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The Photo Miniature

PHOTOGRAPHY BY FLASHLIGHT

The Field and Its Possibilities; Various Forms of Flashlights; Apparatus; Flashlamps and Powders—Magnesium, Aluminium and Compounds; Different Classes of Subjects and Their Treatment, Etc. Notes and Comment . Books and Prints.

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The Photo-Miniature

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Photography by Flashlight

Since the publication of No. 29 of THE PHOTO-MINIATURE in 1901, the popularity of flashlight photography has made great progress amongst all classes of photographers, and as I find there is a strong demand for further information on the subject, I propose to devote the present monograph to a résumé of the chief advances in practical work which have occurred in the last seven years. The subiect will be brought up to date and most phases of it treated by the light of recent experiences. It is over forty years since the first photograph was taken by the illumination obtained from the combustion of magnesium, and today, as then, the problem before the photographer is how best to utilize that and its allied illuminants so as to dispense with daylight in his work, while at the same time he calls into use the simplest forms of apparatus in which to control these artificial substitutes for the solar rays.

The suggestion of Bunsen and Roscoe in 1859 that the magnesium light could be used in photography led to the introduction of a thin wire composed of the metal, and later the wire was made in the form of a ribbon. As I pointed out in No. 29 of this series, Brothers of Manchester copied engravings and took portraits and subterranean stereographs in this manner, and the late Prof. C. Piazzi Smyth also photographed the interior of the Royal Chamber in the Great Pyramid with magnesium. The ribbon subsequently gave place to the powder and many lamps were devised for its use. Then the magnesium itself was improved, changing from a coarse granular

mixture into a smooth powder of fine consistency. The plain magnesium is used today by many photographers in preference to compounds on account of the danger presently to be referred to, which attaches to the latter bodies. The flashlight compound was a product of the late sixties. It was prepared by mixing powdered magnesium with potassium chlorate and a metallic sulphide, such as antimony. The admixture of highly oxidizable substances with the magnesium increases its luminosity: and so flashlight compounds find adherents amongst practical men who claim for them greater combustibility, more intense illumination and less dust and smoke than magnesium alone will give.

Various Forms of Flashlight

Magnesium, then, is available in the powdered or ribbon form; it can be used alone or in combination with other sources of light, such as daylight, oil, gas, electricity, or acetylene. This also applies to aluminium. You can ignite the powder by itself: that is, in a simple heap or number of heaps; or through the media of ribbon, pellets, candles, touch papers, impregnated sheets of paper and in lamps of varied design. Its amenability to diversity of application is greater than that of the sun, electricity, acetylene or other sources of light, inasmuch as domestic interiors, at-home portraiture, studio portraits and groups, street views by night, architectural interiors, subterranean photographs, industrial works in progress, stores, warehouses, and a whole world of subjects, reveal themselves for treatment quite independently of daylight.

Prolonged Exposures

Note, too, that photography by flashlight need not of necessity be instantaneous. You can prolong your exposure indefinitely, within certain limits, and make intermittent or continuous flashes at will. To illustrate the wide range of possibilities in the system I cite two examples, drawn from my own experience. I have photographed a family group in the fraction of a second with five grains of powder: and I have also used the respectable quantity of thirty-two ounces to get the negative of a theater interior. The most modern development of flashlight photography exhibits itself in the form of an

electric flash-lamp by which one may make instantaneous portraits in the studio.

Rationale of Flashlight

The burning of magnesium in a bell jar of oxygen is a familiar class-room experiment. An intense bluish white light is produced and the compound known as magnesium oxide forms the residue of the combustion. This is the fundamental principle of flashlight photography. Atmospheric air not being pure oxygen—it is, of course, known to all that it is diluted with another gas, nitrogen—we get a light of diminished brilliancy when the magnesium is burnt in the ordinary atmosphere, and so various bodies are mixed with it in order than its actinic efficiency may be increased by the presence of oxygen and other accelerators, if I may so term them. For, as Mr. Rau, of Philadelphia, long since pointed out, anything which increases the heat of the burning magnesium will also increase the actinic light. The ribbon or wire burns comparatively slowly when ignited in the ordinary air, because the supply of oxygen is diluted; but it glows brilliantly when burned in a jar of pure oxygen. Hence, bodies which quickly and readily supply it with oxygen during its combustion increase its energy. But this increase of energy introduces the element of danger, or, in other words, the explosive catalytic, chlorate of potash.

Dangers in Mixtures

Chlorate of potash by itself is a harmless substance, but when it enters into flashlight compounds it becomes potentially explosive, although the other ingredients of the mixture may by themselves be perfectly harmless. The danger steps in when all are mixed together and subjected to concussion, so that, in compounding flashlight mixtures containing chlorates or oxygen-forming substances, all the ingredients should be powdered and dried separately, mixed together at the time of using, and then only in quantities for a single flash, as many of them are liable to go off spontaneously and when least expected. The mixing should always be done on a sheet of paper, with a slip of thin cardboard as a spatula; and even then used at arm's-length, so that if an accident happens no great injury will result. In this

monograph, however, I refrain from advising the preparation of flashlight mixtures and prefer to deal throughout with the commercial productions only.

Rapidity of Combustion

An essential condition for the rapid combustion of the powder is that nothing should intervene between the oxygen of the air and the surface particles of the metal. If, however, the metallic powder (and especially so when it is finely comminuted) is exposed to the atmosphere through being kept in a badly corked bottle, or screwed up in a piece of paper, the surface of the aluminium quickly gets covered with a coating of oxide, which, though it may be slight, will seriously interfere with its ready combustibility. A similar difficulty has been traced to a slight coating of grease rendered adherent to the surface of the particles in the process of manufacture. It has been proposed to get rid of this by heating the powder in a closed crucible provided with a small outlet to drive off the slight products of this oily matter. A simpler plan, perhaps, would be to digest it with benzol to dissolve away the grease and then to quickly dry and store it in air-tight receptacles.

