed of 171,000 miles per minute, August 6, 1931. Photographed with 40 inch telescope at Yerkes Observatory, Williams Bay, Wisconsin

ROSS, F. E.

747 Part of Milky Way in Cygnus, showing the "North America" Nebula, the Veil Nebula, and four stars of the Northern Cross. Photographed at Flagstaff, Arizona, with special 5 inch wide-angle lens

RUTHERFURD, Lewis M. New York

748 The Moon, 1865. Lent by the Chandler Chemical Museum, Columbia University, New York

SALTSJÖBADEN OBSERVATORY, Royal Swedish Academy of Science, Stockholm

749 Double cluster in Perseus. Photographed with a 40 inch telescope.

Nos. 744-747, 749 lent by The Franklin Institute, Philadelphia

PHOTOGRAPHY BY INFRA-RED RAYS

EASTMAN KODAK RESEARCH LABORATORIES. Rochester, New York

750 Landscape

751 Ordinary photograph for comparison

752 Man's leg

753 Ordinary photograph for comparison

754 Man's chest

755 Ordinary photograph for comparison

Nos. 750-755 lent by Eastman Kodak Research Laboratories

PHOTOGRAPHY BY X-RAYS (RADIOGRAPHY)

EASTMAN KODAK MEDICAL DIVISION. Rochester, New York

*756 Living person, full size. Lent by Eastman Kodak Medical Division

EASTMAN KODAK RESEARCH LABORATORIES. Rochester, New York

757 Alarm clock

758 Moving picture camera

759 Flashlight

Nos. 757-759 lent by Eastman Kodak Research Laboratories

EDER and VALENTA. Vienna. Josef Maria Eder: born Krems, Austria, 1855. Director, Lehr und Versuchanstalt, Vienna, 1888. Eduard Valenta: born Vienna, 1857.

*760 Fish, 1896

761 Fish, 1896

762 Snake, 1896

763 Cameo, 1896

Nos. 760-763 lent by Eastman Kodak Research Laboratories

PHOTOGRAPHY BY THE GRENZ RAYS

"Less penetrating than the X-rays normally used are the so-called *Grenz* rays. They do not penetrate the glass walls of the tubes used for the generation of the normal rays, and special tubes with a very thin glass window are required for them. They can be used to show the structure of materials, such as paper, leather, cloth, leaves, and insects, which are too transparent to the usual X-rays to show any detail in the photograph." (C. E. K. Mees, *Photography*, London, Bell, 1936, p. 206 f.)

EASTMAN KODAK RESEARCH LABORATORIES, Rochester, New York

764 Cuban cockroach

765 Cecropia moth

766 Columbine

767a-c Samples of (a) pure silk, (b) silk weighted with tin, (c) silk weighted with lead

768 Meal worm

Nos. 764-768 lent by Eastman Kodak Research Laboratories

AERIAL PHOTOGRAPHY

AMERICAN EXPEDITIONARY FORCES. Air Service, Photographic Division

769 Taking of Cantigny, May 28, 1918, by the 28th Inf. Reg., 1st Div., U. S. Army

770 Two aerial photographs mounted with duplicate prints on which landmarks and details of the position of troops have been marked

Nos. 769-770 lent by Edward J. Steichen, New York

FAIRCHILD AERIAL SURVEYS

771 New York Edison Plant, East 38th St., New York

772 Smoke over New York City

773 Coney Island, Brooklyn

774 Forest Fire

775 Woolworth Tower in Clouds

776 The Ribbon of Broadway

777 Site of the World's Fair, Flushing, Long Island

Nos. 771-777 lent by the Fairchild Aerial Surveys, New York Office

HAZEN, V.

778 Berlin, 1886. Photographed from a free balloon. Lent by Eastman Kodak Research Laboratories

McLAUGHLIN AERIAL SURVEYS. New York

*779 Downtown New York

780 New York through clouds

781 Clouds

782 New York and Brooklyn

783 George Washington Bridge

784 Gibson Development, Valley Stream, Long Island

785 Stereoscope for viewing aerial photographs

Lent by McLaughlin Aerial Surveys, New York

NADAR. *For biography see nos. 212-217*

786 Paris. Photographed with wet plate from a balloon basket which contained a portable dark room, 1858. Lent by Eastman Kodak Research Laboratories

STEVENS, Albert W.

787 Central South Dakota, 1935. The highest vertical photograph yet made. Altitude 72,395 feet; area embraced, 105 square miles

788 Division between Troposphere and Stratosphere, showing curvature of the earth, 1935. Photographed by infra-red rays from altitude of 72,395 feet

Nos. 787-788 taken on Stratosphere expedition of National Geographic Society and U. S. Army Air Corps, Nov. 11, 1935. Lent by National Geographic Society, Washington, D. C.

UNKNOWN PHOTOGRAPHER

*789 Progressive photographs of a bombardment during the World War. Lent by Edward J. Steichen, New York

STROBOSCOPIC PHOTOGRAPHY

EDGERTON, Harold E., Kenneth J. GERMESHAUSEN, and Herbert E. GRIER. Massachusetts Institute of Technology, Cambridge, Massachusetts

790 Cup of coffee breaking
791 Water flowing from a faucet
792 Hammer smashing an electric light bulb
793 Foot kicking a football
794 Club striking a golf ball
*795 Splashing of a drop of milk into a saucer of milk

Nos. 790-795 made with an exposure of about 1/100,000 second. Lent by the photographers, courtesy Massachusetts Institute of Technology

METEOROLOGICAL PHOTOGRAPHY

CLARK, G. Aubourne. Born Aberdeen, 1879. Now working at Observatory, King's College, Aberdeen, Scotland.

796 Sunset sky, 1936 or earlier
*797 Bands of cirro-cumulus, 1936 or earlier
Lent by the photographer

MOVING PICTURES

ENGLAND

798 *Contact,* 1932-1933
Production and direction: Paul Rotha
Photography: Jack Parker, George Pocknall and H. Weddon
Produced by British Instructional Films for Shell-Mex and Imperial Airways

799 *Aero-Engine,* 1933-1934
Production: John Grierson
Direction: Arthur Elton
Photography: George Noble
Produced for Empire Marketing Board Film Unit

800 *Shipyard,* 1934
Production and direction: Paul Rotha
Photography: Frank Bundy and George Pocknall
Produced by Gaumont-British Instructional for Orient Line and Vickers Armstrong

801 *Granton Trawler,* 1934
Production, direction and photography: John Grierson
Produced for Empire Marketing Board Film Unit

802 *The Song of Ceylon,* 1934-1935
Production: John Grierson
Direction and photography: Basil Wright
Made for Ceylon Tea Propaganda Board

803 *Coalface,* 1935
Production: John Grierson
Direction: Alberto Cavalcanti
Made for General Post Office Film Unit

804 *B.B.C.: The Voice of Britain,* 1935
Production: John Grierson
Direction: Stuart Legg
Photography: George Noble
Made for British Broadcasting Corporation by General Post Office Film Unit

805 *The Mine,* 1935
Direction: J. B. Holmes
Photography: Frank Bundy
Made for Gaumont-British Instructional

806 *Statue Parade,* 1936
Production: Paul Rotha
Direction and photography: Ralph Keene and Paul Burnford
Produced by Strand Films

807 *The Way to the Sea,* 1937
Production: Paul Rotha
Direction: J. B. Holmes
Photography: George Noble and John Taylor.
Produced by Strand Films for Electrical Development Association, Southern Railway and Portsmouth Corporation

808 *Elephant Boy,* 1937
Production: Alexander Korda
Direction: Robert J. Flaherty
Photography: Oscar Borrodaile
Produced by London Films

809 *Line to the Tochierua Hut,* 1937
Production: R. H. Watt
Direction: Alberto Cavalcanti
Photography: John Taylor
Produced for the General Post Office Film Unit

Nos. 798-809 lent by Paul Rotha, London

FRANCE

810 *Pastime in the Family Circle,* 1896
Photography: Louis Lumière

811 *Madame Sans-Gêne,* 1911
With Réjane
Direction: André Galmettes

812 *Paris Qui Dort,* 1922-1923
Direction: René Clair
Photography: Maurice Desfassiaux and Paul Guichard

813 *Menilmontant,* 1924-1925
With Nadia Sibirskaya
Direction: Dmitri Kirsanov
Photography: Dmitri Kirsanov and Léonce Grouan

814 *L'Etoile de Mer,* 1928
Direction: Man Ray
Photography: Man Ray and J. A. Boiffard

815 *La Passion de Jeanne d'Arc,* 1928
Direction: Carl-Theodor Dreyer
Photography: Rudolph Maté

GERMANY

816 *The Cabinet of Dr. Caligari,* 1919-1920
With Werner Krauss and Conrad Veidt
Direction: Robert Wiene
Photography: Willy Hameister

817 *The Golem,* 1920
With Paul Wegener
Direction: Paul Wegener
Photography: Karl Freund

818 *The Last Laugh,* 1924
With Emil Jannings
Direction: Friedrich Walter Murnau
Photography: Karl Freund

819 *Metropolis,* 1925-1926
Direction: Fritz Lang
Photography: Karl Freund and Gunther Rittau

820 *The Love of Jeanne Ney,* 1927
Direction: Georg Wilhelm Pabst
Photography: Fritz Arno Wagner

U. S. A.

821 *Cripple Creek Barroom,* 1898
Made by the Edison Company

*822 *The New York Hat,* 1912
With Mary Pickford
Direction: David Wark Griffith
Photography: George William Bitzer

823 *Barney Oldfield's Race for a Life, c.* 1913
With Mabel Normand
Direction: Mack Sennett

824 *Intolerance,* 1915-1916
Direction: David Wark Griffith
Photography: George William Bitzer

825 *The Four Horsemen of the Apocalypse,* 1920-1921
With Rudolph Valentino
Direction: Rex Ingram
Photography: John Seitz

826 *Salomé,* 1922
With Nazimova
Direction: Charles Bryant
Photography: Charles Van Enger

827 *The Covered Wagon,* 1922-1923
Direction: James Cruze
Photography: Karl Brown

828 *Moana of the South Seas,* 1925-1926
Direction and photography: Robert J. Flaherty

829 *Sunrise,* 1927
Direction: Friedrich Walter Murnau
Photography: Charles Rosher and Karl Struss

830 *Little Caesar,* 1930
With Edward G. Robinson
Direction: Mervyn LeRoy
Photography: Tony Gaudio

831 *Lone Cowboy,* 1933
Direction: Paul Sloane
Photography: Theodor Sparkuhl

U. S. S. R.

832 *Strike,* 1924-1925
Direction: S. M. Eisenstein
Photography: Edward Tissé

*833 *Armored Cruiser Potemkin,* 1925
Direction: S. M. Eisenstein
Photography: Edward Tissé

834 *By the Law,* 1925-1926
Direction: Lev Kuleshov
Photography: Kuznetsov, supervised by Levitsky

835 *Mother,* 1926
Direction: Vsevolod Pudovkin
Photography: Anatoli Golovnia

836 *The End of St. Petersburg,* 1927
Direction: Vsevolod Pudovkin
Photography: Anatoli Golovnia

837 *October (Ten Days That Shook the World),* 1927
Direction: S. M. Eisenstein
Photography: Edward Tissé

838 *Arsenal,* 1928-1929
Direction: Alexander Dovzhenko
Photography: Daniil Demutski

839 *Old and New,* 1928-1929
Direction: S. M. Eisenstein
Photography: Edward Tissé

840 *New Babylon,* 1929
With Elena Kuzmina
Direction: Gregor Kozintsev and Leonid Trauberg
Photography: Moskvin

841 *Earth,* 1930
Direction: Alexander Dovzhenko
Photography: Daniil Demutski

Nos. 810-841 lent by The Museum of Modern Art Film Library, New York

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Engraving made with the physionotrace. Actual size

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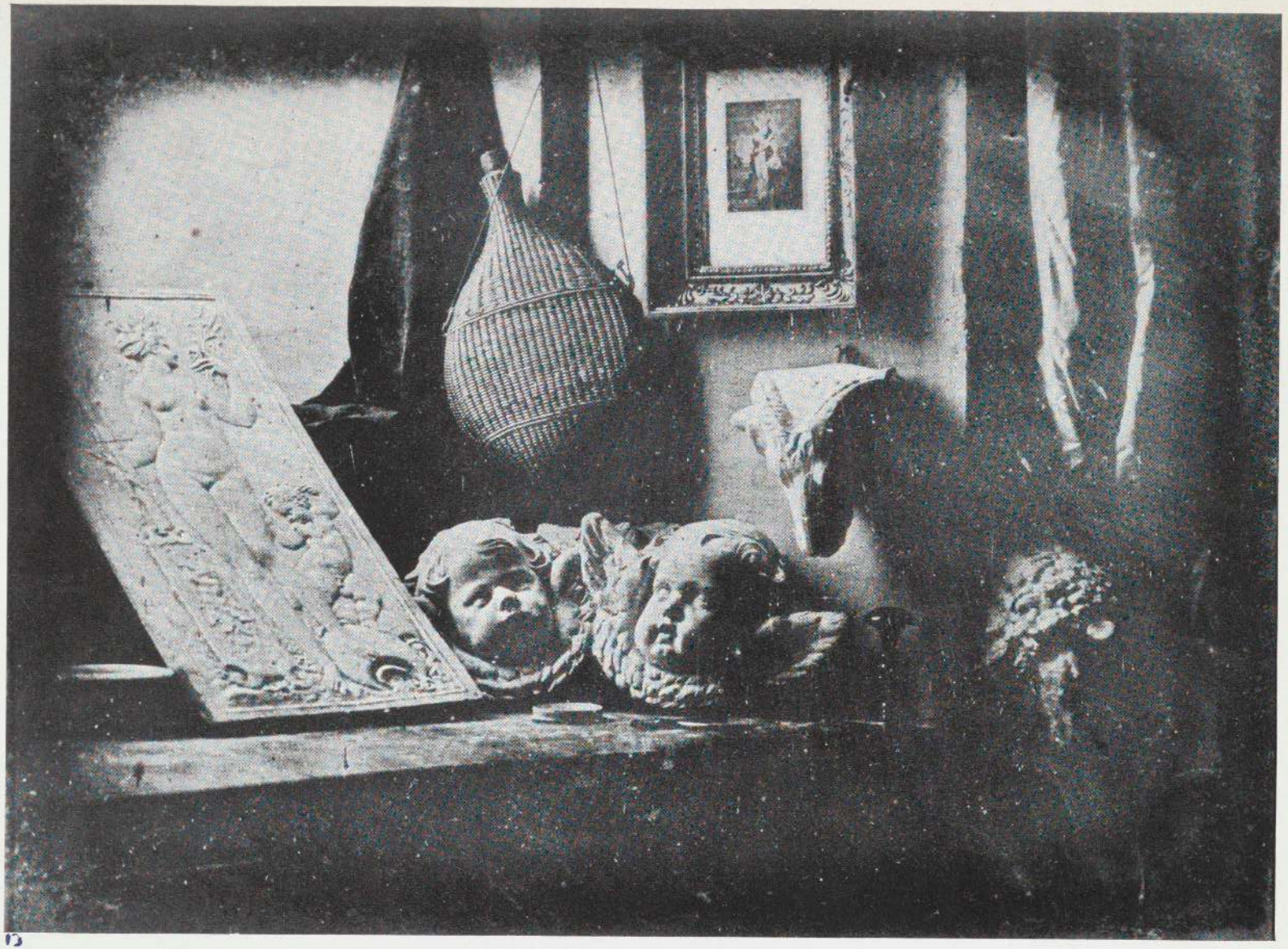
Heliographic plate. Photo courtesy The Science Museum, London



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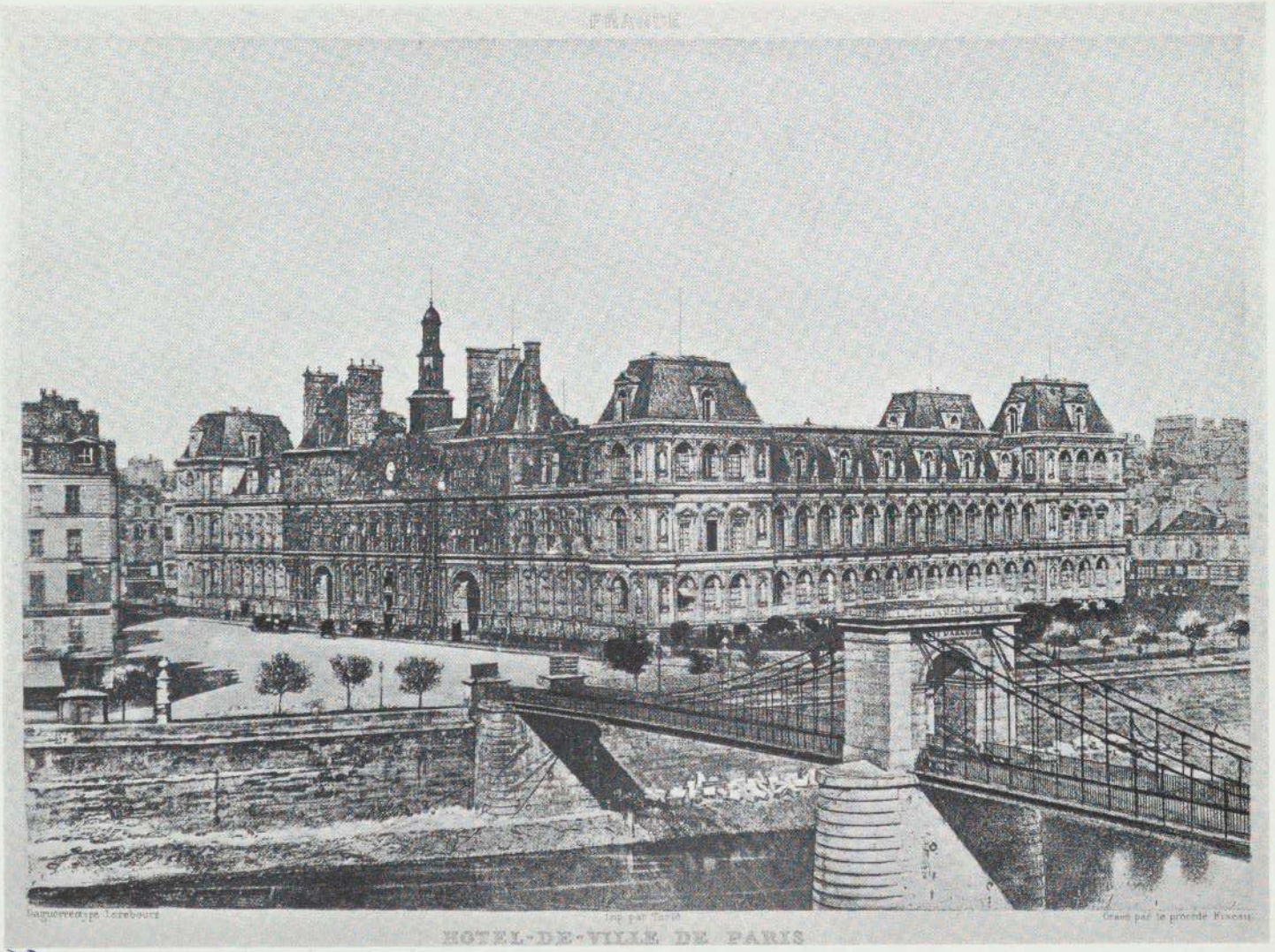
The earliest daguerreotype in existence. Photo Dumas-Satigny, Paris, of original in collection of Société Française de Photographie, Paris. Actual size

The earliest daguerreotype in existence. Photo Dumas-Satigny, Paris, of original in collection of Société Française de Photographie, Paris. Actual size



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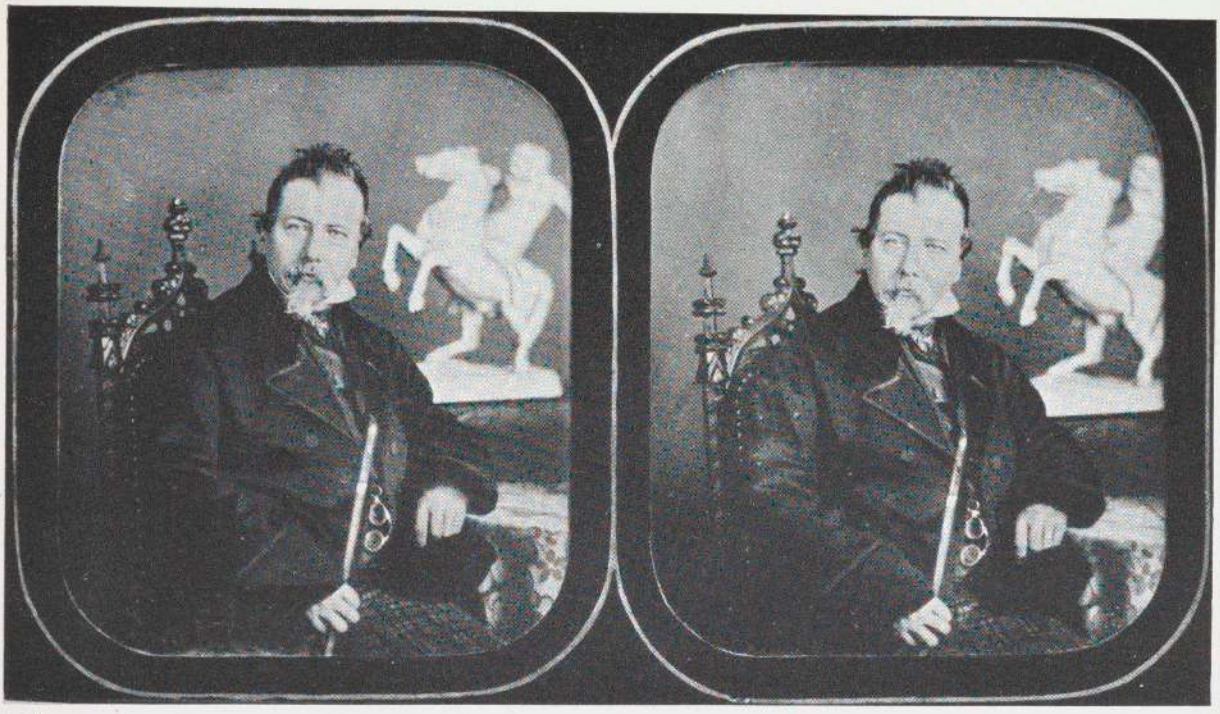

