CHAPTER XV.

PHOTOGRAPHY.

Probably no branch of applied science is so familiar to all classes of people as that of photography. The art is practiced by professionals and amateurs with different degrees of skill, varying from that which can produce only a recognizable shadow to that which is capable of securing results little short of perfection.

A great deal depends upon manipulative skill, and much depends upon the apparatus, and, while a camera of fair quality is indispensable, the best instrument obtainable will not compensate for carelessness nor for lack of the finer judgment required in many of the operations of photography.

Since the introduction of the dry plate, the camera and its accessories, together with a few pans and measuring glasses, constitute the outfit with which the operations are carried on.

The lens is a vital part of the outfit. It should be selected with more regard for its quality than its cost.

While photographs can be taken with a single lens, a compound achromatic lens is very desirable. There are many kinds of lenses in use; those having a wide angle and short focus, employed for photographing buildings, street views, near objects and interiors, and those of a narrower angle and longer focus, adapted for views having considerable distance. When only one lens can be purchased, a lens of the latter class is preferable. Lenses of either kind may be adapted to different conditions of use by means of stops or diaphragms with apertures of different sizes.

After acquiring a sufficient knowledge of photography to judge of the capabilities of a lens, the beginner should procure the best lens he is able to purchase. The writer has for years owned "good" lenses, and he might truthfully say "very good" lenses, but recently he has purchased

some of the best lenses of recent construction and the "good" lenses have been relegated to the second-hand dealer.

The marvelous perfection of modern lenses can hardly be appreciated without the actual trial. The new lenses have great definition, flatness of field, surprising depth of focus, and rapidity equal to any demand. They are also non-astigmatic—a characteristic that cannot be overestimated.

Any good camera box will answer, provided it is light-tight. The more expensive boxes with swing backs, rising fronts and focusing mechanism are convenient and desirable. The modern plate holders are easily manipulated in the dark room, and they are not cumbersome to carry. By the use of kits, large plate holders may be adapted to small plates. A small and light tripod may be chosen, but it should have sufficient rigidity to hold the camera steadily.

The cloth used to cover the head while focusing should be light-tight, also waterproof, as in case of a storm it may be used to protect the camera and the plate holders.

The dealers furnish a great variety of plates from which to choose. Beginners will experience the greatest satisfaction in slow plates, as with these the danger of over-exposure is small. Plates must be kept in a dry place and carefully protected from the light. The boxes of plates should be opened and the plates inserted in the plate holders in a perfectly dark room, if possible. If a light is required, a ruby lamp capable of giving a dark red light may be used, but the light must be used cautiously. Probably more plates are fogged in a dark room than elsewhere by needless exposure to the ruby light. It seems hardly necessary to say that the plates should be placed in the plate holders with the film side out, that is, toward the slides. They should be carefully dusted with a fine, soft camel's hair brush before closing the slides.

The camera is pointed at the object to be taken, and adjusted so that the inverted image on the ground glass is in the desired position. The focusing cloth is then thrown over the head and over the camera, and the movable portion of

the camera box is adjusted until a position is found at which the particular object appears sharp on the ground glass. If the image is too large, the camera must be moved back; if not large enough, it must, of course, be moved forward. After focusing, a suitable stop is inserted in the lens tube. This will vary with the light and with the intended exposure. It will be found that the light acts very much quicker on a July day than in December, and that the duration of exposure varies with the hour of the day as well as with the time of year, so that a larger stop must be used or a longer exposure made in winter than in summer, and in the morning and evening than at midday.

The use of a stop gives more detail in the shadows, in consequence of allowing a longer exposure; it also gives greater depth of field. After the insertion of the stops the cap is put on, the plate holder is inserted in its place and the slide withdrawn. Everything being ready for the exposure, the cap is removed and replaced. On a bright summer day, with an achromatic lens, the exposure of a slow plate with the smallest stop will require from three to five seconds, but the time cannot be given with accuracy; it must be learned by experience. With a fast plate, an exposure given by removing the cap and immediately replacing it is sufficient. With a quick-working lens this exposure would be too long. An instantaneous shutter would be required.

If it can be avoided, the camera should never be pointed toward the sun,* but if it becomes necessary, the lens must be shielded in such a way as to afford adequate protection without interfering with the field of view. The best landscapes are secured in the morning or afternoon, the shadows being longer than they are at midday. Photographing on windy days should be avoided, unless the exposures are to be instantaneous. The duration of the exposure of the plate varies greatly under different conditions. Interiors frequently require an exposure of an hour or two, often longer.