Aluminium

Aluminium, I may point out, has one great advantage over magnesium. The latter in its finely powdered state readily tarnishes and becomes ineffective, so that when the other constituents of the flash powder attract moisture the magnesium must be protected from damp. On the other hand, aluminium powder will keep indefinitely at the ordinary temperature without oxidizing. But it must be in a very fine state of subdivision to be of photographic service, for whilst coarsely powdered magnesium is easily ignited, aluminium must be of the consistency of silver bronze —flour-like to the touch — before it will properly burn in gas or alcohol. It is found that a mixture of aluminium with magnesium in the proportion of 1:3, the other components remaining the same, gives an excellent flash powder. How quickly do these illuminants burn? In other words, what is the duration of a flash in normal circumstances, such for instance, as studio work? This question, of course, is one which can be answered only in general terms.

Duration of Combustion

The duration of the combustion in the case of magnesium powder, pure and simple, may reasonably be considered as a time which elapses between the arrival of the powder at the margin of the lamp flame — for the purposes of the illustration I assume that a stand lamp is being used— and its arrival on the other side of the flame. Granting a flame of the dimensions of four inches in height or breadth, I do not think I should be far wrong in roughly estimating that the exposure would be $\frac{1}{10}$th to $\frac{1}{90}$th of a second. In taking portraits, therefore, with so brief an exposure as this, it is improbable that the shock caused by the sudden flash could influence the nerves which control the expression quickly enough to allow them to alter before the flash was over.

The Camera

These preliminary considerations take us to a brief study of the apparatus and accessories essential for flashlight work. The camera ordinarily employed is the one to choose for flashlight work; but I, personally, prefer an instrument with a focusing screen; a spirit-level; a time and instantaneous shutter; and a stay for holding the tripod firm and steady, especially on a smooth floor. It is a fine safeguard against accidental kicks. Nothing is so annoying to the photographer as to find when he has made ready that a push or a kick has disturbed the apparatus. It does not sweeten the temper.

The Lens

I have nothing to say against the common advice that the lens in current use will probably answer the ordinary requirements of the flashlight photographer, but I insist that large-aperture lenses of anastigmatic form are, whenever obtainable, especially to be desired, as with the valuable property of rapidity of working they combine flatness of field, two obvious advantages where fine definition is sought. Portrait lenses of high intensity are, for their own special work, not to be excelled. On the other hand, lenses whose largest effective aperture is *f*/8. meet, it is true, most normal needs; but, for all that, the anastigmat affords such a valuable extra power that when you can get hold of one, do so; keep it, and use it. You will find it of great help on many occasions.

Focus of the Lens

The use of as long a focus lens as possible is advisable in small interior work by flashlight photography on several important grounds. One well-known worker points out that the two chief points on which the success of a flashlight photograph depends are, first, the use of a long-focus (i. e., narrow-angle) lens, and, second, the employment of two heaps of flash powder simultaneously ignited. These two things are very seldom paid attention to, and that is why flashlight photographs are usually so bad. A wide-angle lens is always bad for figure subjects. But, when out-of-doors, the amateur is frequently far enough away from his models for its wickedness to be inconspicuous: In a room he is brought close up to them, and then the wide-angle perpetrates its atrocities. Of course, the perspective given by a wide-angle lens is quite as accurate as that of a narrow-angle one. Its only fault is that it takes in a wider angle than the eye *sees*. It is true that the image on the retina is of a wider angle than that given by any wide-angle lens. But we *see* only a little bit in the middle of it—a narrow angle—and, if you cut a portion out of the middle of a picture taken by a wide-angle lens, the so-called "unnatural" perspective will be found to have disappeared.

Plates

Use extra rapid plates, and, wherever practicable, let them be backed. I write of plates but I wish it to be understood that the term embraces films. Plates or films—they should be of extra rapidity. It is axiomatic that the one thing most to be aimed at in flashlight work is rapidity and accuracy of exposure. In order to reach that end, large aperture lenses and rapid plates should be given a front place in the list of things the flashlight photographer mostly needs. I found them of enormous advantage in flashlight stereography of which at one time I made a speciality. The lenses I then used were Ross Symmetric Anastigmats working at *f*/5.6. The plates were Imperial Special Rapid, 200 H. and D. approximate. Flash cartridges sold by York Schwartz supplied the light. I took groups of from 3 to 10 persons in my dining-room, which measured 20 feet by 18 feet: and I got satisfac-

tory results by the ignition of a single flash cartridge. The lens I used when the 32 ounces of magnesium were burnt in the theater worked at *f*/6.3, and I was glad of its extra illuminating power. Eight lamps were distributed about the dress circle of the theater, which held 2,500 people, and the single flash gave me on development with metal and hydroquinone a well-exposed negative of the auditorium and proscenium on a 10 x 12 plate. A lens shade will prevent extraneous light from striking into the objective. Once more as to plates: Seed's Nonhalation Orthos are old favorites of mine; and I constantly use Hammer's and Cramer's. But if you already have a favorite plate in regular use it is wise, in the phrase of the time, to hang on to it.

Backgrounds, Screens and Reflectors

For small groups and portraits, which are often attempted by the worker in a humble way, one or two neutral-tinted screens and backgrounds are necessary. These may be either of paper or fabric. As deep shadows are to be avoided, reflecting surfaces of sheets of white paper or cardboard for directing light on to dark patches of the picture, if it be a domestic interior, should be at hand. The background should be darker in tint than the screen, and the latter need not be white, as is so often advised. If it is gray or brown, then the background must be distinctly the darker. There must be a marked contrast in tone or color between the two. The reason for this is that their functions are, to some extent, complementary. For the screen lightens up the shadow side of the figure or group, and the background throws it into relief. Avoid flatness as you would hardness. Do not forget, too, that in most cases you will be throwing your light down on to your group or sitter, and that heavy shadows will obtrude themselves in the lower part of your picture if some light be not directed there by means of white-surfaced reflectors inclined toward the natural shadows from a point situated outside the field of the lens. The use of a diffuser, too, between the light and the subject, if it be a portrait, obviates hard lighting and want of detail in the shadows, and prevents over-exposure in the high lights of the picture.

Lamps

The choice of a lamp is not an easy matter, simply because of the bewildering variety offered by dealers. We must know what we want. The essential features of any flashlight apparatus are as follows: It must offer a simple means of securing complete combustion of the powder used; it must give the maximum light efficiency with as little smoke and dust as possible; it must be portable, simple in manipulation and readily adjustable to any desired height.