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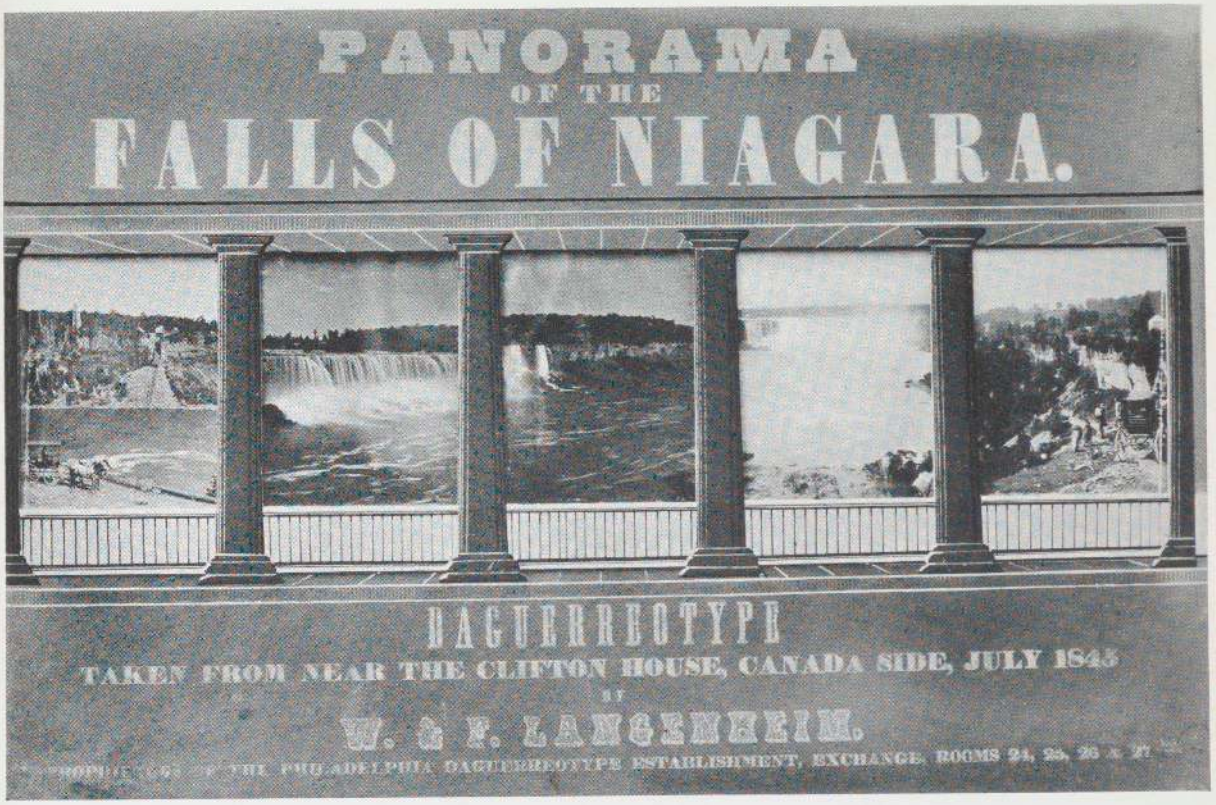

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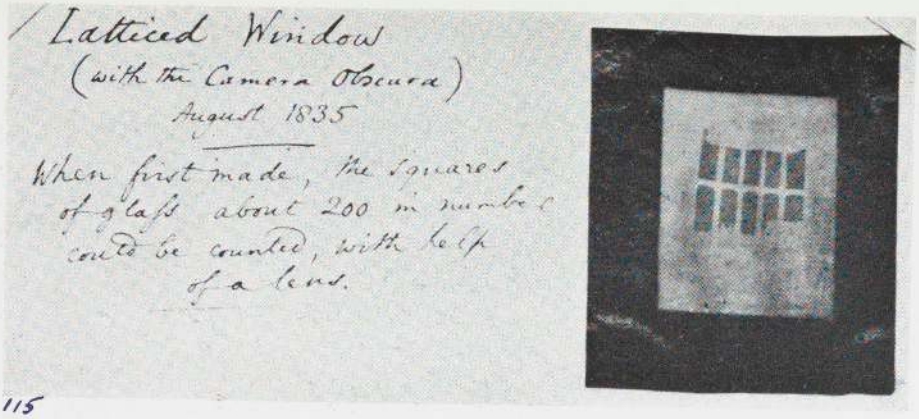

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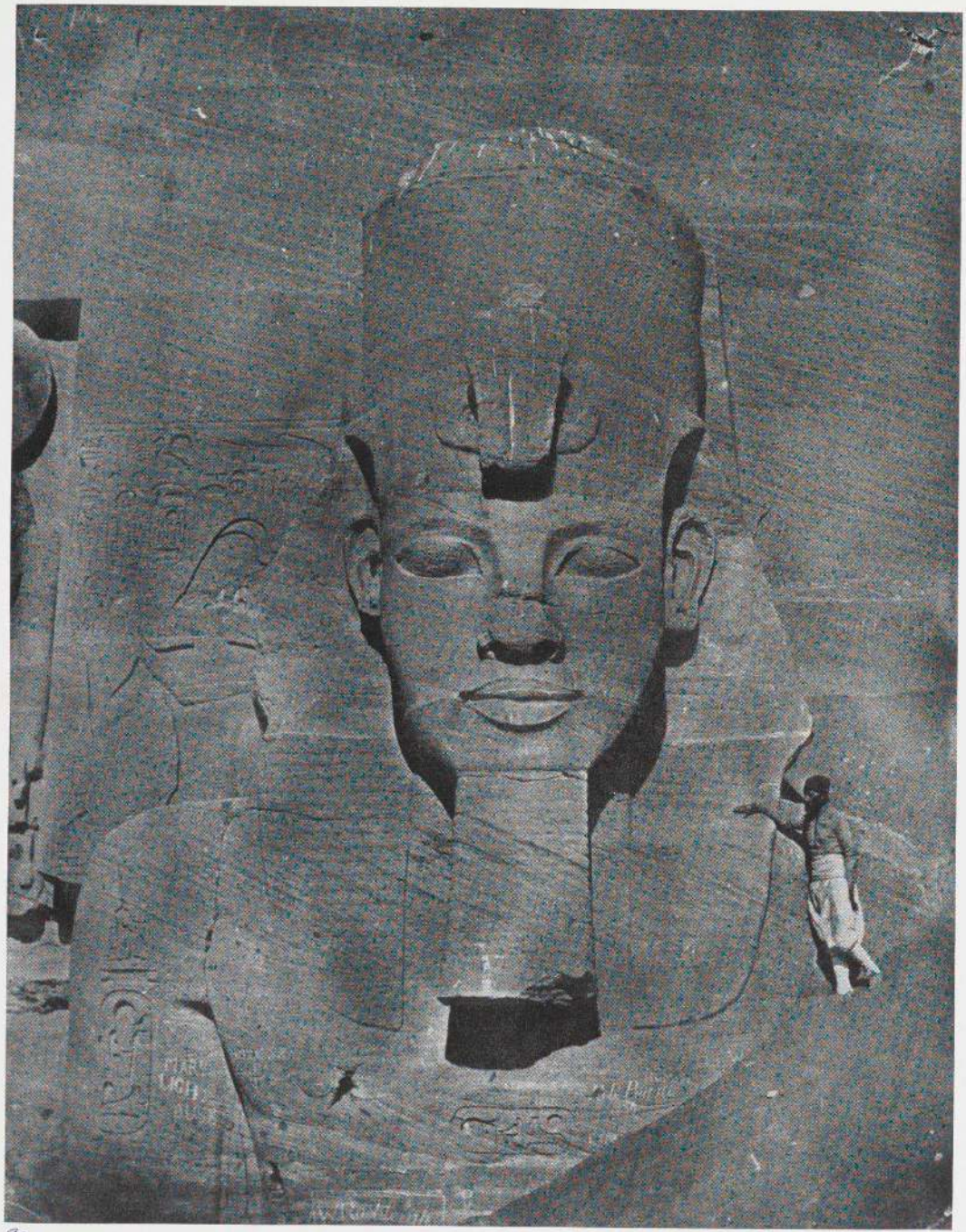

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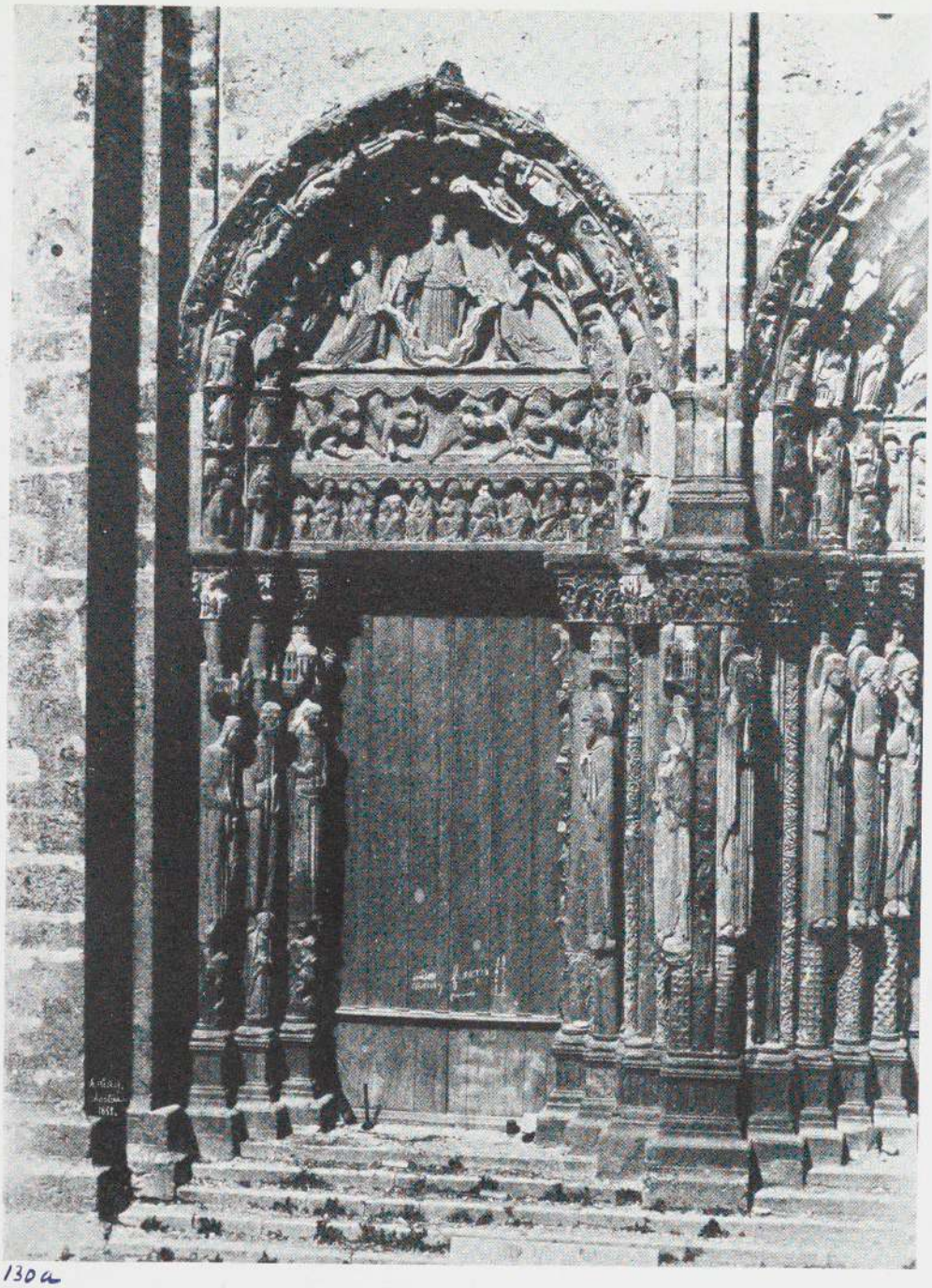

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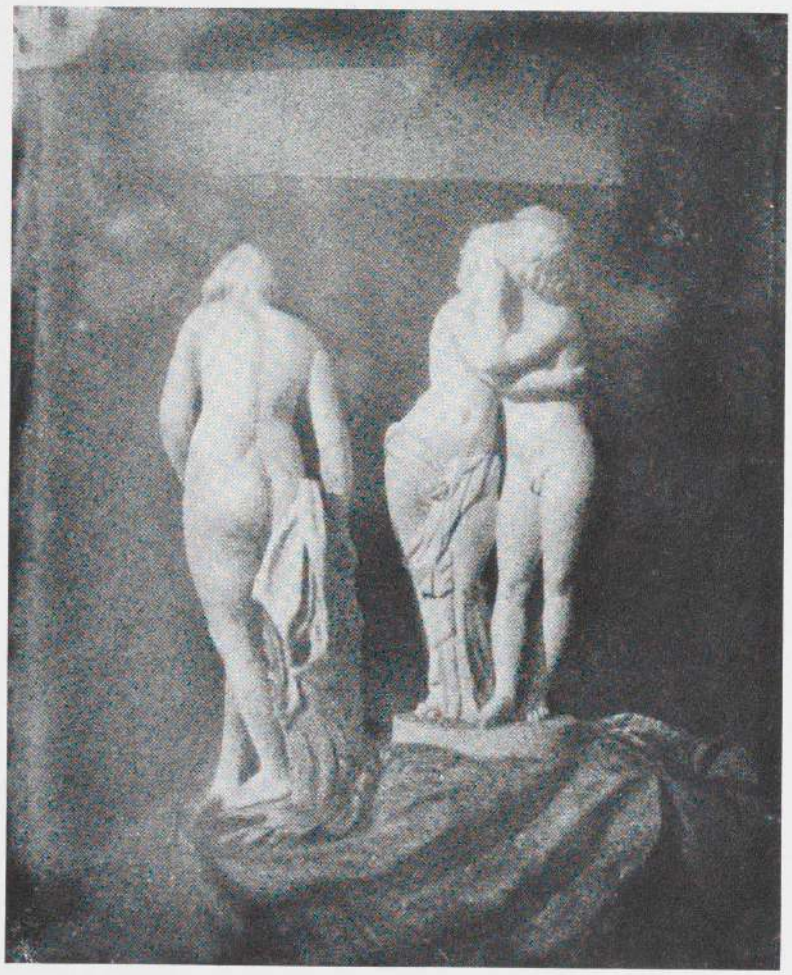

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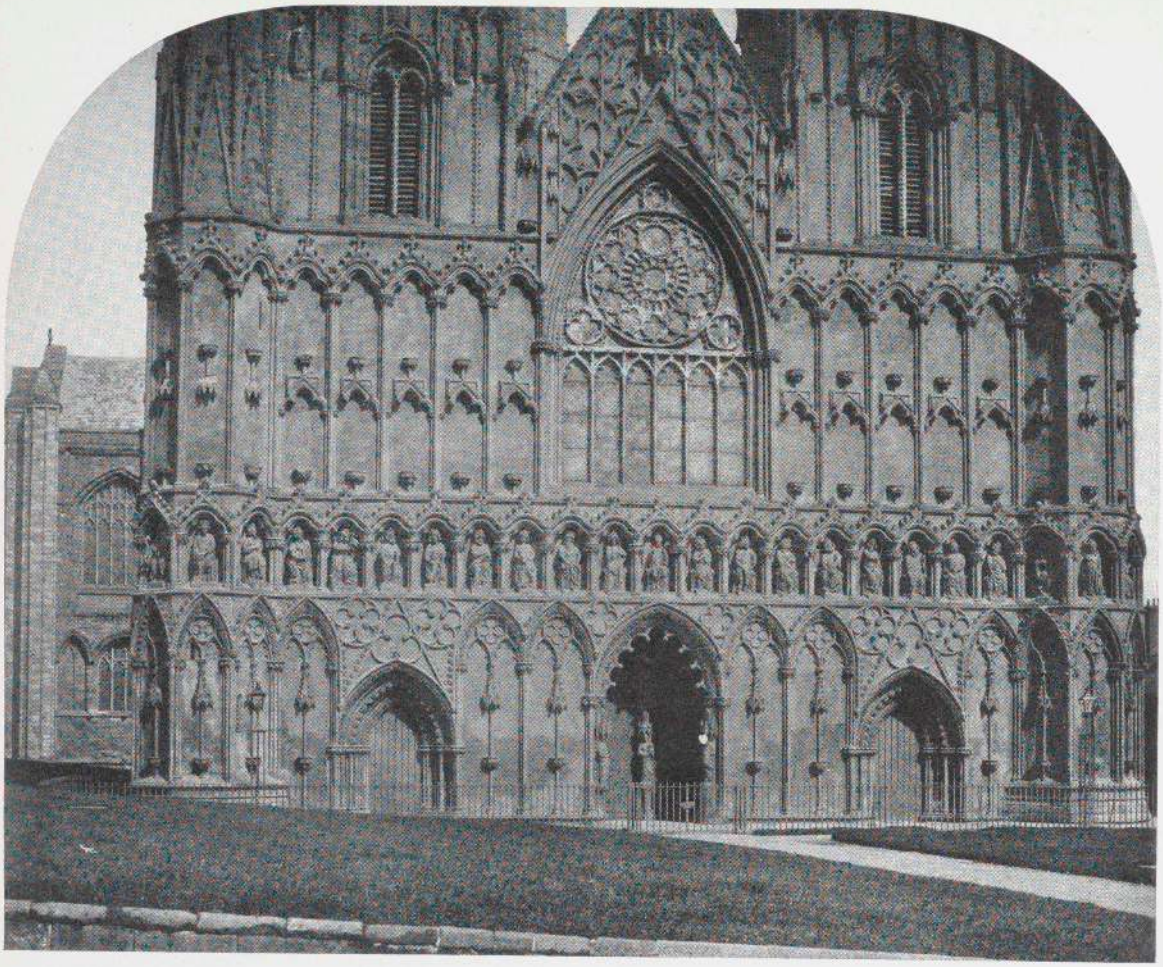
Ambrotype. Actual size



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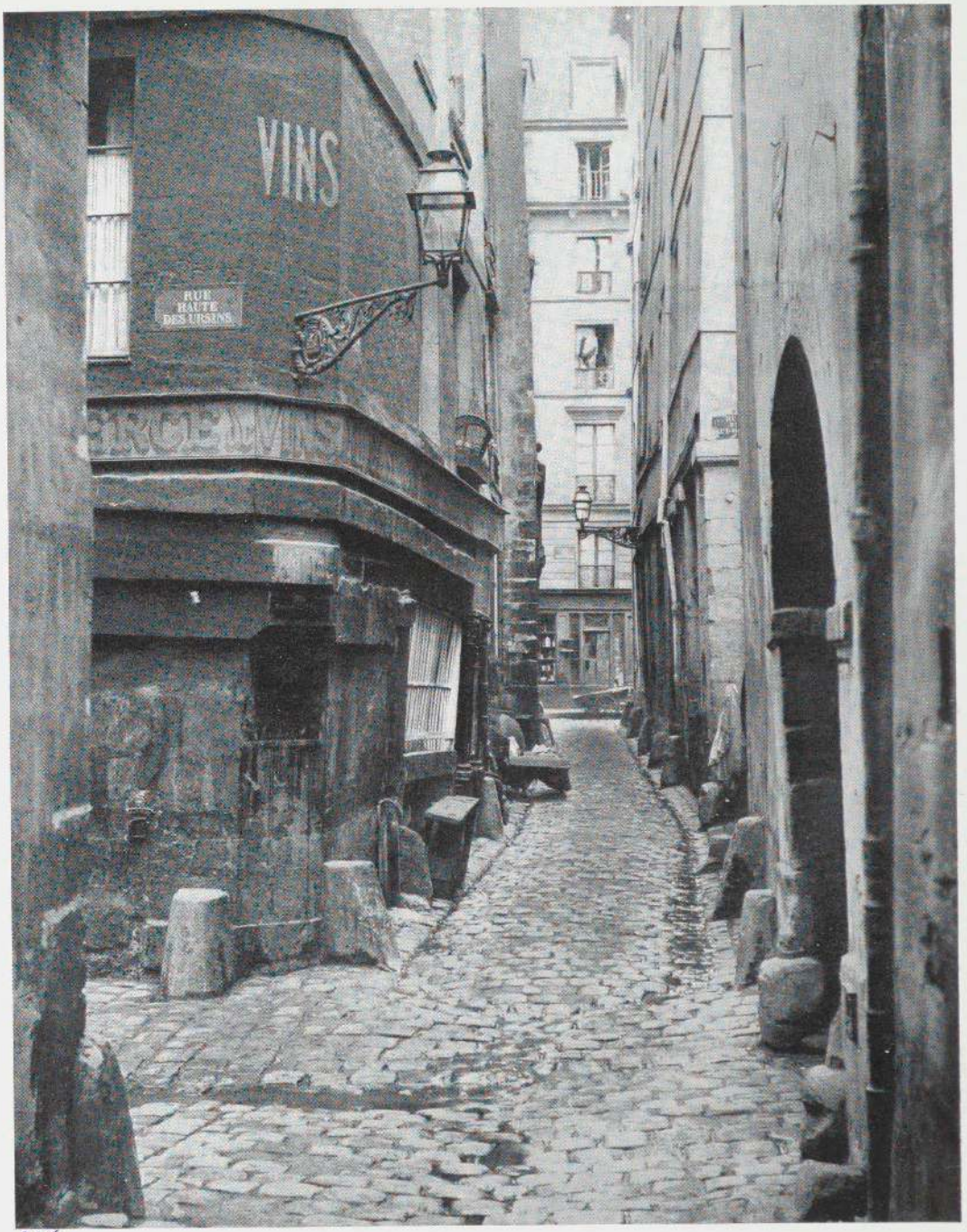
Collodion