For copying from books, engravings or photographs for

* With recent lenses this precaution need not be observed. Some of the best effects are secured by pointing the camera toward the sun.

lantern slides or for reproductions, the ordinary camera box will usually be found too short, but a pasteboard extension may be fitted to the box. For copying, a good achromatic rectilinear lens is necessary. When the work is done by daylight, the camera should be placed with the back or side toward the window, the object to be copied being placed in front of the camera and well illuminated. In this class of work much depends on careful focusing. A magnifying glass of 8 or 10 inch focus is of great utility in this connection. By employing a kerosene or gas lamp provided with a reflector, copying may be successfully carried on at night. The exposures under these circumstances vary from ten minutes to a half hour.

Instantaneous photography is attractive and interesting, but difficult. It should be practiced only when necessary. Time exposures are always preferable when they are feasible. Excellent instantaneous pictures may be taken, however, after a little practice, but success is not always certain.

For instantaneous work, a good shutter and a quick-working lens will be required. The camera is focused in the usual way. A large stop is inserted in the lens tube and a fast plate is used. The slide is removed, and when the object is sighted, the shutter is let off.

The exposure and development of a plate are intimately related to each other; a properly exposed plate may easily be spoiled in developing, while, on the other hand, an unduly under or over exposed plate can never be made to produce a good negative by any process of developing. A perfectly dark room illuminated only by a ruby light with an orange colored glass superposed is indispensable. It should be furnished with a sink and running water, but progress may be made with no other conveniences than a pitcher of water and a washbowl. Several pans of gutta percha, glass, or porcelain are required for developing, fixing, etc., also two graduated glasses and a glass funnel are necessary. A pan should be provided for each kind of developer and one for hyposulphite of soda. The glasses, funnels and pans must be kept scrupulously clean, and the latter should always be used for the same kind of solution.

There are several developers for dry plates. The following is one of the best:

Beach Pyro-Potash Developer.

No. 1.—Pyro Solution.

Sulphite of soda (chemically pure crystals) 4 ounces.
Warm distilled or melted ice water.....4 "

When cooled to about 70° Fah., add:

Sulphurous acid water (strongest to be had).....3½ ounces.
And lastly, pyrogallic acid.....1 "

No. 2.—Potash Solution.

A.

Carbonate potash (chemically pure).....3 ounces.
Water.....4 "

B.

Sulphite soda (chemically pure crystals)..2 ounces.
Water.....4 "

Make A and B separately and then combine in one solution.

For a 5×8 plate, pour into the graduated glass 1 drachm of the pyro solution and ½ drachm of the potash; add 3 oz. water. Mix well. The plate should be lightly brushed clean with a soft camel's hair brush, and placed with the film side up in a pan containing fresh water; soak for about a minute, then pour the water off, and pour on the developer; rock the pan gently, so as to flow the developer evenly over the plate. The pan should now be brought close to the ruby light, and the plate examined. An image should begin to appear within two or three minutes. The plate should be closely watched. The high lights (sky, etc.) develop first, and appear as a darkening of the plate. The other objects

follow. Development should be proceeded with until all parts of the picture show clearly by transmitted light, and until the plate turns gray, and the image seems to fade away. The outlines of the image appear on the back of the plate when it is sufficiently developed. If a plate comes up quickly, say within a minute, it is over-exposed, and should be removed to a pan containing water to which is added a small quantity of developer with the pyro solution in excess, or the plate may be placed in the developer, to which has been added a few drops of a solution containing 150 grains of potassium bromide in 2 oz. water.

In case a plate is very much over-exposed, it will not come up in a long time, and will be worthless. If a plate should not come up in a reasonable length of time, more of the potash solution should be added. An under-exposed instantaneous plate may be started by placing it in a weak solution of potash and water, then developing with an excess of alkali. Fogging is produced by too much alkali.

Over-development produces a hard negative, from which it is difficult to make a good print. Weak negatives having clear shadows, with plenty of detail, but lacking intensity in the high lights, are the result of over-exposure. Too strong high lights with weak shadows are due to under-exposure. Transparent spots (pinholes) are caused by dust, or air bubbles formed in development. If a plate during development is seen to lack detail in places, the development may be forced at such points by applying a large, soft, round camel's hair brush charged with moderately strong developer. The brush is rapidly passed over the portion of the plate to be brought out, care being taken not to touch the other parts. If negatives show too great contrast between the dark and light portions, the developer should be reduced with water.

After development the plate should be thoroughly washed with water and put in a clearing or fixing solution formed of sodium hyposulphite ("hypo") 1 oz., water 5 oz. A very small quantity of hypo mixed with the developer is sufficient to defeat all dark-room operations. Therefore, it must be isolated from everything else, and the hands must