Looking over the flashlight apparatus commercially available the various forms may be grouped in three classes. First, the simplest form of flashlight, such as the Eastman flashsheets, Flash cartridges, the Mills cartridge and the like. These contain a definite quantity of powder, can be used only once, and are ignited with a match, taper or fuse. Flash cartridges fitted with a time fuse, or used in a flash pistol or other equally simple form of holder and ignited by pressure on a trigger, are among the best of these varieties. Such apparatus is capable of a wide range of work, and, skilfully used, will produce satisfactory results, but obviously has a limited capacity.

Hand Lamps

Next we have hand lamps, designed for use in the hand but offering a larger capacity for serious work than the simpler forms already considered. Broadly speaking, hand lamps fall into two distinct classes: Those intended for use with pure magnesium only, and those intended for use with compound or explosive powders.

Magnesium lamps are usually, but not always, spoken of as magazine, closed, storage or blow-through lamps, the magnesium powder being stored or held in a reservoir or container, and, at the moment of ignition, blown through the flame in a fine spray. Thus a continuous "flash" or flame of a few seconds' duration may be made with a single charge of powder. Obviously, an explosive powder cannot be stored in any closed container or handled in close proximity to flame. Hence the rule: Never use anything but plain magnesium in a closed, or magazine, or storage lamp, even though it be described and sold as a "flash lamp." The *Prosch*

Storage lamp, the *Peerlees*. *Perfection*, *Newlite* and *Crown* lamps are good examples of this class. Lamps made for use with "flash powders" or, more properly, compound powders, are known as open lamps, the powder being spread or heaped on the open pan or tray (not confined). Such lamps require to be recharged for each flash. They differ widely in form and capacity. The *Luxo*, styles A and B, *Nichols Junior*, and *Spredlite* lamps are examples of this second class, using compound powders.

Stand Lamps

Stand lamps, or flashlight machines as they are often called, are generally intended for use with compound powders, and come in many different forms. Essentially they consist of a flat or curved metal powder-pan, mounted on a metal standard of light construction, and adjustable at any desired level within certain limits. In such lamps the compound is spread or heaped on the tray (according to the design of the apparatus), the charge being ignited by means of a percussion cap exploded by trigger operated by pressing a bulb, as in the *Eagle* flashlamp; or by blowing a small alcoholic flame through a blast tube, as in the *Nichols* lamp; or by blowing the compound into the flame of an alcohol lamp or series of lamps set in a row, as in the *Luxo* lamp, styles C and D. More elaborate forms are operated by electrical connection, this lending itself to the grouping of several lamps in batteries. To this class belong the Pingree and Thayer lamps used by commercial workers.

Choosing a Lamp

In the choice of a lamp the reader will naturally be most largely influenced by his probable use of the apparatus. Roughly speaking, almost any of the lamps in the market will meet all reasonable requirements for home work, small groups or interiors. In more serious work, where large groups and important social events are attempted the question of relative efficiency is a matter of vital interest. Simplicity and certainty in operation are desirable here, but the chief point is illumination — the larger the area of the flame the greater the efficiency of the lamp. Thus with some lamps a charge of ninety grains of powder will give a larger light area than can

be obtained by the use of half an ounce of powder with other lamps. In this detail, unfortunately, experts agree to differ, some preferring one and some another form of lamp construction as giving the desired flame area. The shape of the powder-pan plays an important part in the distribution of the flame: thus, some lamps give an extended flame about fifteen to twenty inches high, this wide distribution of the light tending to soft and diffused lighting effects; others, such as the *Eagle* lamp, "bunch" the light, giving a flame area about forty inches square, this area being secured in the case of the *Eagle* lamp by means of a powder-pan of peculiar design. In the *Nichols* lamp the arrangement of the powder-pan and its shield is such as to give a light area especially adapted for portraiture and small groups. The flame area given by a lamp is also of interest as influencing the size or capacity required for its use in a smoke-bag or the distance at which one must work in rooms hung with combustible draperies or curtains.

Avoiding and Removing Smoke

The avoidance and removal of smoke is one of the little difficulties in flashlight photography, which the worker on a small scale can easily surmount. Mr. F. J. Mortimer, in his book on magnesium-light photography, points out how a piece of apparatus can be easily constructed by the photographer himself, which will be found useful at times when the smoke nuisance has to be avoided. It takes the form of a square box, and no better type of box can be suggested for conversion than an ordinary tin biscuit box. The cover is removed and its place taken by a sheet of plain white glass sliding in grooves, or, if the whole of the middle of the cover is cut away, leaving only a narrow rim, this can be used to hold the glass in position. The box is used on its side, with the open end pointed at the object to be photographed. A small flap door opening outwards is necessary at the back to allow of the expulsion of air after the flash, This should have a loose hinge, and be weighted so as to fall back quickly and trap the smoke. Either flash-powder on gun-cotton or a flash-lamp can be used inside the box, and after the flash it can be taken out into the open air and the smoke allowed to escape.

It is then ready for use again, or a couple or three can be kept going if a series of photographs are being taken —as for instance at a fancy-dress ball, when each guest is photographed separately in an ante-room. If flash-powder is used, it can be ignited by inserting a lighted taper through a small hole in the side of the box. If a lamp is employed, the rubber tube can be led out through a similar aperture.