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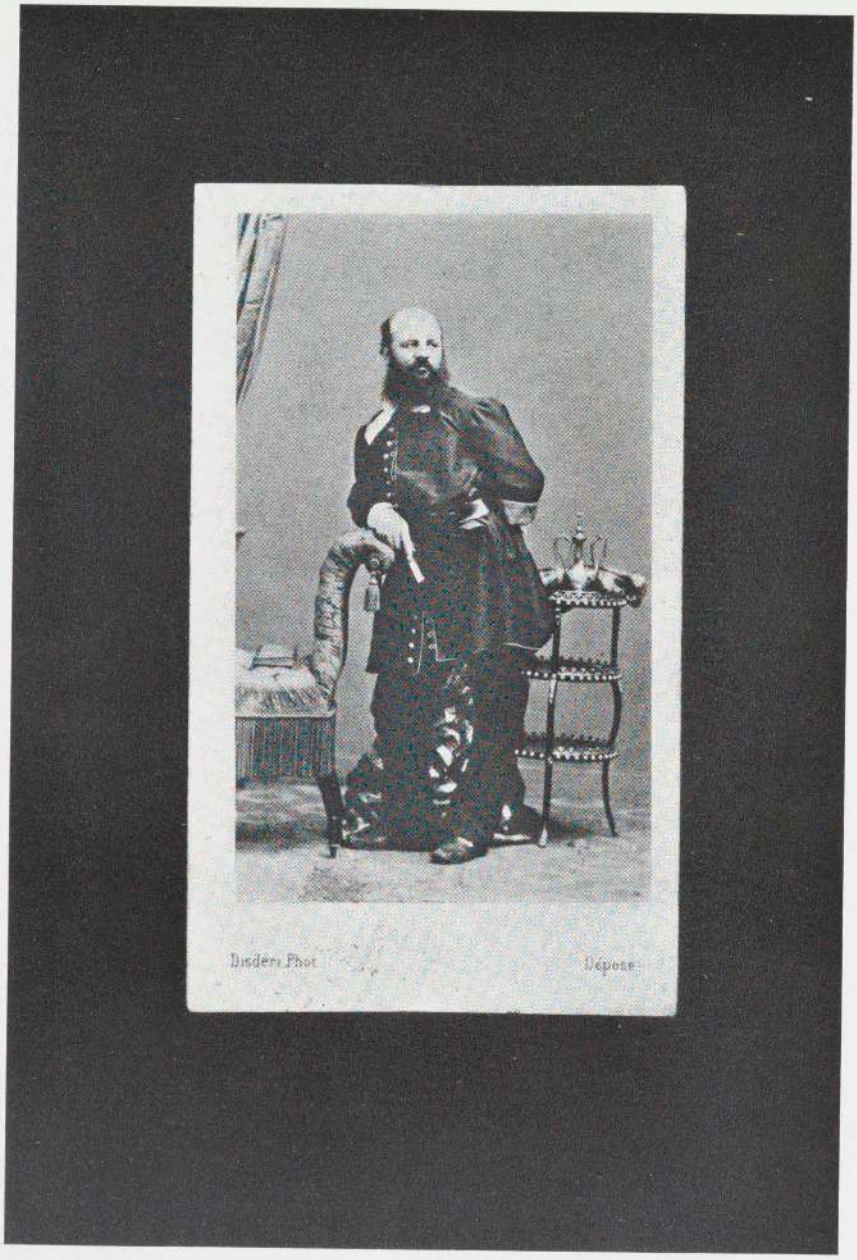

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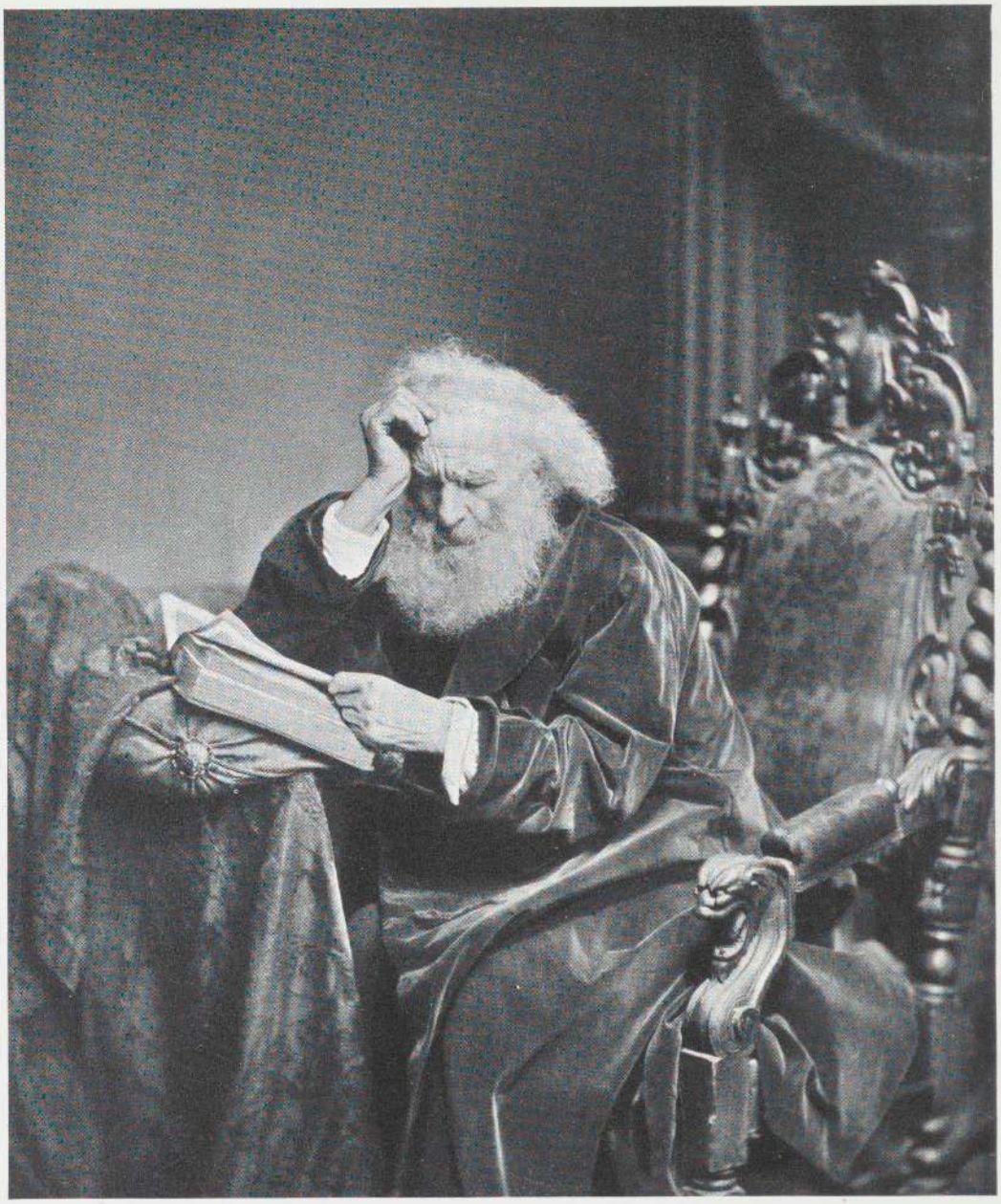
Collodion



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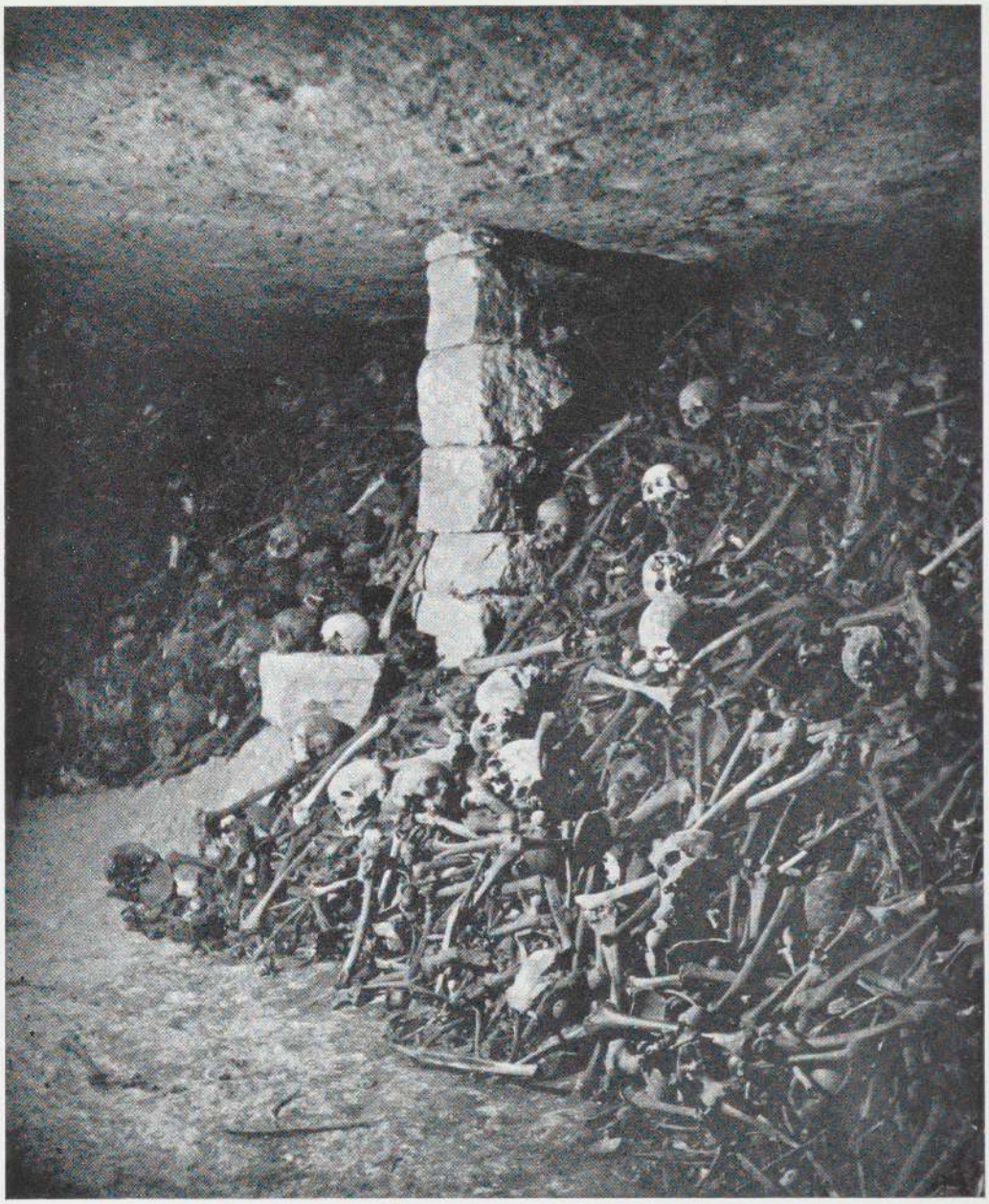

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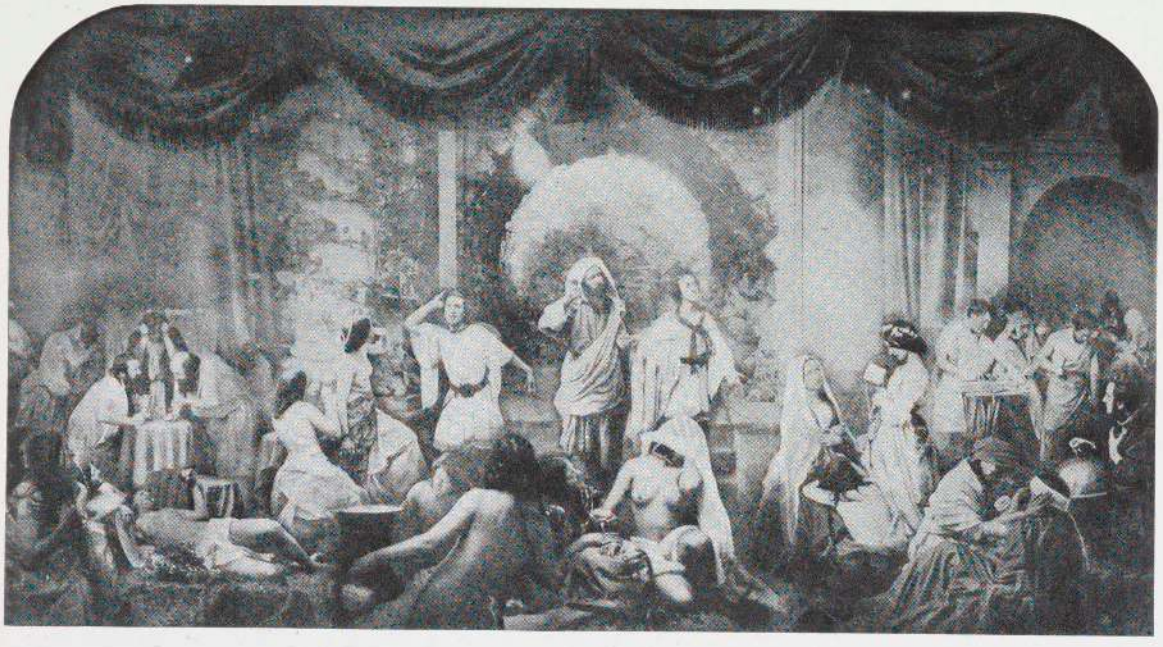

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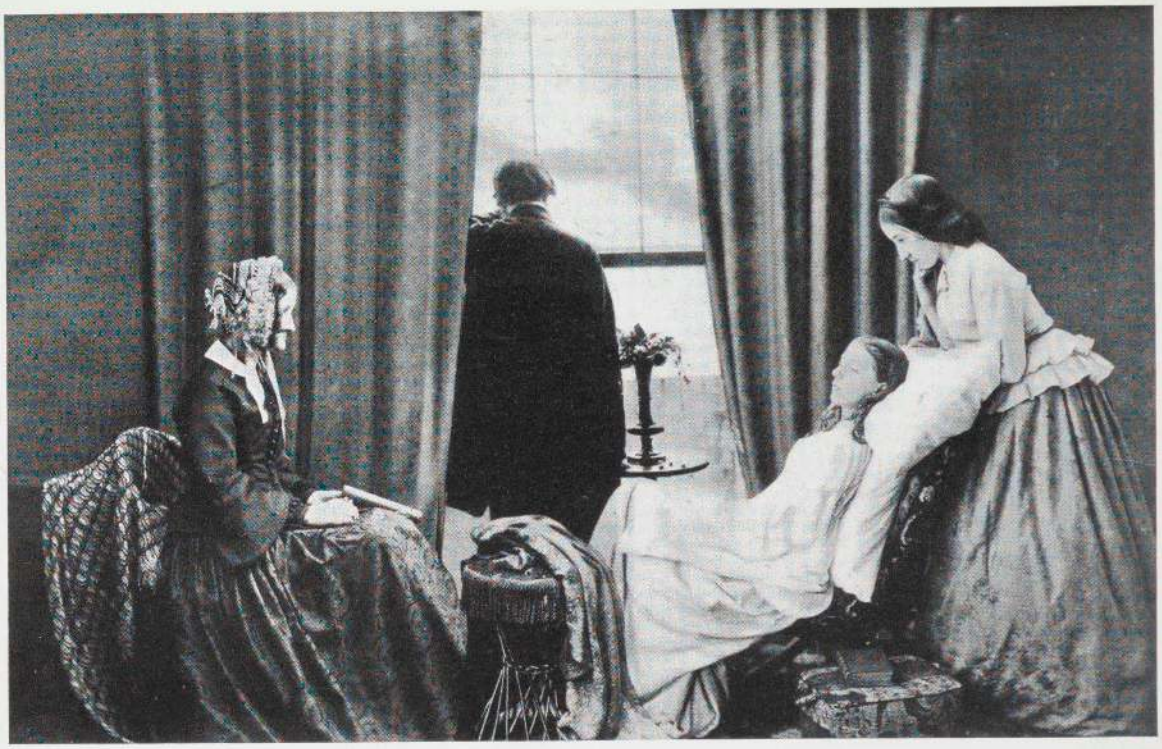
Combination print made from thirty collodion negatives



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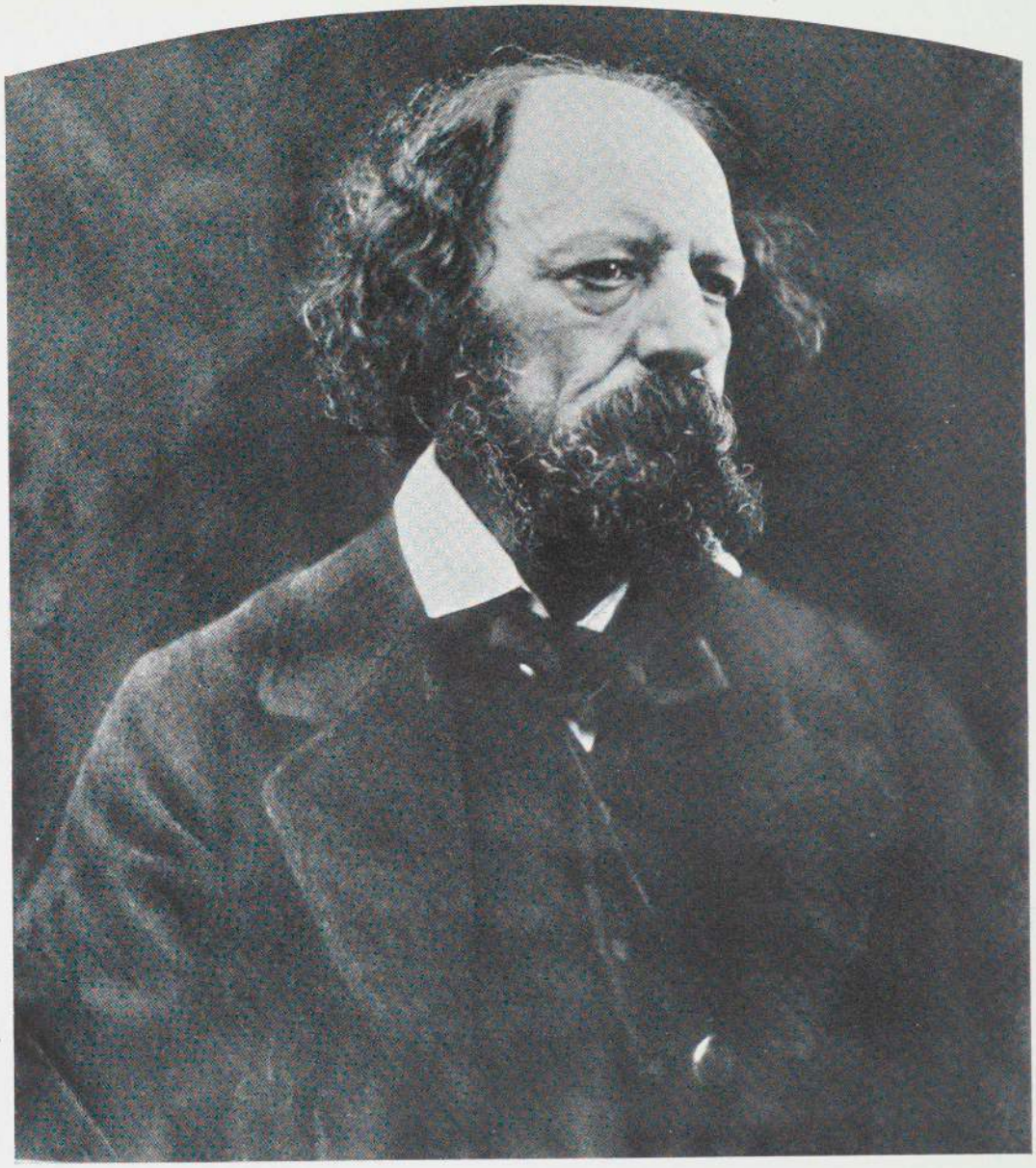
Probably collodion