Smoke-Bags

The production of flashlight photographs of banquets and other gatherings of numbers of persons, is surrounded by many drawbacks, not the least of which is the diffusion about the hall or building of the gases, smoke and magnesic oxide evolved by the flash. Indeed, the discomfort and inconvenience caused in this manner, not to speak of the assumed danger, has often laid a prohibition upon the work so that it is no uncommon thing to hear that it is forbidden in many public buildings to obtain flashlight photographs of important gatherings and ceremonies. But the use of a smoke-bag for trapping and disposing of the products of combustion generally obviates such restrictions; the well-known smoke-bag systems of Lawrence and other photographers meeting, as our readers know, with great success. A smoke-bag, besides diffusing the light, overcomes the evils of smoke, smell and dirt, and should be an essential item of the professional flashlight photographer's equipment. Smoke-bags are placed on the market by several firms, including the Prosch Company and the Crocker Company, of Chicago. The latest form of the device is the Eagle Flash-Bag (George Murphy, Inc., New York). By the courtesy of the inventor, Mr. Fraley, I am enabled to place before the reader some details of its construction, which will enable him to make one for himself. The Eagle Flash-Bag consists of a rectangular envelope of close-woven, fireproofed unbleached sheeting, suspended on four cross rods attached to a vertical standard, and having on top a folding flap of peculiar construction which expands with the released gas, smoke and magnesic oxide, and automatically acts as a cut-off from the rest of the bag. After exposure the bag and lamp can be removed bodily from the scene of operations, the

smoke and other products having been completely trapped. The whole apparatus, if neatly made, should be extremely portable and fold up into a small compass.

Making a Bag

To construct such a bag: Provide a wooden or metal standard from four to six feet high, or any desired length. The standard may be of telescopic form and adjustable to various heights. To the top of it affix an inverted juvenile wooden top in which bore four holes, for the reception of the metal cross rods. These rods support the flexible bag, which should be weighted with metal or lead sinkers weighing four or five ounces each to keep it in position. The dimensions of the bag should, of course, be chosen according to the size of the lamp with which it is used. For the Eagle lamp they should be 5 feet wide, 6 feet deep and 3 feet high, the top fold measuring 2½ feet. For the Nichols lamp they should be 4 feet wide, 3 feet deep and 5 feet high, the top fold measuring 2½ feet. The width of the flash-bag should always be 2 feet more than the tray of the lamp. For magnesium lamps the bag should have a closed bottom with an opening in the back, about one foot from the bottom, large enough to allow the lamp to be inserted and held therein during the exposure. Care should be taken to have the bag sufficiently large for the flame. To fireproof the bag, take ammonium phosphate, 5 ounces; common soap, 2 ounces; water, 90 ounces. Soak for half an hour at 120° Fahr., and hang up to dry. Well wash and fireproof the bag after every four or five exposures or it will be clogged up with dirt from the flash-powder and will not pass sufficient light. Not more than half an ounce of powder should be used in the bag.

"Dega" Electro-Flash Lamp

The "Dega" Electro-Flash Lamp, which has just been place on the English market by the manufacturers of Blitzlicht, referred to on page 13, places a new power in the hands of the flashlight photographer. Externally the apparatus resembles a pocket electric lamp. A dry-battery system is contained in the casing and the top being opened, two metallic studs are seen, between which a piece of the fuse wire is stretched, the thickness of this being so adjusted that on pressing the

button of a contact piece at the end of a flexible cord, the wire is rendered incandescent: hence flash-powder piled upon the wire becomes ignited from the bottom. In using the apparatus, the fuse wire being stretched between the terminals and the requisite quantity of "Agfa" powder being piled on the wire, the exposure is made. The complete apparatus with fuse wires, charged batteries, flexible cord, powder, etc., is marketed in England for two dollars and fifty cents.

Compound Powders

In using compound powders, the question of quantity of powder to use becomes one of great importance. Lens aperture, plate speed, and distance of lamp from subject are variable factors which influence the quantity. The largest available aperture of the lens should be used, and the lamp placed as near as convenient to the sitter or group, always, of course, keeping it out of the field of view included by the lens. The use of a screen between sitter and lamp roughly increases the exposure by a third, and consequently proportionately more powder must be used. If screens of two- or three-fold muslin are used, the quantity of powder must be further increased. In "Rembrandt"-lighting a white cheese-cloth screen being placed between the subject and the lamp, with a reflector on the shadow side of the face, two level teaspoonfuls of Luxo suffice, the lens being at *f*/8, extra rapid plates in use, and the camera five feet from the sitter. In "line-lighting," five; in "edge-lighting," three, and in "full shadow" three teaspoonfuls of the same powder are required, whilst for a group of three or four persons, with a white screen between group and lamp, three level teaspoonfuls of Luxo are needed.

A powder for which startling claims are made is the Victor, which, grain for grain, is said to have from four to twenty-four times the illuminating power of other powders. If these claims can be substantiated in practice, Victor should be found of great advantage in flashlight work. Agfa Blitzlicht is a powder of the non-explosive and smokeless variety, with a noiseless flash, and great rapidity of combustion. I note that it has been subjected to experimental test by the well-known authority, Dr. Miethe, who certifies to its properties.

For single portraits, four grains; small groups, fifteen grains; groups of five or six persons, thirty to forty-five grains, and large groups sixty to ninety grains are advised. With a portrait lens for a head-and-shoulder cabinet, one-third teaspoonful of Nichols' Portrait powder is sufficient, a screen being employed. For a group with the lens at *f*/8 and the lamp unscreened, a quarter box of the same powder is sufficient. In using Nichols' lamp and powder for a home portraiture, the lamp should be operated as near as possible to the subject. The amount of powder advised for conventional lightings varies from one-quarter to one and one-half teaspoonfuls, reflectors being used to diffuse the light and the lens being shaded. It is impossible to be definite in dealing with quantities of powder for use in flashlight work, the variation of any one of the factors mentioned exerting a corresponding influence in the calculations, but the foregoing data will be found safe guides in practical work.

Oxy-magnesium

A little known application of magnesium to flashlight purposes is its association with compressed oxygen. A powerful light can be obtained with the blow-through lamp by using oxygen instead of atmospheric air for blowing the magnesium into the flame. By those who use the lantern and have a cylinder of oxygen on hand, this can be managed by removing the rubber ball from the flash-lamp and making a connection with rubber tubing between the magnesium chamber of the lamp and the nozzle of the cylinder (or regulator). A chemist's spring clip should be used to pinch the tubing half-way, or it may be divided in the middle and joined up again on a small double-ended stop-cock.