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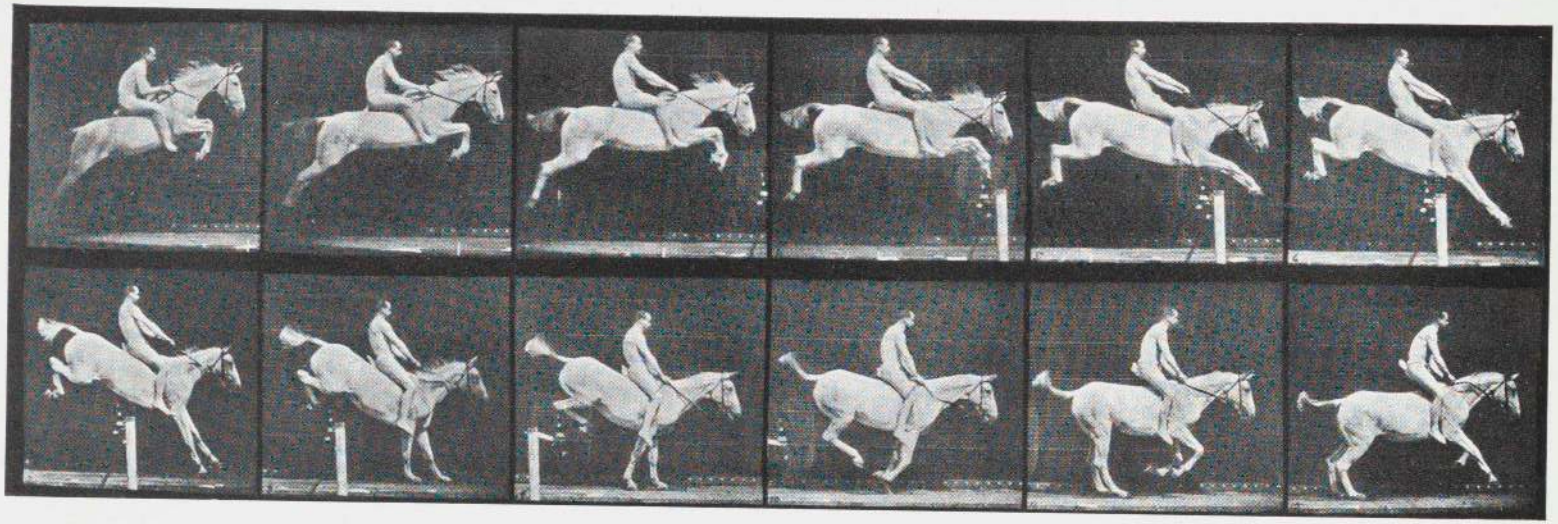
Collodion



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From Muybridge, *Animal Locomotion*, London, 1887, pl. 643. Series of 12 exposures made on dry plates in 12 separate cameras

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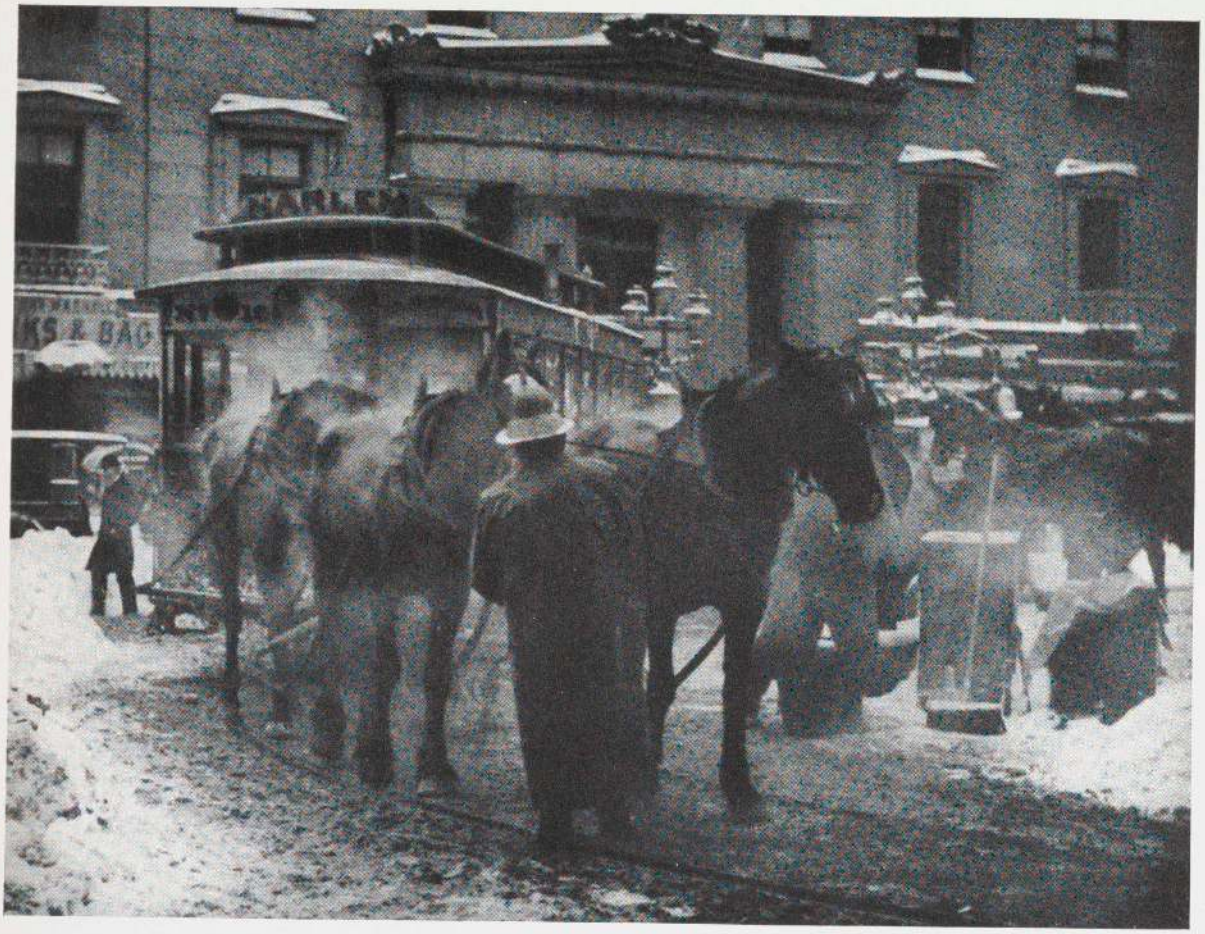
Dry plate



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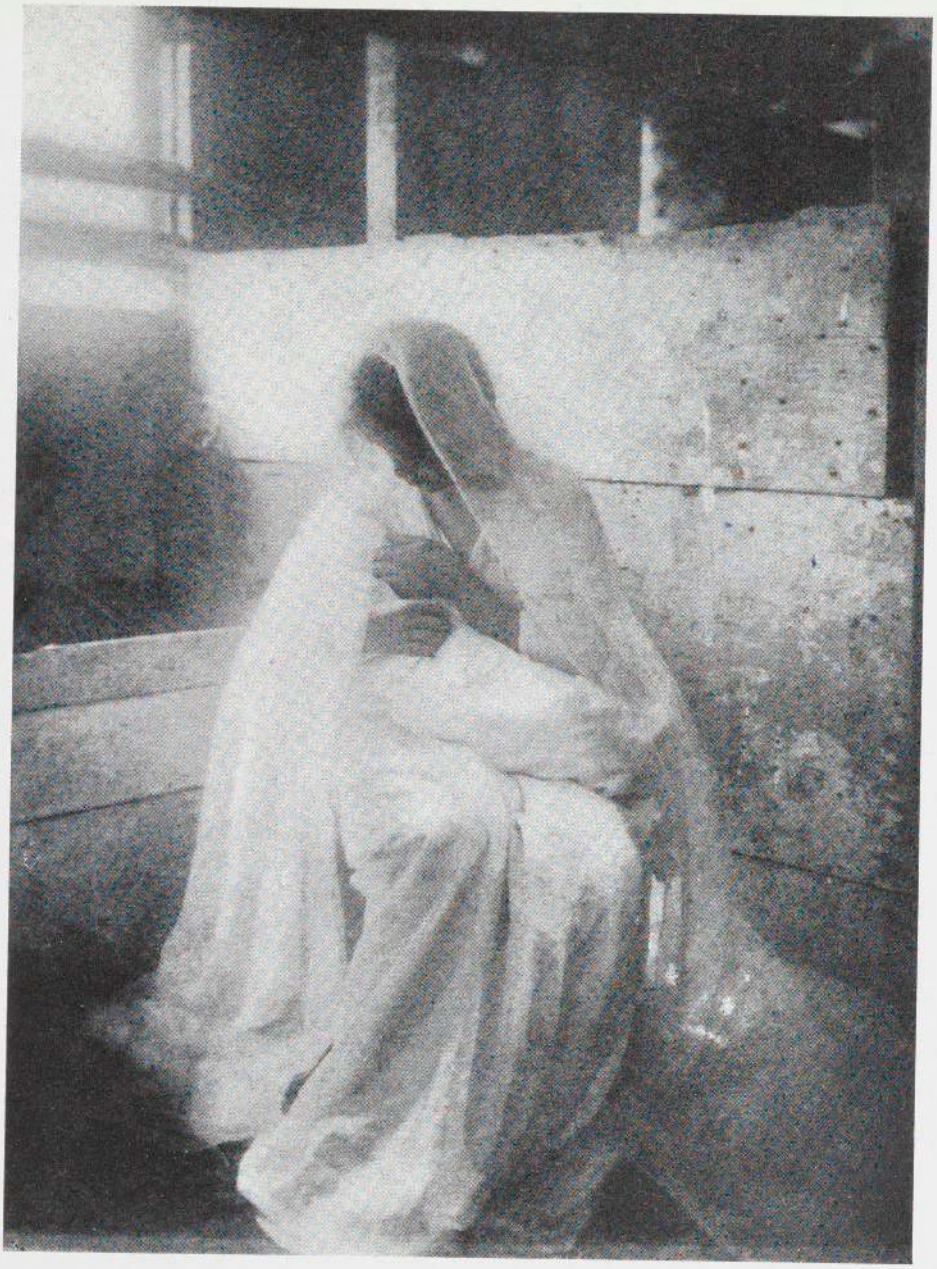

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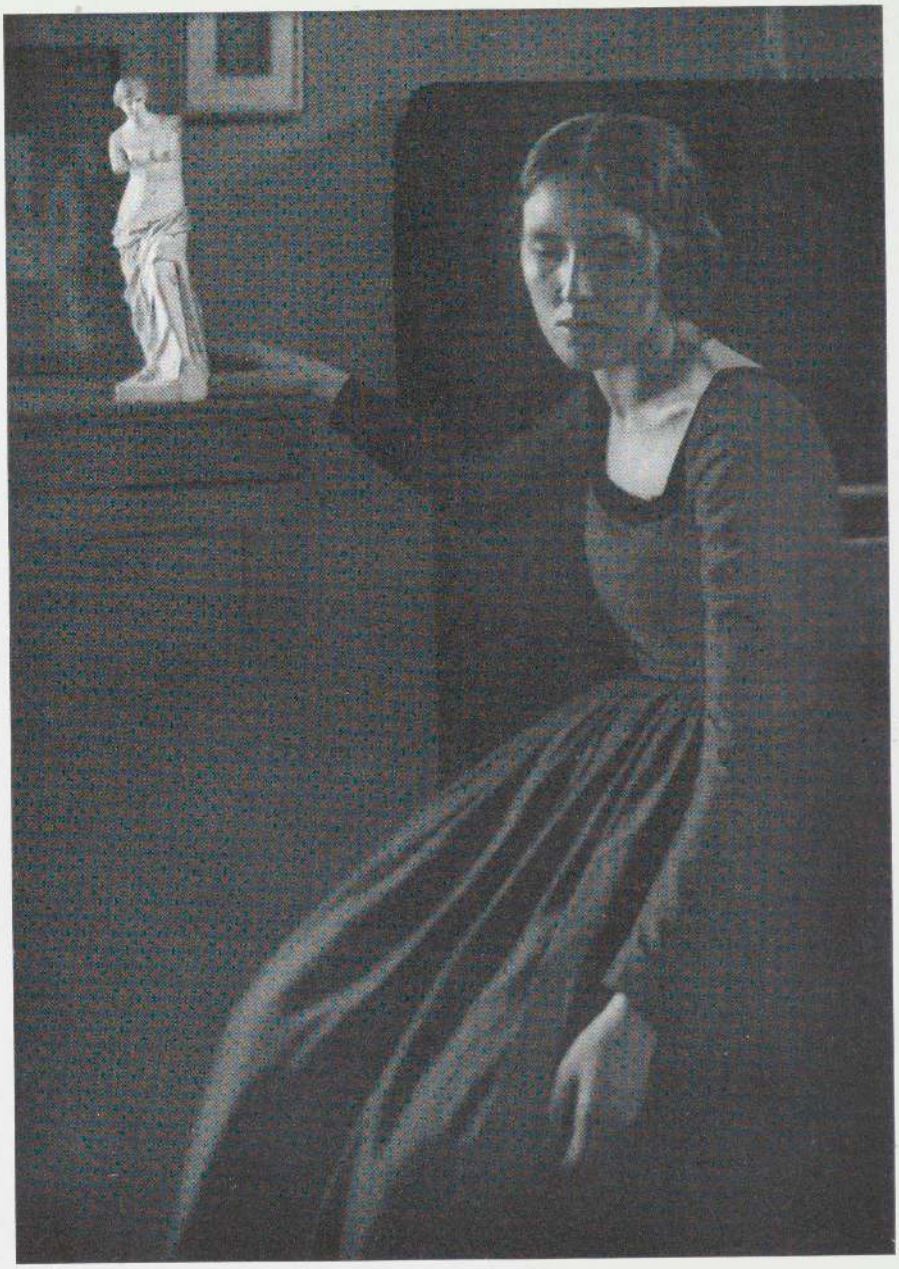
From the original print, exhibited in the International Exhibition of Pictorial Photography, Albright Art Gallery, Buffalo, 1910



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From a photogravure in *Camera Work*, No. 23, 1908, pl. IV

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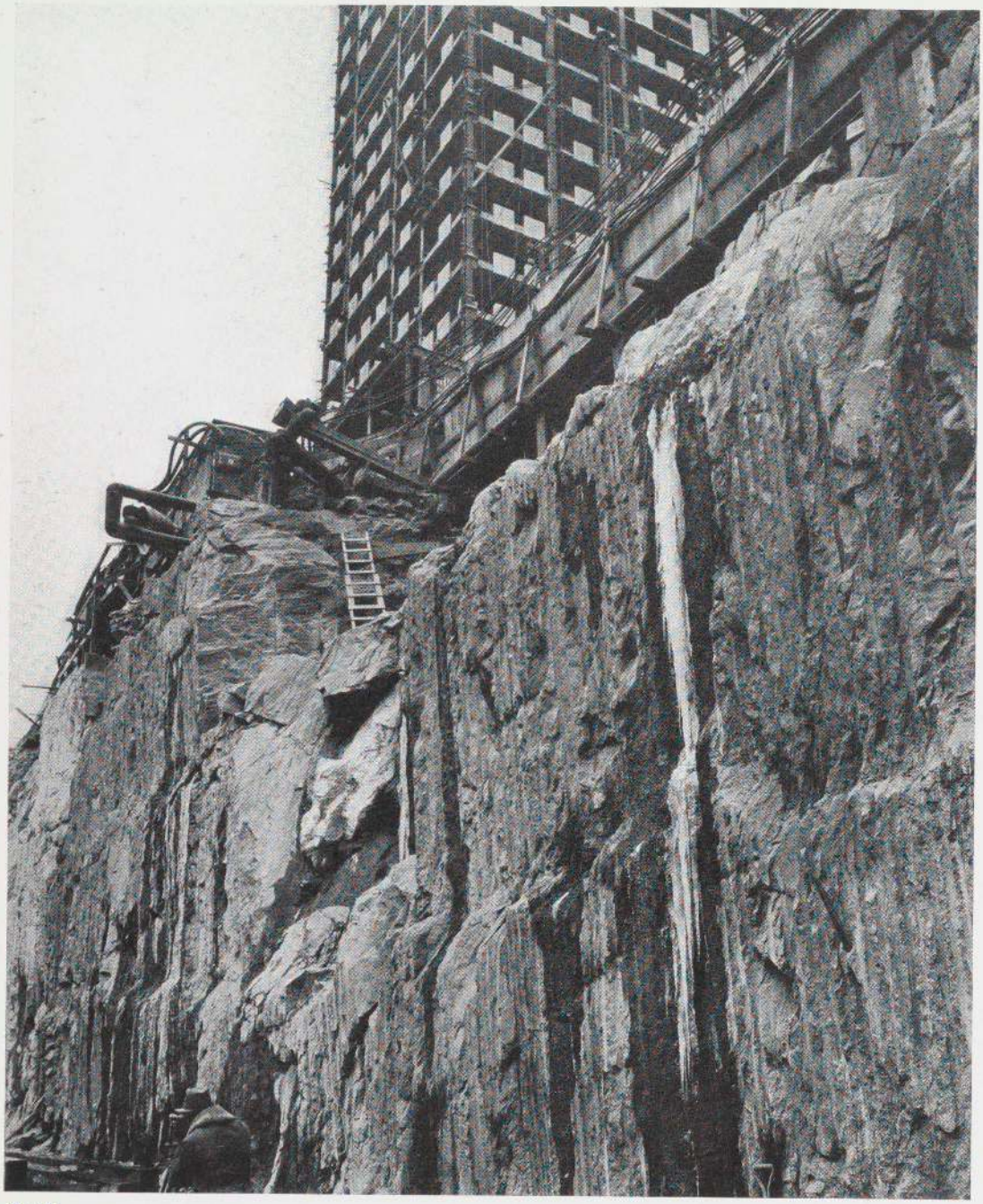
From a photogravure in *Camera Work*, Steichen Supplement, 1906, pl. X

Contemporary Photography

The technical data listed with the plates of contemporary photographers has been compiled from answers supplied by them.



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View camera; 8 x 10 in. film

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Korona view camera; 4¾ in. Goerz Dagor lens; Eastman super-sensitive panchromatic film, 4 x 5 in.; pyro developer. Printed on Eastman P.M.C. bromide paper, developed in amidol

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Studio camera; Goerz Dagor lens; super-sensitive panchromatic film; stop F/32; exposure 2 secs.

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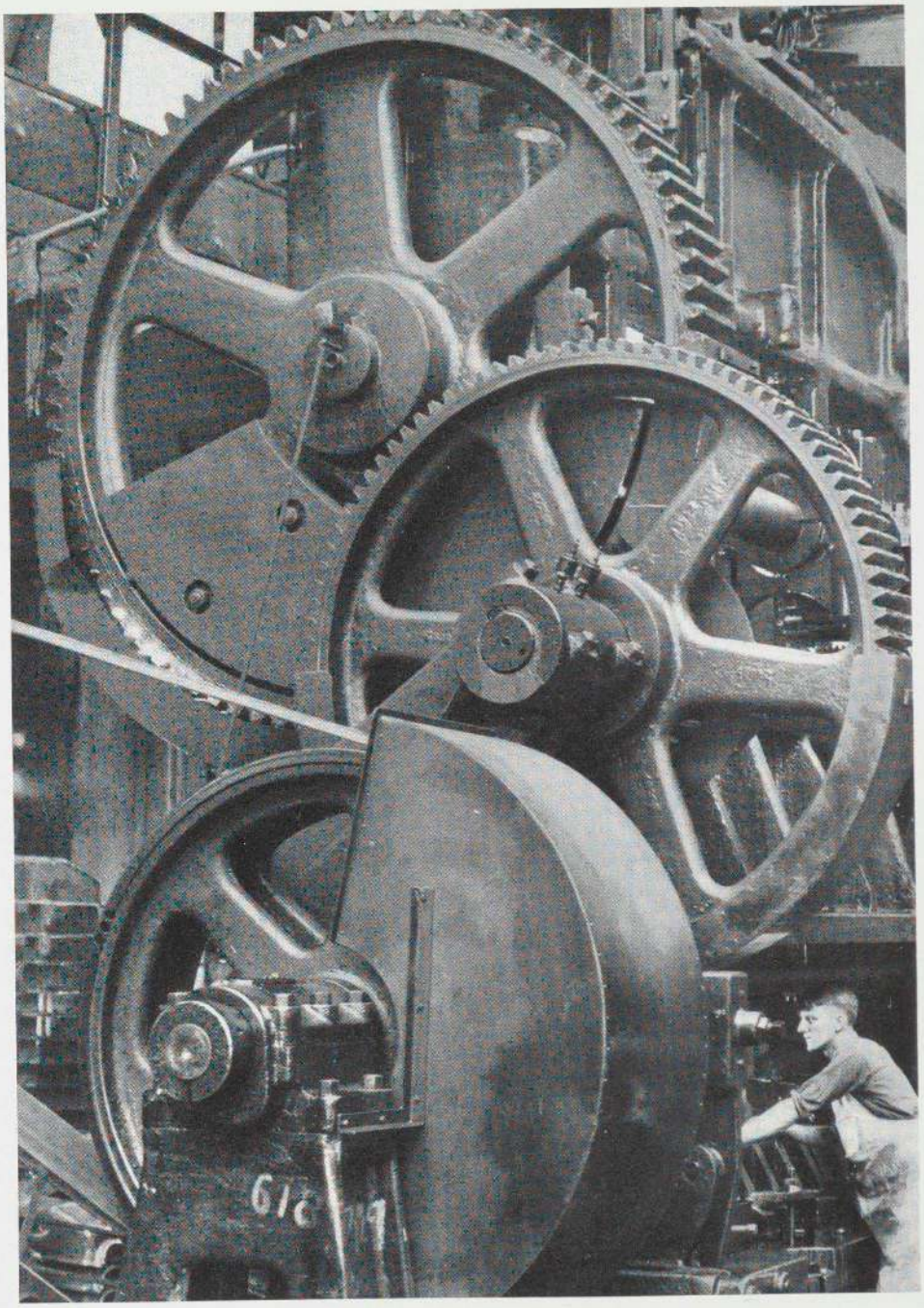

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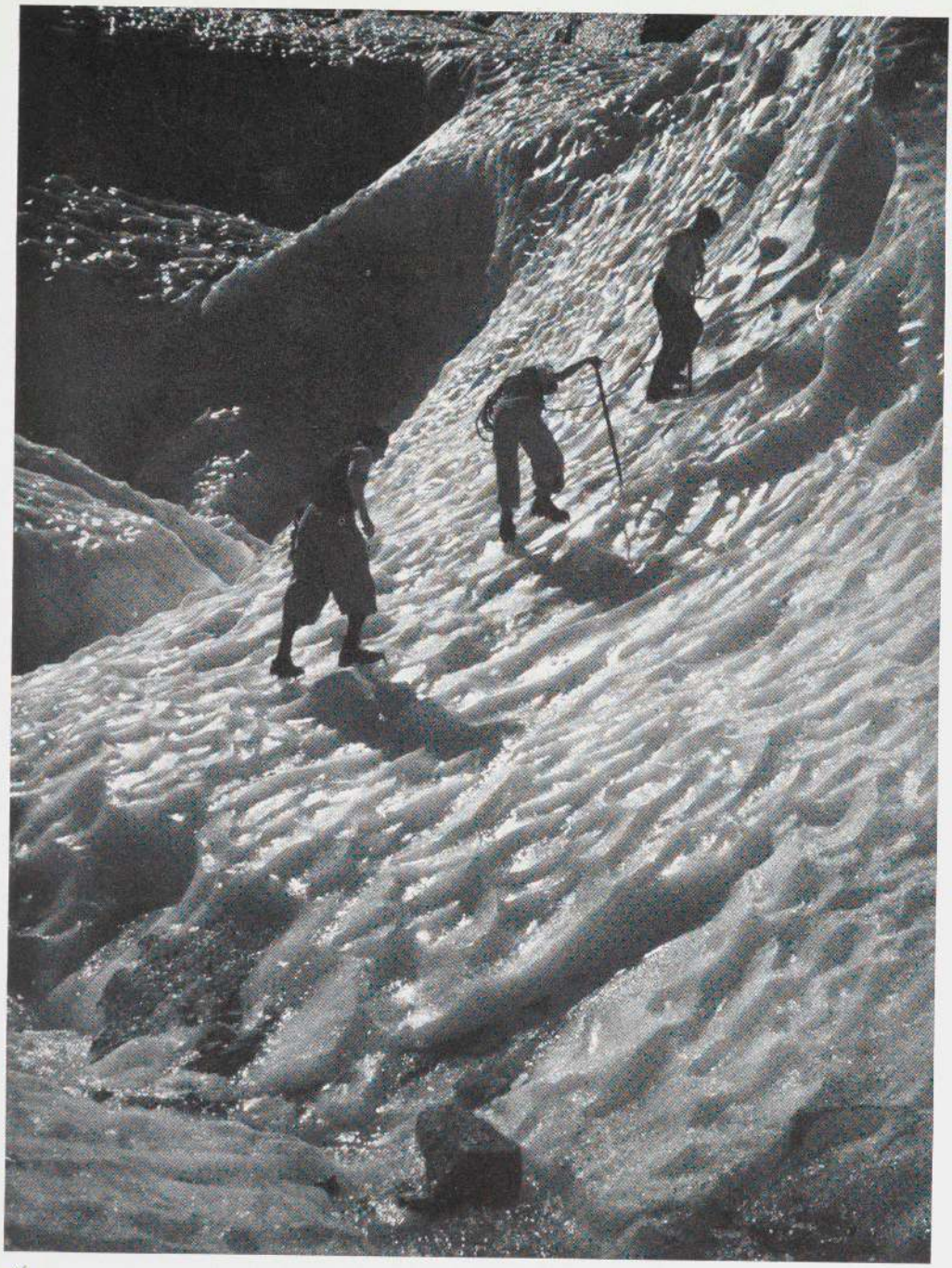

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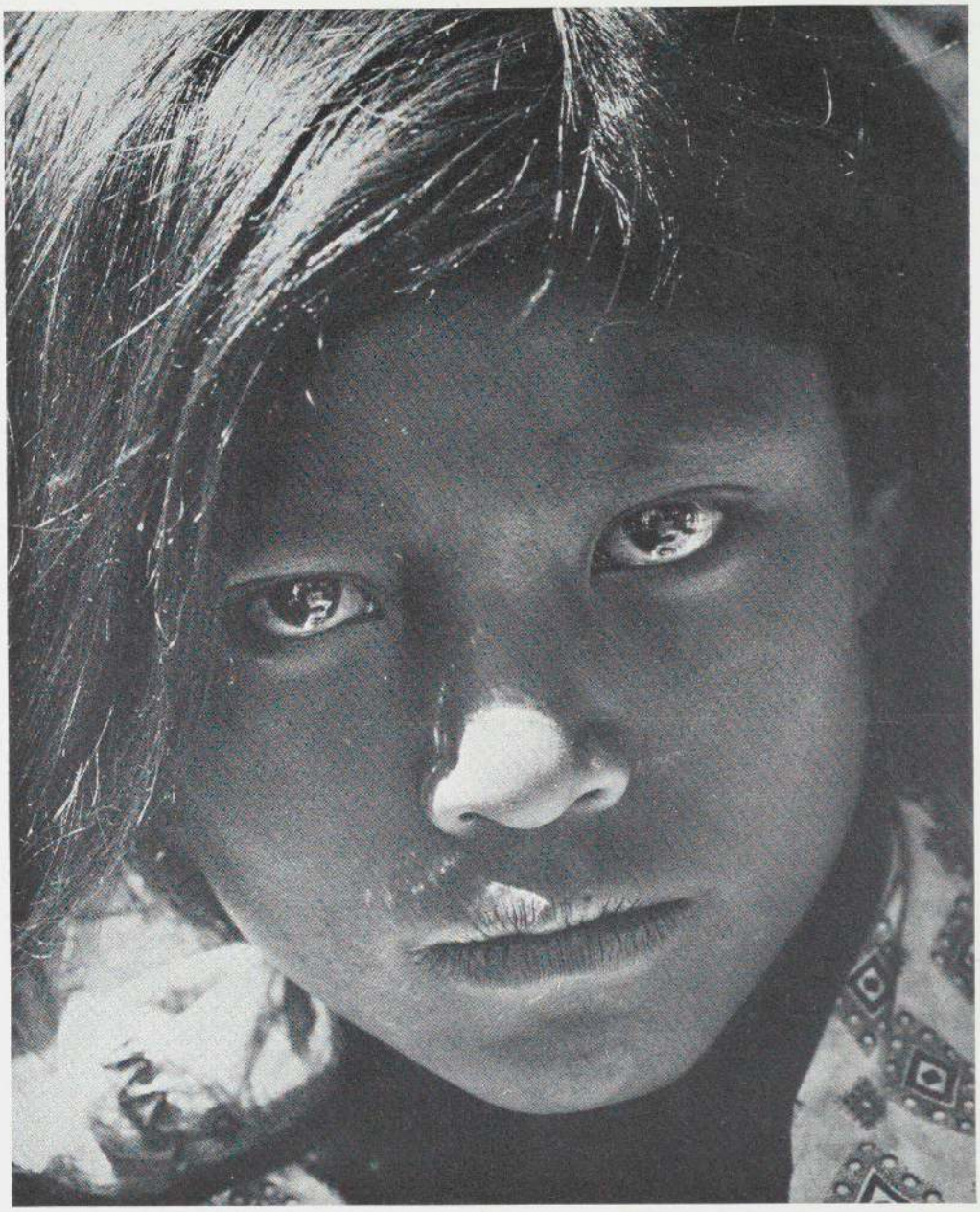
Plate 57 BRASSAÏ: The Glacier of Bosson, 1936

6 x 9 cm. film



405

Plate 58 BRUEHL, Anton: Mexican Child, 1932

423

Plate 59 DAHL-WOLFE: Bijou Theatre, 1933

View camera, rapid rectilinear lens, orthochromatic film, 5 x 7 in., stop 16

429

Plate 60 DUMAS: Butcher and Peasant

Rolleiflex camera, film 6 x 6 cm., exposure 1/100 sec.

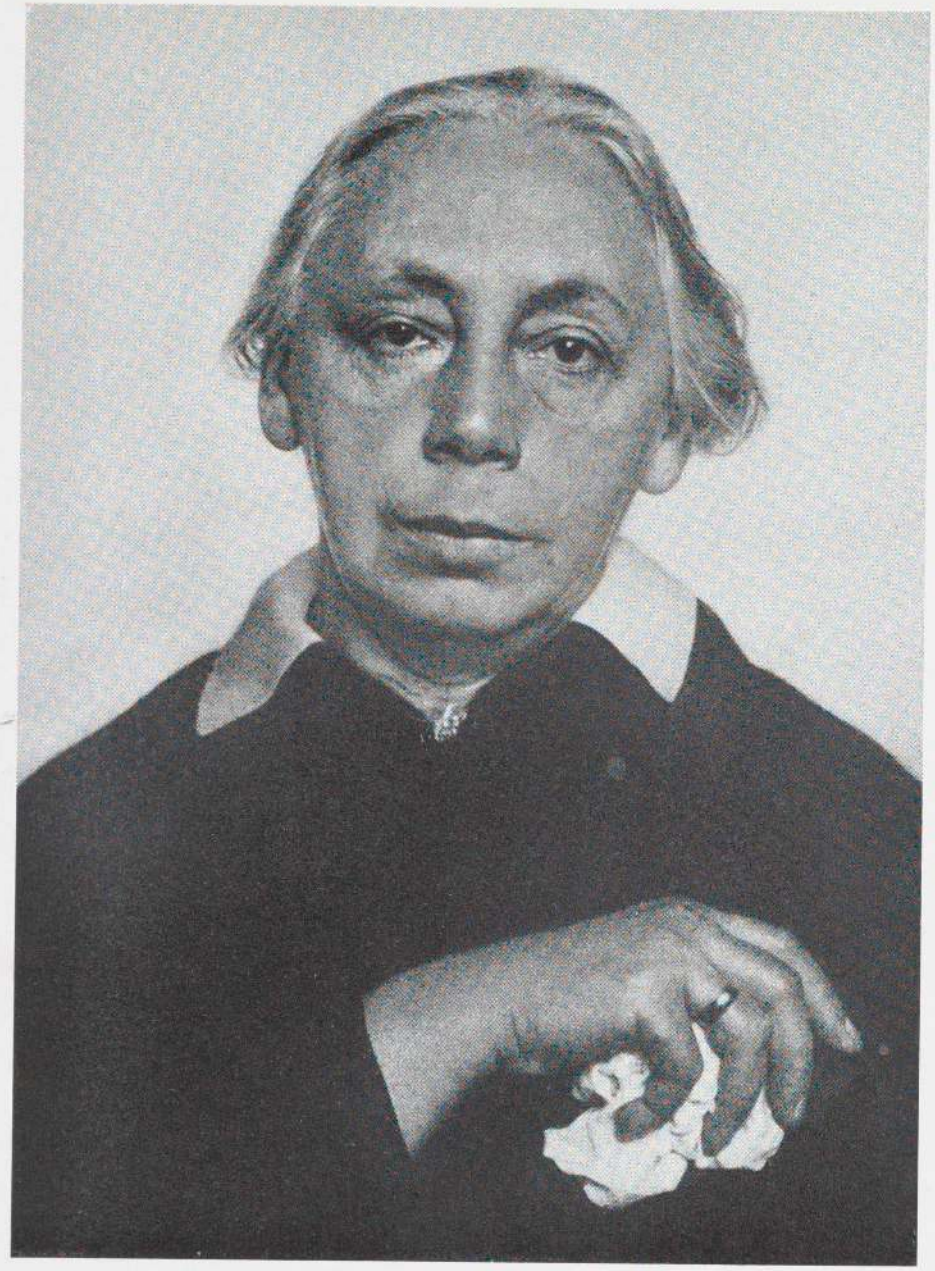


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Plate 61 ERFURTH: Portrait of Käthe Kollwitz, 1924

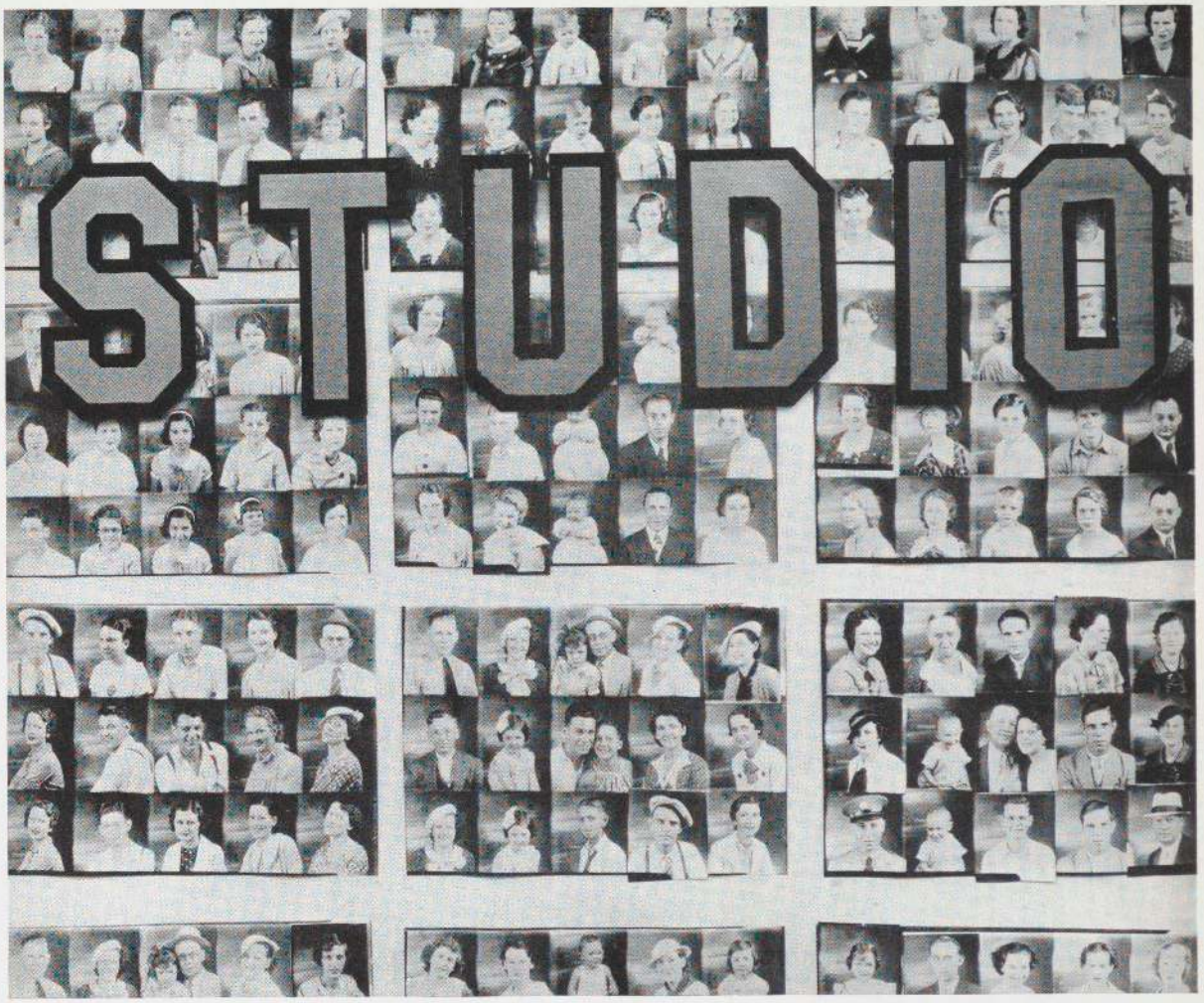


Plate 62 EVANS: Photographer's Window, Savannah, 1936

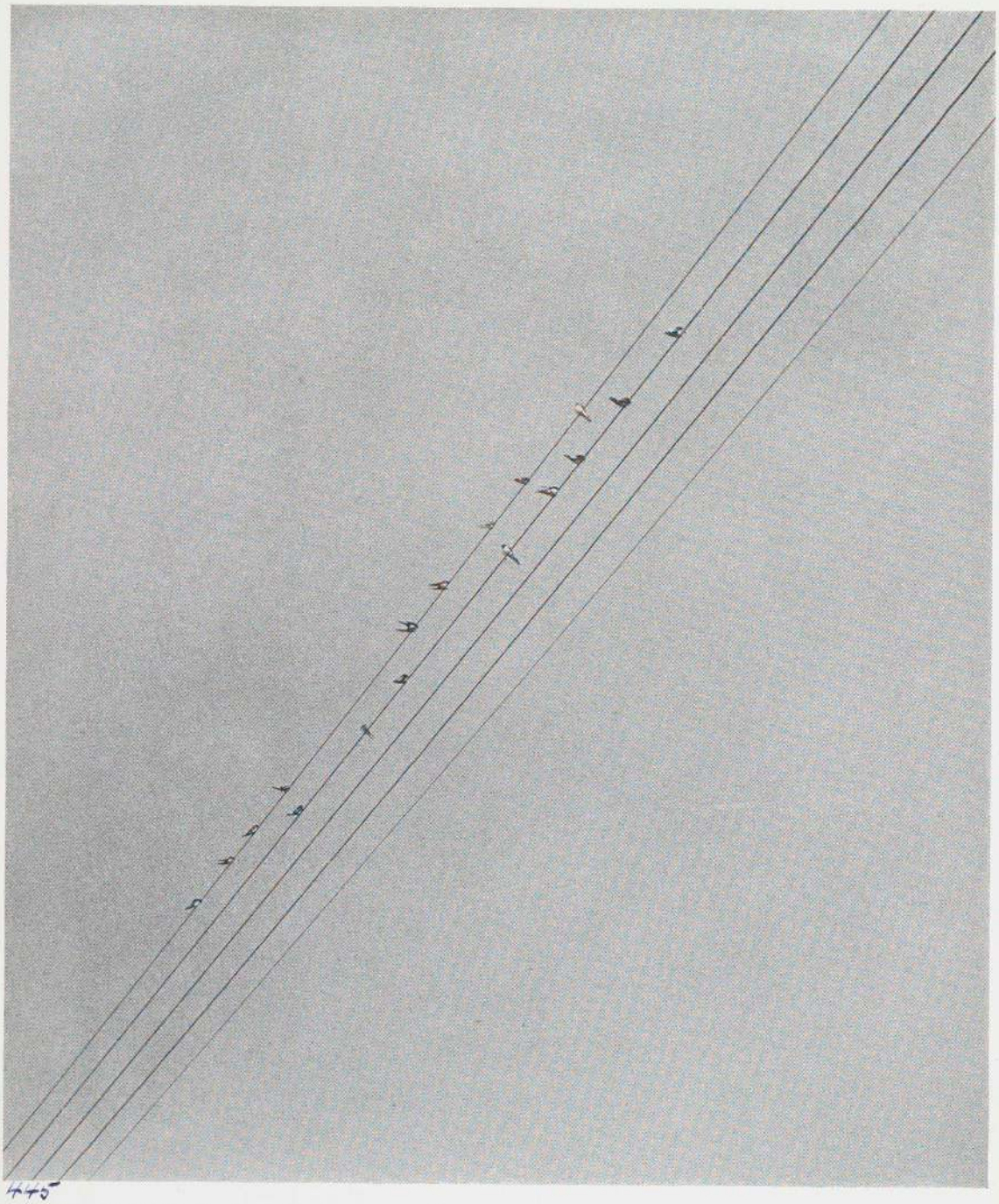


Plate 63 FEHER: Spring Symphony, 1936

Rolleiflex camera, film 6 x 6 cm.