Magnesium Powder

In the use of pure magnesium powder it is important to remember that the quantities specified *must be burned*, with an ample supply of air, not half-consumed or wasted. The following table, given by J. H. Crabtree in the *Photographic Monthly* (March, 1906), may be taken as a reliable guide, being based on practical experience. The conditions suppose a lens at *f*/11 and a fairly rapid plate:

Distance of main object	Relative size of room			Grains of Magnesium required
	Length	Breadth	Height	
Feet	Feet	Feet	Feet	
9	15	6	10	15
15	20	6	10	30
20	25	10	10	75
25	30	12	10	120
30	35	12	10	180
35	40	15	10	230
40	45	15	12	300
45	50	20	12	370
50	60	20	12	460
55	65	20	12	560
60	70	30	15	680
65	75	30	15	780
70	85	30	15	900
75	90	40	15	1,020
80	95	40	15	1,200
85	100	45	20	1,340
90	120	45	20	1,500
95	125	50	20	1,650
100	130	60	20	1,850

It is in order, in closing this section, to emphasize the warning: *Never use a compound flash-powder in a closed, storage, reservoir or magazine lamp*—use plain magnesium only.

Study Your Sitter

Trite advice, no doubt, as you should study every subject, no matter what it it is: but it is peculiarly applicable in in the present case. In portraiture pure and simple, make a preliminary study of the head by the ordinary light of the room, if possible, before the exposure is made. Have at hand a properly-lighted daylight portrait and then, by getting your sitter to alter the position of his head so that the lights and shadows upon it will appear in the flashlight picture in the same relative values as they are shown in the daylight photograph, you will get a daylight pose and effect, or a great deal toward it. See that the shadow cast by the nose does not reach below the middle of the upper lip, and that

the shadow also cast by the nose on the cheek is not too broad. So with the high lights. The face should be full of half-tone, blending into the high lights on the one hand and the shadow on the other. If you have made this experiment by the ordinary light of the room or studio, when you come to expose you will be in a way to get a well-rounded, properly-lighted effect without deep shadows or harsh patches of white upon it.

The Eyes in Portraiture

I assume through this monograph that some standard work on lighting is at hand—the book by Mr. James Inglis, for example,—and that you know how to correctly pose and light your sitter or group. But the assumption may be erroneous. Very well. Get the book and study it. Take a special hint, however, as to the eyes of your victims. Whenever possible prevent them from looking straight at the camera or the source of light: so that the startled expression, so common in these photographs, is obviated. Let the heads be so inclined that they are looking away from the business end of the room. The next best thing to this expedient is to interpose between the light and the figure or group a screen or diffuser made of translucent paper or similar material. This you can have stretched on a light wooden frame and held or supported at such a point that the flash is made directly behind it. This will prevent the rays of light from striking into the eyes of the sitter. In large groups, in halls, theaters, public buildings, etc., this hint may be disregarded. Here your camera and source of light are many feet or yards away from the nearest individual and the confident operator may go about his work quite indifferent to such matters. Sometimes the eyes of the sitter are closed in the photograph: this is due to the fact that the exposure was made in darkness and the sitter startled. The ordinary illumination of the room may be turned down during flashlight work.

Closing of the Sitter's Eyes

In a recently published monograph on magnesium-light photography M. Albert Londe, a well-known French authority alludes to the well-known fact that many flashlight portraits show unnatural effects about the eyes. In many cases they appear half-ciosed, in some com-

pletely closed, and in others abnormally large, the last case being of course due to the absence of other lights in the room. The following table by M. Londe proves how short a flash should be not to show partial or complete closing of the eyes :—

	Commencement of closing	Finish of closing
A powder	0.08	0.12
B powder	0.09	0.12
C powder	0.08	0.12
D powder	0.09	0.11
E powder	0.09	0.11
F powder	0.08	0.10
G powder	0.08	0.11

These results were obtained by the aid of the author's chronophotographic camera, which practically consists of twelve lenses in three rows of four each, electrically opened for $\frac{1}{200}$ of a second, with an interval of $\frac{1}{100}$ of a second between each exposure. The ultimate result is that any powder that burns longer than about $\frac{1}{12}$ of a second will not give a natural apearance to the eyes. The powders used were commercial preparations, the exact nature of which was unknown.

Flashlight versus Daylight

We must dismiss a common fallacy from our minds, namely, that flashlight photographs are necessarily distinguishable from those taken by daylight. This is not the case. If, however, the artificially illuminated photograph shows by critical examination of its lights and shadows that it is lacking the softness and harmony of a good daylight picture, the operator and not the system has been at fault. We should be unable to tell one kind of photograph from the other. The photographer, at the outset of his work, must make up his mind that his finished result,—whether it be a portrait, a group, an interior or a special subject,—shall not betray the nature of the light that was used to make it. Magnesium is practically a perfect substitute for daylight, provided it be handled with intelligence and the conditions that dictate its use are carefully studied.

Auxiliary Lighting

Be sure to keep both yourself and your light out of the picture. You are handling light, as it were, in a liquid form and, without sacrificing roundness or modeling,

your object is to direct that stream of light on to your subject so that it is evenly illuminated without the juxtaposition of heavy shadows. Another thing to consider is that daylight or gaslight are useful auxiliaries in flash-light work. If the photographs are made in the evening, and the hall or room is lighted by electricity, so much the better, You can focus by it and its admixture with the flash will help to soften the results. The same reasoning applies to daylight whether in the studio or elsewhere. The combination of natural and artificial light, so far from being mutually antagonistic, is in every respect advantageous. Another feature of combined, lighting is that the exposure is proportionately shortened. Scientifically, too, combined lighting is to be commended as the entire range of spectrum rays is used when daylight supplies the illumination. For, spectrally, all artificial illuminants are more or less defective and so they fail as ideal substitutes for daylight, although in practice their spectral incompleteness may be neglected.

Interiors

No factor in interior photography deserves more serious consideration than the dominant color of the subject, wholly or in part. It is here that the old advice of exposing for the shadows and letting the high lights take care of themselves applies with some force. There are no distinct high lights in the true sense of the term, the range of tone from light wall-paper, curtains, hangings, down to heavy shadows of a dark interior or mahogany-colored furniture being, after all, comparatively narrow. I presuppose that direct sunlight is absent. There may be windows in the hall or room, and the light they pass, if it be daytime, will be of great service, as I have already pointed out. The point to aim at is that the light must be well diffused and such a lamp used as will admit of the burning of a comparatively large quantity of magnesium. Many subjects require a large and brilliant flame to secure an adequate exposure. Obviously the quantity of powder to be used depends upon the size of the interior and other factors, such as lens aperture, rapidity of plate, etc. Here is a rough idea of various quantities which should guide the operator in interior work embracing small halls, shops, stores or the like:

10-foot	distance	light	subject	1	teaspoonful
10- "	"	dark	"	1½	teaspoonfuls
15- "	"	light	"	2	"
15- "	"	dark	"	2½	"
20- "	"	light	"	3	"
20- "	"	dark	"	3½	"
25- "	"	light	"	4	"
25- "	"	dark	"	5	"

Flashlight Candles in the Ball-room

In the winter time, soirées, balls and dinners are much in evidence, and some good opportunities occur for getting excellent effects. I give the details of some of my own experiments in this work. The room is a dining saloon accommodating about sixty persons; cleared for a dance, the same room would hold about eight or ten sets. The apparatus consisted of a whole-plate camera fitted with a whole-plate rapid rectilinear lens of eleven inches focus (the angle thus being rather narrow), stopped down to *f*/11. The plate was sharply covered, but practically one-half only of the room could be taken, the illumination proceeding from two seven-second-flash arc candles, sold by Fuerst Brothers and ignited simultaneously. The plate was found to be fully exposed, and the result was satisfactory. In order to take in a little more of the room, the same lens, at the next attempt, was used on a 8 x 10 plate, which was covered extremely well. Here the angle is wider, the effect better, and for this group the exposure was three of the candles. The working data were: An 8 x 10 Imperial special rapid plate; 6½ x 8½ R. R. lens, working at *f*/11.; exposure, three seven-second-flash arc candles; developer, Imperial standard.

Details of the Room

The better to guide the reader, I will generalize on certain details, shape and size of the room. The operator should have a clear idea as to how much and how little of the room and space he can get on his plate. Therefore, it is unwise to leave everything to be fixed up at the time of operating. It will save trouble and loss of time to set up the camera and make a visual trial of the place in daylight, noting the standpoint of the camera. By placing a temporary assistant here and there we discover

how much we shall certainly get on the plate, and, consequently, where the grouping must be done. For the proper position of the illuminant, one must be largely dependent on circumstances. A small shelf or bracket may have to be put up temporarily on which to place the candles — or other light source — and these should be ignited on a metal surface. A good plan is to have a large sheet of tin and bend this in such a way—"L" shape—so as to make a reflector as well as a safe surface on which to burn the light. It is not safe to leave these matters until the last moment. With regard to lighting, the candles should be above and behind the camera and to the right or left. If, by chance, the light must be somewhat to the front, the lens must be carefully shielded: indeed, in all cases, the more carefully this little detail is attended to the better will be the results. A projecting hood to a lens is never a disadvantage, and in flashlight work is a *sine qua non*. One has only to look through the length and breadth of a room when some function of the kind is in progress, first with the naked eye and again with a paper cylinder intervening, to note the difference in the penetrating power, as I may term it, of the eye in one case, and when looking through the cylinder or tube. In short: use the lens under similar conditions and the result is seen in the clear and distinct delineation of the subjects.

Subterranean Work on a Large Scale

When a subway or tunnel is in progress, one of the first things usually required by the contractors is a photographic record of the work in its various stages. In making exposures of the kind, the photographer, if new to the undertaking, must be guided to a considerable extent by the experiences of others. His first difficulty is of course to decide upon the quantity of powder to use, and the methods of its distribution and ignition. Not long since the head of a large street railway corporation made exposures with lamps that held a pound of pure magnesium. Considering the fact, adds Mr. H. S. Hood, to whom I am indebted for this information, that a magnesium wire $\frac{1}{100}$ of an inch in thickness will give a light approximating 75 candle-power, it will be seen that one pound will give an enor-

mous volume of light. Nevertheless, this quantity of powder was found to be inadequate when blown through a lamp by means of a large bellows and hose. In addition to this it was possible to take only two or three photographs before the lamp was unfit for use, as the brass of which it was made was unable to bear the immense heat caused by the magnesium. Three or four lamps were designed by the photographer, and after being used several times, were overtaken by the same fate. The work in hand was that of photographing a tunnel three quarters of a mile in length.

How It Was Done

Finally, he evolved a mixture that was about half way between a powder of the Luxo type and pure magnesium. It burned fairly rapidly, making a dazzling flame of tremendous power that projected a path of actinic light to a great distance. It was easy to ignite, nothing being required for the purpose but a piece of newspaper and a match, thus dispensing with a lamp. When the camera was in readiness to take the picture, with the plate-holder in and the slide removed, a line of powder was dropped from one side of the tunnel to the other, at a distance of about ten feet from, and behind, the camera. A fuse was improvised from an old newspaper, and when the lens was uncapped, the paper fuse was ignited. When the flame reached the powder, which took only a few seconds, it burned with a slight hissing noise, giving off a flood of light that traveled approximately three hundred yards. The flash lasted from three to five seconds and gave off great heat. The flame was about twenty feet high and five feet wide. Any of the fast-burning powders on the market can be used, concludes Mr. Hood.

Stage Groups by Flashlight

Stage groups in theaters or large halls are two kinds of work that are practically identical. My own experience in this kind of negative-making is confirmed by that of Mr. C. F. W. Sage, a skilful English photographer, who published in "Photography" some notes on the use of the Bayer powder for the work. He had to take a group of a theater and fired one and a half ounces of powder. He used an Imperial extra-rapid plate and a Ross

Rapid Symmetrical lens working at *f*/8. The negative was fully exposed. As to the position of the light, Mr. Sage points out that the great secret lies in having it sufficiently high up. To exemplify this he supplies a rough plan of the hall in which the photograph was taken. The camera was in the center of the hall, the flashlight system was placed on the top of a pair of stairs twenty-five feet high, about six feet to the right of the camera and about six feet behind it. Behind the steps he had a lantern screen suspended from the roof to act as a reflector. One and a half ounces of the Bayer flash powder was placed in a heap on the tin and in the middle of the heap was stuck about one and one-half inches of wax taper with the ends frayed out. He then asked those in the group not to look toward the steps, as the flash would be very brilliant and would probably make them appear with closed eyes. Having lighted the taper he removed the cap and waited for the flash. The causes of so many failures in photographing a large group he summarizes as, (1) inferior powder; (2) the light not being sufficiently high up, and (3) dividing the light. This last he thinks is a mistake. It is better to have one powerful flash of light.