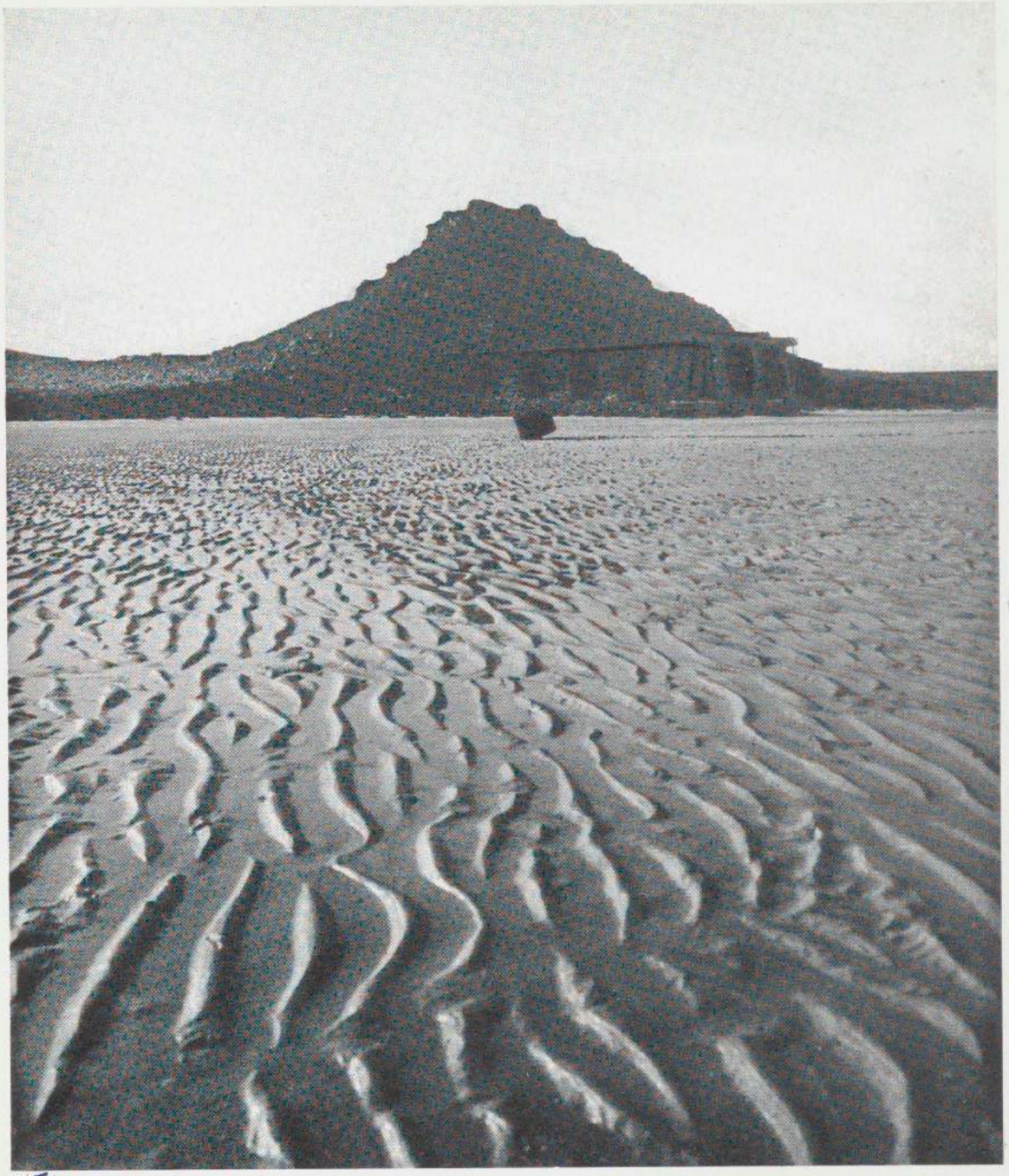
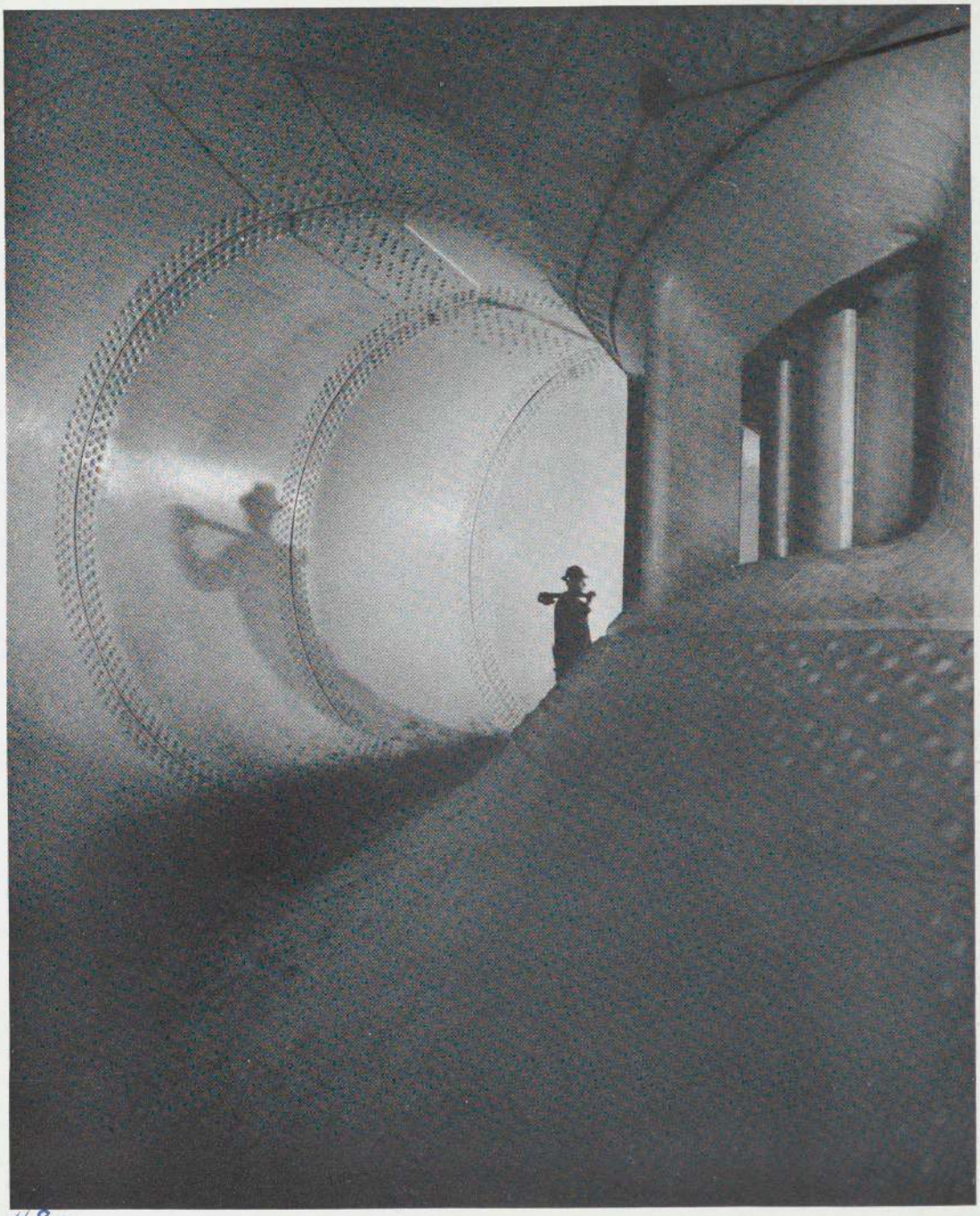


Plate 64 FULD: Low tide, 1936

Rolleiflex camera, panatomic film, exposure, 1/100 sec.

476

Plate 65 KOLLAR: Return from the Fields



480

Plate 66 KRUTCH: Hydraulic Generator Scroll Case, 1936

Century camera; Goerz Super Dagor lens; panchromatic film, 8 x 10 in.; stop F/22; exposure 20 secs.

496

Plate 67 LOHSE: Night-club (Hip-shaker), 1933

Contax camera, Sonnar lens; super-sensitive panchromatic film, 24 x 36 mm.; stop F/1.5 exposure 1/25 sec.

500

Plate 68 LYNES: Jean Cocteau

518

Plate 69 MOHOLY-NAGY: Photogram, 1923

Shadowgraph

520

Plate 70 MOHOLY-NAGY: The Bauhaus, Dessau, 1926

Zeiss Ikon camera, film 6 x 9 cm.

539

Plate 71 RAY: Rayograph, 1922

From *Champs Délicieux,* Paris, 1922. Shadowgraph

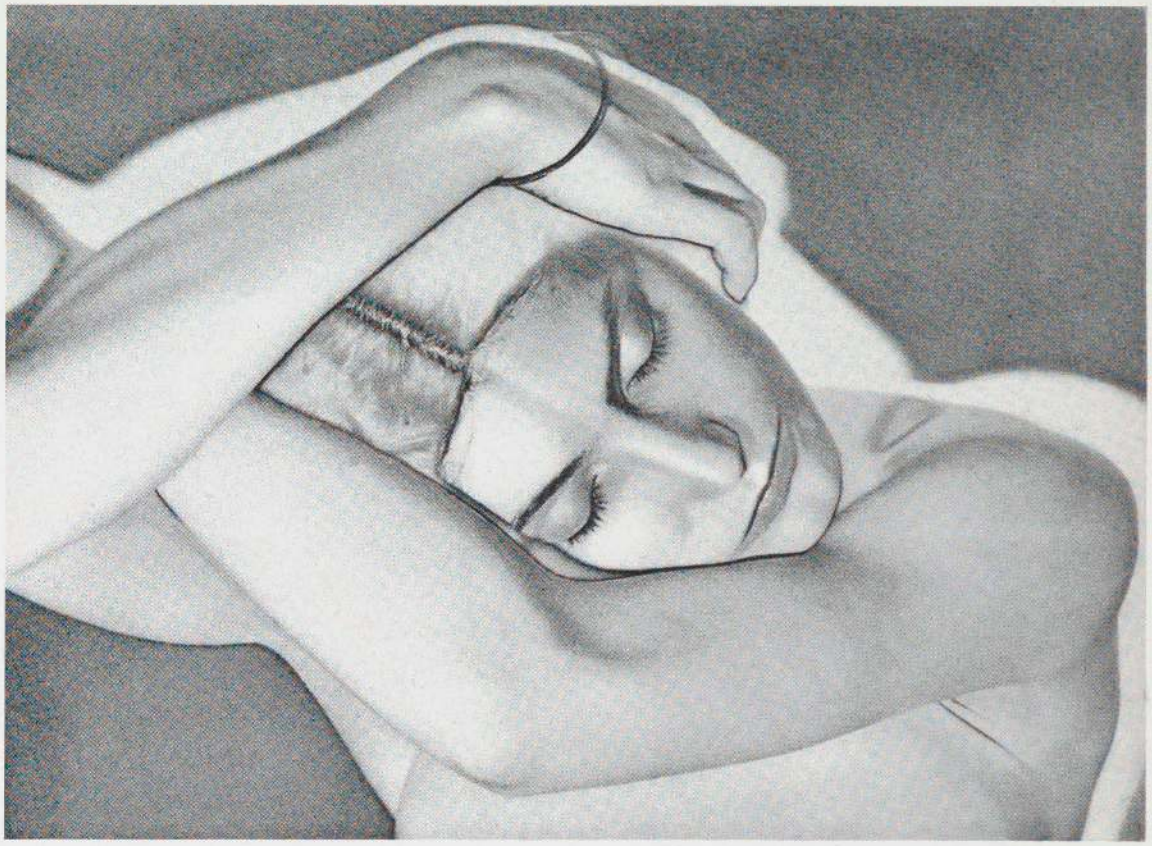


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Plate 72 RAY: Sleeping Woman

Print from partially solarised negative

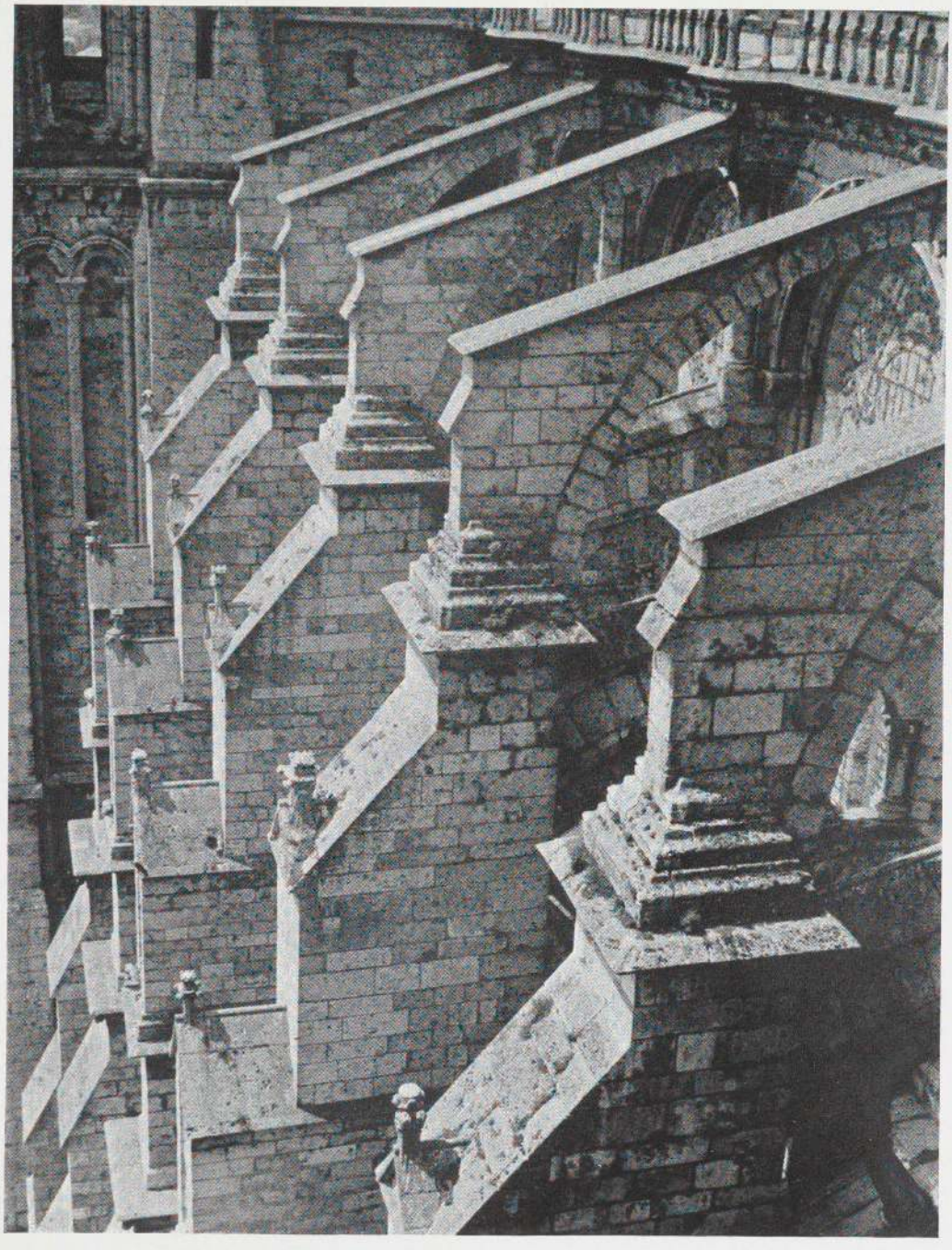

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Plate 73 SHEELER: Chartres, 1929

Ernemann tropical sportsman camera; film, 3¼ x 4¼ in.

569

Plate 74 STEICHEN: Carl Sandburg

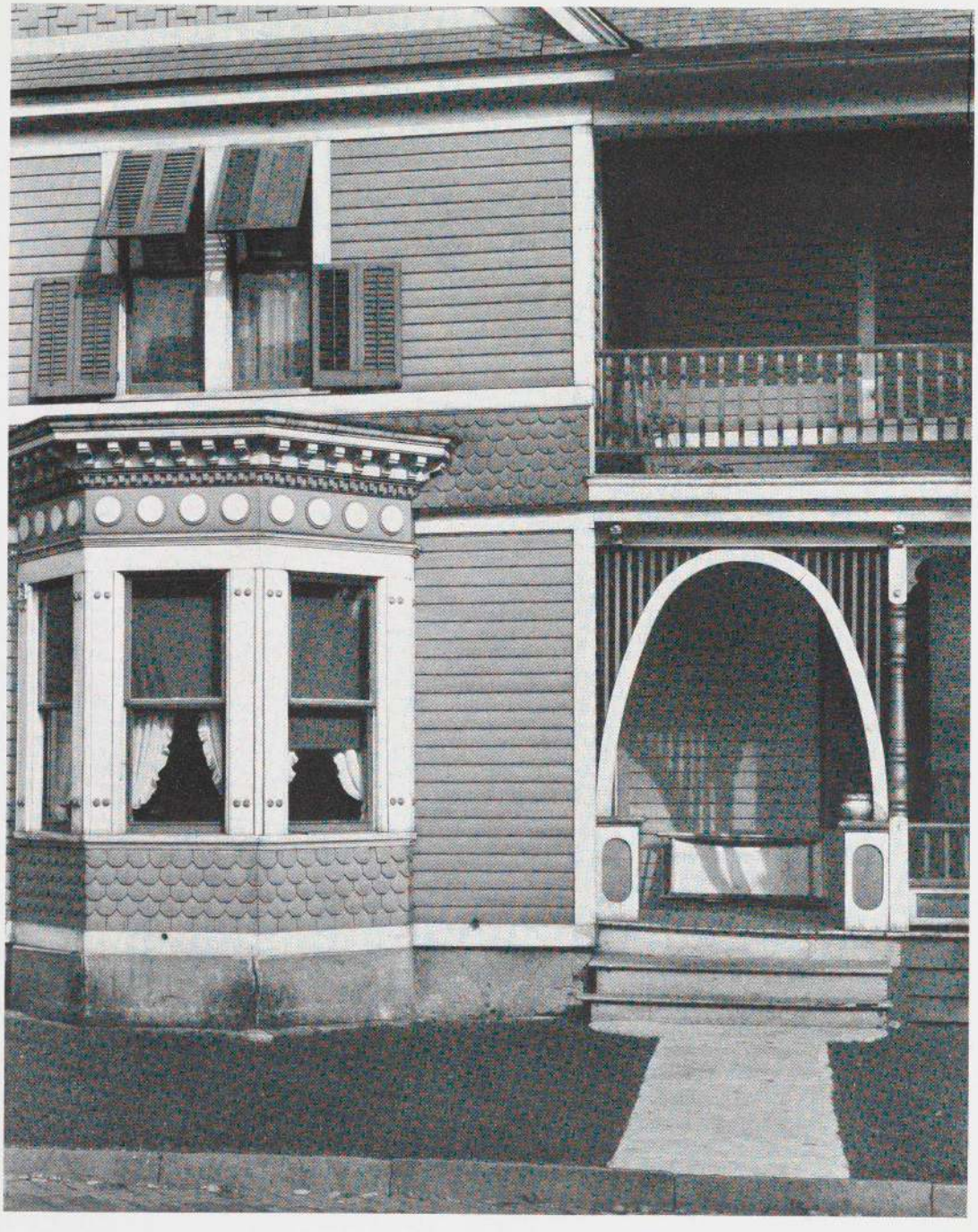

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Plate 75 STEINER: Suburban House