Magnesium Ribbon

A favorite lamp at one time was the "Minasini." I used it for group and interior work, as well as for slow lantern-slide and transparency-making. In this lamp the coil of ribbon was paid out by simple clockwork arrangement, the little machine being held in the hand. The time of exposure was governed by the quantity of ribbon set free from the reel. Such a lamp is, of course, not suitable for large subjects. Ribbon lamps are of comparatively great antiquity—but the system has not survived to any extent. The ribbon itself is quite adaptable for photography at night as it dispenses with the use of special apparatus, and for occasional work is extremely convenient. Portraits and small interiors are the subjects most suitable for treatment. The ribbon should be kept in motion while it is burning, as by that means the sharp outlines of the shadows are softened down, a diffuser being placed behind the ribbon, and the light being prevented from striking behind the lens of the

camera. As with magnesium, the ribbon should be burnt from a position at one side of the camera and behind it. With a time exposure you can burn the ribbon in two portions, one on each side of the camera. As a rough guide to the quantity of ribbon to use: with a domestic interior, having light-colored walls, 6 to 8 feet, would suffice, assuming the aperture of the lens to be *f*/8, and extra-rapid plates in use. The distance of the nearest object I assume to be about 14 feet from the light. At half that distance, 4 feet of ribbon would suffice. As a supplementary illuminant in daylight exposures, the ribbon also has its uses: in dark corners, on heavy old furniture and the like, the light from a few feet of ribbon is of assistance.

The Group

Suppose we are taking one of those small domestic groups that form so large a percentage of the flashlight workers' efforts in the early stages of his career. It is night and the gas or the electric light is on. First pose your figure or group, arrange your reflector and background, if you are using them, and be sure to give a thought to the deep shadow parts of your picture: and lighten them up. Try to make your sitters indifferent to your presence and that of your camera. If you succeed in this you will be fortunate and will make for a result that will have spontaneity of effect written across it. Now focus the picture. If there is no great glare of light and you are using a focusing-screen, a page of printing in large type held in the hand of one of your sitters will assist you in getting a sharp image on your screen. If you are using a focusing hand camera without a ground glass, then use your scale. Now close your shutter or cap your lens and make ready with your lamp, your flash-paper or candle. Choose a position two or three feet behind your camera and have your light by your side. Withdraw the shutter of your plate-holder, uncap your lens and open shutter. Then fire your lamp, paper, bag, or candle as the case may be. After an exposure open a near window so that the smoke may subside with all possible rapidity. This simple method of procedure is expansible in many directions. With dogs, cats or small children it is advisable to make all

your preparations beforehand and trust to the inspiration of the moment for a successful pose and exposure, focusing the chair or seat first of all. The animals soon tire of seeing you handling your camera: whereas, when all is previously ready, their air of natural alertness is the more likely to outlast the small preparations then necessary. See that the light does not impinge on the lens and that smoke from a previous flash is not present in the room, otherwise foggy plates will result. Flatness may be avoided by mitigating too much front lighting and insuring that the flash is made from a point not too low down. For small groups of the kind referred to in this section Eastman's No. 3 Flash cartridges will be found convenient.

For 7 feet distance and light walls and hangings use 1 No. 3 Cartridge.
For 7 feet distance and dark walls and hangings use 2 No. 3 Cartridges.
For 10 feet distance and light walls and hangings use 2 No. 3 Cartridges.
For 10 feet distance and dark walls and hangings use 4 No. 3 Cartridges.

Candle-Light Effect

In candle-light work Mr. Newton Gibson, who has been very successful, recommends the use of a stand camera with a focusing screen. Models and accessories being on one plane permits of the employment of a portrait lens with large aperture: but any lens working at *f*/8 or *f*/11 will do. To make the lamp, procure a piece of wood 2 feet 6 inches long, 1¾ inches wide, and ½-inch thick, with one end rounded and beveled off on one side to 1 inch in width. Having a piece of thin tin, 15 inches long and 3 inches broad, bend this down the center V-shaped, make a few holes ¼-inch from the edge, then tack this on to the beveled edge of the wood 1¼ inches from the bottom. Obtaining another piece of tin 1¼ inches, make a slit in the center to make the magnesium ribbon, edgewise on, a little deeper than the breadth of the ribbon, double this over ¼-inch, make three holes and tack close up to the chimney, bore ¼-inch hole at the other end of the wood 1 inch from the top. Black the chimney and the edge of wood with

dead-black varnish, then cover the other side with black velvet. With another piece of wood, 3 feet long, with a ¼-inch hole in one end, and the edges chamfered off to hold by when in use, bolt to hang loose on the velvet side of the other piece. As soon as the magnesium ribbon begins to burn, open the lens, raise the lamp so that by the time the ribbon is burnt the lamp will be just over the candle flame, then close the lens. With this lamp during the evening in any ordinary room having an incandescent light a little above the camera to focus by, many striking effects can be made, pointing the lens toward some dark corner or open doorway a few feet distant, which acts as a substitute for the black velvet. A typical room for this purpose should be about 15 feet long by 7 feet wide, with a window 3 feet 6 inches by 2 feet 6 inches, with roller blind of white linen and a darker one to keep out bright sunshine. After making all preparations such as backgrounds, model, etc., regulate the blind until the candle gives a shadow round the candle-stick and the exposure is to be made which will require an assistant to manage the lamp or uncap the lens as soon as the ribbon begins to burn. In development, adds Mr. Gibson, the aim must be towards delicacy, high lights and just a little detail in the shadows. As soon as the outline of the lamp begins to show to proceed further would make the negative too dense. Too much daylight gives a flat print; too little too much contrast. The candle must be about the same distance from the lens as the model. Many fail in having the lamp too high; have the light lower than the head of the model.

Firelight Effects

These effects have of late become very popular. They are produced in a simple manner. The subject having been posed and focused, a long and steady flash without smoke must be given. Proceed by taking flash paper (the Eastman flash sheets answer the purpose) in half-inch strips, and attach them to a board about 10 x 18 inches, an inch or so separating the strips. Arrange the strips in zig-zag rows, so that they overlap at each end. The board being placed diagonally in one corner of the fireplace, the lower corner, when

ignited, will make a steady white sheet of flame lasting several seconds, the smoke passing up the chimney. The paper should be ignited by means of a light attached to a long strip; this operation being performed so that your active hand does not appear in the picture.

Mirrors and Their Uses

If there are any mirrors or reflecting surfaces in the field of view, see that you do not photograph yourself, your camera, your light, or anything that is yours in them. Gas globes, or electric-light bulbs should be kept out of the picture, if you are not using backed plates, or you may get halation. That has been my experience; although, on the other hand, with very quick exposures and thickly coated plates or films I have made negatives in which halation has not appeared. But about mirrors: They have their uses in photography as well as their drawbacks. In other words, you can photograph the reflected image or figure or group. Very often it is a convenience to be able to do so. The use of a mirror for this purpose is not a new idea,—very few things in modern photography really are. To proceed: The sitter or groups should be placed obliquely to the reflecting surface, the camera, also, having its position in a like situation on the other side of the room. Roughly, the system forms a kind of triangle, with the mirror as the apex. The light should come from a point behind both sitter and camera. In an ordinary room, a lens of comparatively long focus can be used and distortion of the image thus obviated. You will reverse your lefts and rights by this method, but this need not matter very much if your sitters are not actively using their hands and printed matter is not in the picture. Take care that the light is well behind the camera and that the mirror is clean.

Flowers by Flashlight

The photography of flowers by flashlight is a department to which prominence has been given by Mr. J. H. Crabtree, F. R. P. S. He uses a short-focus lens, preferably an anastigmat, so as to give as flat a field as possible. A special base-board for vertical work, which can be adapted at any angle from 50° to 90°, a right angle of wood, which can also be used as a flower-stand

a few narrow vases, various backgrounds of different shades (large sheets of Nature mounting, attached to a drawing-board), and flashlight powder specially prepared, viz., Bayer's panchromatic time-light powder. Powder-stands are also required, either one to be adjusted at different altitudes, or one three feet, and another about six feet high. Extra rapid orthochromatic and backed plates (about 200 H. & D.) must be used. Briefly: the method is to photograph the flowers vertically: that is, the lens is pointed directly over them, or the flowers may be placed on slanting backgrounds. The powder is fired by means of a cane walking-stick holding a lighted taper. The flowers having been arranged, two flash exposures are given, one to the right of the camera, the other to the left, unequal quantities of powder being used, so as to avoid flatness. Mr. Crabtree's articles appear in "The Photographic Monthly" for March and April, 1907, and should be consulted direct by the reader who desires fuller details of the method. The stern system of compression and condensation followed in the preparation of THE PHOTO-MINIATURE obliges me to deal with Mr. Crabtree's work, and that of many other gifted specialists, in the briefest possible manner.

Christmas Trees

Even such a homely subject as the Christmas tree yields a capital opportunity for flashlight treatment. To proceed: Place the tree in the center of the room and light the candles upon it. Use all the ordinary light of the room and focus the candles. A small stop, say *f*/16, should be used. At the aperture named, and on an extra-rapid plate, the exposure requires about 60 grains of powder. Some workers recommend a time exposure. I have taken photographs of Christmas trees under the conditions specified with complete success. Grouped around the trees have been children and adults: the resulting prints are of lasting interest.

Animals

The faithful dog and the harmless necessary cat must not be overlooked. Good photographs of such subjects have a most engaging spontaneity and alertness of expression. Have everything in readiness before the pet is enticed

into position on the image plane. If the sitter has been accurately focused, then a mass of very fine detail will show in the negative. A moderately large stop should be used, as depth of definition is not sought after, especially in single portraits. On the other hand, when the animal forms one of the family group, the job is usually easier, as the attention of the canine or feline sitter is not wholly fixed upon what is taking place at the active side of the camera.

A Flashlight Developer

The developer I have long used and still recommend is as follows: No. 1. Hydroquinone, 1 ounce; eikonogen, 1 ounce; sodium sulphite, 5 ounces; boiling water, 90 ounces. No. 2. Carbonate of soda, 5 ounces; boiling water, 30 ounces. Dissolve the sulphite in boiling water; add the eikonogen, and lastly the hydroquinone; then dissolve the sodium carbonate in boiling water. These solutions keep well and give good, plucky negatives, suitable for platinotype printing.

An Electric Flash Lamp

Although not strictly part of our present subject, the taking of photographs by the ignition of special compounds, flashlight photography by instantaneous electric exposures in an obvious development of it. The introduction of a special lamp for the purpose, the Jupiter, therefore deserves reference here. This lamp will photograph large groups with an exposure of only a fraction of a second, yet the glare is not disconcerting, because it is interjected into a light that is brilliant already. To describe it briefly, the lamp consists of a reflector, containing eight 32-candle incandescent lamps, with a double arc placed in their center, behind an ornamental-looking diffuser of crinkled glass. The incandescents are used for posing and focusing the arcs for the exposure. The lamp-head has universal motions, and is supported on a stand which can be wheeled about the studio. Posing and focusing by the light of the incandescent lamps is easy, and the double arc, giving very powerful actinic light, can be switched instantaneously, or maintained for an indefinite period. As well-lighted and fully exposed full lengths, and groups of three or four, can be made with $\frac{1}{40}$ of a second, there is seldom

need for the prolonged light. The outfit can be adapted to continuous, alternating, or three-phase current; and it costs, complete, with resistance, switchboard, about two hundred dollars.

Conclusion

In drawing the present number of THE PHOTO-MINIATURE to a conclusion I have only to add that the aim throughout has been to supplement the previous monograph on the subject, and to stimulate interest in a branch of work which is growing in favor with all classes of photographers. At the same time I have endeavored to avoid repeating information already published.

BOOK

The only other work at present available on the subject is *Magnesium Light Photography*, by F. J. Mortimer, F. R. P. S. 1906, 88 pp., 50 cents.