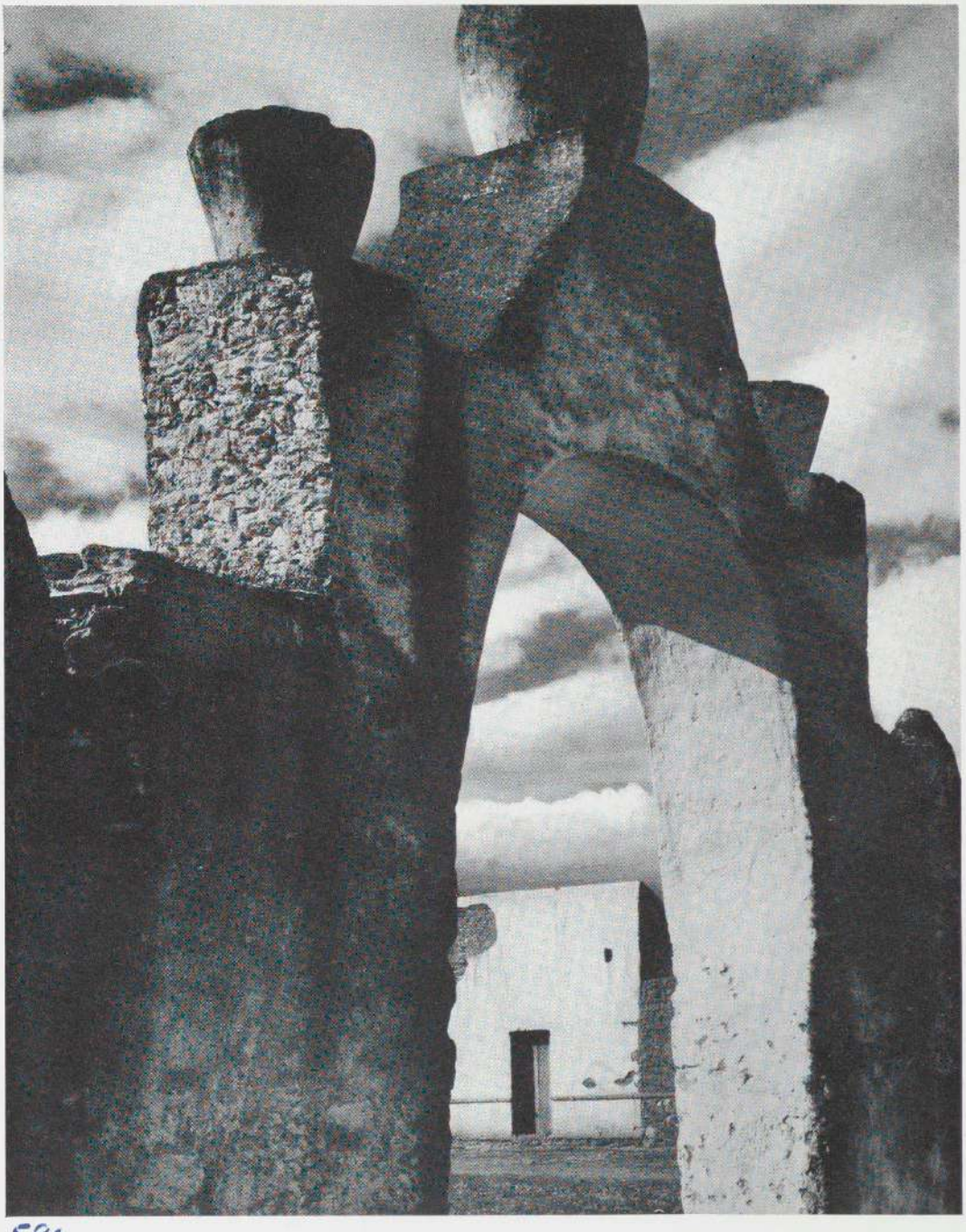

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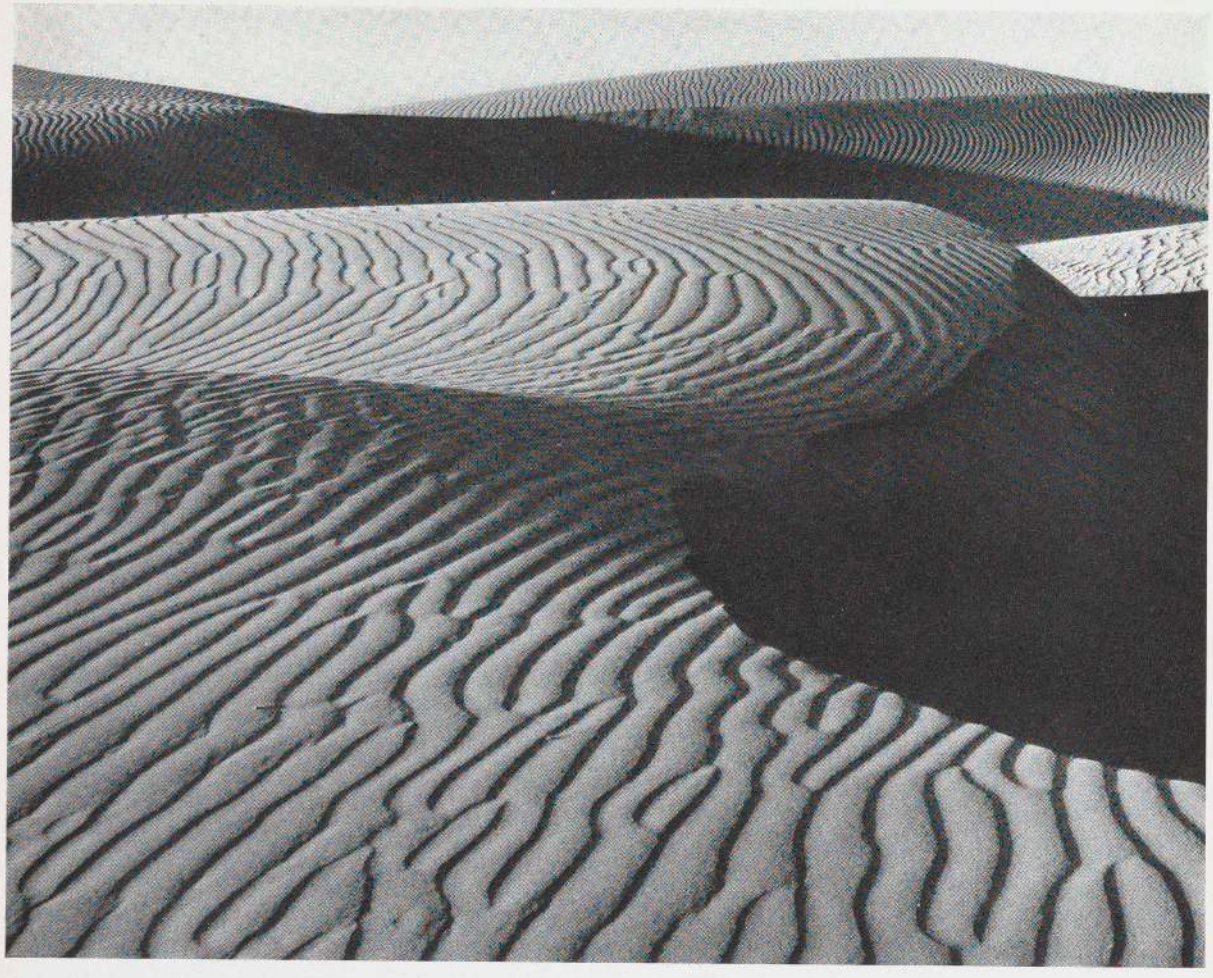
Plate 76 STRAND: Gateway, Hidalgo, Mexico, 1933

Korona view camera; 16 ½ in. Tessar lens; panchromatic film 8 x 10 in. Platinum print



607

Plate 77 WESTON, E.: Sand Dunes, Oceano, California, 1936

Century Universal camera; 12 in. Turner-Reich triple convertible lens; Defender super-sensitive panchromatic film, 8 x 10 in.; stop F/128 (or smaller); K2 filter.

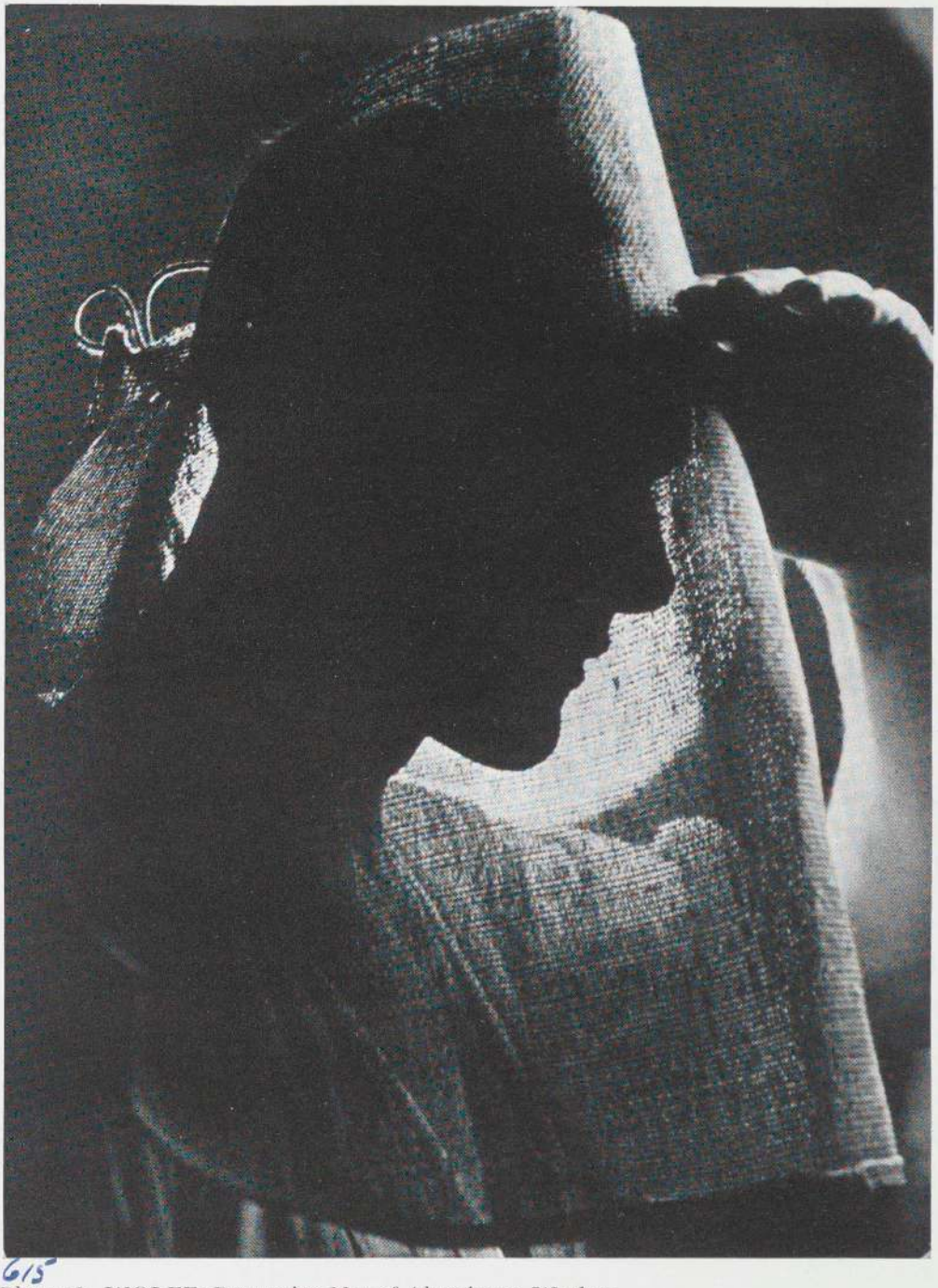


Plate 78 WOLFF: Protective Net of Aluminum Worker

Leica camera; film 24 x 36 mm.

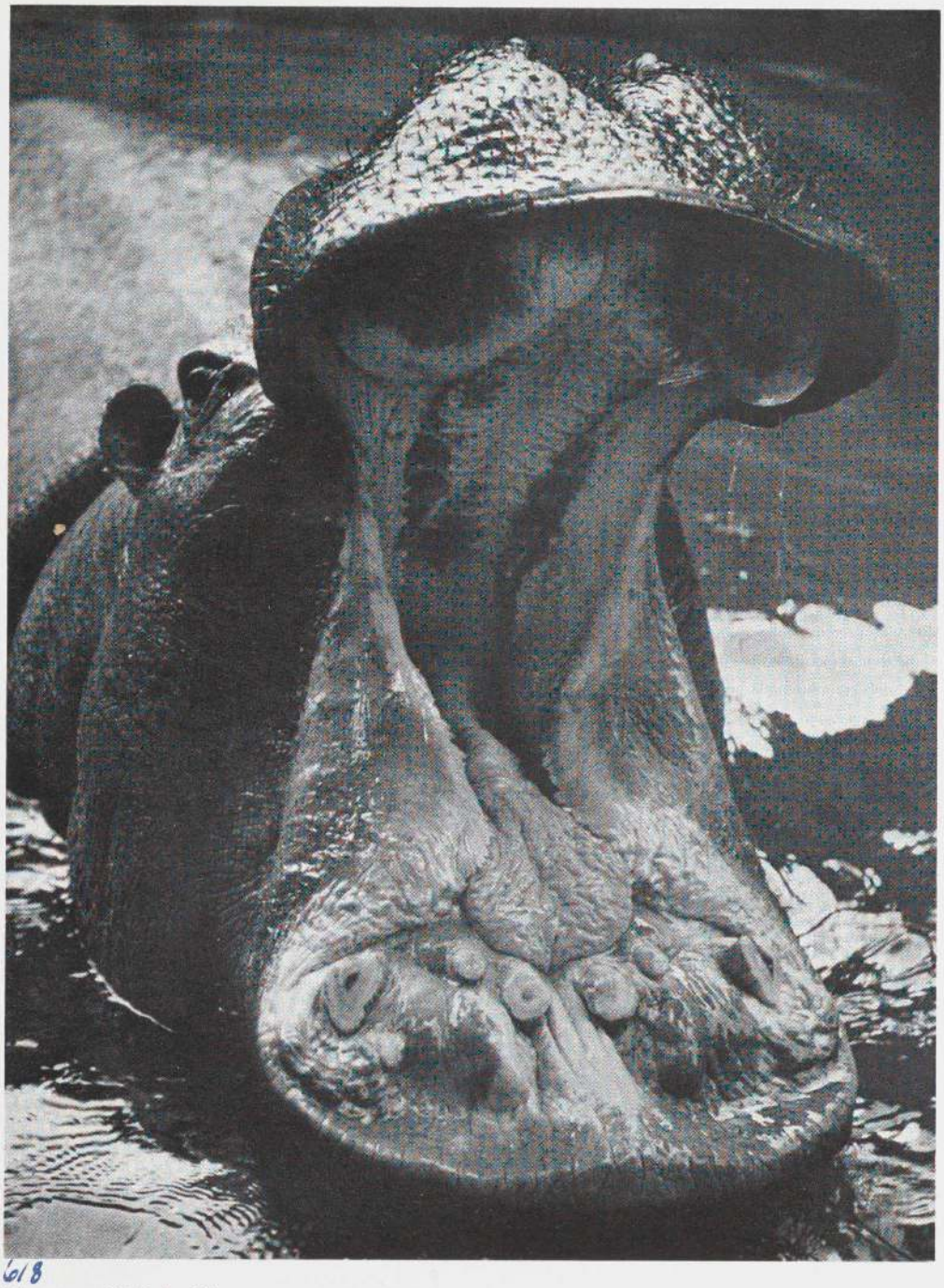


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Plate 79 YLLA: Hippopotamus

Rolleiflex camera, film 6 x 6 cm.

Press Photography

Scientific Photography

Moving Pictures

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Plate 80 UNKNOWN AMERICAN PHOTOGRAPHER: A scene in Shantytown, New York, 1880

Reproduced from *The New York Daily Graphic,* March 4, 1880, p. 38. The earliest direct reproduction of a photograph appearing in a daily newspaper.

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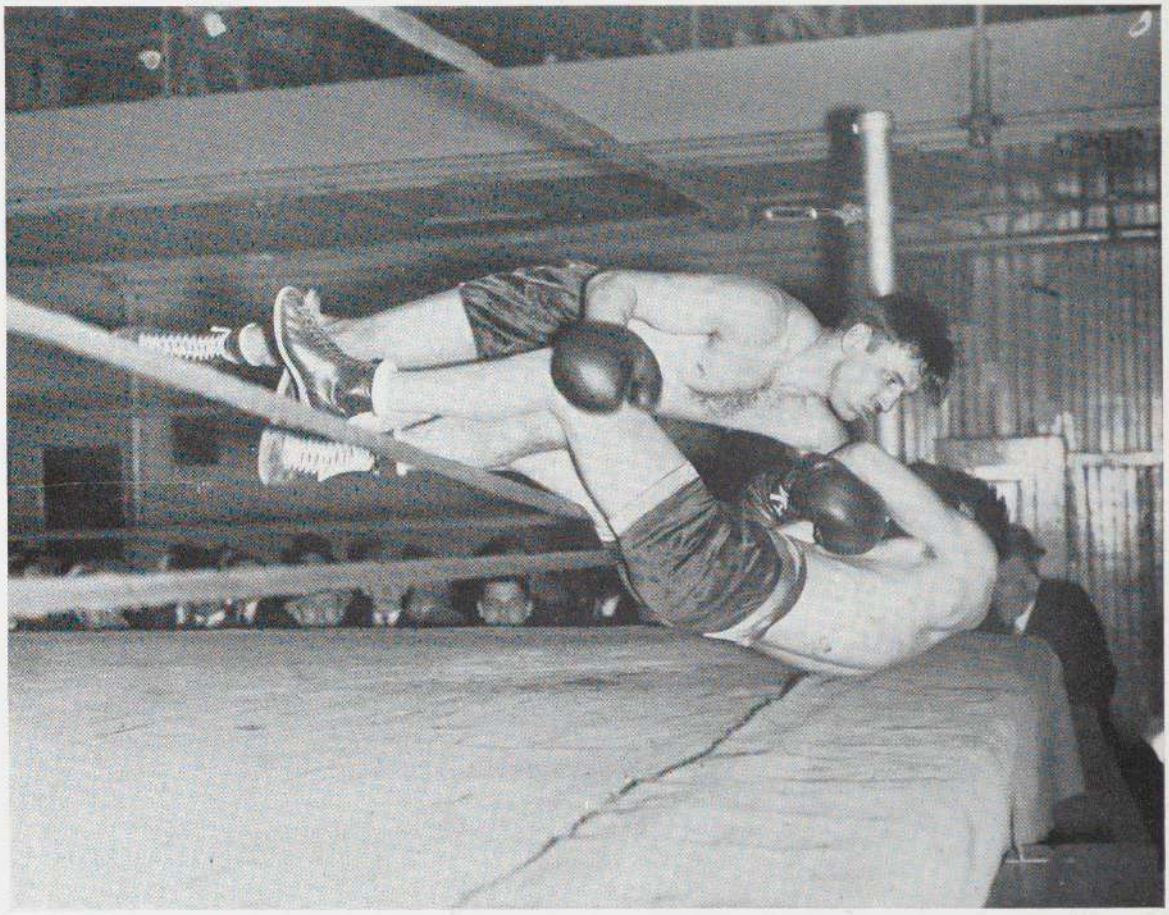
Plate 81 ROTH: A Land Tanker Explodes, 1936

Courtesy *The Bergen Evening Record*. Speed Graphic Camera, plate 4 x 5 in.; stop, F/4.5; speed 625

645

Plate 82 WARNECKE: The Shooting of Mayor Gaynor, 1910

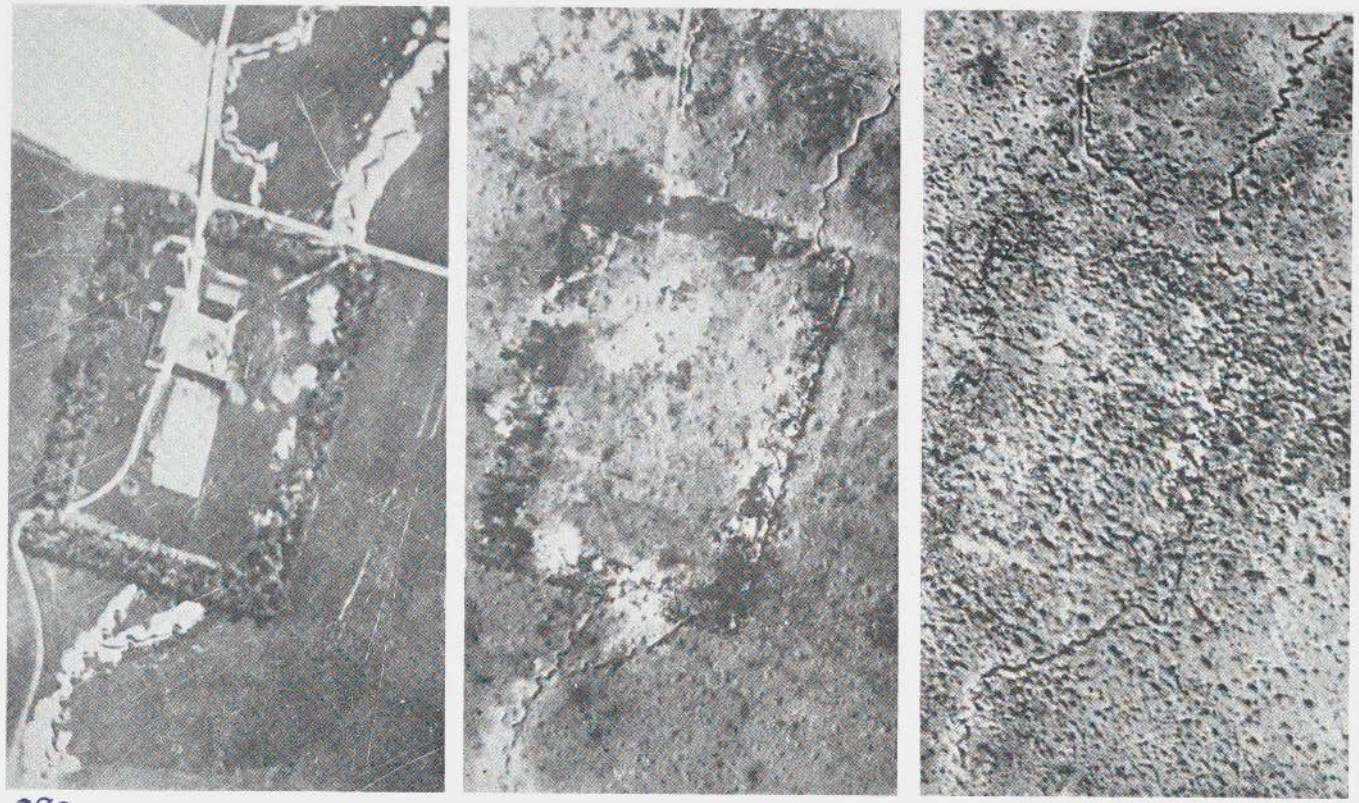
Courtesy *The New York World-Telegram*. Zeiss Ica camera; plate, 10 x 15 cm.; stop, F/8; exposure, 1/100 sec.



640

Plate 83 OLEN: "Powerful K.O. Punch Sends Victor and Vanquished Flying out of Ring"

Courtesy *The Daily News*, New York. Ernemann camera; film, 9 x 12 cm.; stop F/1.8; exposure 1/200 sec.



789

Plate 84 UNKNOWN PHOTOGRAPHER: Progressive aerial photographs of a bombardment, World War

779

Plate 85 McLAUGHLIN AERIAL SURVEYS: Downtown New York

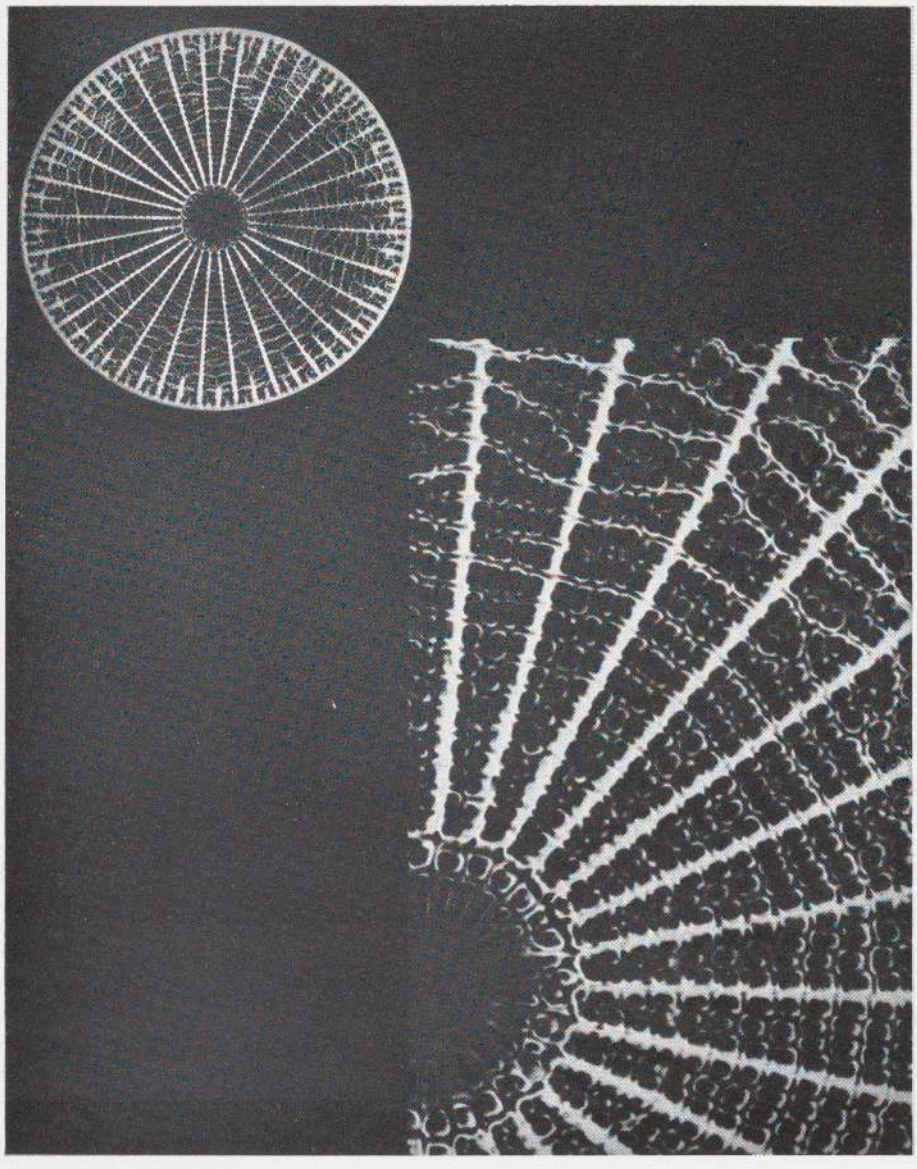


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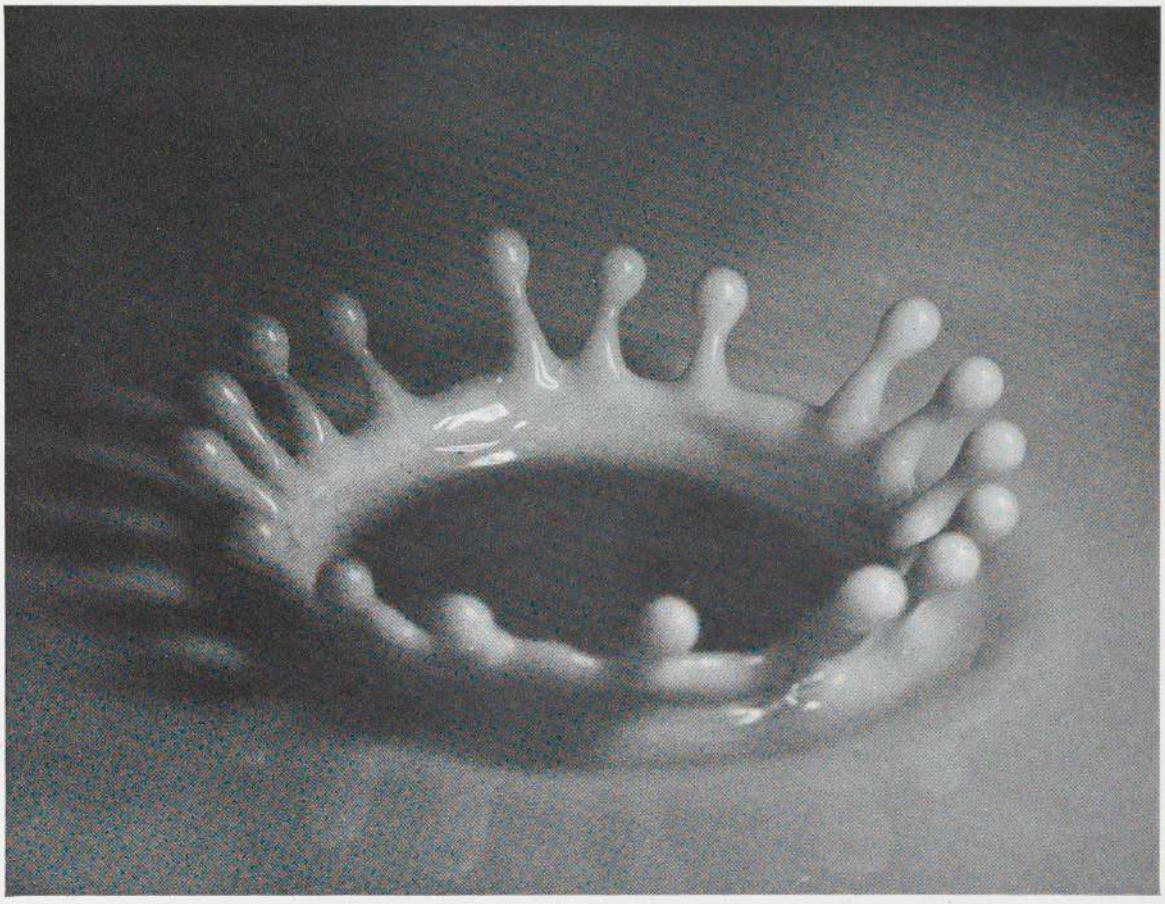
Plate 86 ALBIN-GUILLOT: Diatom

Photogravure from Albin-Guillot, *Micrographie Décorative*, Paris, 1931, pl. XVIII



795

Plate 87 EDGERTON, GERMESHAUSEN, GRIER: Drop of milk splashing into saucer of milk

Stroboscopic photograph; exposure about 1/100,000 sec.

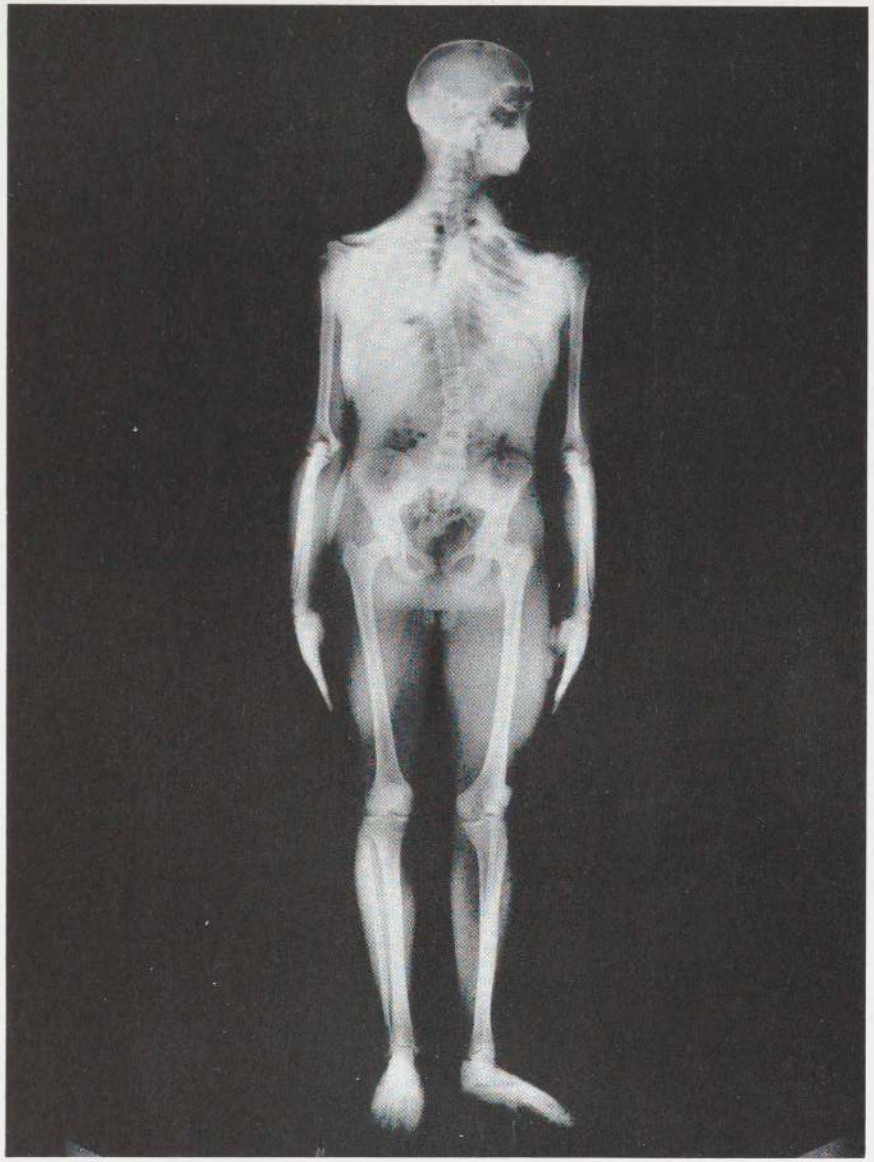


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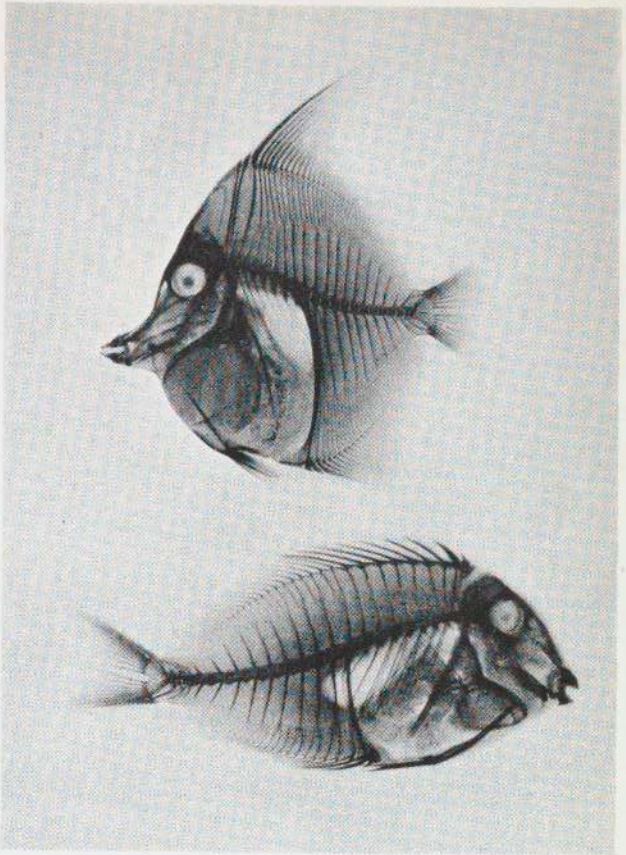
Plate 89 EASTMAN KODAK MEDICAL DIVISION: Living person

X-ray transparency (radiograph)



760

Plate 88 EDER and VALENTA: Fish, 1896

X-ray transparency (radiograph)

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Plate 90 CLARK: Bands of cirro-cumulus, 1936 or earlier

Meteorological record. Ernemann folding camera: Ilford panchromatic process plate, 4¾ x 6½ in.; stop F/.8; exposure, 1/20 sec.; Ilford yellow (minus blue) filter

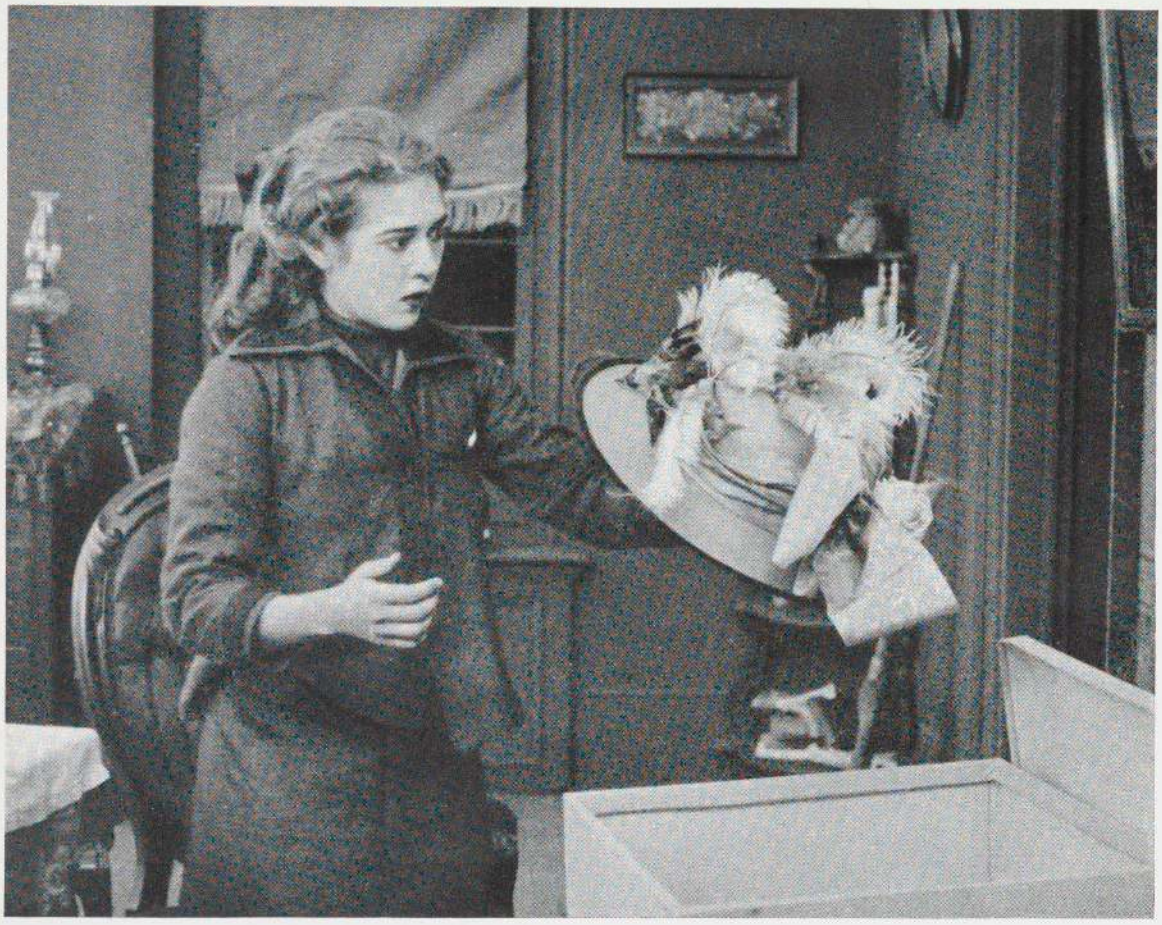

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Plate 91 *The New York Hat,* 1912

Still from the moving picture with Mary Pickford. Direction: David Wark Griffith. Photography: George William Bitzer. Enlargement directly from one frame of the film.

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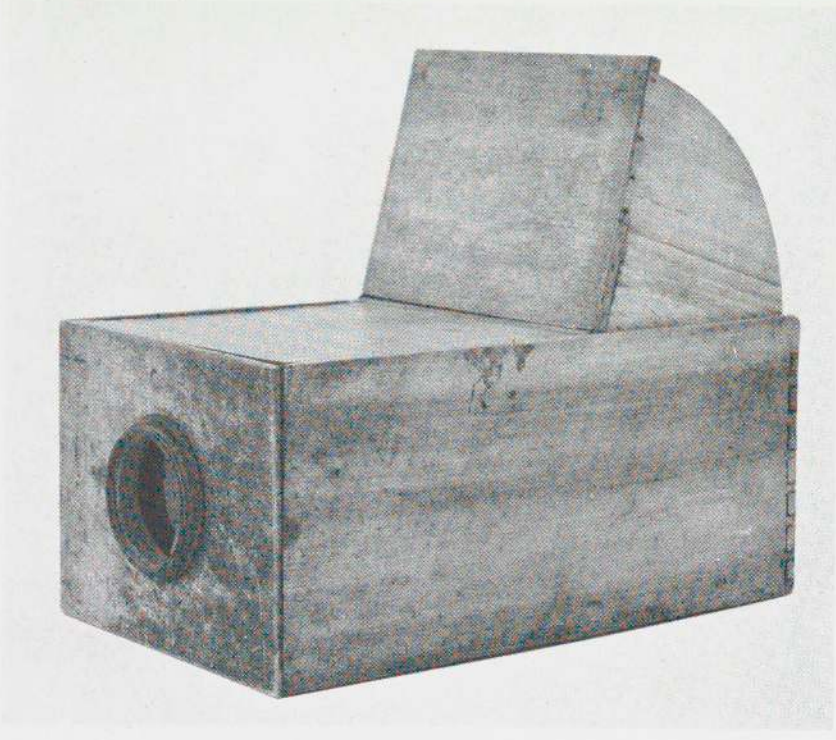
Plate 92 *Armored Cruiser Potemkin*, 1925

Still from the moving picture. Direction: S. M. Eisenstein. Photography: Edward Tissé



3

Plate 93 Camera obscura, late 18th century

Simple lens; image reflected to ground-glass on top of camera, covered with an adjustable hood

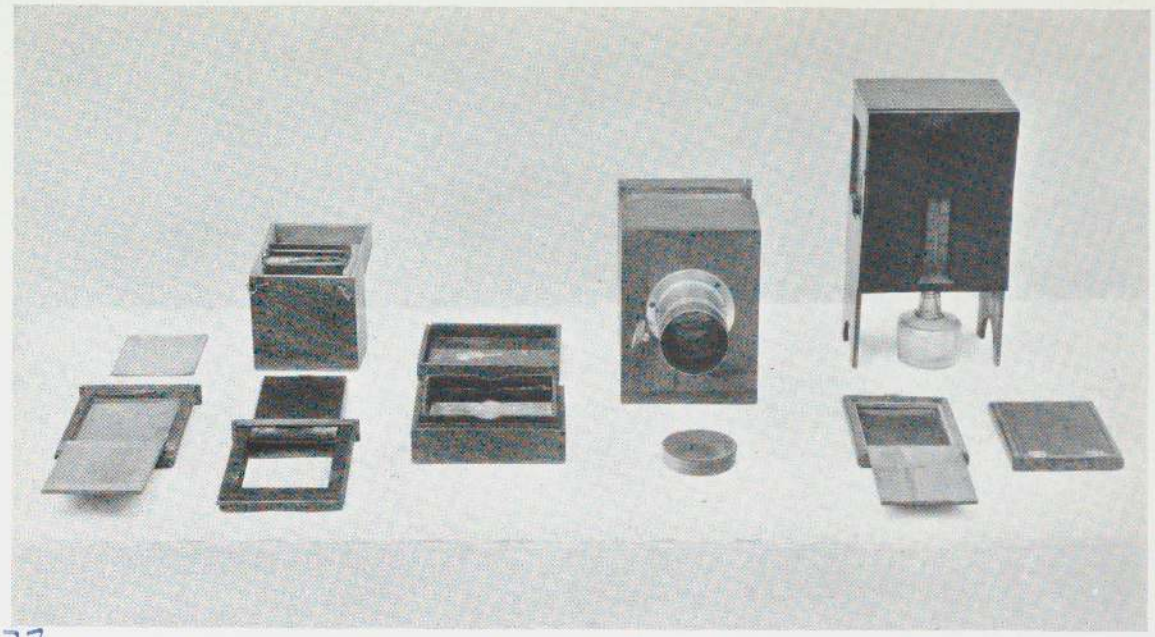


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Plate 94 Portable Daguerreotype Outfit, about 1843

Camera, with telescoping body and ground glass back, for plates 3 3/16 x 4 3/16 in. fitted with double Chevalier lens dated 1843. Two plate holders. Box for carrying plates. Iodizing box. Holders for exposed plates. Developing box with alcohol lamp.

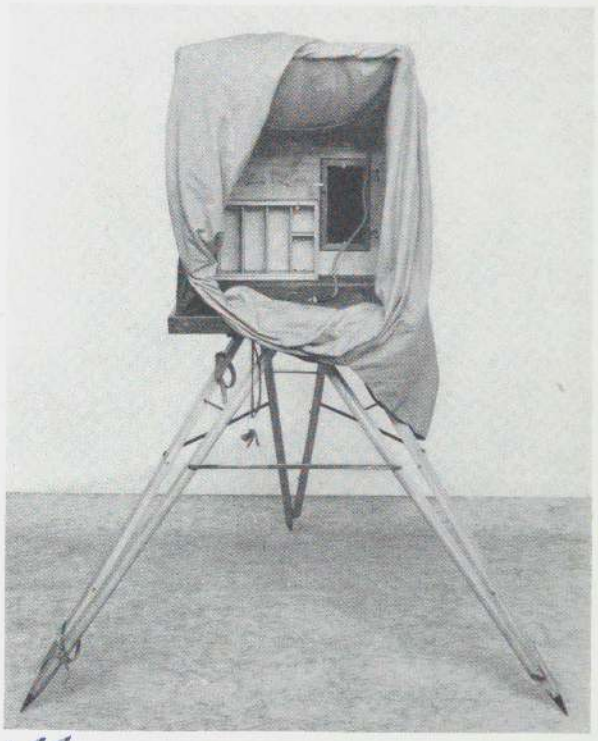

Plate 95 Dark tent for sensitizing plates, *c.* 1865

Photo courtesy The Science Museum, London

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